CHAPTER 7

COMPOUNDING IN DISTRIBUTED MORPHOLOGY

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7.1 Introduction

The Distributed Morphology framework attemps to present a fully explicit, completely syntactic theory of word formation. Compounding, prima facie, presents a seemingly paradigm case of morphology-as-syntax. It is productive, and manipulates items which are canonically themselves free morphemes and clearly independent terminal nodes. As shown by Lieber (1992a), nominal compounding in English and other Germanic languages can even include syntactically complex phrases, as in the following four examples from *Tucson Weekly* film reviews by James DiGiovanna:

(1) a. These aren't your standard *stuff-blowing-up effects.* 3 June 2004

b. When he's not in that mode, though, he does an excellent job with the *bikini-girls-in-trouble genre.* 30 November 2006

c. I've always found it odd that the people who complain most about realism are *comic-book and science-fiction fans.* 23 December 2004

d. There's the aforementioned *bestiality and drooling-stroke-victim jokes.* 29 March 2001

Despite the apparently tailor-made empirical phenomena, there have been very few Distributed Morphology proposals concerning compounding, beyond the unspoken assumption of a standard syntactic treatment for noun-incorporation cases like that proposed in Baker (1988), which predates the DM framework itself. Consequently, the following discussion is more of an exploration of the consequences of the DM network of assumptions for various types of compounding, rather than a survey of extant proposals.

The key to understanding compounding in DM is understanding the nature of Roots within the theory. For the purposes of this paper, I will assume that a compound is a morphologically complex form that is identified as word-sized by its syntactic and phonological behaviour and contains two or more Roots:

(2) **Compound**: A word-sized unit containing two or more Roots.

First I will briefly review the structure of the DM framework, with attention to the status of inflectional, derivational, and Root morphemes within it. Then I will consider the implications of the theory for various familiar forms of English compounding, including synthetic argument compounds, synthetic modifier compounds, primary ('root') compounds, and phrasal compounds.

7.2 Background: Distributed Morphology in 2008

In Distributed Morphology, all identifiable morphemes are the realizations of terminal nodes of a hierarchical (morpho)syntactic structure. Abstract feature bundles are manipulated by syntactic operations (Merge, Move, Agree, etc.) into an appropriate tree structure, along the lines proposed by Minimalist syntactic theory (Chomsky 1995a). The derivation of this tree structure at some point splits into two subderivations, one of which fine-tunes the structure further to create a semantically interpretable object (LF), and the other of which adjusts it to create a well-formed phonological representation (PF).

Distributed Morphology holds that the subderivation on the way to PF contains various parameterizable operations with which languages manipulate terminal nodes before they are 'realized' by the addition of phonological material. These operations can adjust feature content, fuse two terminal nodes into one, split one terminal node into two, and even, within a limited domain, reorder terminal nodes or insert extra ones. These adjustments are postulated to account for the many and varied empirical situations in which observed morphological structure is not isomorphic to syntactic structure. Nonetheless, there is a clear foundational

principle at work: where there is a morpheme, there is a terminal node of which that morpheme is the realization.

Terminal nodes come in two varieties: feature bundles and Roots, called in some earlier work 'f-morphemes' and 'l-morphemes' (Harley and Noyer 2000). An agreement morpheme is a typical example of a realization of the feature-bundle type of terminal node. An Agr terminal node may be composed, depending on the language, of person, number, gender/class, and case features. Its phonological realization, a 'Vocabulary Item', is specified for a subset of the features of the terminal node which it will realize. In this way, a Vocabulary Item which is underspecified, containing just a few features, may be compatible with several different terminal nodes, allowing for underspecification-driven syncretism without requiring underspecification in the syntactico-semantic representation. Vocabulary Item insertion occurs in a competition model, to capture the effects of the Elsewhere Principle (Kiparsky 1973).

It is important to note that the features of feature-bundle terminal nodes are in general semantically contentful, as they are subject to interpretation at the LF interface. For example, the [+past] feature which may occupy a Tense terminal node is interpreted as an ordering relation between two events at LF (Zagona 1988, Demirdache and Uribe-Etxebarria 1997). On the PF branch, this same feature typically conditions the insertion of the Vocabulary Item *-ed* (which happens to be a suffix) into the T^o terminal node in English. Similarly, the [+Def] feature which may ocupy a D^o terminal node conditions the insertion of the Vocabulary Item *the* into the D^o terminal node in English at PF, and has a particular uniqueness-presupposition interpretation at LF.

The other type of terminal node is 'Root'.[1] Roots carry the non-grammatical, encyclopedic semantic content of a given message. It is perhaps easiest to think of them as the lexicalization of a pure concept, though their interpretations can vary depending on the syntactic contexts in which they find themselves, as in, for example, idioms. It is thus more precise to understand them as instructions to access certain kinds of semantic information, which may vary depending on the morphosyntactic context of the Root in question.

