Domain Correspondence
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12/12/89

So we better call the calling off off. *

1. Introduction

In this paper I will present a constraint on the relation between the syntax and the phonology, specifically regarding the linearization of syntactic structures. A principle of domain correspondence will act similarly to the Projection Principle, keeping representations parallel. This will be applied to particle constructions, verbs with prepositional phrase arguments, datives, NP modifiers and performance phenomena. A complete examination of these minor rules of English syntax will reveal a host of interacting factors and possibilities for dialect variation, not typically present in the rules of core syntax. It is this difference that argues best for the construction of an interacting system of parameterized modules and interfaces between the lexicon, syntax and PF.

I will explore this alternative within a modular theory of grammar, where grammaticality is judged relative to a set of interacting constraints. Fully grammatical structural descriptions are those that meet all constraints at all levels. Structural descriptions which violate one or more constraints at one or more levels of representation will represent sentences of degraded acceptability.

In this paper I will assume the framework of generative grammar, specifically, I will be assuming maximally binary branching constituents, no immediate recursion, VP complements of V, and V raising (see Kayne (1984), Larson (1988) and Hale and Keyser (1989)).

2. Verb Particle Constructions

Although recently (McArthur 1989) termed “long-neglected” by a prominent lexicographer, the verb-particle construction in English has been discussed many times in generative grammar. One oft-quoted pair of examples is:

1 Mary looked the number up.
2 Mary looked up the number.

Researchers have sought criteria for the identification of verb-particle combinations, with limited success. It is commonly thought that these constructions are idiomatic, but as Bolinger and Dixon have pointed out, many of the examples can be analyzed with a common meaning for the particle. Thus “up” can be used in a completive or a directional sense (among others):

3 Let’s finish this work up. / Let’s finish up this work.
4 Let’s polish up the glasses. / Let’s polish the glasses up.
5 John pulled his socks up. / John pulled up his socks.

and “out” can refer to a location:

* “Let’s call the whole thing off” from Shall We Dance music by George Gershwin and lyrics by Ira Gershwin.

1 I would like to thank my committee members: Ken Hale, Jay Keyser and Wayne O’Neil, the participants in the syntax workshop and Lisa Selkirk for comments and discussions. Of course they can’t be held responsible for the content of the paper. This work was done with the support of an NSF Fellowship.
6  Put the cat out. / Put out the cat.
7  Let the cat out. / Let out the cat.
8  Shake the salt out. / Shake out the salt.

This observation about particle constructions will find an expression in the analysis developed below. The first aspect of this account will be to assign particles to already extant grammatical categories, thus denying any special categorial status of particles. Emonds (1970, 1976, 1985) argues that particles are intransitive prepositions. We will basically adopt this analysis, although prepositions are not the only category that can so function. We will postulate the underlying structure:

```
   VP
    
   NP  V
      
     Mary  VP
        
           e  NP V
              
              the number V PP
                               PP
                                  P
                                      up

The verb in the lower VP then raises via Head Movement to occupy the initially empty V position in the upper VP:

```

```
   VP
    
   NP  V
      
     Mary  VP
        
           looki  NP V
                           
                           the number V PP
                                        PP
                                               P
                                                   up

At this point we would be able to generate the V NP P order, but not the V P NP order. One solution to this problem would be to formulate other movement rules moving either the particle or the object NP. However, we can account for the V P NP order without movement if we
```
assume that immediate constituents of VP are not specified for their linear order.\textsuperscript{2} Then the lower "subject" could surface in the other order as well:

\[\begin{array}{c}
11 \\
\text{NP} \\
V \\
\text{Mary} \\
V \\
\text{look}_i \\
V \\
\text{NP} \\
\text{V} \\
\text{PP} \\
\text{the number} \\
\text{t}_i \\
\text{up}
\end{array}\]

We could go on to propose that syntactic structures encode only hierarchical relationships, and that word order is determined by a set of linearization principles and operations in PF.\textsuperscript{3} Were we to do this, we would immediately run into several problems. One is that in English verbs and their objects are not freely ordered. In this case, we will need to say that V immediate constituents are ordered V XP by a language specific rule of English, but that VP immediate constituents are not so ordered. I will not pursue the general linearization theory here, interesting though it is. We will now assume that the immediate constituents of VP are syntactically unordered, leading to two possible surface manifestations.

2.1. Other Projections

Another problem that we run into is that free constituent order only obtains between NPs and particles. Kayne (1985) notes that with the order V P XP, the following maximal projections are possible: VP, PP, AP, and CP. However, in the order V XP P, only NP is possible. Examples (from Kayne) of particle constructions with prepositional phrases are:

\[\begin{array}{c}
12 \\
\text{V P PP} \\
\text{John teamed up with Bill.} \\
\text{John stocked up on rice.} \\
\text{Don't mess around with me.} \\
\text{He blasted away at them.}
\end{array}\]

\[\begin{array}{c}
\text{\* V PP P} \\
\text{\* John teamed with Bill up.} \\
\text{\* John stocked on rice up.} \\
\text{\* Don't mess with me around.} \\
\text{\* He blasted at them away.}
\end{array}\]

Such sentences could be given a structure directly analogous to the structures proposed for the other particle constructions:

\[\begin{array}{c}
\end{array}\]

\textsuperscript{2} This lack of specification of linear order achieves a partial re-interpretation of Keyser's (1968) Transportability Convention. I'm grateful to Jay for pointing this out to me.

\textsuperscript{3} See also Marantz (1988a,b) and Sproat (1988) for similar proposals within the morphology.
In this case, however, only one of the structures is grammatical. Likewise, we find similar facts (also from Kayne) for particle verbs with clauses:

15 \[ V \text{ Prt CP} \]
   \begin{align*}
   & \text{Mary pointed out that he was wrong.} \\
   & \text{They're trying to make out that he's a drunkard.} \\
   & \text{He blurted out that he was guilty.} \\
   & \text{They found out that they were right.}
   \end{align*}
   \begin{align*}
   & \text{*Mary pointed that he was wrong out.} \\
   & \text{*They're trying to make that he's a drunkard out.} \\
   & \text{*He blurted that he was guilty out.} \\
   & \text{*They found that they were right out.}
   \end{align*}

Again, the CP particle constructions can be given the same structures:
However, we find that only one of the pair of linearized structures is grammatical. Thus, we will need some extra mechanisms to account for this lack of free constituent order in particle constructions involving clauses and prepositional phrases. If we want to maintain our theory of free order in VP immediate constituents, then we will have to find a constraint which will rule out clauses and prepositional phrases preceding particles.

2.2. Linearization Constraint

To maintain the free order hypothesis, we need to unify the observations:

18  V Prt NP / PP / CP
19  V NP Prt
20  *  V PP / CP Prt

We notice that one distinction that can be drawn to capture the difference in order possibilities is the presence or absence of internal complementation in the phrasal argument. Stated as a linearization filter, it would look something like:

21  Linearization Constraint
    * [ ...α ... [ ...β ...γ ... ] ...δ ... ] where
    β governs/selects γ
    γ is a maximal projection
    α governs/selects δ
With this linearization constraint, we can now account for the observed patterns of verb particle orders. In the example:

```
22    VP
     /  \
    NP   V
   Mary V
   look_i
     /  \
    NP   V
   the number V
   t_i PP
   up
```

If the NP is linearized to the left of the `V` as V NP P, then the V and the P are separated, but not by a configuration containing a (lexical) head and a complement maximal projection. If, on the other hand, it is linearized to the right of the `V` as V P NP everything is still alright, because the PP in this case is intransitive, and thus has no complement.

The order V CP P is out because of the internal complementation inside the CP. In the example:

```
23    * Mary found that John hit Sue out.
```

The structural description can be parsed as:

```
24    * [... α [... β [... γ ... ] ... δ ... ] ]
   \   \   \   
  found hit Sue out
```

violating the Linearization Constraint. Since CP proforms do not contain internal complementation, they are acceptable when they appear between V and P:

```
25    Mary found that out.
```

We can also explain why the order V PP P is unacceptable, again the internal complementation violates the linearization constraint. However, PP proforms don't seem able to intervene between the V and P:

```
26    John blasted away at them.
27    * John blasted at them away.
```

In the V PP P case the structure will meet the structure of the Linearization Constraint:

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4 Problems regarding the status of the DP hypothesis with respect to these facts will be discussed below.
5 The example parsing indicates only one violation of the linearization constraint in this example. In fact there are at least three, with β as C, I and V. See below, in the section on Heavy NPs, for a fuller explication.
6 There are other possible parsing which also violate the Linearization Constraint, see below.
7 The CP proforms may be pronouns dominated by NP.
and will thus be ruled out.

