Linearization and Local Dislocation: Derivational mechanics and interactions[*]

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1 Introduction On the assumption that the syntax generates hierarchical representations that are accessed by both sound and meaning systems, it is an empirical question how the syntactic representation and the representation(s) referred to in different morphophonological processes relate to one another. In Chomsky and Halle (1968:9), for example, this question is posed in terms of how two conceptions of *surface structure*, "output of the syntactic component" and "input to the phonological component", relate to one another, with identity being a possibility that is excluded because of the existence of cases in which these two notions appear to differ. What is then required is a theory of the possible relationships between syntactic and phonological structures, on the assumption that in spite of some differences, the overall patterns are systematic. In terms of current models of syntax and its interfaces, this amounts to giving a theory of PF.

Since this set of questions was initially formulated, research in this area has identified a range of cases in which syntactic structure and phonological structure do not line up with one another, in a number of domains (prosodic phonology, cliticization, bracketing paradoxes, etc.). To the extent that phenomena of this type require syntactic and phonological representations that are distinct from one another, the further question is how great the differences are. I take it that the possible deviations are highly restricted in their scope, something that amounts to assuming a 'restrained' view of PF. Within the context of a derivational framework, the program is to specify the different computations that augment and alter the syntactic representation. The central concern is thus to provide a theory in which sound/syntax connections (and thus sound/meaning connections) are as systematic as possible given the range of data to be accounted for.

In terms of specific proposals, one way of viewing a certain part of the research in the framework of Distributed Morphology is as an attempt to identify some of the relevant PF-mechanisms, and to answer attendant questions concerning their ordering, interaction, and so on. One component of this syntactic approach to morphology is a theory of the operations that apply on the PF branch of the grammar, with some traditionally "morphological" phenomena (allomorphy, phonological versus syntactic bracketing, syncretism) being addressed as part of a larger set of questions whose primary concern is the interface that mediates between hierarchical representations and their ultimate phonetic expression.

This paper contributes to this line of research by examining the representation of linear order

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in the PF component of the grammar, as revealed by cases in which PF-rules affix one element to another under linear adjacency: *Local Dislocation* (LD). Part of what it means to have a theory of PF is to have a constrained theory of mismatches between syntax and morphophonology, and affixation under adjacency results in mismatches that any theory must account for. Moreover, by looking at the "special" cases– i.e. the cases in which some PF requirement triggers an operation resulting in a mismatch– some insight can be gained on linear representations in the normal case.

While the focus of this paper is on the details of LD, it is important to view this operation in the context of a general theory of syntactic affixation. The fact that the conditions on affixation are sensitive to syntactic and post-syntactic notions of locality is a significant point with important architectural consequences; see Embick (2006) and Embick and Marantz (2006) for discussion. There are two primary components to the discussion below, which follow on some initial points about LD in §2. Concentrating on the formal properties of LD, I examine in §3 two different properties of linear representations that restrain the application of LD. It is argued that linearization statements that concatenate elements– and hence LD operations defined in terms of these– are *typed*, with the types being distinct structural objects defined by the theory of constituent structure. The second part of this formal characterization makes clear the idea that LD is (head-)adjunction under adjacency. Beyond these formal properties of LD, another factor that potentially interacts with processes of this type is found in the idea that syntactic structures are interpreted at the interfaces cyclically. In §4 I examine a specific way in which cyclic spell-out interacts with PF operations and LD, based on an example from French prepositions and determiners. This case study paves the way for further investigation of cyclicity and the interface of syntax and PF.

1.1 Architectural Assumptions The framework of *Distributed Morphology* is assumed here. This is a *Non-Lexicalist* theory of grammar, in which there is no generative *Lexicon*; this means that the derivation of complex objects takes place in the syntax, or in terms of operations that make reference to the output of the syntactic derivation (i.e. representations in the PF component).

I assume here a "dynamic" conception of PF, in which this component consists of an (ordered) set of computations that apply to the output of the syntax.[1] In the normal case, morphological structure is syntactic structure; i.e. PF operations that are 'morphological' in nature apply to the structure that is the output of the syntax. This is part of a larger picture, in which structure generated by the syntax is modified in various ways at PF in accordance with that component's function of "packaging" syntactic representations for phonology.

The syntax derives hierarchical structures out of two types of terminal nodes. The first type, the *Roots*, correspond in many ways to the "lexical" or "open-class" vocabulary. The second type are functional heads (= "functional" or "abstract" morphemes). These feature bundles do not contain phonological representations in the syntax; rather, the phonological content of these nodes is added to them at PF. The process responsible for this is called *Vocabulary Insertion*. At PF, morphemes like T[past] (Tense with the feature [past]) have phonological material added to them, as specified in that language's *Vocabulary Items* (e.g. *T[past]* ↔ *-ed*). Following the application of Vocabulary Insertion, the node T[past] has a phonological matrix, e.g. T[past,*-ed*], where *-ed* is called the phonological *exponent* of this node.

A further set of operations in the PF part of the grammar linearize the hierarchical structure generated by the syntax. Local Dislocation, because it is defined in terms of linear adjacency, occupies an important position in the theory of linearization.

[1]In some cases it appears that "PF" is used ambiguously in this sense and in the sense of "final phonological representation" (i.e. the output of the computations that are articulated in the dynamic view). Whatever the relevant notion of "final output" here might be, the point is that any derivational approach requires an account of what the different PF representations are and how they are derived.

1.2 Linearization and Local Dislocation: Preliminaries The starting point for the discussion of post-syntactic representations of linear order is the hierarchical representation generated in the syntax. An important assumption behind the project pursued in this paper is that the structural notions relevant for PF representations and linearization are those defined by the constituent structure. For the purposes of this discussion, I take for granted certain notions that are operative in current research, such as "head", "complex head", and so on. The approach that is outlined here is exclusively structural. This means that, for example, the analysis make no reference to the notion of "word" (prosodic or otherwise) as far as syntax and morphology are concerned– there are only structures ("head", "terminal", etc.) and their phonological interpretations. Whether or not there is ultimately the need for something like the *prosodic word* that cannot be defined structurally, it must be recognized that adding such an element to the ontology would constitute a significant addition.[2]

Some structures, and in particular the head, have an important status at PF. In particular, the normal case is for objects within a complex head to have an intimate phonological connection ("word-level phonology"). This aspect of the relationship between structure and phonology figures prominently in the discussion of §3.

Some of the important structural notions are illustrated in (1). What (1) represents is a structure typical of head movement, in which a Root moves to functional head b, with the resulting complex then moving to functional head c:[3]

(1) Hypothetical Structure
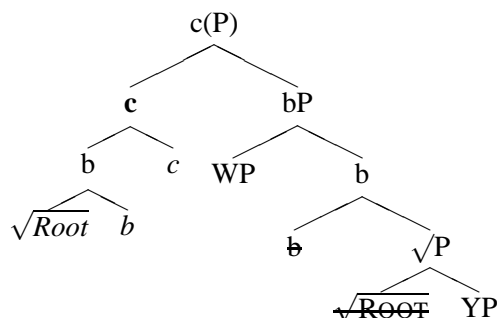
One possibility discussed below is that the syntactically significant objects in this representation– the complex head(s) and the terminals within such heads– are themselves the objects that figure in statements of linear order. As a preliminary to this component of the discussion, the following definitions from Embick and Noyer (2001) are relevant:

(2) Definitions

   a. M-Word: (Potentially complex) head not dominated by further head-projection (cf. Chomsky (1995) "H^{0max}")

   b. Subword: Terminal node within an M-Word (i.e. either a Root or a feature bundle)

Illustrating with reference to (1), boldfaced **c** is an M-Word, while italicized *Root, b, c* are Subwords. Part of what is being investigated here is the idea that only these objects can be referred to by PF processes, such that other structure (e.g. the "intermediate" b in the complex head in (1))

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[2]For related questions concerning the general status of the prosodic hierarchy from the perspective of the kind of theory advanced here see Pak (2005, 2006).