Root Vocabulary Items are also subject to competition, though much less obviously so than feature bundles. For the most part, a single abstract Root is realized deterministically by a single Vocabulary Item –√CAT is realized by 'cat', √WALK is realized by 'walk', etc. However, certain Roots are realized by different Vocabulary Items in different circumstances, for example, in cases of suppletion.[2]

[1] In tree and bracket notation, the 'Root' category is symbolized by √.

[2] Because of the tendency for a learner to behave in accordance with the Mutual Exclusivity principle when learning content words (Markman, Wasow, and Hansen 2003) – that is, they assume that different sounds have distinct meanings – suppletion in Root Vocabulary Items is usually limited to highly frequent items for which the learner will get a lot of evidence. Suppletion in feature-bundle Vocabulary Items, on the other hand, is much more common, since their content is partially given by UG and they are all highly frequent in any case.

√GO is realized as 'go' in one morphosyntactic context, and as 'went' (or 'wen-', according to Halle and Marantz 1993) in another – that is, when √GO is c-commanded by a [+past] T^o. Siddiqi (2006) also proposes that word-internal alternations like 'ran/run' are instances of Vocabulary Item competition for a single Root terminal node √RUN, rather than produced by post-insertion, phonological Readjustment Rules of the kind proposed by Halle and Marantz.

Roots are acategorical, needing to be Merged in the syntax with a category-creating feature bundle, n^o, a^o, or v^o (Marantz 2001). These category-creating terminal nodes may be null (as in 'cat', composed of $[[\sqrt{\text{CAT}}]_{\sqrt{}}\ n^o]_{nP}$) or overt (as in 'visible', composed of $[[\sqrt{\text{VIS}}]_{\sqrt{}}\ a^o]_{aP}$). Not only that, they come in different 'flavours', i.e. contribute different semantic information, just as, for example, different Tense heads do. The most well-studied head of this type is the verb-creating v^o, which has varieties that mean CAUSE, as in *clarify* (tr), 'cause to be clear'; BE, as in *fear*, 'be afraid of'; BECOME, as in *grow*, 'become grown'; and DO, as in *dance*, 'do a dance'. However, it is clear that other types of category-forming heads may have different semantic features too. The a^o head can mean at least 'characterized by' as in *care-ful*, *comfort-able*; 'able to be', as in *ed-ible*, or 'like', as in *yellow-ish*, *box-y*. The n^o head has varieties that mean 'the event or result of', as in *concord-ance*, *congratulat-ion*, *mix-ing*; 'the agent or instrument of', *mix-er*, *discuss-ant*; or 'the property of', as in *happi-ness*, *elastic-ity*.

These derivational feature-bundle nodes are, like all terminal nodes, subject to competition in Vocabulary Insertion, so in English, for example, n_{PROP} can be realized by the VI *-ness* or the VI *-ity*, with the winning VI depending on which Root the n^o has Merged with, just as, for example, the Num_{PL} terminal node can be realized as *-s* or *-i* depending on whether it has merged with the nP 'cat' or the (bound) nP 'alumn-'. These constraints on realization are part of the licensing conditions attached to individual Vocabulary Items – morphologically conditioned allomorphy, also called 'secondary exponence', and central to accounting for morphologically based selection effects in the framework.

Category-forming feature bundles can, of course, be stacked: a Root can be merged first with an n^o, then an a^o, then an n^o again, if desired, as in *pennilessness*, $[[[[penni]_{\sqrt{}}\text{-}\emptyset]_n\text{-less}]_a\text{ness}]_n$. Each subsequent merger affects the particular inflectional terminal nodes with which the structure can be combined, since such terminal nodes have their own morphosyntactic and semantic restrictions; Degree nodes, for example, are compatible only with adjectives (aPs); T^o nodes with verbs (vPs), and Num nodes with nouns (nPs).

In the theory, there is no hard-and-fast distinction between inflectional terminal nodes and derivational terminal nodes: they are simply feature bundles containing different kinds of features, subject to morphosyntactic and semantic well-formedness conditions as the derivation manipulates them. The fundamental distinction is between Roots and all other terminal nodes; only Roots refer to encyclopedic semantic content.

A final key point: no feature-bundle terminal node is necessarily realized by affixal phonological material, or necessarily realized by non-affixal phonological material. The 'derivational' feature bundles can be realized by Vocabulary Items (VIs) that are bound (v_{CAUSE} as *-ify*) or free (v_{CAUSE} as *get*), and the 'inflectional' feature bundles can realized by VIs that are bound (T_{PAST} as *-ed*) or free (T_{FUT} as *will*). Similarly, the Vocabulary Items (VIs) which realize Roots can be free ($\sqrt{}$SEE) or bound ($\sqrt{}$VIS); they always occur in construction with a category-creating node, but that node need not be realized by an overt affix.