2.3. Heavy NPs

The ordering possibilities in verb-particle constructions involving NPs is also restricted along the same dimension. Ross (1986 p 33) noted that Particle Movement was sensitive to the "heaviness" of the accusative NP:

29 * I ran a man who was old down.
30 I ran an old man down.
31 * I'm going to call somebody who is strong up.
32 ? I'm going to call somebody strong up.
33 * I polished the vase which was from India up.
34 ? I polished the vase from India up. (Ross)

Ross defined the notion Complex NP to account for his ungrammatical sentences:

35 A noun phrase is complex if it dominates the node S (Ross)

My judgments are somewhat different. I find all the V NP P particle constructions involving NPs with post-nominal modification to be degraded:8

36 * I'm going to call somebody who is strong up.
37 * I'm going to call somebody strong up.
38 * I polished the vase which was from India up.
39 * I polished the vase from India up.

The structures of NPs with post-nominal complements9 fall under the Linearization Constraint:

40 * [... α... [... β... γ... ]... δ... ]
   |     |     |     |
   polished from India up

thus ruling these sentences out. Of course in the case of the NP with a CP complement there are a number of parsings for the structure that will violate the Linearization Constraint. Not only does the internal PP interrupt the relation between polish and up, there is also a C IP relation, an I VP relation and a V PP relation:

41 * [... α... [... β... γ... ]... δ... ]
   |     |     |     |
   polished P NP up
   C IP
   I VP
   V PP

---

8 Certainly this is not the same unacceptability as that of an ECP violation, but then it involves a constraint of a rather different nature.

9 See below for a further discussion of complementation within NP's
Thus an NP with sentential complementation violates the Linearization Constraint in several ways, whereas an NP with only a PP complement violates it only in one way. This might account for the difference in the judgments given by Ross. Thus if we define heavy NPs as those involving internal complementation, we have the following patterning:

42   V Prt NP / PP / CP
43   V NP\textsubscript{light} Prt
44   * V NP\textsubscript{heavy} / PP / CP Prt

The Linearization Constraint thus applies to NPs as well, ruling out the order V NP P when the NP contains internal complementation.

2.4. **Non-alternating forms**

Logically, there are two types of non-alternating forms possible, ones displaying only the V NP P order, and those displaying only the V P NP order. An example of the second type is:

45   * He called the student on.
46   He called on the student.

Two possible explanations exist for the lack of alternating forms for such pairs; either there is a true compound verb [\textit{v} call on], or \textit{call} selects only a PP rather than an NP and a PP. In this case the latter move seems the correct one, due to the pattern of nominalizations:

47   * Her calling on of the student disrupted his sleep.
48   Her calling on the student disrupted his sleep.

The nominalizations lack of–insertion, indicating that \textit{the student} is not the object of \textit{call}. Contrast these sentences with:

49   The beating (up) of the students provoked a demonstration.

Another case with only V P NP order is \textit{look after sb}, which displays a different behavior in gerunds:

50   The looking after of the children

This suggests that \textit{look after} is a true compound verb [\textit{v} look after]. Thus, for cases of possible verb-particle constructions that display only the order V P NP there are two possible analyses: compound verbs and verbs with one PP complement.

Constructions displaying only the V NP P order might indicate a null object of the preposition, blocking the V P(P) NP realization because of the internal government of the null object. This might be taken as an indication that some prepositions are obligatorily transitive. Indeed, this class seems restricted to items that do not show alternates with any forms:
She brought the survivors to.
She brought to the survivors.
She rushed the child past.
She rushed past the child.\(^{10}\)
She brought the horses by.
She brought by the horses.\(^{11}\)

Other examples might be constructed with inchoative forms (see below) such as "near" in call sb near, "call near sb. Another notable quality about these forms is that they contain unexpressed limitations on the understood object of the preposition, bolstering the claim that they are transitive structures. The meanings of the various verbs are approximately:

bring someone to (consciousness)
rush something past (here)
bring something by (here)
bring someone around (to our way of thinking)

This can also be seen by the lack of simple predicates:

He is toward.
He is to.
He is by.
He is around *(to our way of thinking).

Since there are alternate analyses open for non-alternating forms of both types that fit the present theory, I will not consider them in detail. Having made these observations, we would then expect other non-alternating forms to exhibit behavior consistent with these remarks.

3. **Domain Correspondence**

In this section I will offer an interpretation of the Linearization Constraint that locates its effect in the correspondence between structures of the syntax and PF structures.

A major function of the mapping from syntax to PF is the conversion of syntactic constituency to phonological constituency. Selkirk (1986) along with others have developed an end-based theory of phonological phrase formation. The ends of a set of distinguished maximal projections define the phonological constituents. By formulating a distinguished category definition for the formulation of English intonational phrases, we should be able to account for some observed phonetic intonational phenomena. Along with this, a principle of Domain Correspondence will be proposed. This will serve to constrain the possible syntax - PF relationship. The Linearization Constraint will then be the product of the interaction between intonational phrase formation and Domain Correspondence.

3.1. **Interpreting the Linearization Constraint**

To account for the differing possibilities of linear order, we formulated the Linearization Constraint:

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\(^{10}\) This sentence is not, of course, stringwise ungrammatical, rather it fails to have the same meaning as the preceding example, perhaps pointing out the preference for past to be transitive.

\(^{11}\) The only example of V by in Fraser is: pass sb by, pass by sb I don’t find this example completely convincing, however, as I'm not sure that they mean the same thing.
65 \* [ \ldots α \ldots [ \ldots β \ldots γ ] \ldots δ ] \ldots ] \text{where}

\begin{itemize}
    \item β governs/selects γ
    \item γ is a maximal projection
    \item α governs/selects δ
\end{itemize}

The effect of this constraint is to ensure that a relation between α and δ is not interrupted by a similar relation between two other elements. This could be achieved by precluding the recursion of domains at some level of representation. Interestingly, this non-recursivity is an important feature of current work in phonological phrasing (Selkirk 1986). If we assume that the edge of the XP γ marks the end of an intonational phrase\textsuperscript{12}, then structures of this sort would violate principles such as:

66 a verb and all its arguments must be in the same τ

Generalizing the proposed principle, we can formulate a principle ensuring a type of correspondence in domains between different modules of the grammar:

67 Domain Correspondence
    domain of government / selection = domain of τ

We now have to consider the construction of phonological constituents. There has been much recent work in this area. There is a growing consensus on the use of end-based theories. In such theories phonological constituents are constructed off the S-structure syntactic constituency by marking the left or right edge of distinguished syntactic categories. The research points to maximal projections being the distinguished syntactic constituent. In many languages, the construction of phonological constituents also seems to be subject to further conditions. Chen (1987) argues for an argument / adjunct distinction, Hale and Selkirk (1987) argue for a condition based on government (see below), and Rice and Cowper (1987) argue for a branchingness condition\textsuperscript{13}. This work on English would have to include a new construction condition for intonational phrases.

The construction of intonational phrases in English will require a government condition, but it will have to be evaluated with respect to the head of the phrase being converted. That is, when we are constructing the intonational phrase from the syntactic phrase headed by the verb, the right edge of a maximal projection not governed by the verb will define the edge of the intonational phrase.

68 English τ construction
    ] Xp, Xp governed by another node

Returning to the Linearization Constraint, in the structure:

\textsuperscript{12} Lisa Selkirk has pointed out to me that the discussion of verbs and their particles should refer to the intonational phrase, rather than the phonological phrase. For most of this paper this distinction is not of any consequence. It suffices that there be some phonological constituent having these properties. I do agree with this observation, however, and will have more to say about it with regard to the internal phonological structure of NPs. In anticipation of this distinction, I will mark the constituents as τ phrases (for intonation) rather than the more standard IP, to avoid confusion with the syntactic use of IP for the maximal projection of Inflection.

\textsuperscript{13} These works deal with the construction of phonological (q) phrases.
\[ * [ \ldots \alpha \ldots, [\ldots \beta \ldots \gamma \ldots] \ldots \delta \ldots ] \] where
\( \beta \) governs/selects \( \gamma \)
\( \gamma \) is a maximal projection
\( \alpha \) governs/selects \( \delta \)

the right edge of \( \gamma \) will mark the end of the \( \tau \) constructed with respect to \( \alpha \). Then \( \delta \) will not be in the same \( \tau \) as \( \alpha \), violating the principle of Domain Correspondence. When the constituent between \( \alpha \) and \( \delta \) does not contain a maximal projection with a closer governor than \( \alpha \), only one intonational phrase will be constructed, and therefore \( \alpha \) and \( \delta \) will appear in the same \( \tau \), thus satisfying Domain Correspondence.

