

# Nuclear Stress, Cyclicity, and Edge Sensitivity at the Syntax-Phonology Interface\*

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## 1. Introduction

The purpose of this paper is to propose a new analysis of the location of default primary sentence stress across languages within a derivational approach to the syntax-phonology interface. Specifically, I propose that the location of this type of stress can naturally be calculated at the intersection of the syntax and phonology, given certain recent proposals concerning the introduction of adjuncts (Goodall 1987; Uriagereka 1999; Chomsky 2004), multiple spell-out (Uriagereka 1999; Chomsky 2000, 2001, 2004), locally computed informational encapsulation (Fox and Pesetsky 2005), and the role of edge-sensitivity in phonological computation (Halle and Vergnaud 1987; Selkirk 1986; Chen 1987). Our analysis correctly derives nuclear sentence stress patterns in a wide variety of constructions in typologically different languages, including English, German, Spanish, Italian, French, Persian, Eastern Armenian, and Japanese. In so doing, I compare our analysis with several alternative analyses presented in Bresnan (1971), Legate (2003), Cinque (1993), and Kahnemuyipour (2004). I show that these accounts have a different set of typological and empirical problems that are naturally resolved in our analysis. I also briefly discuss a number of theoretical implications that our proposed analysis brings to bear on the proper theory of the syntax-phonology interface.

The present paper is organized as follows. In section 2, I propose a new analysis of the primary sentence stress in an out-of-the-blue/broad focus context (i.e. as a reply to questions such as *what happened?*). I argue that the location of such stress is the product of the interplay between the bottom-up derivational syntax, phase-based information encapsulation, and left vs. right edge sensitivity at the phonological component. I use examples from English to illustrate how our system works. In section 3, I compare our analysis with several alternative proposals concerning nuclear stress proposed by Bresnan (1971), Legate (2003), Cinque (1993), and Kahnemuyipour (2004). I point out empirical and typological problems with these analyses and show how those problems are naturally resolved under our alternative analysis. Section 4 addresses the position of nuclear stress in double object constructions, questions with simplex *wh*-words, echo questions, multiple *wh*-questions, and stage-level vs. individual-level predicate constructions. Section 5 is the conclusion.

## 2. Nuclear Sentence Stress and Edge-Sensitivity at the Syntax-Phonology Interface

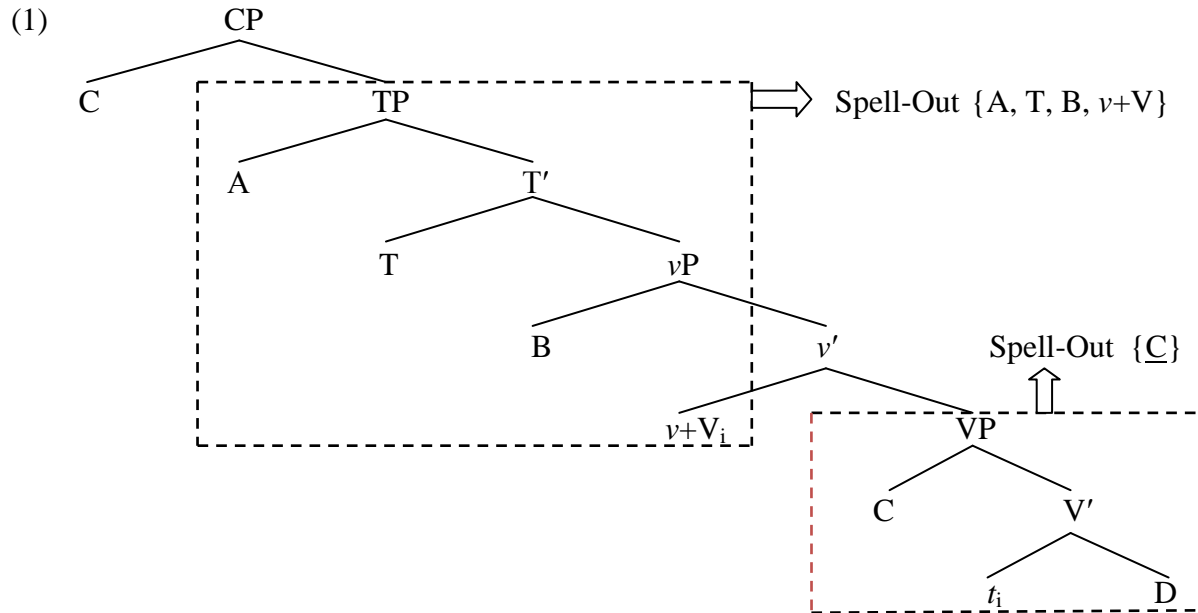
Nuclear sentence stress has been one of the most frequently discussed research topics in the area of the syntax-phonology interface. Especially since the advent of the so-called Minimalist Program (Chomsky 1995), this topic has generated a series of important work, including Neeleman and Reinhart (1998), Zubizarreta (1998), Arregi (2002), Ishihara (2001, 2003), Legate