7.3 Compounding as syntax

As noted above, compounding appears to represent an ideal case of morphology-as-syntax. The phrasal compounds listed above, for example, contain apparently syntactically formed phrases, such as *drooling stroke victim* ($[A\ [N]]_{NP}$) or *bikini girls in trouble* ($[[N]\ [P\ N]_{PP}]_{NP}$). The central puzzle of compounding for DM, then, is why these complex elements behave as apparently X^0 units in the phrasal syntax, inaccessible for, e.g., phrasal movement, and unavailable as a discourse antecedent for pronominal reference? Why are they subject to special phonological rules?

The answer given by Baker for noun-incorporation cases – syntactic head-to-head movement – forms one key part of the answer. Compounds are formed when Root(-containing) heads incorporate. I will follow Baker in assuming that this accounts for their behaviour as syntactic X^0s (indivisibility, etc.), as well as the impossibility of phrasal movement out of them, and I will argue that this also (indirectly) accounts for the impossibility of discourse antecedence from within a compound.

The other key part of the answer, provided by the DM framework, lies in the idea that compounds are constructed when phrasal elements merge with a Root before that Root is itself merged with a categorizing terminal node. To motivate this idea I will first present a quick analysis of *one*-replacement effects, and then explore the consequences of that proposal for synthetic compounds.

7.3.1 *One*-replacement, Roots, and internal arguments

In Harley (2005), I proposed to use the concept of a categorizing nP to capture the standard English *one*-replacement paradigm, in which arguments and adjuncts behave differently with respect to their inclusion in the antecedent of anaphoric *one*. Given a nominal which can take an argument, such as *student* (*of chemistry*),

the argument of that nominal must be included in the interpretation of anaphoric *one*, while superficially similar adjuncts may be excluded, as illustrated in (3).

(3) a. ?*That student of chemistry and this one of physics sit together.
b. That student with short hair and this one with long hair sit together.

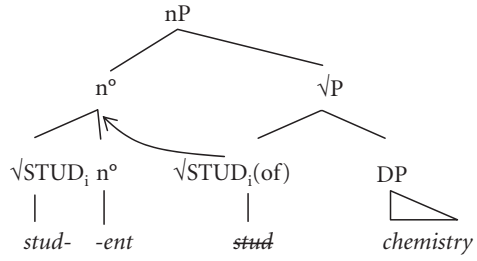
In fact, it seems reasonable to claim that the argument PP *of chemistry* is not an argument of *student* per se, but rather an argument of the Root, √STUD, considering that it is also an argument of the verb:

(4) She studies chemistry, and he studies physics.

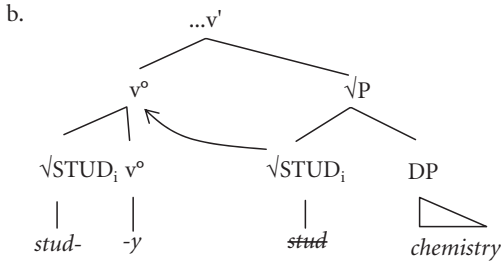
The notion that (internal) argument selection is a property of Roots makes intuitive sense, since it is Roots which contain the encyclopedic semantic information that would differentiate a type of event which necessarily entails an internal argument from one which does not.

If the Root selects for an internal argument, then the Root must merge with that argument before it merges with its category-determining feature bundle. The structure of *student of chemistry* in (3a) is thus that shown in (5a). The Root √STUD first merges with its DP argument *chemistry*. The √P (Root phrase) structure then merges with n°, ultimately realized as *-ent*. The Root head-moves to attach to n°.[3] I assume that the *of* heads a 'dissociated morpheme' inserted into the structure as a Last Resort operation to realize the inherent case of the argument DP, as a DM implementation of the 'inherent case' proposal of Chomsky (1986). The structure of *study chemistry* is given in (5b) for good measure.

(5) a.



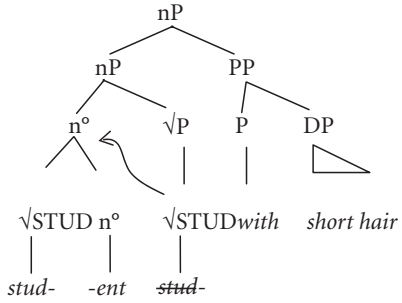
b.



[3] The mechanism of head movement could be either the conflation mechanism adopted in Harley (2004) or the phrasal-adjunction-plus-morphological-merger mechanism proposed in Matushansky

In contrast, the modifer *with short hair* in *student with short hair* in (3b) above does not modify the root √STUD; rather it modifies the nP *student*. The structure of *student with short hair* is thus that in (6), below. The Root √STUD first merges with n° and then head-moves to incorporate into it.[4]

(6)



Given these structures, all that needs to be asserted about anaphoric *one* is that it necessarily takes an nP as its antecedent, not a √ or √P. Given that *chemistry* merges as part of √P before the nP superstructure is added on, *chemistry* must necessarily be included in the interpretation of *one* in (3a). Since the adjunct *with long hair* is merely adjoined to nP, however, it can be included in the interpretation of *one* or not, as the discourse demands; in (3b), the pragmatics of the situation suggest that *with long hair* is not included in the interpretation of *one*, which is understood merely as the simplex nP *student*.