3.2. Papago Intonation

The proposed Domain Correspondence interpretation of the English Linearization Constraint owes much to the Hale and Selkirk (1987) account of the intonational contours of Papago sentences. They introduce a government condition on the construction of phonological phrases (p 164, eg 29):

\[ \] XP, XP not lexically governed

This is the closest analog to what I am proposing for English intonational phrases. The basic clause structure is SOV and has one tonal phrase. Extraposition in Papago yields the biphrasal surface tonal patterns. In Papago, government is to the left, so in SOV order the verb phrase can be realized in one intonational unit:

71
\[
\text{Na-}\text{t g wákial g wísilo cépos?} \quad \text{(LHHHHHHHL)} \quad \text{(SOV)}
\]
inter-AUX:3:sg:perf art cowboy art calf brand:perf
‘Did the cowboy brand the calf?’

The noun phrase complements can also be extraposed to the right. When this happens they will appear to the right of the lowest segment of VP, which is dominated by a non-lexical governor (Infl), and marks the end of the intonational unit. Thus such sentences will be multi-phrasal.

72
\[
\text{Na-}\text{t g wákial cépos g wísilo?} \quad \text{(LHHHHL)} \quad \text{(HLL)} \quad \text{(SV)} \quad \text{(O)}
\]
inter-AUX:3:sg:perf art cowboy brand:perf art calf
‘Did the cowboy brand the calf?’

73
\[
\text{Na-}\text{t cépos g wísilo g wákial?} \quad \text{(LHL)} \quad \text{(HLL)} \quad \text{(HLL)} \quad \text{(V)} \quad \text{(O)} \quad \text{(S)}
\]
inter-AUX:3:sg:perf brand:perf art calf art cowboy
‘Did the cowboy brand the calf?’

74
\[
\text{Na-}\text{t cépos g wákial g wísilo?} \quad \text{(LHL)} \quad \text{(HLL)} \quad \text{(HLL)} \quad \text{(V)} \quad \text{(S)} \quad \text{(O)}
\]
inter-AUX:3:sg:perf brand:perf art cowboy art calf
‘Did the cowboy brand the calf?’

Non-canonical orders in Papago are derived through extraposition, which allows a separate intonational contour. If we cast this in terms of Domain Correspondence, the existence of the trace inside the VP will ensure that Domain Correspondence is satisfied.

4. Interacting Factors

There are a number of grammatical phenomena and categories which interact with particle constructions. In this section I will examine the effects of pronouns, extraposition, small clauses and the possibility of particle subjects.
4.1. Pronominal Objects

A further fact regarding particle constructions is that when the object NP is a pronoun, the only possible order is V NP P:

75       * Mary looked up it.
76       Mary looked it up.

If, as has been suggested (Selkirk 1972, 1984), object pronouns in English are clitics, then a reasonable assumption would be that to be visible to the verb they must cliticize to the verb -- cliticization to the Prt in particular will render the NP invisible to the verb. This would amount to the inability to "see inside" a prosodic word. The ungrammaticality follows if we assume that the verb must satisfy its theta requirements at all levels. If the object were cliticized to the particle, then it would be invisible to the verb, and hence the verb would not be able to match its DS assignment of theta roles in the PF structure.

Such an account would provide further evidence that particles do not cliticize. Though the sentences with particles are ungrammatical, multiple object clitics are acceptable:

77       Gimme it.
78       * Give my brother it.
79       Give it to my brother.

This could also be handled by assuming that multiple clitics have positional requirements within the prosodic word. For example, the prosodic word would be something akin to:

80       [ø V (Pronoun*) (Particle) ]

This remains a possibility, although the lack of phonetic reduction of particles suggests that they simply fail to cliticize.

4.2. Extraposition

As in Papago, we also have available an Extraposition rule. In Papago this rule allowed the derivation of all derived orders. In English extraposition will serve to also give us two derivations for some stringwise equivalent sentences. Assuming that Extraposition is adjunction to VP we get:

81

```
          VP
         /   \
        NP    V
       /   |   |
      Mary V  VP
      /   |   \
     look i VP NP k
     /   |   |
    NP   V
    /   |   |
   t k V  PP
   /   |   |
  t i up
```

the number I asked you about
This leaves us with a surfeit of ways of generating this sentence type. In these cases, given the discussion so far, even extrapolation is not necessarily going to cause a phrasing break, unlike extrapolation in Papago. English seems to allow both types of phrasing: as in Papago we can get the extrapoed NP into a separate phonological constituent:

82 \[ \tau \text{ looked up } \tau \text{ the number I asked you about } \]

We are still able to generate the sentence with a single phonological constituent by linearizing the NP to the right, sans extrapolation. The structure:

\[
83 \quad \begin{array}{c}
\text{VP} \\
\text{NP} \\
\text{Mary} \\
\text{look}_i \\
\text{t}_i \\
\text{V} \\
\end{array} \quad \begin{array}{c}
\text{VP} \\
\text{NP} \\
\text{PP} \\
\text{up} \\
\end{array} \\
\text{the number I asked you about}
\]

would give the phrasing:

84 \[ \tau \text{ looked up the number I asked you about } \]

We could account for this by allowing free generation of ends of phonological phrases if we keep the linearization constraint. We would still need to force the introduction of certain ends (those governed by other items) if we wish to keep the domain correspondence interpretation of the linearization constraint. This would allow the extrapolated NP to be either in the same phrase, or in a separate phrase. If we wanted to force the separate phrase under extrapolation, we could adopt an anti-locality condition on trace binding: traces would have to be bound from outside their phonological constituent, but such a condition seems of dubious merit.

Another point of equivocation available here is the status of the VP node with respect to the verb. It certainly seems to be governed by another item (Inflection), but that item is a functional category.\(^{14}\) Thus it could be taken to denote the end of the phonological constituent constructed with respect to the verb. The status of the extrapolated NP is somewhat ambiguous under this theory, given that it is contained within some but not all segments of the VP node. This may account for its ambiguous behavior also. So, we are still left with a variety of ways of explaining the phrasing possibilities.\(^{15}\)

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\(^{14}\) The functional / lexical distinction is again drawn in the section on NP modifiers.

\(^{15}\) Something needs to be said about the ability of very short NP's to function as autonomous phonological phrases in S-structure subject (spec IP) position. Although this is not the main point of the paper, I assume that this is generally a focused position, and that focus contributes to heaviness. This is admittedly vague, but this is a footnote after all.
So, why can't we perform extraposition on the PP containing only the particle when the object is itself a PP or a CP, giving the ungrammatical:

85  * Mary teamed with John up.

the structure:

86  
  VP
  \[\overline{V}\]
  NP
  Mary
  \[V\] VP
  \[team\] VP PP
  \[\overline{V}\] PP up \[k\]
  \[V\] PP with John
  \[t\] i \[t\] k

Either linearization possibility (\[\overline{V}\] PP or PP \[\overline{V}\]) will yield the same result since the \[\overline{V}\] contains no phonetic material.

In order to rule this out, we will need to state a type of heaviness restriction on extraposed items, almost the complement on the non-heaviness restriction on NPs between V and P. Ross again noticed this with regard to other extraposition cases:16

87  * He attributed to a short circuit the fire.
88  * He threw into the wastebasket the letter.
89  * We elected president my father.
90  * They dismissed as too costly the proposal. (Ross)

In order to capture these facts, we will need a notion of minimal intonational phrase. A good candidate for this would be a branchingness requirement on the output, essentially requiring that the resulting structure is branching, for example. This amounts to some sort of eurhythmy requirement. We will state the condition as:

91  Minimal Intonational Phrase Requirement
  * [\[t\] [\[e\] \[\omega\]]]

This requires an intonational phrase to consist of more than one phonological word. This is not intended to be the final word on the matter. It is certainly possible that the internal structure of the phonological words in terms of syllables and feet makes a difference. This also raises the problem of extraposing PPs with no internal complementation, such as on the table, do they form one or two phonological words? Another possible requirement would be internal

16 Focus and presentation contexts can contribute to the heaviness, apparently, as these examples are better is the extraposed NP is stressed or in a presentation context.
complementation. This suggest that the classes of extraposable items would be disjoint from the class of items occurring between the verb and the particle. This is of course contrary to fact. One point of variability is the type of complementation necessary. This will be explored further in the section on NP constituents. In short, lexical complementation cannot intervene between the verb and the particle, but either functional or lexical complementation might be sufficient for extraposition.

This raises some further issues with regard to complex particles. It is possible to have modification of the particle itself, usually with words such as back and right. Some examples are:

92 They put the guns back down.
93 They put back down the guns.
94 They put back down the guns that they had brought.
95 They put the guns that they had brought back down.

If the structure of back down is:

96 PP
|    |
| P  |
|    |
| PP |
|    |
| back |
|    |
| down |

then we would expect put back down the guns to violate either the Linearization Constraint in the structure without extraposition, and to violate the Minimal Intonational Phrase Requirement when the guns is extraposed. We could then give the last sentence the structure:

97 VP
|    |
| V  |
|    |
| NP |
|    |
| They |
| V |
|    |
| VP |
|    |
| put |
| V |
|    |
| VP |
|    |
| PP |
|    |
| back down |
|    |
| V |
|    |
| NP |
|    |
| the guns that they had brought |
|    |
| V |
|    |
| PP |
|    |
| t_i |
|    |
| t_k |

However, it is also possible that the structure of back down is:
In this case, _put back down the guns_ would not violate the linearization constraint. We might expect to find some difference in the amount of phonetic reduction of the constituents depending on the analysis. The prediction would be that the extrapoed constituent would be less likely to contain reduced forms. This could also be due to its status as a separate intonational phrase.