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(2003), Kahnemuyipour (2004), Adger (2006), Kratzer and Selkirk (2007), Jackson (2007), among others. The purpose of this section is to propose a new analysis for nuclear sentence stress and illustrate it with basic examples from English. Examination of the stress pattern in more complex examples in a wider range of languages, including Persian, German, Dutch, Eastern Armenian, Spanish, Italian, French and Japanese is deferred till section 3, where I compare our analysis with several prominent alternatives. In this paper, I am only concerned with the default sentence stress in the out-of-the-blue context (as a reply to questions like *what happened?*). I indicate the position of nuclear sentence stress throughout in this paper by underling.

My analysis draws on three independently motivated assumptions made in the literature. First, I adopt a cyclic spell-out model of syntactic derivation (Chomsky 2000, 2001, 2004) and its interface with phonology. I assume, following Legate (2003), that both CPs and  $\nu$ Ps, including unaccusative and passive verbs, constitute phases. Within the phase-based syntactic computation, the complement of these phase heads, namely, VP and TP, are spelled-out chunks for phonological interpretation. Consider the syntactic derivation in (1). In this derivation, when the  $\nu$ P phase is completed, its complement undergoes Spell-Out. The derivation continues until the CP is constructed, at which point the TP (or the whole root CP as an exception) undergoes Spell-Out.



Following Adger (2006) and Kahnemuyipour (2004) (see also Dobashi 2003, Ishihara 2007, and Kratzer and Selkirk 2007), I adopt as a minimal theory of the syntax-phonology interface that the Spelled-Out chunks serve to demarcate a significant domain for nuclear stress assignment.

Second, I extend the proposal of Fox and Pesetsky (2005) on word order preservation to phonological information in general and assume that information obtained at a phase of the syntactic derivation must not be destroyed by that obtained at all later phases of the same derivation. Fox and Pesetsky argue that the linear order established at a phase cannot be altered by the linear order established by all later phases in the phase-based derivation. They dub this principle *the Law of Order Preservation*. To illustrate, consider the following syntactic derivation.

- (2) i.  $\nu P$  phase:  $[_{VP} A B C] \rightarrow A < B < C$   
 ii. CP phase:  $[_{TP} A_i B_j [_{VP} t_i t_j C] \rightarrow A < B < C$   
 iii. CP phase:  $[_{TP} B_j A_i [_{VP} t_i t_j C] \rightarrow B < A < C$

When the VP is Spelled-Out at the  $\nu P$  phase, the order is established as  $A < B < C$ . The step in (2ii) involves movement of both A and B out of the VP domain into the TP domain, yielding the order  $A < B < C$ . This step is acceptable because the order in (2ii) is consistent with the order in (2i). The alternative step in (2iii), on the other hand, involves movement of both A and B out of the VP domain into the TP domain but the order established here is  $B < A < C$ . This step is ruled out because the order derived by this step (i.e.  $B < A < C$ ) is inconsistent with the order derived by the initial step in (2i) (i.e.  $A < B < C$ ). This proposal of order preservation receives support from the Holmberg's Generalization (Holmberg 1986), namely, that Object Shift is permissible only when there is accompanying verb movement out of the VP. This is illustrated in Swedish examples (3a-c).