I therefore conclude that the arguments of Roots are merged with the Root before the categorizing terminal node is added. Let us now turn to the consequences of this assumption for synthetic compounds.

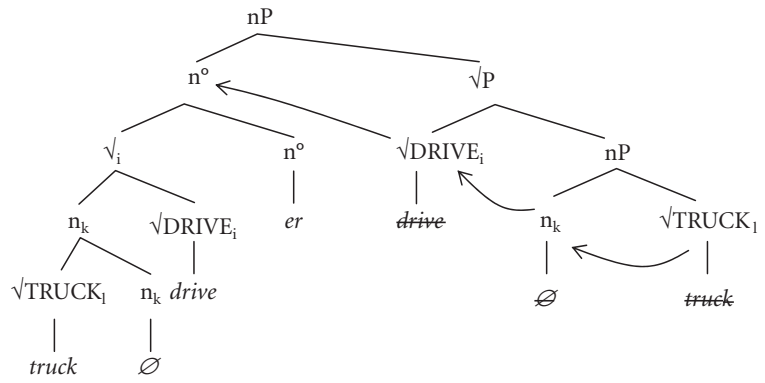
7.3.2 Synthetic compounds

Canonical synthetic compounds are formed when a nominalized or adjectivalized verb and its internal argument appear in an N+N or N+A compound together, as in *truck-driver*, *drug-pusher*, *car-chasing (dog)*, or *grass-clipping (machine)*. Given the conclusions from *one*-replacement above, it must be the case that the complement noun composes with its Root before the Root is merged with the categorizing n° head. The complement noun is of course itself a noun, so it has its own n° head within; as should be clear by now, 'noun' = nP in the present framework. The structure of *truck-driver*, then, is given in (7):

(2006). For the purposes of the present paper, it doesn't matter what technical implementation of head movement is adopted, so long as it behaves in accordance with the standard assumptions about the process.

[4] In fact, under Bare Phrase Structure assumptions, the merger and incorporation of √STUD could happen in a single step; for the purposes of the proposal here, it doesn't matter whether incorporation follows merger or is simultaneous with it.

(7)



The complement of √DRIVE is first created by merging √TRUCK and a nominalizing n^o head; I assume head-movement into n^o from its complement. Subsequently this structure merges as the argument of √DRIVE, and incorporates into it. This incorporation, being syntactic, must be feature-driven. Since incorporated elements satisfy their Case needs by incorporation in Baker's system, let us assume that this feature is Case-related.[5] Finally, the complex head $[[[\sqrt{\text{TRUCK}}]_{\sqrt{}}\ n]_{nP}$ $\sqrt{\text{DRIVE}}]_{\sqrt{}P}$ merges with the categorizing agent-flavoured n^o, and head-moves into that, creating the complex head $[[[[\sqrt{\text{TRUCK}}]\sqrt{n}]_{nP}\ \sqrt{\text{DRIVE}}]_{\sqrt{}P}\ n]_{nP}$, which is then realized by Vocabulary Insertion as *truck-driver*.

If, rather than the nP *truck*, the argument of √DRIVE had been a DP, e.g. *the truck*, or *trucks*, the step of incorporation into the Root would not have occurred and the argument would be stranded to the right of the head, giving *driver of the truck*, or *driver of trucks*, rather than [*the-truck*]-*driver* or *trucks-driver*. One important question, within a syntactically based word-formation framework, is what blocks such DP incorporation, while allowing nP incorporation.[6] We will defer an answer to this question until the discussion of phrasal compounds in section 7.4.1 below.

The evidence of argumental synthetic compounds, then, suggests that compounding occurs when the √-containing constituents of a phrasal √P incorporate first within themselves and then into a category-creating head such as n^o or a^o. Note that *-er/-or* nominals may be formed on bound Roots, as in *groc-er*, *tract-or* or

[5] If incorporation did not occur, some kind of case-licenser would be needed, such as Last-Resort *of* (*driver of trucks*), or some other P^o head. See Larson and Yamakido (2006) for a related proposal.

[6] Conjoined NPs in synthetic compounds, like *car- and truck-driver*, do not, I think, represent the incorporation of a phrasal element. Conjunction by *and* in English is subject to linearity effects, and can operate on non-constituents, like SBJ+V sequences in Right-Node Raising cases, and on subword constituents, like *pre- and post-colonial*, etc. It would be possible to treat these as a kind of conjunction reduction case – *car-driver and truck-driver* – or to search for a way to incorporate them within Phillips' (2003) parser-based account of such constituency-defying coordinations.

brok-er; they need not be formed on free verbs, even when in synthetic compounds, as in *stockbroker*.