Again, as in Papago we could contemplate multiple extrapoion as another source of these sentences. Then the structure of the last sentence could be:

\[
\begin{array}{c}
99 \\
\text{VP} \\
\text{NP} \quad \text{V} \\
\text{They} \\
\text{V} \quad \text{VP} \\
\text{put} \quad \text{VP} \quad \text{PP}_k \\
\text{VP} \quad \text{NP}_m \\
\text{NP} \quad \text{V} \\
\quad \text{t}_m \quad \text{V} \quad \text{PP} \quad \text{t}_k \\
\end{array}
\]

This would allow us to get the phrasing:

\[100 \quad [\text{put}] [\text{the guns that they had brought}] [\text{back down}]\]

by interpreting the first VP as the end of the verbal intonational phrase.\(^{17}\) It has been observed\(^ {18}\) that not all phrasing are possible:

---

\(^{17}\) One concern here might be the appearance of _put_ as the sole constituent of an intonational phrase. It does of course contain internal complementation, and there is some focus present on the verb, so this may not be a problem. Another factor is lengthening before traces as reported by Cooper and Paccia-Cooper.

\(^{18}\) See also Selkirk (1984) for phrasing possibilities in datives.
The relative acceptability of the phrasings is modelled by the status of the VP segments and the presence of internal complementation in the extraposed items. Extraposing the constituents to form the opposite relative positions inside the VP segment yields:

```
105
   VP
      NP  V
         They
             V  VP
                put_i  VP  NP_m
                                the guns that they had brought
             VP  PP_k
                  NP  V
                      t_m  PP
                          V  PP
                             t_i  t_k
```

The phrasings:

```
106  [ put ] [ back down ] [ the guns that they had brought ]
107  ? [ put back down the guns that they had brought ]
108  [ put back down ] [ the guns that they had brought ]
109  * [ put ] [ back down the guns that they had brought ]
```

One issue here that seems to be underdetermined in the literature is whether this type of extraposition arrangement is a violation of the Path Containment Condition of Pesetsky (1982). My judgement on the applicable phrasing indicates that it is not in violation of a constraint, but it is not clear to me how the PCC applies in a framework where adjunction yields a category with diffuse segments.

### 4.3. Small Clauses

Kayne discusses a class of particle constructions involving small clauses, citing the following contrasts:

```
110  Fred will make John out a liar.
111  * Fred will make John a liar out.
112  ?* Fred will make out John a liar.
```

---

19 This is of course an acceptable structure, provided that *back down* is associated with *bring* rather than *put*.
Kayne analyzes these as arising from an underlying structure with:

113 make [sc John a liar] out

with extraposition of a liar. If we follow this analysis, putting the small clause in place of the object NP, then [John t] contains no internally governed XP so the good sentence can be generated. It also predicts that make out John a liar should be acceptable ECM may have stronger requirements on case assignment than normal structural case, this might explain the degradation. Here, we would propose that ECM requires adjacency, whereas ordinary assignment of case requires only that the items be in the same intonational phrase.

Another consideration is if [John a liar] is extraposed then the trace of the small clause would be in a position to receive case. Consequently if case were assigned to that trace, John would not receive case. Kayne also notes that a liar cannot be extracted, we could again follow his analysis, explaining this because a liar is not in an A position. Thus, we can adopt Kayne's analysis of small clause constructions with particles without sacrificing the main tenets of our account.

4.4. Particle Subjects?

It is interesting to note that we are not forced to assume that the particle is generated as the complement of the innermost V. That is, using the same linearization constraint, if we switch the DS position of the object and the particle, we will still have the same result:

114

```
  VP
   /\  
  NP  V
    / \ 
   V  VP
    / \
   look_i PP
    / \
   P  V
    / \
   up  t_i
```

This structure can be linearized in the same two ways as before, with PP to either the right or the left of V. Also as before, since neither of these phrases contains an internal complement, they both satisfy the linearization constraint. Thus we will need some arguments if we want to maintain the complement analysis of the particles. Certain types of word formation processes seem sensitive to internal complements: in man-eating the man must be the food. We get similar formation from some V-Prt constructions: up-standing, off-putting, put-aside-able, put-off-able. We also fail to find conflations such as number up, in the sense "cause the number to be up" or book down meaning "cause the book to be down". Additionally, in following Hale and Keyser's work, we find a natural interpretation for the structure:
This structure has two components, a inchoative relation (V PP/AP) and a causative relation (V VP). Thus its interpretation is that of causing a change. The structure with a PP subject has no standard interpretation in Hale and Keyser's work. This does not preclude it as a possibility, indeed, there might be two classes of particle constructions, certainly not all particle constructions have the semantics of causative resultatives.

Given the lack of a specific, plausible interpretation of the structure involving particle subjects, I conclude that while this is an interesting possible structure, we have no reasons to believe that it is realized. This same argumentation can be applied to the cases of particle verbs with prepositional phrases, such as "put up with somebody". Given the considerations which lead us to reject particle subject constructions, we should also reject PP subjects in these cases, given the lack of a plausible interpretation.

5. Other VP phenomena

There are a number of other VP construction types that are similar to particle constructions in their structure and the order of their constituents. In this section I will briefly comment on the place of subcategorized prepositional phrases, inchoative predication, passive by-phrases, dative "movement" and the interaction between datives and particles.

5.1. Prepositional Phrases

An obvious place to turn to now is constructions with obligatory transitive PPs. An example of these verbs is put. Hale and Keyser have argued that put also involves a causative-inchoative structure, yielding the underlying:

```
116  VP
    /\NP V
   /  
  Mary V VP
   \   
    e NP V
      \  
       the book V PP
               put on the shelf
```
Again, as with the particle analysis, the verb raises to the higher VP. Again, we are free to assume that VP immediate constituents are unspecified for linear order. In this case we predict that because the PP contains a maximal projection not governed (minimally) by the verb that there will only be one linear order possible: V NP PP, as is the case:

117  * Mary put on the shelf the book.
118    Mary put the book on the shelf.

We can generate the V PP NP order by extraposing the NP, but in order to do this it must meet the heaviness requirement that we already outlined. Thus the NP must contain at least two stressed words, and perhaps some type of complementation.

119

\[ \begin{array}{c}
\text{VP} \\
\text{NP} \\
\text{Mary} \\
\text{V} \\
\text{put}_{i} \\
\text{VP} \\
\text{NP}_{k} \\
\text{the book that I gave her} \\
\text{VP} \\
\text{t}_{k} \\
\text{V} \\
\text{t}_{i} \\
\text{PP} \\
\text{on the shelf} \\
\end{array} \]

With \textit{put}, however, we do not have such a wide choice in the phrasing possibilities with extraposed constituents:

120  [ put on the shelf ] [ the book that I gave her ]
121  * [ put on the shelf the book that I gave her ]

The latter phrasing is impossible with the extraposed constituent, since we are forced to end the intonational phrase after \textit{on the shelf}, due to the presence of a maximal projection (\textit{the shelf}) governed by another item (\textit{on}). We are also able to generate the order with the heavy NP preceding the PP through extraposition of the PP, and linearization of the heavy NP following the \textit{V}:

122    Mary put the book that I gave her on the shelf.

having the structure:
As with the other type of extraposition, only one phrasing is possible:

124 \( [\text{put the book that I gave her}] [\text{on the shelf}] \)
125 \( * \) \( [\text{put the book that I gave her on the shelf}] \)

We can also generate the sentences with separate intonational phrases for each item through double extraposition, as before:

126 \( [\text{put}] [\text{the book that I gave her}] [\text{on the shelf}] \)
Let's consider now a couple of questions involving wh-movement. Questions formed from sentences with no extraposition have the relative acceptabilities:

130  What did Mary put on the table?
131  What did Mary put the book on?
132  * What did Mary put on \( t \) the book?
133  Where did Mary put the book?

We can rule out the ungrammatical question the same way we ruled out put on the table the book. This indicates that traces of maximal projections count for the construction of intonational phrases. With heavy NPs, however, the facts are slightly different:

134  Where did Mary put the book that I gave her?
135  ? What did Mary put the book that I gave her on \( t \)?
136  * What did Mary put on \( t \) the book that I gave her?

In such cases in Larson's analysis the heavy NP shift is actually achieved by raising the predicate "put on NP" around it, via Verb Raising. In order for this to apply the V must be re-analyzed as a V. Thus wh-extraction from such a raised verb would violate the principle of lexical integrity.