[3]Some additional unpronounced structure with b̶ is ignored. Unpronounced instances of moved elements are presented in strikethrough. I do not address the question of how it is determined which instance of a moved item is pronounced.

has no status as far as the theory is concerned. This idea is clearly related to a parallel premise for phrase structure.

The structure in (1) shows a complex head created by one kind of syntactic affixation, head movement. In many cases, a complex head is created by a process that is not head-movement as typically understood. Instead, one piece is affixed to another under adjacency: Local Dislocation, in the terminology employed here. This operation is a descendant of "merger under adjacency" (Marantz 1984,1988 and related work) and ultimately of the "affix hopping" transformation of early generative grammar (Chomsky 1957).[4]

To take an example, the formation of English comparatives and superlatives shows distinct analytic and synthetic forms, depending on the some phonological properties of the adjective involved:

(3)   a. Mary is more intelligent than John.

      b. Mary is smarter than John.

As discussed in Embick (2006) (extending Embick and Noyer 2001), the affixation of the comparative morpheme (Deg) occurs under linear adjacency. As far as the syntax is concerned, both types of comparatives in (3) have an identical structure; this is represented in (4), where Deg is part of a DegP that is attached to aP:

(4)   Syntax of the Comparative

      $[_a\text{P} \ [_{\text{DegP}} \ \text{Deg...}] \ [_a\text{P} \ \text{Adjective...}]]$

At PF, there is a rule of Local Dislocation that affixes Deg to the adjective to produce a synthetic form when they are linearly adjacent, and when the adjective has the appropriate phonological properties. When the rule attaches Deg to the adjective as in (3b), Deg is realized as the "affix" *-er*, and the result is one "word" (i.e. a synthetic form). When the rule does not apply, Deg and the adjective are spelled out as two distinct "words", as in (3a).

In an abstract sense, Local Dislocation operations like that illustrated above take two separate elements– e.g. two M-Words– and create from them a single M-Word by affixing one to the other. Unlike the other types of syntactic affixation (head movement, Lowering), LD operates in terms of linear adjacency.

With reference to the structure in (1) and the definitions in (2), Embick and Noyer (2001) define a "typed" conception of LD, in which the two categories of objects in (2) can only move with respect to one another:

(5)   TYPING ASSUMPTION ON LD: M-Words only dislocate with adjacent M-Words, and Subwords with Subwords.

This condition imposes restrictions on the application of LD, and is investigated in further detail below.

2   Some Properties of Local Dislocation   In the following subsections I examine two instances of LD, with reference to some particular properties that are important to the theory under discussion. The first example, involving the placement of the Latin enclitic *-que* 'and', illustrates the typing assumption (5), along with some of its consequences. It also illustrates the importance of a *cyclic* conception of PF operations. The second case, drawn from Lithuanian, is based on the distribution

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[4]In addition to this, some approaches discuss the need for a "downwards" operation with the same locality properties as head movement (head to head of complement); this is *Lowering* in the terminology of Embick and Noyer (2001).

of the "reflexive" morpheme *-si*. This case study shows that *-si*, a Subword with a requirement that something appear to its left, must satisfy this requirement within its own M-Word. This appears to be a case in which the "word" is special for linear relations, but illustrates and in fact follows from (5) as well.

2.1 Illustration 1: Latin *-que*   As the examples below show, the Latin enclitic *-que* 'and' appears in simple conjunctions as an enclitic on the second conjunct, as the following examples show with elements of different grammatical categories:[5]

(6)   a. Nouns: diu noctu-**que** 'by day and by night'

   b. Verbs: vivimus vigemus-**que** 'we live and we flourish'

   c. Adverbs: bene pudice-**que** adservatur '[She's] been chaperoned well and modestly'

While the distribution of *-que* in these cases could be accounted for by a number of means, the broader generalization about the distribution of this element is that it attaches to the first head (in a sense to be made precise below) of the second conjunct, whatever that may happen to be. This pattern is seen clearly in cases in which the second conjunct is phrasal or clausal; ▽ marks the position between the two conjuncts, and [the beginning of the second conjunct:

(7)   Phrases/Clauses

   a. ...cum hac   et praetoria   cohorte   cetratorum   ▽
       with   this-ABL and official-ABL escort-ABL caetratus-GEN
       [barbaris-**que**   equitibus   paucis
       barbarian-ABL.PL-AND cavalry-ABL.PL few-ABL.PL
       'with these and his official retinue of lightly-armed troops and a few barbarian cavalry-men'
       C. *B.C.* II.75

   b. ...▽ [maius-**que** commodum ex   otio   meo   quam ex   aliorum
           more-AND profit   from idleness-ABL my-ABL than   from others-GEN
       negotiis   rei   publicae   venturum.
       work-ABL.PL thing-DAT public-DAT come-FUT.PART
       '...and more profit will come to the republic from my idleness than from the activities of others.'
       Sall. *J.* III.4

The distributional pattern illustrated above can be accounted for directly if attachment of *-que* occurs under linear adjacency. The first M-word of the second conjunct bears *-que*, no matter what that M-word is and no matter what syntactic configuration it may be in in its own XP. A treatment in terms of syntactic movement would be problematic. The problem is that the process in question cannot be head-movement as standardly understood, since the elements hosting *-que* are not the syntactic heads of the conjuncts; nor can it be phrasal movement, since such an operation would not have the ability to move the "first word" of a conjunct and (evidently) attach it to a head.[6]

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[5]The properties of *que* are discussed in all standard reference works on Latin grammar; e.g. Kühner and Stegmann (1966), Sommer (1914), Ernout and Thomas (1951), Leumann et al. (1963). Theoretical discussions of this clitic in terms that line up with the assumptions of this discussion are found in Marantz (1988) and Embick and Noyer (2001).

[6]Even if remnant movement were appealed to, there would be a question as to where the remnant containing the first word of the second conjunct was moving, and why this process had to affect a remnant containing one and exactly one word.

An adjacency-based treatment of *-que* is schematized in (8-9); X,Y,Z stand for M-Words, ⌢ for concatenation (see below), and ⊕ for affixation produced by LD:[7]

(8) Structure (Partial)   (9) *Local Dislocation*

[CONJ [$_{\text{Conj2}}$ X...Y...Z]]   CONJ⌢X ⟶ X⊕CONJ

A point that casts some additional light on this process is that many of the hosts of *-que* are internally complex, consisting of more than one piece. The verb *vigemus*, for instance, consists of a Root, a Theme Vowel, and an agreement node. However, *-que* is affixed to the entire M-Word ([$_{\mathcal{M}}$ = M-Word boundary)

(10) a. Structure: [que [vigemus]] '...and we flourish'

b. Output: vigemus-**que**

c. Internal structure: [$_{\mathcal{M}}$ que]⌢[$_{\mathcal{M}}$ [vig e] mus]

d. No Interpolation:
   *vig-**que**-e-mus
   *vig-e-**que**-mus

In order for Local Dislocation to generate the correct outcome, it is necessary to assume that when the M-Word *-que* is moved, it can only target another M-Word. This is important in the following sense: it is not the case that the M-Word *-que* attaches to the adjacent *piece*; this would predict the unattested interpolations seen in (10d). Rather, the object that is targeted by the moving M-Word *-que* is the entire adjacent M-Word. This is an illustration of the typing assumption: the M-Word is placed with respect to the following M-Word, not the following Subword.