It is useful to note that the division within DM into Root and category-creating heads allows us to avoid the most pressing problem associated with this type of structure for these cases of synthetic compounds, namely, the prediction that English verbs should also permit noun-incorporation-style compounding (see e.g. Lieber 2005: 380–1). The claim here is that English Roots allow incorporation into them. They are not yet of any category. In order to become nominal or verbal, they have to incorporate further into a category-creating head, n^o, a^o, or v^o. These heads can have their own restrictions on what may or may not incorporate into them; see discussion below in section 7.4.1.

7.3.3 Modificational synthetic compounds

Another subtype of synthetic compounds, which I will call 'modificational', makes it clear that the incorporated element can be something other than an argument of the root. In these (adjectival) compounds, composed of a deverbal adjective plus an incorporated adjective, the incorporated element is a modifier of the verb contained within the deverbal adjective. Roeper and Siegel (1978) show that this kind of compound can only be formed from verb+modifier pairs where, in the corresponding verb phrase, the modifier would be the 'first sister' of the verb – that is, no internal argument of the verb may intervene. Consider the examples in (8):

(8) a. quick-acting baking powder (It acts quick(ly))
b. fast-falling snow (It falls fast)
c. snappy-looking suit (It looks snappy)
d. light-stepping horse (It steps lightly)
e. odd-seeming sentence (It seems odd)

When the verb has an internal argument, as with transitive *grow* in (9a) below, a compound adjective can only incorporate the internal argument, as in (9b); incorporating the adverb (which is not the 'first sister') is impossible (9c). However, when no overt internal argument intervenes between the verb and the adverbial element, as with intransitive *grow* in (9d), the adverb may incorporate (9e).[7]

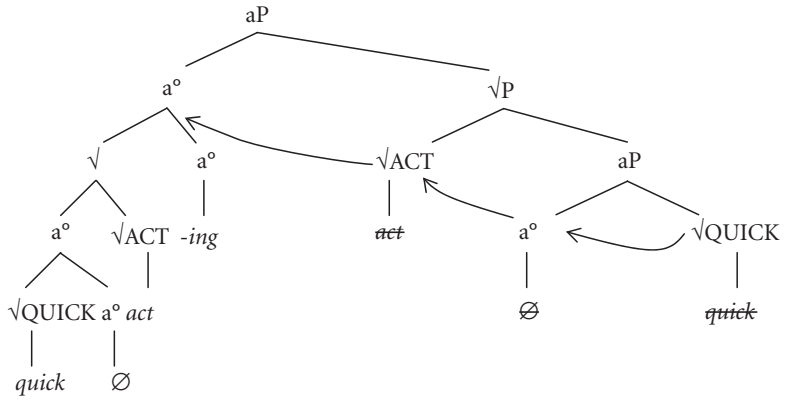
(9) a. The farmer grows wheat quickly.
b. a wheat-growing farmer

[7] Note that while the Unaccusativity Hypothesis entails that single arguments of intransitive unaccusative verbs are base-generated in the same position as the object arguments of their transitive counterpart, that position might not be sister to the Root. In the argument structure framework of Hale and Keyser (1993), the internal arguments of change-of-state verbs like *grow* are in a vP-internal specifier position, rather than in 'first sister' position.

c. *a quick-growing farmer
(bad where it's the things he's growing that grow quickly)
e. The wheat grows quickly.
f. quick-growing wheat

The 'first sister' constraint is extremely suggestive given the usual understanding of syntactic constraints on incorporation (i.e. that only governed items may incorporate), in conjunction with the assumptions of the Bare Phrase Structure (BPS) theory of Chomsky (1995b). Under BPS, there are no vacuous projections: projections and bar-level distinctions are only created epiphenomenally, by Merge. Arguments must be introduced by 'first merge', attaching to the Roots which select them, so modifying adjuncts will be introduced second, adjoining to a projection of the Root. However, in cases where no internal argument is introduced, the modifier will be the first thing merged to the Root. In this circumstance, in which Root and modifier are sisters, the Root will govern the modifier, just the same as it would govern its internal argument. In these circumstances, I propose, the modifier may incorporate, creating a compound; the analysis is a variant of that proposed in Roeper (1988).[8] The basic structure proposed is illustrated in (10):

(10)



A problem arises, here, however. The *-ing* suffix may affix only to actual verbs, never to bound Roots. In this way, *-ing* is different from *-er/-or* nominals, which may be formed on bound Roots (*grocer*, etc.). To account for this, we should posit a licensing restriction on *-ing* such that it can only be inserted in the context of structures headed by the category-creating head v°. In that case, the structure in (10) perhaps should also contain a null v° head above √ACT. However, such an intermediate verb-creating category head would produce the problematic predic-

[8] The feature which drives movement in this case is unlikely to be a Case feature, however, suggesting that perhaps a more general property should be appealed to in naming it. In Harley (2004) I named the feature a [± affix] feature; this would do here as well, of course.

tion of verb-incorporation in English, described at the end of the previous section. The complex head $[[[\sqrt{\text{QUICK}}]_{\sqrt{}}\text{a}]_{\text{a}}\ \sqrt{\text{ACT}}]_{\sqrt{}}$ would be categorized as v^{o} by movement into a v^{o} head prior to moving into the a^{o} head realized by *-ing*, entailing that **to quick-act* should then be a possible English verb. Above, this very problem in argumental compounds was obviated by the Root-incorporation treatment at the end of the last section. Carrying this analysis over to the structure in (10), here, means that we are assuming that *-ing* may attach to Roots as well as vPs. This correctly rules out **to quick-act*, but comes at the cost of predicting that forms like **tract-ing* (from the root of *tract-or*) should be well-formed. See below for an alternative approach.