- (3)a. Jag kysste henne inte  $[_{VP} t_v t_o]$   
 I kissed her not  
 b. \* ... att jag henne inte  $[_{VP} \underline{kysste} t_o]$   
 ... that I her not kissed  
 c. \* ... Jag har henne inte  $[_{VP} \underline{kysste} t_o]$   
 I have her not kissed (Fox and Pesetsky 2005: 17)

This generalization naturally falls out from Fox and Pesetsky's system. The order established within the VP is  $kysste < henne$ . (3a) is grammatical because the order established at the CP phase ( $Jag < kysste < henne < inte$ ) is consistent with the order established earlier within the VP ( $kysste < henne$ ). This order preservation does not obtain in (3b, c) due to the lack of the verb movement to C: In both cases, the order established at the CP phase ( $henne > kysste$ ) contradicts the order established when the VP was Spelled-Out ( $kysste < henne$ ). My proposal here is that this law of order preservation is extended to all phonological operations including nuclear stress assignment. In other words, if stress is assigned to a particular element A within a derivational phase PH, all other pieces of information about stress assignment within all later phases of the same derivation must be consistent with the information obtained at PH.

With the two assumptions made above, I incorporate a metrical grid theory outlined in Halle and Vergnaud (1987) into Phase Theory and propose that nuclear stress falls on the element on the phonological edge of a Spelled-Out domain. My proposal is stated in (4).

(4) Stress Assignment Rule

Stress falls on the *phonological edge* of a Spelled-Out domain. A language chooses the {leftmost, rightmost} phonological edge for the purposes of nuclear stress assignment.

It is a central working hypothesis within the Minimalist Program (Kayne 1994; Chomsky 1995) that linear order does not play any role within the narrow syntactic computation but is fixed only post-syntactically in the phonological component. Thus, the notions “left edge” or “right edge” are primitives of phonology, not syntax. To the extent that the actual stress assignment rule is a phonological operation, it stands to reason that it is sensitive to these notions rather than syntactic notions such as the depth of embedding (Cinque 1993; Legate 2003), structural height (Kahnemuyipour 2004), and asymmetric c-command (Zubizarreta 1998).

To illustrate, consider (1) again. When the VP is Spelled-Out at the vP phase, it is mapped onto a domain at the phonological component within which stress assignment rule applies. Suppose we select the right-edge value of the nuclear stress rule for a given language L. Then, this rule assigns stress on D, as in (5i), since D is the rightmost element within this domain. When the derivation reaches the CP phase and Spells-Out its TP complement, the stress rule assigns stress onto the verb since this element is the right edge, as shown in (5ii).

- (5) i. D (read as “assign stress to D”)  
ii. v + V (read as “assign stress to v + V”)

Notice now that (5ii) contradicts (5i) since the two pieces of information require that D and V be realized as having maximal prominence. It is important that, within Fox and Pesetsky’s system of cyclic linearization, the linear order established earlier in a derivation must be taken as a template against which all orders established later must be checked against for consistency. Extending this insight to our present case, I propose that D receives primary stress since (5i) is obtained derivationally earlier than (5ii) due to the bottom-up derivational nature of syntactic computation. Our analysis correctly captures a well-known observation about word order and stress, namely, that stress always falls on the direct object in transitive verb constructions across a wide range of typologically different languages, including English, German (Cinque 1993), Japanese (Ishihara 2000, 2001), Ondarroa Basque (Arregi 2003), Scottish Gaelic (Adger 2006), Persian (Kahnemuyopour 2004), and many other languages documented in Dezsö (1982) and Kim (1988), no matter what linear order each language may possess on the surface. Examples from some of the languages mentioned are given in (6a-d).

- (6) a. John bought a book. (English)  
b. Taro-ga hon-o katta.  
Taro-Nom book-Acc bought  
‘Taro bought a book.’ (Japanese: Ishihara 2001: 154)

- c. Chunnaici Seònag Calum.  
 see-Past Seònag Calum

‘Seònag saw Calum.’