Some further aspects of the distribution of *-que* implicate a kind of cyclicity. With PPs headed by many monosyllabic prepositions, *-que* surfaces after the complement to P, not affixed to the preposition, as shown in (11a). This is not the case with all prepositions as (11b) illustrates (see Ernout/Thomas (1953:120,454), Kühner/Stegmann (1966, v.1:583, v.2:10):

(11) a. in rebus-**que** 'and in things'
      de provincia-**que** 'and from the province'
      ad Caesarem-**que** 'and to Caesar'

b. circum-**que** ea loca 'and around those places'
      contra-**que** legem 'and against the law'
      sine scutis sine-**que** ferro 'without shields and without sword'

This pattern results from the operation of another process. In the (11a) cases, the relevant prepositions undergo an additional string-vacuous LD operation to become procliticized to the following noun:[8]

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[7]The syntactic status of the CONJ realized as *-que* depends on assumptions about the syntax of coordination, as well as assumptions about peripherality in LD (cf. Marantz (1988) and §3-4).

[8]Some additional evidence for this operation comes from Latin orthography, which occasionally treats monosyllabic prepositions as part of the same word as the complement; see Sommer (1914:289), Leumann et al. (1963:241), among others. Note that treating the preposition and its complement as a single unit does not imply that they form a single unit for all types of word-level phonology (e.g. syllabification as revealed in the calculation of heavy and light syllables in verse). The procliticized prepositions might simply behave phonologically like prefixes in compound verbs, although the situation varies somewhat across periods of Latin poetry, to judge from Sommer (1914:289).

(12) $[_{\mathcal{M}}\text{in}]^{\frown}[_{\mathcal{M}}\text{rebus}] \longrightarrow [_{\mathcal{M}}\text{in}\oplus\text{rebus}]$

The process shown in (12) is an instance of a general process that affects the relevant prepositions. It occurs inside the PP and precedes the affixation operation that places -*que*. At the stage of the derivation when the rule affecting -*que* can apply, the derived M-Word *in⊕rebus* is adjacent to *que*, so that LD affixes *que* to this, and not to the preposition itself.[9]

In the way noted above, the analysis of -*que* illustrates the role of the Typing assumption on LD. In addition, the analysis of the P-cliticization facts implicates cyclicity. The interaction between P and N is determined before the dependency of -*que* is handled, something that follows from the idea that the dependencies inside the second conjunct are calculated prior to those involving -*que* itself.

2.2 Illustration 2: Lithuanian *si*   As discussed in Embick and Noyer (2001), movement under adjacency is also apparently found within M-Words, resulting in what looks like "affix movement". This is found when a Subword surfaces in a linear position that is unexpected given its hierarchical location, or when a particular morpheme shows a second-position effect within an M-Word. For such cases, Embick and Noyer (2001) hypothesizes that Subwords undergo LD with respect to adjacent Subwords, in a typed fashion as per the discussion above. While there is some question about whether or not this operation can be treated as Local Dislocation in terms of a typed system like that discussed above (see §5.2), there are some important observations to be made concerning "word-internal" interactions. In particular, it appears that satisfaction of a Subword's requirements is handled internal to the M-Word in which that Subword originates. Subwords do not seem to 'escape' one M-Word and attach to another. The placement of the Lithuanian "reflexive marker" -*si* (Senn (1966), Ambrazas (1997), Nevis and Joseph (1992)) is relevant to this question. While this is a complicated case, the basic point that I hope to establish here concerning the "no escape" property can be established directly.

In simple (unprefixed) verbs the reflexive morpheme (exponent -*si*) appears after the Verb-Tense complex (13a); in verbs with a single prefix, -*si* appears between the prefix and the verb (13b); and in verbs with two prefixes, -*si* appears between these two prefixes (13c):

(13) a. laikaũ-**si** 'I get along'

  b. iš-**si**-laikaũ 'I hold my stand'

  c. su-**si**-pa-žinti 'to know [someone], to recognize'

One clear point about this distribution is that -*si* cannot occur word-initially; that is, it is suffix-like in the sense that it always has an element to its left. The complication, of course, is that -*si* does not always appear at the end of the verbal complex; rather, it shows a type of second-position behavior.

This distribution can be understood as follows. The morpheme -*si* is adjoined highest in the node containing the verb; in the case of finite verbs, it can be assumed that the verb undergoes head movement to T, and that the REFL morpheme is attached to this entire complex. The simplest assumption is that -*si* is initially linearized as the leftmost element. Then, in accordance with the requirement noted above, it undergoes LD with the adjacent Subword.[10]

For the purposes of this initial stage of the discussion, an important point is that -*si* is restricted to finding a host within the M-Word that it originates in. While elements may of course precede

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[9]There are certain cases noted in the works above in which the prepositions in question host -*que*, e.g. when there is contrastive stress or in certain fixed phrases. I take these to be cases in which the general rule behind (12) does not apply, for reasons that could be articulated in a comprehensive treatment of Latin prepositions.

[10]For the distinct types of requirements at play here, see the different types of linearization statements employed in §3.

the verb in Lithuanian, it is never the case that -*si* simply suffixes onto one of these to satisfy its requirement as in (14a); the action occurs within the M-Word containing -*si*, as in (14b):

(14) a. *àš-**si**   ne-lenkiù
        I-REFL NEG-bow.1S

        'I do not bow.'

     b. àš ne-**si**-lenkiù
        I   NEG-REFL-bow.1S

        'I do not bow.'

The general point, of which this is one instance, is that it appears that a Subword cannot escape an M-Word in order to satisfy its requirements. That is, although -*si* requires something on its left, this requirement does not take into account elements outside of the M-Word to which -*si* belongs.

The effect here is related in some sense to what is seen in some of the Latin examples, where moving -*que* does not interpolate inside of a complex element of a particular type. That is, the fact that M-Words do not move inside of M-Words and the fact that Subwords do not move out of M-Words, seem to be related to one another. As will be shown below, both the absence of interpolation into an M-Word and the absence of escape from inside of an M-Word can be made to follow following from the same general condition on linear relations, in which it is basic statements of linear order that are typed.[11]

2.3 Synopsis   These cases of movement and others examined in the literature appear to be cases of affixation under adjacency. This leads directly to the question of what this means formally; i.e., in terms of the hierarchical and linear representations found at PF. A further point illustrated in the cases chosen above is that LD is subject to restrictions on its application. It does not, as far as I know, allow interpolation of an M-Word into an M-Word, or allow a Subword to escape an M-Word. These restrictions and the LD operation in the first place should be stated in terms of (and ideally follow from) the linearization representations that are required in the "normal" case.

3 Hierarchical Structure and Linear Order   The information involved in the linearization of syntactic structures is of different types, and relates to statements that are more and less abstract in terms of what they relate. One type of linear representation relates categories to one another. For example, statements of headedness of the type 'X precedes its complement YP' relate members of the category X to a phrase, YP. Such statements encode generalizations that go beyond the properties of individual terminals. When X precedes YP this means that X appears to the left of the first element of YP, whatever YP may happen to contain. I assume that this kind of linear information is encoded in a process that for [X Y] generates either (X * Y) or (Y * X), where * is an operator for 'is left-adjacent to'. This information is generated for each (branching) node in the syntactic structure. While I make use of *-statements here as a means of stating headedness generalizations, the crucial part of the theory of Local Dislocation makes reference to another type of statement, involving concatenation. Whether other types of processes require *-statements is a question for further research; one possibility is that this step in the procedure can be eliminated.