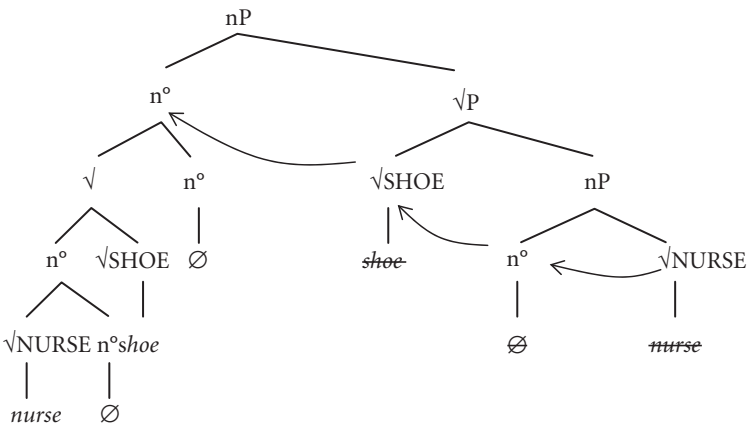
7.3.4 Primary ('root') compounds

The recognition that modifiers can incorporate so long as they are the first things merged with the Root of the head of the compound points the way to a treatment of regular primary compounds.[9] The relationship between the head noun and the compounded nouns in primary compounds is different from that in argumental synthetic compounds. In the latter case, the compounded noun is an internal argument of the Root of the head noun, and the interpretation of the compound is unambiguous. In the former, a sort of interpretive free-for-all obtains, where encylopedic and pragmatic information combine to determine the understood relationship beween the two nominal roots, as in, for example, *nurse shoes* vs. *alligator shoes*. Broadly speaking, the relationship is again modificational, with the proviso that the nature of the modification is determined pragmatically: *nurse shoes* are [shoes [(for) nurses]] while *alligator shoes* are [shoes [(of) alligator (skin)]]. One could imagine a proposal where a null phrase-head selected the modifying nominal prior to incorporation ($[[\sqrt{\text{SHOE}}]_{\sqrt{}}$ [P [n $[\sqrt{\text{NURSE}}]_{\sqrt{}}]_{\text{nP}}]_{\text{PP}}]_{\sqrt{}\text{P}}$), providing a locus for the underspecified semantic relationship between the two nouns; in the interests of structural parsimony, however, I will assume that no such relational head is necessary, and that the head noun's Root and the modifying noun are in a direct sisterhood relationship. As long as the head noun's Root is not itself multivalent, no argumental interpretation for the sister noun will be available, and consequently it is up to the interpretive component to construct some plausible relationship between the incorporated noun and the head noun. The nature of that constructed interpretation has been addressed much more thoroughly elsewhere (see e.g. the discussion in Kastovsky 2005, among many others), and will not be pursued here. The crucial thing for the proposal under

[9] These are usually called 'root' compounds, but since that could create confusion given the use of 'Root' within DM, I will use the term 'primary' here instead.

discussion is that the modifying nominal be introduced as sister to the Root of the head noun before it is categorized by its own n° head, as illustrated below:

(11)



Having sketched a general incorporation-style treatment within DM of these three types of compounds, we must now address some of the thorny questions raised by syntactic treatments of X°-internal phenomena. In particular, why can't elements larger than nP generally be included in English nominal compounds? And, given that it is usually impossible for such elements to appear within compounds, how come they sometimes *can* appear? That is, how can the phrasal compounds exemplified in (1) above be accounted for in a principled way? Let us consider these problems in turn.

7.4 Failure of incorporation

There are two major ways in which compounding can be non-productive which raise issues for the syntactic approach. First, certain syntactically derived constituents refuse to participate in compounding on the non-head side – they cannot incorporate into a Root. This is the case for full DPs, in cases like *[*drugs*]-*pusher* or *[*that-novel*]-*writer*. Second, certain syntactic categories refuse to *host* compounding, on the head side: they can't be heads of compounds, that is, they do not allow incorporation of a compounded Root. This is the case for v° in English, since there are no productively incorporated verbs like **to quick-act* or **to truck-drive*.