Under this analysis, to avoid violating the Linearization Constraint, the VP \( t \) NP sentences would then have to be formed by extraposition of the NP. If we assume that wh-mvt entails first an adjunction to VP, we would then have the structure:
This structure is quite similar to the double extraposition structures we have been examining. However, this yields an ungrammatical result. The difference in acceptability is either due to the further movement undergone by the wh-phrase, or to the difference in what adjoins to VP. One possible test for this would be to try yet another phrasing possibility, one corresponding to the structure:

138

This structure is quite similar to the double extraposition structures we have been examining. However, this yields an ungrammatical result. The difference in acceptability is either due to the further movement undergone by the wh-phrase, or to the difference in what adjoins to VP. One possible test for this would be to try yet another phrasing possibility, one corresponding to the structure:
yielding the phrasing:

139  
*    [ put on ] [ the table that broke ] [ the book that I gave her ]

Or, alternatively, the other extraposition possibility:

140

```
  VP
    _______________
   NP     V
    Mary
    VVP
    put_i
    VP
    NP_k
      the table that broke
    VP
    NP_m
        the book that I gave her
    NP
    V
    t_m
    V
    PP
    t_i
    P
    NP
    on
    t_k
```

yielding the phrasing:

141  
*    [ put on ] [ the book that I gave her ] [ the table that broke ]

One distinction between the two types of double extraposition structures is that the acceptable ones involve extraposition of maximal projection of differing categories. Thus, if the traces retain their categorial marking, the binding relationships could presumably be recovered, in a way that double NP extraposition binding relationships could not.²⁰

Finally, we might consider that the lack of V PP PP and V CP CP verbs might expose some principle of effability of expression for the projection of structure. In both these cases, one of the arguments would always have to be extrapoed to satisfy the Domain Constraint and the intonational phrasing conditions of English.

---

²⁰ This also explains some differences in the application of the Freezing Principle with respect to double extraposition structures. Xwier and Culicover (1980) formulated the Freezing Principle for sentences such as:
* What kind of frogs did John send to Horace a book about?
However, in cases where an NP is extracted out of an extraposed PP the results are much better:
What did John put the book nervously on?
Thus, Freezing seems mostly to ensure that no A over A violations take place from moved constituents. See also Wxier (1981), Williams (1981), Pinker (1981) and Halvorsen (1981) for further discussions of the Freezing Principle.
5.2. Secondary Predicates

In analyzing verb-particle constructions as having the underlying structure:

```
142   VP
      /\    \\
     NP   V

Mary     VP
        /\    \\
       e NP  V

the number V PP
         /\  /\  \\
        look up
```

we are using the structures that Hale and Keyser adopt for causative structures and for inchoative structures. The structure:

```
143  V
     /\    \\
    V  VP
```

is interpreted as a causative and the structure

```
144  V
     /\    \\
    V  PP / AP
```

is interpreted as an inchoative. Thus, we might expect that APs with no internal complementation will participate in constructions with NPs in either order, giving them the structure:

```
145  VP
     /\    \\
    NP  V

Mary     VP
        /\    \\
       set NP  V

the birds V AP
         /\  /\  \\
        t free
```
We should expect both linearizations: V NP A and V A NP. This seems to be true for causative-inchoative constructions:

146  set free sb / set sb free
147  hammer flat sth / hammer sth flat
148  tear apart sth / tear sth apart
149  strip bare sth / strip sth bare
150  pry loose sth / pry sth loose
151  pull taut / tight / loose sth / pull sth taut / tight / loose
152  sand smooth sth / sand sth smooth
153  shoot dead sth / shoot sth dead
154  walk home sb / walk sb home
155  pat dry sth / pat sth dry

Depictive predicates seem unable to participate in such ordering variation:

156  John ate the meat raw.
157  * John ate raw the meat.
158  John ate the meat naked.
159  * John ate naked the meat.

This differentiation would suggest that the structures for depictive predicates are different from those for inchoatives. This contrast has also been noted before, by Erades:

Again it was Peter Erades who hinted at the kinship. He observed (p 59) that in
She pushed the basin across.
the particle is "a predicative rather than an adverbial adjunct."
An example already used can be cited again,
He ran the flag up.
—after the flag has been run up it is up, just as after the basin has been pushed
across it is across. (Bolinger p. 67)

Similarly, directional predicates are not possible:

160  John pushed the key in.
161  John pushed in the key.
162  John pushed the key inward.
163  * John pushed inward the key.

We could account for this fact directly if directional predicates involve a complementation structure such as one of:

164

```
PP
  P
  in
PP
  XP
  X
  ward
```

These structures are similar in effect to those proposed by Jackendoff (1983) and Pinker (1989).

Some of these alternations are not as acceptable to some people. There seems to be a
significant class of people for whom the examples involving adjectives are more difficult to get
than the examples with prepositions. This might be related to the availability of another structure for the adjectival cases:

The difference in acceptability could then be related to the differences in the structures. For example, subjects of AP might be less freely ordered. Also, in these cases, the internal subject is being directly assigned a $\theta$-role by the inchoative predicate.

Bolinger also notes that the availability of the causative construction is limited in interesting ways by the choice of verb:

- The third set is lexically open but semantically closed. It would be impossible — short of doing a complete dictionary — to list either the verbs or the adjectives. But the semantic relationship between the two is circumscribed. Compare:
  
  Will it bleach white the undies?
  * Will it paint white the fence?

  *Bleach* and *white* are synonymous, or represent some kind of cause-effect relationship in which the effect is more or less intrinsic to the cause: to bleach something is to make it white. To paint something, however, does not in any way imply whiteness. Other examples:
  
  He's planing / buffing / sanding smooth the boards.
  I was busy downstairs wringing dry the sheets.
  ...
  They packed tight the wadding.
  * They packed loose the wadding.
  (Bolinger)

and further:

Consider the causative verb *turn*. In its general sense, it does not pass the definite-noun-phrase test:

* It turns black the banana.
* It turned young the man.

But *turn* has the specific sense "to sour," and when used causatively in this sense, it passes the test:

* It turned sour the milk.
  (Bolinger)

This shows that the phenomena is not only restricted by PF considerations, but also by LF restrictions, further showing the complex nature of the minor syntactic processes. These restrictions also show great variation among informants, pointing again to a parametric system of mapping constraints between the modules of the grammar.
5.3. Dative Movement

Double object constructions were the original motivation for Larson's proposal that English had VP complements of V and verb raising. This analysis is also proposed by Hale and Keyser, and I will also assume that the dative construction involves internal VP recursion. However, contra this previous work, I will assume that the dative phrase is generated as the subject of the lower VP:

```
166
  VP
     /\ 
    V /  
   /   
  Mary V
     /   
    e  VP
       /   
      PP V
```

Arguments for this view are advanced in IJsard (1989), the principle one being that this structure best accords with Hale and Keyser's theory of conflation, as it allows conflation in English to be limited to the inner-most V complement. This structure then straightforwardly accounts for the difference in conflation possibilities:

```
167 We gave the church money.
168 We moneyled the church.
169 * We churched the money.\textsuperscript{21}
```

The English dative construction is at least as well studied as the English verb-particle combination. Again, it involves the possibility of realizing a pair of arguments in different orders:

```
170 I gave a book to Mary.
171 I gave Mary a book.
```

Since the structure we are proposing for datives also involves an internal VP constituent, by our hypothesis of free order immediately within VP, we should expect either linearization of the PP and the V:

\textsuperscript{21} This sentence can mean "We put money in the church (for safekeeping)." but that is incorporation from the object of "put".
All that remains, is to formulate a way of getting rid of the dative preposition in the former linearization and keeping it in the latter. I would like to propose that part of the lexical information coded on the dative verbs is their ability to absorb certain prepositions when they are adjacent to them. This absorption must meet the two conditions outlined in Kaisse (1985) for cliticization: government and adjacency.

When this absorption takes place, the dative object will no longer meet the conditions of the English intonational phrase formation, and hence will not mark the end of the intonational phrase, allowing the realization of the V NP NP order. If we include the adjacency requirement as a condition on English P to V incorporation, then when we choose the linearization with the dative final, no incorporation will take place. As we have seen with particles, NPs without internal complements do not induce ends of intonational phrases, hence the order V NP PP is also acceptable.

Lisa Selkirk has also pointed out that these preposition reduce, whereas the particles considered above do not, suggesting a difference between them. The dative prepositions and particles are assigned different categories by Hoffman (1980), also indicating a difference between them. We noted above that these prepositions also do not occur in particle constructions, suggesting a lexical distinction, perhaps in terms of transitivity of the prepositions.
As with particle constructions, pronominal objects require cliticization to the verb. Additionally, in datives, once the dative preposition is absorbed, we can iteratively cliticize the two object pronouns:

174  *  Give Joe it.
175  Gimme it.