Beyond the more abstract * relation, PF must impose further order on the syntactic terminals, since * does not specify a concatenation of terminal nodes. By 'terminal' at this stage I mean 'M-

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[11]While Lithuanian -*si* occurs between prefixal elements and the verb, it does not interpolate between the verb and Tense/Agreement pieces, as discussed in Embick and Noyer (2001). The treatment of this effect within the present system relies on assumptions about the type system involved; see §3.3.2. Other considerations– e.g. the possibility of having REFL begin as a suffix when there are no pre-verbal morphemes, might lead to possible treatments as well.

Word'; I return to the ordering of Subwords below. Using $\frown$ for concatenation, this part of the linearization procedure produces statements like (X$\frown$Y) and (Y$\frown$Z).[12]

Finally, concatenated elements must be "chained" into a linear representation that can be employed by the input/output system; I will have little to say about this chaining step here (see Pak (2006) for discussion centered on syntax/phonology interactions).

The steps described above are schematized in (15). I assume that both larger objects (M-words, phrases) and smaller objects (Subwords within M-Words) are subjected to the same procedures. For expository purposes, I continue to use $\oplus$ to indicate concatenation of Subwords as opposed to M-Words:[13]

(15)   Phrase Structure $\rightarrow$ Linear Order

   a. SYNTACTIC STRUCTURE: $[_{XP}$ X $[_{YP}$ Y Z]]

   Hierarchical representation. Relevant for e.g. *Lowering* (head lowers to head of complement; see Embick and Noyer (2001) and §4).

   b. *; ADJACENCY:

   Represented as: $(_{XP}$ X * YP), $(_{YP}$ Y * Z)

   * = 'is left adjacent to'; representation of headedness/adjacency of abstract objects (phrases, etc.)

   c. $\frown$/$\oplus$; CONCATENATION:

   Represented as: X$\frown$Y, Y$\frown$Z; a$\oplus$b, b$\oplus$c

   $\frown$/$\oplus$ = concatenation for M-Words/Subwords respectively

   d. CHAINING: Representation of all information in a linear sequence.

For illustration, consider (16) (phonological exponents of the functional heads are included for expository purposes):[14]

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[12]A linearization procedure with two-steps like * and $\frown$ is employed in Sproat (1985); cf. also Marantz (1984). A two-step procedure with different properties (relations) is sketched for some complex cases in Embick and Noyer (2004)). It might be the case that certain phenomena require an analysis in terms of operators that have properties different from * and $\frown$.

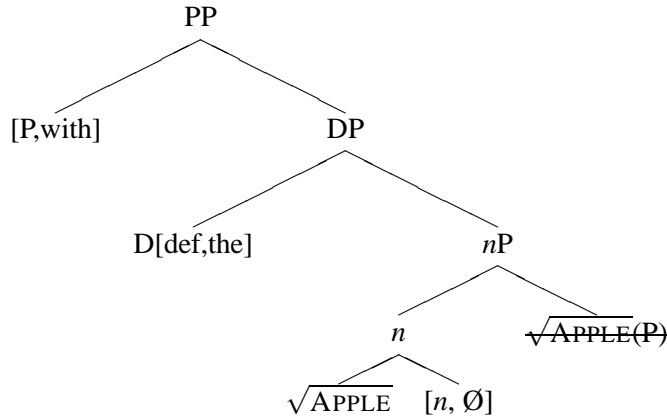[13]In some of the representations below I abbreviate with statements like those in (i):

(i)   a. *: $(_{XP}$ X * $(_{YP}$ Y * Z))

   b. $\frown$: X$\frown$Y$\frown$Z

The statement of Local Dislocation operations involves only binary statements, for reasons that are discussed below. Ultimately, however, there is a question as to whether representations like those in (13) might be relevant for certain phenomena. In particular, various questions arise concerning how * and $\frown$/$\oplus$ statements relate to phrasal phonology. One specific question concerns which types of linearization statements are referred by such prosodic rules. Pak (2005a,b) follows earlier work in identifying different types of phrasal rules, and advances the further proposal that these rule types apply at different stages of the PF-derivation, i.e. operate in terms of different statements of linearization along the lines outlined above. Within such an approach it is an empirical question how much information appears in the formulation of the phonological rules in question (e.g. how big the objects in question are).

[14]To this point, nothing has been said concerning the ordering of the linearization operations in (15) with respect to Vocabulary Insertion. Embick and Noyer (2001) hypothesize that Local Dislocation occurs "after" this process. The reason for this is that many LD operations are sensitive to phonological or morphological properties of specific Roots, which might not be present unless some VI has taken place (i.e. if one assumes late insertion of Roots). Importantly, the cases in question are cases in which it is the phonology of the target that is at issue. Whether or not the element moved by LD (the "affix") has been subject to VI prior to LD is not always clear. It seems that there are cases in which an element moved by LD acquires its phonological form only after moving, but there are a number of factors to take into account in this. For instance, it might be that a concatenation statement like X$\frown$Y makes Y close enough to X so that it would be

(16) *with the apple*

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                    PP
                   /  \
            [P,with]   DP
                      /  \
               D[def,the]  nP
                          /  \
                         n    √APPLE(P)
                        /  \
                   √APPLE  [n, Ø]
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Focussing first on relations among larger objects (M-Words and phrases), the first stage of linearization introduces the *-operator, in a way that reflects general properties of English (e.g. PPs are head-initial, etc.):

(17) Stage 1

LIN-*[n √(P)] $\longrightarrow$ (n * √(P))
LIN-*[D[def,the] nP] $\longrightarrow$ (D[def,the] * nP)
LIN-*[[P,with] DP] $\longrightarrow$ ([P,with] * DP)

The representation that is the input to late stages of PF contains information about concatenated terminals. I assume that the procedure involved in determining such statements operates on representations derived by LIN-*, and has the following effects:

(18) For $X(P) = [W_1 \ldots W_n]$ and $Y(P) = [K_1 \ldots K_n]$, where W_i, K_i are M-Words, $(X(P) * Y(P)) \rightarrow (W_n \frown K_1)$

Thus what it means for X to be next to Y when (X * Y) is that the final element of X is concatenated with the initial element of Y; see Marantz (1984) for some discussion of the relevance of this procedure for clitic phenomena. With reference to (17), the second set of linearization statements are as follows:[15]

(19) Stage 2

LIN-$\frown$[(n * √(P))] $\longrightarrow$ ($n \frown$ √APPLE)
LIN-$\frown$[([D,the] * nP)] $\longrightarrow$ ([D,the]$\frown n$])
LIN-$\frown$[([P,with] * DP)] $\longrightarrow$ ([P,with]$\frown$[D,the])

visible for contextual allomorphy (e.g. indefinite article in English, if this involves two distinct Vocabulary Items).

In any case, some of the analyses below appear to support the idea that LD can move a node before VI occurs– see in particular the discussion of French in §4– whereas e.g. Latin preposition cliticization appears to occur after P has undergone VI. The interaction between Local Dislocation and Vocabulary Insertion is worth examining in greater detail, although I will not do this here.

[15]There is a question about whether non-pronounced copies figure in the linearization statements of the type discussed here. It is possible that the system could be defined in either way, although the simplest mechanically would be to hold that unpronounced elements are present until eliminated by some further operation. This point connects with some other issues. There is the possibility that the locality conditions on contextual allomorphy might be statable in terms of concatenation, and that (at least some) morphemes with null exponents are 'invisible' for this process; see Embick (2003) for discussion.