What rules out compounding of phrasal elements larger than nP, like [*drugs*]-*pusher* or [*that-novel*]-*writer*? In the proposal here, such compounding would entail incorporation of the complex $[[\sqrt{}\text{DRUG}]_{\sqrt{}}\ \text{n}^{\circ}]_{\text{nP}}$ ('drug') up through the higher functional complex, into Num° ('-s') and D°. Two possible approaches to

the ill-formedness of such incorporation spring to mind. First, it might be the case that in English, elements other than n^o or a^o simply cannot host incorporation. This constraint could be syntactic in nature – the requisite features for driving head-to-head movement do not appear in feature bundles like D^o or Num^o in English. Alternatively, the constraint might be morphophonological in nature: there might be, for example, prosodic requirements on the realizaton of D^o terminal nodes or other 'inflectional' feature bundles that forbid the inclusion of more than one independent stress-bearing Root in their phonological makeup (see e.g. Hale 2003 for a proposal exploiting the notion of a morphophonological template attached to verbal terminal nodes in Navajo).

For the failure of incorporation of DPs in cases like **trucks-driver* or *[*the-truck*]-*driver*, an account of the first type seems appropriate. Above, it was proposed that the feature which drives incorporation of nP is Case-related. If an nP is merged with Num^o or D^o material, that Case-related nP feature must be checked DP-internally; the feature is no longer accessible for checking via incorporation into a Root. Consequently, **trucks-driver* is not possible.[10]

However, the prohibition on noun-incorporation into verbs in English seems more amenable to an explanation of the second kind. Whatever the nature of the prohibition, it must be parameterizable, since, in some languages (e.g. Mohawk), v^o can host incorporation, in contrast to the English situation in which n^o and a^o may host incorporation, but v^o may not (**to truck-drive*). A parameter attachable to particular categories of terminal node seems more appropriate.

Hale (2003) proposed that Navajo verbs are subject to a prosodic morphophonological constraint – a prosodic template – which determines their morphological behaviour with respect to incorporation.

Similarly, let us assume that English v^o is subject to a constraint such that it cannot host internally complex heads containing more than one Root element. This will prevent incorporation of complex heads containing multiple Roots into Engish verbs: **to quick-act* or **to truck-drive* will be ruled out because the v^o in which the final verb is realized contains more than one Root.

Recall, however, that we ended section 7.3.3 with something of a conundrum. Since *-ing* attaches only to verbs (i.e. to items that have merged with v^o), formations like *quick-acting* seem as though they must contain a v^o head. This v^o head would intervene between the topmost a^o head, realized by *-ing*, and the Root $\sqrt{}$ACT. But if that is so, then the incorporated Root $[quick\text{-}act]_{\sqrt{}}$ has moved into v^o, resulting in a constituent which would, if pronounced, end up as the incorporated verb **to quick-act*. (The same remarks apply, of course, to *truck-driving*, etc.)

[10] If, in accordance with Siddiqi's (2006) proposal, the plural VI *mice* is a Root in its own right, competing for insertion into $\sqrt{}$MOUSE, rather than a phonologically readjusted version of *mouse* in a+PL context, it explains why *mice* can occur in compounds but *rats* cannot: $\sqrt{}$MOUSE in a compound structure might be realized by 'mice', while $\sqrt{}$RAT could never be realized by 'rats'; the *-s* morpheme is an independent VI that realizes Num^o. See Siddiqi (2006) for discussion.

The problem can be resolved, however, when we consider that in *quick-acting*, the head which actually ends up having two Root Vocabulary Items realized in it at Spell-Out is a^o. We can assume that the prohibition prohibits Roots being realized in a v^o *in its base position*. If they move through v^o on up into another head, such as a^o, the original v^o will not contain the offending extra Roots at Spell-Out, and the prohibition on multiple Roots in v^o will not be violated. *Quick-acting* will be well-formed, while **to quick-act* will not.[11]

We have, then, technical proposals to implement the ban on incorporation by DPs and the ban on incorporation into v^o. How, then, can phrasal compounds be formed? They certainly include both DPs and vPs, to say nothing of CPs and PPs (though they cannot themselves *be* a DP; Lieber 1992a:12). What allows the formation of compounds like *stuff-blowing-up effects*?

7.4.1 Phrasal compounds

We have proposed that compounding is characterized by incorporation, which in English produces right-headed structures, as is clear from the contrast between incorporated *truck-driver* and non-incorporated *driver of trucks*. Phrasal compounds, however, do not exhibit that inverted order within the modifying phrase: we have *bikini-girls-in-trouble genre*, not *trouble-in-girls-bikini genre*. Consequently, it is clear that the phrase itself is not subject to internal syntactic incorporation. Indeed, given our assumption above that DPs may not incorporate, such phrases could not incorporate internally, since it would involve the DP *trouble* head-moving into the P *in*.