(Scottish Gaelic: Adger 2007: 252)

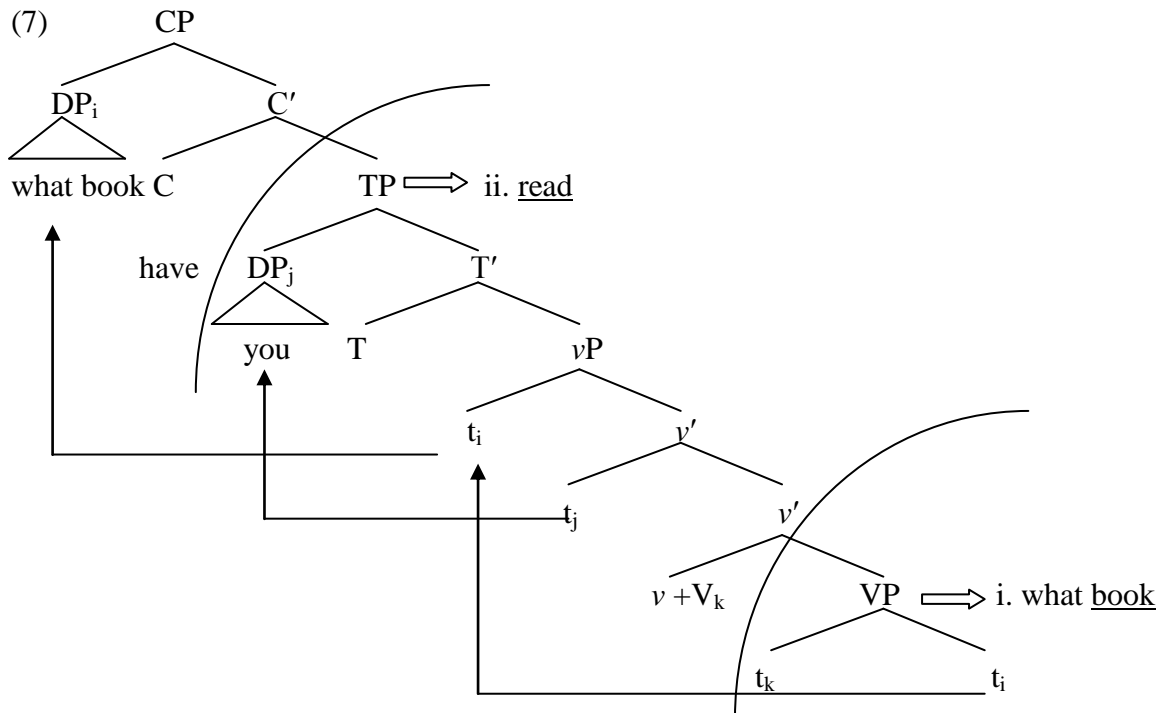
- d. Ali ye ketaab xarid.  
 Ali a book bought

‘Ali bought a book.’

(Kahnemuyipour 2004: 13)

This observation falls out from our analysis. Suppose that verbs always move out of the VP into a higher phase domain and that  $v$  is a strong phase crosslinguistically (see section 3.3 for further discussion on the phasehood of  $v$ 's). The VP complement of the phase head is Spelled-Out and mapped onto a domain for stress assignment at the  $vP$  phase. Since the object is the only element within this derivationally earliest Spelled-Out domain, it always receives nuclear sentence stress.

Let us now consider a more complex case than the derivation in (1) that involves phrasal movement, as in the English sentence *what book<sub>i</sub> have you read  $t_i$* ? Its derivation is shown in (7).



Suppose that English selects the rightmost value of the edge parameter for stress assignment. When the VP complement of  $v$  is Spelled-Out at the  $vP$  phase, phonology assigns stress on *book* (i.e. book). At the CP phase, the TP (or the root CP) undergoes Spell-Out. This time, phonology assigns

stress on *read* since this is rightmost within the TP. Since the information at the vP phase is obtained earlier and hence needs to be preserved throughout, nuclear stress ends up on *book*. Our analysis, therefore, correctly captures the insight behind Bresnan’s (1971) analysis of nuclear stress (see section 3.1 for more discussion and criticisms of Bresnan’s analysis), namely, that “the stress patterns of certain syntactically complex constructions reflect those of the simple sentences embedded within them in deep structure” (p. 257). Bresnan’s point is illustrated by (8a, b).