One of the elements that figures in these statements, the n, is internally complex; i.e., it is an M-Word containing more than one Subword. Complete linearization requires linearization of the contents of M-Words as well. I assume that the procedures outlined above apply in the same way; from * statements, the system derives statements of concatenation between Subwords (represented with $\oplus$):[16]

(20)　For X = [W$_1$ ... W$_n$] and Y = [K$_1$ ... K$_n$], where W$_i$, K$_i$ are Subwords, (X * Y) $\rightarrow$ (W$_n \oplus$K$_1$)

In (21-22) the linearization procedure is illustrated in a case where a Root combines with two heads X and Y:

(21)　Structure
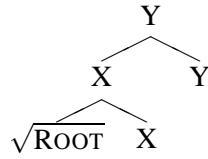
(22)　Linearization

　　a.　*: (($\sqrt{\text{ROOT}}$ * X) * Y)

　　b.　$\oplus$: $\sqrt{\text{ROOT}}\oplus$X, X$\oplus$Y

With reference to the example above, this concatenation statement ($\sqrt{\text{APPLE}}\oplus n$) is derived.

There are two important assumptions that underlie the proposal developed to this point, each of which has implications for the restrictions on LD operations. The first is that the linearization procedure itself is typed; this is the source of the typing restriction on LD:

(23)　TYPED LINEARIZATION HYPOTHESIS: Statements of concatenation are typed; i.e, they relate only elements of like type. There are at least two types: M-Words and Subwords. Where upper case X,Y are M-Words and lower case a,b are Subwords, linearization procedures generate two types of concatenation statements, X$^\frown$Y and a$\oplus$b. No such statements exist between objects that are not identical in type.

The second hypothesis is that the procedure derives (i) concatenation statements between M-Words; and (ii) concatenation statements between Subwords within a particular M-Word. It does not derive concatenation statements between Subwords of adjacent M-Words. Thus when an M-Word *X* containing Subwords a,b is linearized with respect to (right-)adjacent M-Word Y with Subwords c,d, the procedures above derive what is represented graphically in (24):

(24)　Graphically
　　$[_\mathcal{M}$ X] $^\frown$ $[_\mathcal{M}$ Y]
　　　　|　　　　|
　　$[a\oplus b]$　　$[c\oplus d]$
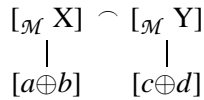
This second assumption derives from the fact that ordering M-Words and Subwords within them is sufficient to order the phrase-marker:

(25)　SUFFICIENT ORDERING HYPOTHESIS: Linearization concatenates M-Words, and Subwords within M-Words. This suffices to order the phrase-marker. There are no concatenation statements between Subwords that are contained in different M-Words.

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[16]There is a question here about what range of structural possibilities are found within complex heads in the first place. While in many cases head-movement produces 'simpler' structures compared to those found in the larger domain– i.e. structures that are derived by successive adjunction– there are cases in which more complex structures appear M-Word-internally as well (e.g. in the case of compounds like *butterfly net collector hat*).

It is possible that some cases covered by this hypothesis might be reduced to independent factors. For instance, in a system with cyclic spell-out, it might be that Y functions as "one object" by the time a relationship with X is considered, by virtue of having been processed already phonologically. However, it is not clear that a general reduction along these lines can be performed. I therefore state SUFFICIENT ORDERING as a hypothesis of its own.

3.1 Mechanics of Local Dislocation Local Dislocation can be formulated in terms of the representations discussed above. Concentrating on interactions between M-Words, there are two cases in which effects can be considered– those in which there is reordering, and those in which there is not. In the former case, there are two effects. One is that the order of the two elements is reversed. The second is that the moving element is pushed one step down in the ontology (i.e. what was an M-Word becomes a Subword). In the string-vacuous case, only the second part applies: an M-Word becomes a Subword. In both cases, the operation has a clear phonological effect: it places two M-Words in a structure in which they show close phonological interactions (informally, the moving element ceases to have the phonology of a separate "word"). These considerations suggest that it is the "affixation" step that is the essential part of Local Dislocation. Pursuing this intuition, I will explore the possibility that the relevant operation is one of adjunction: Local Dislocation adjoins X to Y. The subsequent linearization of adjoined X with respect to the contents of Y then determines whether or not the result is string-vacuous or not.

An example articulates this view and specifies some of its consequences. Consider hypothetical LD rule that affixes X to Y. For a structure like (26), the linearization mechanisms described above generate statements like (27) and (28):

(26)   Structure: Syntax

$$\begin{array}{c} XP \\ \diagup\quad\diagdown \\ X\qquad YP \\ \diagup\quad\diagdown \\ Y\qquad BP \\ \diagup\diagdown\quad| \\ b\ \ y\quad B_1... \\ \diagup\diagdown \\ a\ \ b \end{array}$$
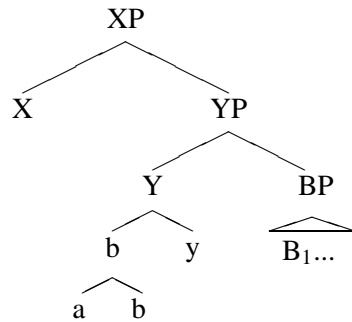
(27)   Linearization: Larger

   a. [X [Y BP ...

   b. (X * (Y * BP...

   c. (X⌢Y), (Y⌢B$_1$)

(28)   Linearization: Smaller

   a. [[[a b] y]

   b. (((a * b) * y)

   c. (a⊕b), (b⊕y)

By hypothesis, the first concatenation statement in (27c) meets the structural description for the LD rule that adjoins X to Y. Adjunction is hierarchical in nature, so that its effect is to create a representation with X adjoined to Y as in (29):[17]

(29)   [[[Y]X] BP ...

Formally, then, the LD rule (i) deletes the concatenation statement that is on the left-hand side of the rule, and (ii) introduces the hierarchical information that X is adjoined to Y. As part of this, X is a Subword in the derived structure, not an M-Word:

(30)   X⌢Y ⟶ [[Y]X]

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[17]I represent adjunction of X to Y with [X[Y]], with the understanding that this is contingent upon further assumptions about the status of adjunction in phrase structure that are not addressed here.

While some aspects of the linearization of elements internal to Y have been calculated prior to LD, the adjunction of X to Y requires the system to calculate * and ⊕-statements based on (29), after LD, since the effects of that process are hieararchical and require linear processing. The recalculation of linear statements is as follows:

(31)   a. $(((a * b) * y) * X)$

      b. $(a⊕b)$, $(b⊕y)$, $(y⊕X)$

When a syntactic structure S is spelled-out and processed by PF computations, the system generates a PF representation that is linked to S. The PF representation(s) linked with S, PF_S, contains information of the first three types in (15a-c): i.e. $<p_1,p_2,p_3>$, for hieararchical information, *-information, and concatenation information respectively. Within S, recalculation after LD is easiest to formalize if there is no deletion of earlier representations as later ones are derived. The deletion can be "put off" until the PF cycle is done with PF_S. When S is merged syntactically with something else to yield the syntactic object S′, there is a question about how much information in PF_S must be taken into account when the $PF_{S′}$ is computed.

Generalizing, the question concerns how much information is present in the PFs associated with different syntactic objects before and after they are put together. A certain amount of information should be inaccessible, in line with the general idea behind cyclic derivation. Answers should connect directly to syntactic definitions of cyclicity, at least in the ideal case. While the general point cannot be pursued here, I will examine some cyclic effects below in §4, in the context of a case study from French, which has additional properties of interest relating to the fact that LD is an affixation operation.