The order of the pronouns here is fixed by the requirement that the dative preposition be adjacent to the underlying verb. This only comes about under the linearization with the dative object preceding the accusative object, hence the relative order. Under the other linearization possibility, we can cliticize the accusative pronoun, but can neither absorb the dative preposition nor can we cliticize the dative object:

176  Give-it to me.
177  *  Give-it me (to).

By analyzing the dative construction in this manner, we are also able to examine some the the dialect variation observed with the traditional interaction between datives and instances of move-α. Fillmore (1965, quoted in Kuroda 1968) describes the sentences:

178  I was given an umbrella.
179  An umbrella was given me.
180  An umbrellas was given to me.

as acceptable. This is rather different than the usual judgement:

181  *  An umbrella was given me.

We can account for this dialect split by breaking the community into two groups: one that allows cliticization of to (and its subsequent disappearance) after affixation of -en, and those that do not allow such absorption. This corresponds to a distinction in the system of syntactic morphology of Halle (1989), where some languages allow only a single inflection suffix.23 There is a similar dialect split in the possibility of wh-movement of the dative object:

182  Who did you give a book to?
183  ?  Who did you give a book?

The distinction in judgements on the second sentence could relate to a relaxation of proper government in some dialects, allowing proper government after absorption in one of the dialects. The unacceptability of:

184  *  Who did you give it?

is captured by the inability to cliticize a wh-trace, a pre-requisite to cliticization of the accusative object if to is absorbed. Thus, the other possibility:

185  Who did you give it to?

is acceptable. Thus the phonological issues of cliticization interact with the requirements of structures resulting from the application of move-α and considerations of the syntactic morphology.

---

23 See also Idsardi (1989) for similar proposals regarding a distinction between lexical and non-lexical syntax.
5.4. Interactions between Datives and Particles

There are many conflicting claims in the literature regarding the combination of the dative and particle constructions. Given the time and the inclination, this would most likely turn out to be a very fertile area for parametric dialectology. In the absence of time and good source materials, I will present my own judgements on the matter, and can only speculate as to the nature of the dialectal differences.

186  * Hand me down them.
187    Hand me down the tools.
188    Hand them down to me.
189    Hand me them down.
190    Gimme that back.

One possibility for the structure of such “hybrid” items is to simply extend the VP complements so as to project two “internal subjects”. This gives us a choice of two structures:

191
   VP
  /     \
 NP     V
   /   \    
  l     VP
    /  \     
   PP   V
     /   \  
   (to) Mary
     /   \  
    V    VP
     /  \    
   t i   NP
      / \  
     V  PP
    /  \  
   t i up
However, only the first of these structures contains within it as substructures the relevant relations. Specifically, the second example does not contain the inchoative structure for "the book ... up", nor does it contain the relative arrangement of the dative and accusative NPs from the analysis of simple datives. Thus the first structure is the most compatible one.

193  * Hand the book to Mary up.
194  * Hand it me up.

The order V NP PP P is ungrammatical because of the PP intervening between the verb and the particle. The sentence Hand it me up is unacceptable because phonological adjacency between hand and to is required, but not met here. Cliticization of object pronouns only requires adjacency to a verb, dative preposition incorporation on the other hand, requires adjacency to a particular item.

5.5. Passives By-phrases

I do not intend to give even a modest account of passive constructions. There are, however, a few issues regarding the status of the agentive by-phrases that I would like to examine. One tempting analysis is that the by-phrases are base-generated in the subject position in VP, giving a structure like:

195

```plaintext
(1) I
    |
    V
    |
    PP
    |
    by John
    |
    drive - en
    |
    a car
    |
    NP
    |
    V
    |
    be
    |
    VP
    |
    I
```
Since we are claiming that the immediate constituents of VP are unordered, we would normally expect to find both orders exhibited. We will need to explain why this is not the case:

196 The car was driven by John.
197 * The car was by John driven.

It seems necessary to assume some selection of -en or the verb by be. 24 Hence no government-complement structure could intervene between them in the linear structure. Then would preclude the by-phrase from being realized in VP initial position. If it was so linearized, then the phrase constructed with respect to be would end at the end of the by-phrase. Then the verb would not find its arguments in its intonational phrase. Further, be would not find its selected argument (the verb) in its intonational phrase. Thus, the only

In sentences with a PP in addition to the by-phrase, at least one of the PPs would have to be extraposed.

198 The window was hit by / with a ball.
199 The window was hit by the man.
200 The window was hit by the man with a ball.
201 The window was hit with a ball by the man.

Assuming that the relevant structure is something like:

202

\[ I \]

\[ I \]

\[ VP \]

\[ be \]

\[ PP \]

\[ V \]

\[ by \ John \]

\[ V \]

\[ VP \]

\[ hit \ -en \]

\[ PP \]

\[ V \]

\[ (with) \text{ the ball} \]

\[ V \]

\[ NP \]

\[ t \]

\[ \text{the man} \]

The grammaticality of the various phrasings is:

203 [ was hit by / with a ball ]
204 [ was hit ] [ with a ball ]
205 [ was hit by the man ]
206 [ was hit ] [ by the man ]
207 * [ was hit by the man with a ball ]
208 [ was hit by the man ] [ with a ball ]
209 ? [ was hit ] [ by the man ] [ with a ball ]
210 * [ was hit ] [ by the man with a ball ]

24 Or even selection of -en by be, and selection of the verb by -en.
In the case of double extraposition, the extraposed nodes will be adjoined to different VP projections. Thus, the important form is the one in which the by phrase follows the verb, but precedes the instrumental where there are three intonational phrases:

Unfortunately, the status of this sentence is unclear to me, so I don't know whether it offers evidence for or against cyclic movement of extraposed constituents.

The structure for the passives of dative verbs will be something akin to:

```
216
  I
    VP
      be
        PP
          V
            by John
              V
                VP
                  give
            PP
              (to) Mary
                V
                  NP
                    a book
```

Presence of certain inflectional affixes (-en, -ing) would preclude the incorporation of the dative preposition, as noted above. We also notice that datives in spec of IP are realized without their preposition. This preposition loss may be due not to cliticization of the preposition to the verb, but to absorption of the preposition by Comp. We might like to carry this idea further, and generate all subjects as a by-phrase whose preposition is unrealized when the phrase appears in spec of IP, the preposition being absorbed by Comp in those cases.

6. Constituent Order in NP

Combining suggestions in early generative grammar by Carlotta Smith, and more recent work by Abney, let us assume that the NP is structured so that modifiers are sisters of the determiner:
When we have deverbal nouns that select arguments such as PP, NP, AP or CP, they are generated within the NP, parallel to their verbal structure.

Unlike the VP, DPs do not appear to allow free ordering of their specifiers with respect to $D$. There is a variability in the ordering of the complement and the specifier, in accordance with what we would expect from domain correspondence, only items without complementation can intervene between the D and the NP:

225  The red book.
226  The up escalator.
227  The able to see his faults man.
228  The able to the third floor escalator.
229  The cats chased mice.

The grammatical sentences with post-nominal modification will be derived by extraposition of the modifier:

230

yielding the observed surface orders:

231  The man able to read see his faults.
232  The escalator up to the third floor.
233  The mice cats chase

Again, internal complementation seems to be a pre-requisite for extraposition, creating in this case a binary partitioning of modifier types. This partitioning suggests that multiple modification will be possible only when they are split: one occurring pre-nominally, and one occurring post-nominally. If the NP is deverbal and selects a complement, then we should be able to have extraposed complements of the determiner, resulting in a structure:
However, these constructions seem somewhat marginal:

This may indicate that there is more to the selection of CP complements than merely selection for Comp. If there is also an element of semantic selection of "proposition" as in Chomsky (1986) then there may need to be a link established between the verb in the proposition and the selecting head. This would restrict DPs to only one clausal complement, either of D or within NP. NP complements could peaceably co-exist with non-extraposed D complements, however.

A major question given this account of DP structure is why the complementation inside the DP, specifically the selection of the NP does not mark the end of the intonational phrase in verb phrases. The answer lies in the distinction between functional and lexical government. The functional government within the DP serves to delimit phonological phrases. The lexical government inside the VP serves to delimit intonational phrases. The strict layer hypothesis of Selkirk (1986) states that intonational phrases must be exhaustively comprised of phonological phrases. Given the strict layer hypothesis, the formation of phonological phrases within intonational phrases is fine: the end of a phonological phrase does not imply the end of an intonational phrase. The end of an intonational phrase does not necessitate the corresponding end of a phonological phrase. Hence D complementation can appear between a verb and one of its arguments. But, if a V selection structure intervenes between a D and one of its arguments, then there will be a phonological phrase boundary between the D and the argument. This will violate the Domain Correspondence at the level of the phonological phrase, and thus such structures will be degraded. In this way we can have the same Domain Correspondence principle apply at two prosodic levels, with slightly different effects due to the strict layering of these levels.