- (8) a. Mary liked the proposal that George left.  
b. Mary liked the proposal that George leave. (Bresnan 1971: 258, 259)

Bresnan’s analysis for (8a, b) is illustrated in (9) and (10), respectively.

- (9) [<sub>S</sub> Mary liked [<sub>NP</sub> the proposal [<sub>S</sub> that George left the proposal <sub>S</sub>] <sub>NP</sub>] <sub>S</sub>]
- |   |   |   |   |   |   |                   |
|---|---|---|---|---|---|-------------------|
| 1 | 1 | 1 | 1 | 1 | 1 | (word stress)     |
|   |   |   | 2 | 2 | 1 | 1st cycle: NSR    |
|   |   |   | Ø |   |   | 2nd cycle: Syntax |
| 2 | 2 | 1 | 3 | 3 |   | 3rd cycle: NSR    |
- (Bresnan 1971: 260, Figure 4)

- (10) [<sub>S</sub> Mary liked [<sub>NP</sub> the proposal [<sub>S</sub> that George leave <sub>S</sub>] <sub>NP</sub>] <sub>S</sub>]
- |   |   |   |   |   |                |
|---|---|---|---|---|----------------|
| 1 | 1 | 1 | 1 | 1 | (word stress)  |
|   |   |   | 2 | 1 | 1st cycle: NSR |
|   |   | 2 | 3 | 1 | 2nd cycle: NSR |
| 2 | 2 | 3 | 4 | 1 | 3rd cycle: NSR |
- (Bresnan 1971: 260, Figure 4)

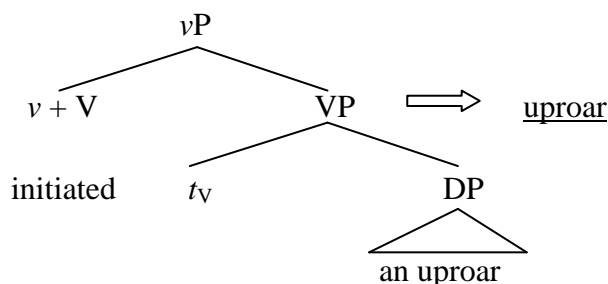
Crucial to Bresnan’s analysis is the position of stress in (8a). In (9), stress is assigned to the rightmost item *proposal* on the lower S cycle, lowering all other stress levels by one, before relativization applies on the next NP cycle. When the derivation reaches the higher S cycle, stress appears on (the higher copy of) *proposal*, inheriting the information regarding stress assignment from the lowest S cycle. Our analysis captures Bresnan’s insight on stress assignment and cyclicity in the current minimalist framework by drawing on multiple spell-out and phase-based cyclic determination of stress within the phonological component.

Our analysis also sheds light on the location of nuclear stress in sentences with complex subjects. Relevant cases include examples like the following, pointed out by two reviewers.

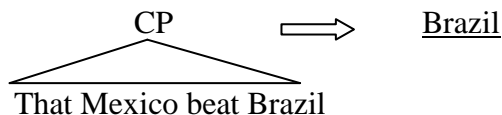
- (11) a. [TP [CP That Mexico beat Brazil] initiated an uproar]]  
 b. [TP [TP Writing yet another book on how Germany lost World War II exhausted Bill]]

Cinque (1993) proposes that nuclear stress falls on the most deeply embedded constituent in surface syntactic structure (see also section 3.2). The stress pattern in (11a, b) then challenges this theory. It would wrongly predict stress to fall on *Brazil* and *World War II* because these elements are the most deeply embedded constituent in the whole sentence. Cinque addresses this issue by drawing on the distinction between the major and minor paths of recursion, which roughly corresponds to the distinction between the specifier and complement positions for the purposes of this paper (see Cinque 1993: 268-271). Specifically, Cinque suggests that, when the minor path/specifier combines with the major path/complement, the stress within the complement wins out, no matter how internally complex the minor path/specifier may be. This suggestion does account for the position of nuclear stress in (11a, b), but it is still not clear why it is that the stress of the major path must win out; the theory in principle could accommodate the opposite arrangement of stress prominence. Our analysis provides a principled answer to this question. Consider a few crucial steps of the syntactic derivation for (11a), shown in (12a-c).