3.2 Interim Summary   With the specific linearization mechanics above, and with the further idea that LD is adjunction under affixation at hand, the constraints on LD may now be examined in greater detail. The system of linearization and LD advanced above is centered on two hypotheses, which relate to the nature of linearization statements and the formulation of LD in terms of these:

(H1)   TYPED LINEARIZATION. M-words are concatenated with M-Words; Subwords are concatenated with Subwords.

(H2)   SUFFICIENT ORDERING. Concatenation statements do not relate Subwords that are in distinct M-Words.

In terms of the system above, LD is defined as follows:[18]

(H3)   Postsyntactic movement under adjacency (Local Dislocation) is defined structurally in terms of concatenation statements. Formally, the operation is one of adjunction under adjacency.

Taken together, (H1-3) rule out a number of conceivable interactions. Two prominent cases involve *escape* from an M-Word, and *interpolation* into an M-Word. As noted above, it appears

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[18]The idea that LD is formally an adjunction operation has some implications for the status of 'head relations' in the grammar. It requires that PF have the power to adjoin a head to another head. In this way the current set of proposals relates to the ongoing discussion of whether or not head movement takes place in the narrow syntactic derivation or at PF (cf. Chomsky (2001) and related work). If head movement were a PF operation, then something like adjunction at PF is required, assuming that adjunction structures are created by this process. Other alternatives can be envisioned, however.

Another way in which adjunction is implicated at PF is in processes that add morphemes. For instance, if there are no AGR projections, and morphology is piece-based, then AGR nodes could be taken to be added at PF in accordance with language-particular rules (these nodes added at PF are so-called "dissociated morphemes" in the sense of Embick (1997)). This variety of adjunction is binary (as opposed to unary) since the morpheme is not part of the syntactic structure to begin with, as it is in the case of LD.

that a Subword cannot escape the M-Word it originates in by LD, and attach to another M-Word (this was illustrated with Lithuanian *-si*). Conversely, an M-Word such as Latin *-que* cannot appear between two Subwords of an adjacent word that is internally complex; rather, it suffixes onto the entire adjacent M-Word, ignoring that element's internal structure.[19]

(32) Prohibited Interactions

    a. No Escape

        i. $*[_{\mathcal{M}} \text{ a}\oplus\text{b}]^{\frown}[_{\mathcal{M}} \text{ X }] \longrightarrow [_{\mathcal{M}} \text{ a}]^{\frown}[_{\mathcal{M}} \text{ b}\oplus\text{X}]/[_{\mathcal{M}} \text{ X}\oplus\text{b }]$

        ii. $*[_{\mathcal{M}} \text{ X }]^{\frown}[_{\mathcal{M}} \text{ a}\oplus\text{b}] \longrightarrow [_{\mathcal{M}} \text{ a}\oplus\text{X}]/[_{\mathcal{M}} \text{ X}\oplus\text{a }]^{\frown}[_{\mathcal{M}} \text{ b}]$

    b. No Interpolation

        i. $*[_{\mathcal{M}} \text{ a}\oplus\text{b}]^{\frown}[_{\mathcal{M}} \text{ X }] \longrightarrow \text{a}\oplus\text{X}\oplus\text{b}$

        ii. $*[_{\mathcal{M}} \text{ X }]^{\frown}[_{\mathcal{M}} \text{ a}\oplus\text{b}] \longrightarrow \text{a}\oplus\text{X}\oplus\text{b}$

In order to escape an M-Word, a Subword c would have to be in a statement like c$\oplus$X, where X either is or is in a separate M-Word. Neither type of statement is derived by the system presented above. M-Words are ordered with respect to one another by $^{\frown}$, which does not recognize Subwords, and Subword concatenation does not extend outside of the M-Word. Similarly, interpolation of an M-Word inside of another M-Word would require a concatenation statement between the moving M-Word and a Subword; statements of this type are not derived.

The account above makes some crucial assumptions about how structures relate to phonology. As touched on at various points in the discussion above, elements within the same M-Word show close phonological interactions. The LD of M-Words is an interaction between two elements that combines them into a single M-Word. In instances of LD that appear to 'skip' an element, like the examples with Latin *-que* and P-N units, there is a clear prediction: the two items that are 'skipped' form a single M-Word, and should display phonological closeness that is unlike what is found with other types of adjacent elements. As noted in the discussion of Latin, this appears to be true for 'light' prepositions, which can be seen as proclitic on following nouns. The prediction here is that if two elements are apparently skipped by an LD operation, they must have formed a unit (single M-Word) by some earlier process. The phonological reflexes of this earlier operation should be evident. This is a reflection of the fact that the M-Word is special for phonology, in terms of the basic distinction between word-level phonology and the phonology of larger objects.[20]

3.3 Some Further Questions The discussion to this point develops specific claims about linear representations and the effects of Local Dislocation. In this section I examine some implications of these claims for different aspects of linear operations, concentrating on how they are constrained (§3.3.1) and the implications of a typed system for M-Word internal operations (§3.3.2).

3.3.1 Consistency One clear question concerns the range of LD operations, and in particular whether given some set of concatenation statements, any element in those statements could undergo LD. While ultimately this is an empirical question, the goal is of course to formulate as restrictive an approach as is possible.

It was recognized in early work on cliticization and linear order that a restrictive account of affixation under adjacency could be framed in terms of a kind of *Consistency* condition. Marantz

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[19]The ban on a Subword escaping an M-Word it originates in could also be made to follow from 'consistency' assumption that forces elements undergoing LD to be peripheral (see §3.3.1), although it is not clear whether this can generalize to a global ban on escape.

[20]For this reason mismatches like that studied in Poser (1990)– which argues for phrase boundaries within "words", are worth examining, along with cases in which items that are evidently phrasal show "word-level" phonology.

(1984,1988), for instance, is at pains to restrict adjacency-based merger to cases in which an absolutely peripheral element exchanges a relationship of adjacency for one of affixation. The motivation for this is that under such circumstances, the inverting element does not destroy a relationship of adjacency with an element to its right/left. Abstractly, this is schematized in (33), where $\diamond$ is a linearization operator:

(33)   a. $(X \diamond (Y \diamond Z...$

        b. $(W \diamond (X \diamond Y...$

According to the original formulation, X may merge under adjacency with Y in (33a). If this happens in (33b), on the other hand, there would be a problem. A statement $(W \diamond X)$ exists, but X no longer is in a position to satisfy this requirement, having affixed to Y. If X affixes to Y in (33a), on the other hand, Y maintains its relationship with Z because X has adjoined to Y, and adjunction does not disrupt relations in this fashion (cf. Marantz 1988).

The prima facie problem with the peripherality condition is that, as has been identified above and in other case studies, LD is not restricted to absolute sentence-initial or sentence-final positions in the way that a peripherality condition predicts.

In terms of the analysis above, a restriction along these lines can be formulated in terms of CONSISTENCY:[21]

(34)   CONSISTENCY: Concatenation statements are maintained and cannot be contradictory.

The one way that a concatenation statement can be removed is by a rule of LD, in the manner described above. Otherwise, (34) would require linearization statements for syntactic object S and its PF to be retained when S is part of a spelled-out S′ that contains S, or when there is action internal to PF_S.

The condition (34) could restrict LD to phase-boundaries, in a way parallel to what Marantz's formulation did for absolute first or final positions. It remains to be seen whether a restriction of this type makes the correct predictions in a phase-based model, however.

It seems clear that different predictions are derived depending on whether the system incorporates TYPING, CONSISTENCY, or both (taking SUFFICIENT ORDERING to go along with TYPING). Among other things, CONSISTENCY without typing might predict an aysmmetry between string-vacuous and non-string-vacuous LD, with the former being allowed at non-edges. The salient differences are summarized in (35):

(35)   Predictions:

        a.   TYPING: All cases of LD are restricted to M-Words adjoining to the adjacent M-Word, ignoring its internal structure (see next subsection for the Subword case).

        b.   CONSISTENCY: All cases of LD that alter the string order are restricted to phase boundaries.

        c.   CONSISTENCY + TYPING: All cases of LD are typed and restricted to phase boundaries.