A few questions about DP modifiers remain. First is the existence of some complex adjectives, note the contrast in:

I called the out-of-town cab company up.
I picked the book yellow with age up.

The simplest account for these cases is to say that the prepositional phrase out of town has been reanalyzed as an adjective, lacking internal syntactic government. Then its behavior would follow those of ordinary adjectives. A more interesting problem involves genitive DPs:

I looked John's friends up.
I looked that friend of John's up.
*? I looked the friends of John up.
Following the types of analyses proposed so far, one tack would to be to assume that genitive DPs involve an internal DP complement:

241

```
      DP
     /   \
    D     NP
   /     \  friends
  /
those
 /  \\
D   DP
   /\  \\
's   NP
     \  \  Bill
```

The internal DP, involving functional government, would have to extrapo to allow those and friends to appear in the same phonological phrase, yielding:

242

```
      DP
     /   \
    DP   DP_i
   /     \
  D     NP
 /     \\
those  friends
   /\  \\
   /
  t_i  Bill's
```

More work on this question needs to be done, especially with regard to the intrusive preposition of. It is quite likely that the structure suggested here is only part of a more detailed structure that would account for the presence of of.

There is one further puzzle, in the domain of relative acceptability of PP violations of Domain Correspondence. The distinction seems to hinge on whether the PP is a modifier within DP. Thus, many people note a contrast in acceptability in:

243  * I put with John up.
244  ?? I put the poster from Wyoming up.

This difference in the judgements could indicate that the analysis initially proposed for PP particle verbs is wrong. We already have encountered a good reason to doubt that these have the same structure as other particle verbs. We were unable to find a standard interpretation for such a structure within the interpretations provided by Hale and Keyser. Before abandoning the conjectured structure, we should note that other, extragrammatical factors such as analogy may also play a role. The order V [PP P NP] P is going to violate Domain Correspondence in all cases. The order V NP P, on the other hand, will not violate Domain Correspondence as long as the NP does not contain an internal lexical selection structure. Thus, the latter sentences may be ungrammatical but easily interpretable. This would be similar to the usual cases illustrating the competence - performance distinction, only with ungrammatical structures. The availability of a close form I put the poster up may cloud the perception of the acceptability of the sentence.
7. Phonetic Issues

Having pinned so much on the whereabouts of the intonational phrases in English, it would be gratifying if the measurements of phonetic properties were to provide support for the claimed locations of intonational phrase boundaries.

7.1. Studies of Vowel Length and F0

Cooper (1976) and Cooper and Paccia-Cooper (1980) examined the effects of syntactic factors on the realization of phonetic vowel length in the surrounding words. Cooper and Sorensen (1981) did similar work with respect to fundamental frequency. The syntactic environments tested included clause boundaries, phrase boundaries, moved constituents, traces and deletion sites.

In addition to verifying phrase-final lengthening, Cooper and Paccia-Cooper found that nouns with clausal complements were longer than verbs, as in the pair:

245 I showed Marie a coach that Eve will like.
246 I helped Maria coach the team last night.

But that there was no difference in the pair:

247 Tom told Eva a joke about Harry.
248 Tom and Eva joke about Harry.

These cases can be reduced to intonational phrase-final lengthening in our account, as the clausal complements will be extraposed, with the selected complement of joke is within the phrase in both cases. As they note, the phrasal explanation is more attractive because of their other findings indicating phrase-final lengthening.

The tests for lengthening at trace sites are more complicated to evaluate, as Cooper and Paccia-Cooper were not using a generative theory involving traces. The found lengthening in cases such as:

249 My mother thinks that Marion tricked that detective.
250 He seems to think the judge has been tricked that detective.
251 My mother thinks he might have been tricked that detective.

However, this experiment did not control for the effects of constituent-final lengthening. It is fairly clear that extraposition from NPs does not cause lengthening at the trace site. In testing sentences such as:

252 Mary gave a plaque to Clark when she went to the festival downtown.
253 Mary gave a plaque to Clark which she bought at the festival downtown.
254 I gave an antique clock to Jake when he came to repair the roof on the back porch.
255 I gave an antique clock to Jake which I found under some rags on the back porch.

the findings were:

<table>
<thead>
<tr>
<th>Word</th>
<th>VL (normal)</th>
<th>VL (xpos)</th>
<th>Pause (normal)</th>
<th>Pause (xpos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>plaque</td>
<td>215.8</td>
<td>210.2</td>
<td>112.8</td>
<td>112.0</td>
</tr>
<tr>
<td>clock</td>
<td>235.5</td>
<td>238.9</td>
<td>112.1</td>
<td>110.7</td>
</tr>
<tr>
<td>Clark</td>
<td>275.9</td>
<td>273.0</td>
<td>177.0</td>
<td>190.5</td>
</tr>
<tr>
<td>Jake</td>
<td>231.1</td>
<td>217.5</td>
<td>190.9</td>
<td>217.0</td>
</tr>
</tbody>
</table>
The duration and pause associated \textit{clock} and \textit{plaque} did not change under extraposition, indicating that no lengthening is associated with the trace in these positions. However, under our analysis of DPs the clauses would originate as complements of D, hence the post-nominal trace, if it exists, is in an A position. It is possible that traces would have different effects based on the argument status of the position. Traces in A positions could presumably not be deleted, as they can serve to satisfy Domain Correspondence. The traces in A positions have only limited utility in PF, however. Unfortunately, the relevant examples of NP movement were not tested, and we cannot determine whether traces of A-movement would have an effect on the length or pause associated with the preceding word.

Verb Gapping, however, turned out to cause lengthening of the preceding constituent, \textit{Kate} being longer in the second sentence than in the first:

256 I thought that Jane completed Allen's story and my friend \textit{Kate} completed Ed's poem.
257 I thought that Jane completed Allen's story and my friend \textit{Kate} Carmella's new poem.

Unfortunately, it is not clear that verb gapping has the same properties as verb raising, nor is it clear whether these effects are only cumulative upon constituent-final lengthening.

The "debatable rule of Object Deletion" received no support in an experiment that tested the hypothesis that it would strengthen the effect of constituent-final lengthening. Sentences such as:

258 If the pilot \textit{flies} the plane will surely crash.
259 If the parrot \textit{flies} the boy will feed him cake.

were lengthened by the same amount relative to:

260 If the pilot \textit{flies} the plane we'll surely crash.

Thus, if traces contribute to lengthening generally, we find no support for a trace in object position of intransitives.\footnote{This paradigm could also be used to test for evidence for the unaccusativity hypothesis}

Cooper and Sorensen also discovered end of clause and end of phrase effects with regard to the magnitude of pitch changes. They were also able to find intonational disambiguation of prepositional phrase attachment in sentences such as:

261 Jefferey hit the \textit{cop} with a stick.

When \textit{with a stick} was an argument of \textit{hit}, the pitch fall on \textit{cop} was greater than when \textit{with a stick} modified \textit{cop}. In the first case, \textit{cop} is obligatorily DP final, whereas in the second case we have the ambiguity of our analysis of PP extraposition within DP. Verb gapping also caused a significant increase in the magnitude of the pitch fall on the preceding word.

7.2 Silent Demibeat Addition and Intonational Phrases

Avery et al (1986) and Idsardi et al (1987) examined vowel lengthening effects in subject position and the first object in a double object construction. These experiments were specifically designed to test the theory of Silent Demibeat Addition (SDA) in Selkirk (1984) in Selkirk (1984) no representational distinction is made between rules of phonetic implementation and rules of the prosodic phonology. Both types of phenomena are said to be conditioned by
boundary elements called Silent Demibeats. Flattening the syntactic structure and adding these Silent Demibeats are the substantive functions of the mapping between the S-Structure syntax and PF. The rules for adding Silent Demibeats are:

262 SDA: Add a Silent Demibeat at the end of the metrical grid aligned with:
   a. a (content) word,
   b. a word that is the head of a nonadjunct constituent,
   c. a phrase,
   d. a daughter phrase of S.

Clauses (b,c,d) are dependant on a SD being added under clause (a). So, for example, the sentence "The boat in the bay sank." would be assigned the following structure:

263

```
  S
    ^
   /|
  VP--NP
     /|
    PP--V
       |
      |   N
       /|
      PP--V
       /|
      |   N
       /|
      PP--V
       /|
      |   N
       /|
      PP--V
       /|
      |   N
```

yielding:

264 the boat xx in the bay xxxxxx sank xxx

The function words ("in", "the") receive no silent demibeats. The content words ("boat", "bay", "sank") each receive silent demibeats for clauses (a,b). The beats for phrases go on the last words of the phrases, thus "boat" gets none as it is not at the end of an XP, "bay" gets 3 (NP, PP, NP), and "sank" gets 1 (VP). Finally, "bay" and "sank" get 1 extra SD each for being at the end of daughter phrases of S. Thus "bay" receives as many silent demibeats as it does because the recursive nature of the syntactic phrasal embedding is directly transferred to the representation.