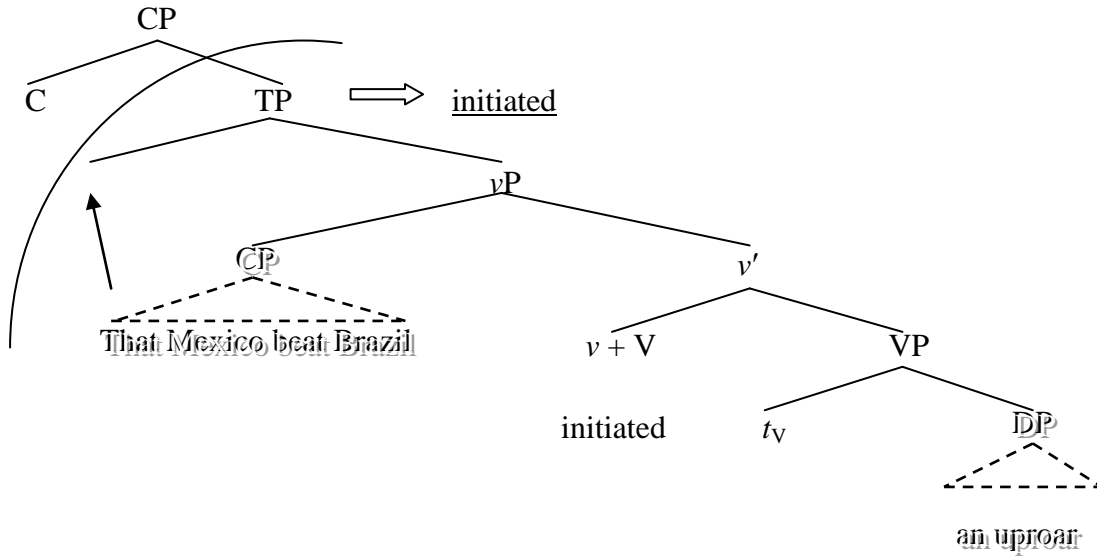
- (12) a. Step 1: Merge ( $v$ , VP) and Spell-Out VP



- b. Step 2: Construct CP and Spell-Out CP



c. Step 3: Merge ( $\nu$ P, CP) and Spell-Out TP after Merge (C, TP)



In (12a), the verb merges with its object. The resulting object then undergoes merger with  $\nu$ , completing the  $\nu$ P phase. When the VP is Spelled-Out, phonology assigns stress to *uproar*. (12b) consists of creating the CP phase for the sentential subject that *Mexico beat Brazil*. When this chunk is Spelled-Out, stress is assigned on *Brazil* as the rightmost element. In (12c), this CP merges with the  $\nu$ P. When the CP phase is completed, the TP undergoes Spell-Out. Phonology assigns stress on *initiated* because this is the rightmost element within this domain. Thus, the question is what constituent phonology assigns primary stress on. It is clear that *initiated* cannot bear stress since this option is consistent neither with the information obtained in (12a) nor with the information in (12b). Recall here crucially that our stress assignment rule is a phonological operation that is sensitive to the independently motivated notion of phonological edge (rightmost vs. leftmost). When all the individually constructed phasal objects are combined together at the phonological component, only *uproar* is located at the right edge. As is clear from the linear order, *Brazil* is neither at the left edge nor at the right edge in the phonological component. Therefore, our analysis correctly predicts that nuclear stress falls on the linearly rightmost element in derivations with complex specifier/phasal elements, as illustrated in (11a, b).