While the details of these different systems cannot be explored here, these are the types of questions that further empirical investigations have the potential to clarify.[22]

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[21] This formulation assumes that complications arising from pronunciation or non-pronunciation of copies have been factored out.

[22] The question is complicated by the fact that there might be string-vacuous forms of "cliticization" that do not involve adjunction: "leaning" or "simple cliticization", in a terminology derived from Zwicky (1985). The hope is of course that some set of properties could be identified for each of the two cases, so that the adjunction-type of interaction could be systematically differentiated from the non-adjunction type.

3.3.2 Movement under Adjacency in M-Words The operation of Local Dislocation is formalized above as adjunction under adjacency. The defining property of this operation is that it pushes an element X one step down in the ontology, so that an M-Word becomes a Subword.

How precisely this adjunction is to be understood inside of an M-Word raises some questions that can be illustrated in cases like the following:

(36)   [[[w x] y] z]   (37)   w⊕x, x⊕y, y⊕z

In the case in which the element *z* undergoes Local Dislocation with the element to its left, *y* in this example, the surface order of *y* and *z* are inverted to yield *wxzy*. In an ontology that contains only M-Words and Subwords, this adjunction operation cannot perform exactly the same function as LD of M-Words does; the objects *y* and *z* are already Subwords. That is, adjoining a Subword to another Subword has structural consequences, but in a two-level ontology it does not affect the status of the elements involved. This leads to some potential difficulties with the concatenation statements that arise after LD has applied: in a two-level ontology, movement of the minimal elements can never be CONSISTENT in the sense discussed above, because *z* appearing between *x* and *y* cannot be consistent with the concatenation statement relating those two elements.

It is therefore possible that patterns of "second position" effects inside the M-Word force some further modifications to the approach. Two obvious possibilities would be (i) to extend the type system, or (ii) to treat M-Word internal operations like this as some sort of simple linear reordering, whose formal properties are different from those of affixation under adjacency.[23] Naturally it is to be hoped that further work will reveal more about the status of these M-Word-internal operations.

4   Cyclicity, Adjunction, and Derivational Domains   At various points above I have posed the question of how incremental (phase-based) spell-out might be relevant for LD and its interaction with other PF processes. There are two PF operations in French whose interaction forms the basis for an examination of these issues. As is well known, definite articles in French show a close phonological union with following vowel-initial elements: *l'arbre* versus **le arbre*, cp. *le chat*. I refer to this as *Article Cliticization*; it operates under linear adjacency and is sensitive to the phonology of the target. These properties motivate a treatment in terms of (string-vacuous) LD. This operation adjoins D to vowel-initial elements when they are concatenated (cf. (39a) below).

The second process is one that creates "fused" prepositions/determiners; this applies with the prepositions *à* and *de*, and the masculine and plural definite articles:[24]

(38)   a. du chat (*de le chat)

       b. aux enfants (*à les enfants)

I assume that this process, which affects certain nodes independently of the phonological content of either, is an instance of Lowering: the process which adjoins a head to the head of its complement (as with English T-to-*v*; cf. Embick and Noyer (2001)).

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[23]Embick and Noyer (2001) appeal to something like the first option in the analysis of some prefix/suffix asymmetries in the Lithuanian example discussed in §2, but the relevant cases might be analyzed otherwise; see the papers cited for details.

For something like the second option, see, for instance, Halle and Harris (2005), based on Halle (2004) and related work. It remains to be seen how that system of linear relations relates formally to the one discussed here. This second type of option might be problematic to the extent that it denies the piece-based nature of the process in question, a move that should (all other things being equal) be suspect.

[24]Although I refer to *du* etc. as "fused", I am not taking a stance on whether there is one VI involved or two; i.e., there may or may not be *Fusion* in the technical sense in this case. The important point for my purposes is that P and D are in the same complex head.

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For the purposes of this discussion, these processes are formulated as in (39):[25]

(39) PF Rules: French

    a. *Article Cliticization:*
       Local Dislocation: $D[def]^\frown X \longrightarrow [D[def][X]]$, X vowel-initial.

    b. *P-to-D Lowering:*
       Lowering: P^+ lowers to $D[def]^+$, where $^+$ is a diacritic for the particular terminals that are subject to this process.

In the system presented in Embick and Noyer (2001), the interaction between the two PF processes of *Article Cliticization* and *P-to-D Lowering* appears to be problematic. The reason for this is as follows. Head-to-head operations like Lowering are hypothesized to occur early in PF. LD rules are hypothesized to come after these, when linear relations and some aspects of the phonology have been introduced into the representation. Assuming this ordering, P-to-D Lowering should bleed the application of *Article Cliticization.* But the reverse situation holds; cliticization of D to vowel-initial elements prevents *P-to-D Lowering*, not vice versa:

(40) a. de l'arbre

    b. *du arbre

The interaction is one that appears to require a cyclic approach to PF. The intuition that I explore here is that the problem arises because the entire PP is too large an object to calculate the PF-relations on. In an incremental derivation in which PF interpretation of the DP occurs when reference cannot be made to the P for the purposes of Lowering, an application of LD on the PF cycle for the DP may bleed Lowering because the LD applies before the structure in which Lowering could occur is interpreted.

An account along these lines requires at least two distinct cycles for the PF of an entire PP: one in which the DP and internal material are processed without reference to P, and a subsequent one in which this higher structure is taken into account. What syntactic structure is being spelled-out at these two stages depends on assumptions about "Phase Impenetrability". What is important for the purposes of this discussion is separation of DP and PP cycles, such that the first stage to be considered is one in which the PF processes apply to (41), where the D in question is of the + type:

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[25]Certain aspects of (39) are simplified for convenience. For instance, the formulation of (39a) does not take into account similar cases (such as with prepositions, e.g. *d'argent*). The classification in (39) moreover assumes that P-to-D is an instance of Lowering (and not LD), because it seems to apply before either of the nodes involved has undergone VI; see Embick and Noyer (2001).This assumption could be examined in greater detail as well, since it is not possible to determine directly if this process skips intervening elements, a hallmark of Lowering. Consider the following examples, from Abeillé et al. (2003):

(1) a. Jean parle à tout le monde.

    b. *....tout au monde.

(2) a. Je m'occupe de tous les problèmes.

    b. *....tous des problèmes.

Here there is an intervening element *tout-*, and no "fused" P/D. Rather than indicating that Lowering cannot apply here, however, it could be the case that quantificational *tout-* heads a QP (see e.g. Koopman (1991))that is complement to P, in which case Lowering is not expected.

If the P-to-D process were an instance of LD, then this case study still illustrates cyclicity, just in a way that is more or less the same as what is seen with Latin *-que* and its interaction with prepositions.

(41) Stage 1

```
              DP
           ╱      ╲
          D        nP
                 ╱    ╲
                n      ...
              ╱  ╲
          √ROOT   n
```
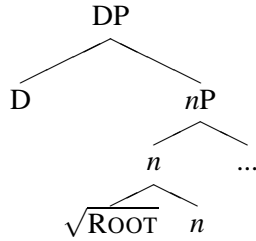
Assuming that D defines a cyclic domain in the relevant sense, PF receives this representation and computes linearization statements in the manner described above:

(42) PF

$[_{DP}$ D $[_{nP}$ *n* ...]