Rules can now be formulated in terms of the number of silent demibeats that they can cross. The difference between phonological rules and phonetic implementation rules is drawn in a variability in the number of silent demibeats that condition the rules. Thus, phonological rules are invariant, and phonetic implementation rules can vary. The model, then of the relation between syntax and speech is:

265

```
phonological rules
phonetic implementation rules
  SDA
      ↓
grid
      ↓
speech
```
There is only one major representational change, that of replacing the syntactic structure with silent demibeads. A clear and concise theory of vowel lengthening for syntactic contexts in English is then formulated. Her theory is that vowels spread into the silent demibeads that are added in the SS to PF mapping. Thus it is predicted that the more silent demibeads that are added at the end of a word, the longer its (final) vowel will be. Since this spreading means that gradient distinctions in vowel lengthening will result, vowel lengthening is a phonetic implementation rule.

In a series of phonetic studies of vowel lengthening with respect to this model (Avery et al (1986), ldsardi et al (1987)), it was discovered that Selkirk’s silent demibead model of vowel lengthening gave a very good account of the data for NPs in subject position, both matrix and embedded. However, this phenomenon was noticeably absent from the last vowel of the first object in a dative object construction. NPs in this position seemed sensitive only to the function/content word distinction. This was inexplicable in terms of a theory that incorporated only the rules of silent demibead addition. However, these results are also incompatible with a theory that assigns phonetic structure solely on the basis of non-recursive phonological constituents derived from syntactic structure. That is, the data for subject positions showed the fine-grained distinctions predicted by the silent demibead theory, specifically, those sensitive to clause (c), which adds silent demibeads for each $X^{\text{max}}$ node dominating the word containing the target vowel.

A resolution to this problem is to say that VL must meet two requirements. Not only must there be the appropriate silent demibeads to spread onto, but also VL only happens at an intonational phrase boundary. The added constraint that we need is that the phonological phrase containing the dative object should not have its edge at the end of the dative object. Rather, that phonological phrase should also include the object of the verb.

7.3. Predictions

Having argued for very specific placements of intonational phrase boundary locations to explain the constraints on free constituent order, we make clear predictions about the phonological structure that will be phonetically realized. Thus, we should be able to find evidence of these intonational boundaries, and in the case of extraposition, perhaps also evidence of maximal projection A-position traces. We should begin by looking for evidence of lengthening in clear-cut examples of extraposition, as in the pair:

266 John put a book on the table.
267 John put on the table a book that he had bought last week.

If we do find evidence of A-trace induced lengthening in these cases, then we can go on to examine the effects of intonational phrase boundaries and traces on lengthening and pausing.

8. Performance Issues

In reviewing the proposed Domain Correspondence and phonological constituent construction constraints for English, it is instructive to examine their relation to certain phenomena that have generally been characterized as parsing or performance issues. The non-recursivity of the

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26 For example: “The man gave the slide of the bee some new preservative”. The experiments have some flaws in their design, as they ask for phrasings of some sentences that violate Domain Correspondence, more comprehensive studies involving the interaction of extraposition should be undertaken.
phonological representations is very reminiscent of various proposals regarding the on-line calculation of linguistic structure. In this section, I will apply the model of phonological constituent construction and Domain Correspondence with some important performance phenomena. I will briefly discuss PP attachment ambiguities, garden path sentences, and multiple center embeddings.

8.1. Attachment Ambiguities

On class of performance phenomena discussed in Frazier (1979) is the problem of where to attach incoming constituents. When asked to complete the phrase “Bill liked ___” after hearing:

268 They told the girl that Bill liked the story.

people consistently responded “the story”, indicating that the structure:

269

```
  VP
   /\  \\
  NP  V
 /     \\
They V  VP
       /\  \\
      V  PP V
    /     \\
  told i  \\
```

(to) the girl that Bill liked

is systematically unavailable. This structure also happens to be in violation of the model developed here, violating the principle of Domain Correspondence. Likewise, there is a preference in reading:

270 John called the people who smashed his car up.

to associate up with smash. This again serves to build a structure which conforms to Domain Correspondence in preference to one which violates it. Some sentences exhibit more than just preference, they are hard to process:

271 & Mary put the book on the shelf on the table.28

This sentence violates Domain Correspondence without extraposition of the PP on the table:

---

27 The relative heaviness of the final NP might have an effect on the availability of the extraposition structures.

28 I will use the symbol ‘&’ to denote sentences which have been traditionally described as “grammatical but hard to process”.
The principle of Domain Correspondence is not all-powerful, however. It offers no relevant distinction for the pair:

273 John hit (the girl) (with a book).
274 John hit (the girl with a book).

in which the former reading is preferred. Thus, though Domain Correspondence and Minimal Attachment make the same predictions in some cases, they are not equivalent. This raises the possibility of examining their separate contributions experimentally.

8.2. Garden Paths

Another famous example of sentences that are “grammatical but hard to process” are those termed Garden Paths (Bever 1970, Carroll n.d., Frazier 1979, Pritchett 1987, 1988). The oft-quoted example of these is:

275 & The horse raced past the barn fell.

The correct phrasing for the sentence requires that fell be in its own intonational phrase. This intonation structure violates the eurhythmy requirement that intonational phrases be more than one word long. Such eurhythmy requirements can be satisfied by adding material to the verb phrase, and when this is done, such sentences become more understandable:

276 The horse raced past the barn fell down by the river.

Extremely light post-nominal complements along with light verb phrases also are hard to process:

277 ? The bird eaten died.
278 & The boat floated sank.

Pritchett notes that the latter sentence is “much harder to process”, and indeed it violates not only the two weight requirements of the former, but also has an ambiguous relative clause head. Still other garden path sentences examined by Pritchett have grammatical structures which violate Domain Correspondence:

279 & The patient persuaded the doctor that he was having trouble with that he should leave

The correct structure for this sentence is:
in which *persuade* is separated from its complement by a complex NP, thus violating Domain Correspondence. A number of the other garden path sentences are disambiguated in speech by the intonation, such as:

281 & The cotton ! fields produce makes warm coats.
282 & I warned her ! mother hated me.

which will have various intonational cues at the points marked by the exclamation point in speech. Clearly, the various garden path accounts have much to recommend them. The overlap with the postulated principles of intonational phrase formation and the lack of processing errors during listening should lead us to a finer examination of the relative effects of processing strategies and intonational constituency.

8.3. **Multiple Center Embeddings**

Finally, let us consider one of the earliest types of sentences recognized to cause processing overload, multiple center embeddings (Chomsky and Miller 1963). These sentences have the further distinction of not being readily disambiguated by intonation techniques, suggesting that whatever else they violate, they violate principles of intonational phrasing. An example is:

283 & The mouse the cat the dog bit chased was caught in the trap.

Following the theory of DP structure outlined above, and ignoring details of the VP, the underlying structure for the above sentence is:
To generate the surface word order, we must extrapose each of the embedded clauses. After these two extrapositions we have:

If we make the further assumption that the selection for CPs includes a semantic selection for the verb, then, because the\textsubscript{2} is not in the same domain as chased, which, by hypothesis, it selects. Consequently domain correspondence is violated by this sentence. If we re-organize the sentence so that chased is accessible to the\textsubscript{2}, then we get a better sentence:

\begin{enumerate}
\item The mouse chased by the cat bitten by the dog was caught in the trap.
\item The mouse chased by the cat the dog bit was caught in the trap.
\end{enumerate}
This suggests that there is a type of semantic selection for the verb in the syntactic selection of a clausal complement. This suggests a connection with the Canonical Categorial Realization for propositions of Chomsky (1986).

8.4. The Relationship between the Parser and the Grammar

The work presented here does not argue against the traditional competence - performance distinction. Nor does it negate or devalue the large body of work on processing models. Rather, it add yet another dimension to the complex relationship between the grammar and the parser. Part of the task of reading is certainly the recovery of intonational information. It is an empirical question whether this task precedes, follows or parallels the recovery of the syntactic structure. Certainly many of the sentences which produce such interesting processing effects during reading have no such effect when being heard. Thus, the relationship between reading, intonation and syntax would seem to be an excellent area to look for explications of some processing phenomena.

9. Summary and Conclusion

By examining the relation between PF and the syntax proper we have been able to construct general constraints on the mapping that allow for a simplification of the syntax. We have made a greater stride toward eliminating linear order from the syntactic representations. In summary the proposed constraints are: domain correspondence, object cliticization and a minimal intonational phrase eurhythm requirement. To describe the action of the constraints operative here most provocatively, Domain Correspondence is one possible instantiation of the Projection Principle into PF. And by extending the coverage of the Projection Principle explicitly into PF we begin also to ensure some measure of recoverability of syntactic information from phonological form, that is to begin to grammaticalize the parsing problem.
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