Rather, the phrase seems to be frozen as an expression evoking a particular abstract conceptualization of the compositional meaning determined by the internal phrasal syntax. In some cases, as has often been remarked, these compounds have a quotative flavour, as in this example from DiGiovanna:

(12) 'And frankly, DMX is a pretty compelling action hero in the Arnold Schwarzenegger "why bother acting when I've got this scowl perfected?" school of drama.' 6 March 2003

These quotative phrasal compounds evoke a particular attitude that might be attributed to a putative utterer of the phrase in question. Intuitively, the phrase has been fully interpreted, and an associated concept extracted from it – an attitude, in the case of quotatives, or an abstraction from an existing conceptual category, in the case of complex nP phrases as in *stuff-blowing-up effects* or *bikini-girls-in-trouble genre*.

[11] This view of the prohibition on incorporation into verbs in English is particularly compatible with the treatment of head-movement as phonological conflation of Harley (2004).

Further, these phrases needn't be part of a compound. They can be directly attached to derivational morphemes like *-ish*, *-y*, or *-ness* (e.g. *feeling a bit rainy-day-ish / a bit 'don't bother'-y / the general 'bikini-girls-in-trouble'-ness of it all*). This suggests that these phrases have undergone a derivational process into an appropriate category prior to affixation.

I will follow Sato (2007) in treating such phrasal elements as having undergone zero-derivation to a nominal category (see Ackema and Neeleman 2004: chapter 4 for a related approach; the analysis also is Lieber-and-Scalise-ish; Lieber and Scalise 2006: 28). In DM, this entails that the complex phrase is affixed by a zero n^o head, in a schema like this:

(13) $[[XP]\ n^o]_{nP}$.

The semantic contribution of this n^o head will be to 'reify' the content of the XP-phrase: it will denote a concept evoked by the phrasal syntax, though not compositionally determined by it.

The resulting nominal is then expected to be able to participate in nominal affixation (e.g. with *-ish*), like any other nominal. Further, it should then be able to participate in primary compounding like any other nominal.

This still raises significant puzzles in the current framework. The incorporation of the nominalizing n^o into the Root of the primary compound clearly brings along the complex XP, since the XP ends up in prenominal position in the right-headed compound. This means that the complex XP must have incorporated into the n^o head during the nominalization process – but, according to what we have said so far, the DPs, vPs, etc. contained within the XP should prevent such incorporation. How can the XP incorporate?[12]

Descriptively, the entire XP is behaving syntactically like a Root, rather than like an internally complex XP. I suggest that this is a necessary part of the reification operation: in order for the XP's denotation to compose with the reifying n^o head, it must be interpreted *as if uttered*. That is, the LF of the XP has to be accessed by the Conceptual-Intentional system, and fully interpreted. The XP itself is then not able to enter into further computation *as itself*; rather, it becomes a symbol, a Saussurean sign, for the concept which it evokes. Technically, we could propose that the XP is created in a separate derivational workspace from a separate numeration, sent off to LF for interpretation, and then 'renumerated' as a Root, in the derivation of the matrix clause – a Root denoting the abstract concept that was evoked by the previous computation of the XP's compositional meaning. (For the concept of 'renumeration' see Johnson 2002).

[12] Carnie (2000) proposes to allow phrases to incorporate into head positions so long as they are assigned the correct features, in an account of Irish nominal-predicate constructions. The account here adds the step of semantic interpretation and renumeration to the derivations of these head-like phrases in an attempt to account for their particular interpretive properties.

This is really just speculative, but it has the right consequences in the framework. In DM, Saussurean signs are necessarily Roots – only Roots can contribute non-grammatical semantic content. Hence the XP behaves like a Root, morphosyntactically speaking.

7.5 Conclusions

In the above, I have envisaged compounding as incorporation into an acategorial Root, in a framework in which word formation is treated purely syntactically. The distinction between Root and category-forming functional head within the Distributed Morphology framework enables this approach to treat the syntax of verbal argument structure and the syntax of argument structure in synthetic compounds in an entirely parallel way without making incorrect predictions about the availability of incorporation into V in English.

A simple extension allows the approach to apply to modificational synthetic compounds and to primary compounding in English as well. The difference between these three types of compounding resides in the semantic relationships between the Roots which are the target of incorporation and the elements which are generated as their first sister. Some roots (especially those that can become verbs) have argument structure, and the first-sister element, if appropriate, can be interpreted as satisfying that argument structure, generating an argumental synthetic compound. Other such Roots, especially those with event structure, can be modified in the same way as their corresponding verb can; in such cases, an incorporated first-sister modifier results in a modificational synthetic compound. Primary compounds are formed when either the Root is semantically purely 'nominal' in character – having no argument or event structure – or when the incorporated element does not form an appropriate argument or event-structure modifier. In such cases, the incorporated element is interpreted as in some kind of relationship with the head noun, where the particular relationship involved is determined via a complex inference involving the semantics and pragmatics of the two items involved.

Finally, I sketched a possible approach to phrasal compounds within the framework, one which, however, still leaves many questions unanswered. Nonetheless, I hope to have shown that compounding is certainly tractable within the Distributed Morphology framework, and that perhaps certain insights the framework makes available allow for a perspicacious treatment of some of the well-known questions associated with the phenomenon.