(D * ($_{nP}$ *n* * ...))

D⌢*n*

Crucially, one such statement concatenates D with whatever follows; in the case above, a noun ($\sqrt{\text{ROOT}}$-*n* = *n*): At this stage, if the LD rule that affixes determiners can apply, it does, the information that the following element is vowel-initial having been computed (either because the Root is present to begin with, cf. Embick (2000), or because the *n* has already been spelled out in some sense, cf. Marantz (2001)). D is affixed to N in the manner discussed above, with PF relations for the N with D affixed to it recalculated on the derived structure; the result of this, i.e. the PF that is associated after all operations have occurred, is as follows:

(43) PF: Cliticization

$[_{DP}$ $[_{nP}$ [D[*n*] ...]]]

($_{nP}$ ($_{n}$D * *n*) * ...))

D⊕*n*

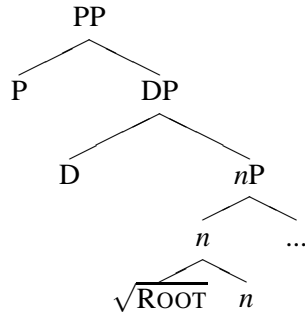When *Article Cliticization* does not occur, the PF representation for the DP is that given in (42) above.

For an account along these lines, it must be the case that there is no Vocabulary Insertion at D when the linearization statements for the DP are intially calculated; i.e., VI at D has to wait until (at least) the cycle in which the PP (and the head P in particular) is interpreted at PF. If Vocabulary Insertion applied to the DP by itself, then e.g. *le* would be inserted, and this would be problematic given that some "suppletive" form such as *du* or *au* would never appear.[26] Thus there is an asymmetry at play here with respect to which aspects of the derivation are calculated at which stage: Linearization statements must be calculated for the D, but this D is not subjected to VI.[27]

Continuing with the creation of the prepositional phrase, further derivation proceeds with the object (41). In the derivations under consideration, the syntax contains a PP headed by a P of the +-type, and this must be processed at PF as well:

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[26]Even if *du*, *au*, etc. are two Vocabulary Items rather than one, the point is the same: the phonological form of D cannot be calculated until a local relationship with P arises.

[27]There might be some need to reconcile this assumption with the treatment of Latin prepositions in §2, although there are some prima facie differences between the two cases.

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(44) Stage 2

```
              PP
            /    \
          P       DP
                /    \
              D        nP
                      /   \
                    n      ...
                  /   \
             √ROOT     n
```

When this object is interpreted by PF operations, whether or not *P-to-D Lowering* applies depends on the representation that is derived by earlier PF cycles. PF computation on (44) depends on what happens in the DP-cycle in particular. In particular, whether (42) or (43) is a subpart of the PF for the structure with the preposition (44) depends on what has occurred in the PF cycle for the DP. When no cliticization of the article has occurred, the hierarchical part of the PF representation meets the environment for Lowering; this is seen in (45). On the other hand, when *Article Cliticization* applies, it has the structural effect illustrated in (43), where the D ceases to exist as an M-Word. When the PP is interpreted at PF, the application of the LD rule effectively creates a configuration in which the structural description for *P-to-D Lowering* is not met, as shown in (46):

(45) PF: No Cliticization

From (42):

[P [$_{DP}$ D nP]]

(Application of *P-to-D Lowering*)

(46) PF: Cliticization

From (43):

[P [$_{DP}$ nP]]

(No *Lowering*)

In the case without cliticization, *P-to-D Lowering* applies. The preposition and determiner are subsequently spelled out as one of the fused forms. In (46), the Lowering rule cannot apply because there is no D heading the complement of PP; the preposition is subsequently spelled out on its own.

For present purposes, the analysis above illustrates two points. First, it shows how cyclic derivation might account for an otherwise problematic bleeding effect between two postsyntactic processes. The second point concerns treating affixation under adjacency as adjunction. Treating D-cliticization as adjunction affects the structural part of the PF representation; it removes D from a position in which it could be involved in the *P-to-D Lowering* rule. It is not clear that this interaction could be predicted in an approach in which LD was not treated as adjunction. In this way, the example also illustrates some consequences of this hypothesis concerning LD.

4.1 Aside: Interaction with Coordination An additional point of interest for the French example is discussed in Miller (1992) and subsequent work, and concerns the behavior of P-D combinations under coordination:

(47) J'ai parlé...

    a. à la mère et la fille

    b. *au père et la mère

    c. *à le père et la mère

    d. *à la fille et le garçon

e. *au pére et le garçon

f. à la fille et l'autre garçon

Example (47a) shows that two DPs may be coordinated under a single P, but (47b-e) show that this is impossible if *either* of the two conjuncts is a candidate for the rule combining P and D. It is interesting to note here that the examples like (47b-e) are evidently syntactically well-formed (given (47a) and (47f)), but are nevertheless deviant. If rules like Lowering are obligatory, with the structural environment being met by both D's in (47), then the unacceptable cases may be explained as follows. Example (47b) is ungrammatical because Lowering produces a violation of the Coordinate Structure Constraint. Examples (47c-d) are ungrammatical because the structural description of *P-to-D Lowering* is met, and Lowering must apply under such conditions. Thus in (47e), Lowering has applied once, but it does not apply to the second conjunct. Assuming that this conjunct meets the environment for the rule, as above, the example is ungrammatical for the same reason as (47c,d). Finally, example (47f) is grammatical because *Article Cliticization* removes all possible structures for the application of *P-to-D Lowering*, rendering it equivalent to (47a).

One question for future research is what the general principles governing the interaction of PF processes and coordination are.[28]

5   Conclusions, Implications, and Further Directions   The primary line of discussion above is aimed at identifying some specific properties of Local Dislocation, and understanding how this process is to be formalized in a way that yields the desired consequences. The discussion above advances specific hypotheses concerning the nature of linearization, and how Local Dislocation operations can be understood in terms of such representations. Additional points suggest that some interactions among PF process require the consideration of cyclic models of PF, in which syntactic subobjects are (partially) subjected to PF computations before these syntactic objects undergo further derivation. A number of empirical points are clarified and raised in the course of the discussion.

In terms of the assumptions of this paper, Linearization is central to what PF and has a clear motivation in the form of the requirement that syntactic structures must, whatever the output modality, be instantiated in real-time.[29] To the extent that apparently independent assumptions about operations like Local Dislocation can be derived from the representations that are required for linearization in the general case, we move towards a restrictive theory of PF, and build a foundation for investigating why the operations of this component are restricted in the ways that they are. Conceptual points of this type notwithstanding, it is clear that the issues are ultimately going to be decided in terms of empirical questions, like those discussed in and suggested by the analyses above.

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[28]Another potential case along these lines occurs in the interaction of Tense-Lowering in English with constituent negation; see Embick and Noyer (2001) for some discussion. A related fact is that VPs cannot be coordinated in English under T[past] or T[pres] in configurations where Lowering is possible:

(i)   a.   John will slice and cook.

b.   *John T slice-d and cook/*slice-s and cook.

c.   John did not slice and cook.

In (iib), the presence of negation removes the environment for Lowering and the coordination is grammatical. If morphemes cannot distribute in the way describe in the main text, it would be possible to explain the deviant cases along the lines of what was suggested for French in the main text.

As a general point, I am not aware of any systematic treatment that makes predictions about the interaction of post-syntactic processes and coordination.

[29]It could be asked if linearization requirements are "external" to the grammatical system (various suggestions in recent Minimalist work), or whether the requirement that syntax be instantiated in real time has deeper ramifications on the syntax itself (as in e.g. Kayne (1994), or Phillips (2003)).

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