It is clear from the discussion above that phonological computation requires “global” readjustment to accommodate the position of sentence stress in certain cases. However, it is well-known that phonology requires precisely such mechanisms. Certain prosody-theoretic notions such as intonational phrases are clearly larger than syntactic phases (Selkirk 1980), suggesting that the domains of phonology are not necessarily isomorphic to the domains of syntax. Boeckx and Grohmann (2007: 209) also point out that the intonation contour (e.g. falling or rising intonation in interrogative sentences) can only be determined after the entire derivation is completed. Nonetheless, our analysis has as an important conceptual advantage to keep reference to global rearrangements to a minimum by restricting the access of the phonology to *locally encapsulated information* within the syntactically delimited small chunks, not the entire chunks themselves (see also Fox and Pesetsky 2007: 15, note 9).



### 3. Comparison of the Proposed Analysis with Other Alternative Analyses

In this section, I compare our analysis with several alternative analyses of nuclear sentence stress as in Bresnan (1971), Legate (2003), Cinque (1993), and Kahnemuyipour (2004). I show that each of these past analyses has problems, some noted in the literature and others not noticed thus far, that can be resolved under our analysis. I also pay close attention to the core facts that led these researchers to their particular analyses and demonstrate how they naturally fall out from our proposed system.

#### 3.1. *Bresnan's (1971)/Legate's (2003) Cyclic Theory of Nuclear Stress*

As mentioned in section 2, Bresnan (1971) proposes that the nuclear sentence rule assigns primary stress to the rightmost constituent at the end of each transformational cycle, NP and S. Legate (2003) reformulates Bresnan's analysis within Phase Theory. Legate proposes that a) primary stress is assigned to the final stress-bearing element within each phase and that b) this information is inherited by the higher copy of the element when it is moved out of one phase domain into the other. To illustrate her analysis with (8a), the object *proposal* merges with the V. This element is moved into [Spec, CP]. Thus, the higher copy of *proposal* inherits stress from its lower copy. On the other hand, an element moving from a VP-final position to a position within the *vP* phase does not receive stress. Legate argues that this is the case with the stress pattern in verb-particle constructions shown in (13a, b).

- (13) a. Please put away the dishes.  
b. Please put them/?the dishes away. (Legate 2003: 512)

Stress falls on *dishes* in (13a). Given that the V+ Object +Prt order is derived from the V + Prt + Object order by phase-internal movement of the object (cf. Johnson 1991), *the dishes* does not move out of the *vP* phase. Thus, stress is on *away* instead of *dishes* in (13b).<sup>1</sup>

We have seen in the previous section how the derived stress pattern in (8a) is accounted for under our proposed analysis. The nuclear stress pattern in (13a, b) is also naturally predicted since both *dishes* and *away* are at the right edge. Looking beyond these core facts that led Legate and Bresnan to their particular analysis, however, we can see that their analysis is rather difficult to sustain. Starting with Legate's analysis, den Dikken (2006: 7) points out that her analysis makes an incorrect prediction concerning the position of nuclear stress in (14).

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<sup>1</sup> As an anonymous reviewer points out, there seems to be variation on the position of nuclear stress in this construction. For example, Gussenhoven (1984) observes that nuclear stress falls on the direct object in the V + DP + Prt order, contrary to Legate's (2003) judgment reported in the text.

- (i) a. I'll put on the kettle.  
b. I'll put the kettle on. (Gussenhoven 1984: 105)

I take the judgments reported by Legate as dominant, leaving the source of variation for another occasion.

- (14) John put the book<sub>i</sub> [<sub>vP</sub> quickly/carefully down *t<sub>i</sub>*].

Assume that *quickly/carefully* marks the left border of the *vP*. Then, the fact that the direct object precedes this adverb means that it has undergone movement from a VP-internal position to a position *outside of* the *vP* phase. Thus, Legate's analysis predicts that nuclear stress should fall on *the book*, contrary to facts. Our proposed analysis, however, correctly predicts this stress pattern because the particle *down* occupies the rightmost edge position within the VP.

Bresnan ends her paper by mentioning two problems with her own analysis. Let us consider how our proposed analysis can resolve one of them.<sup>2</sup> The problem concerns the position of stress in sentences with more than one NP next to the verb, as in (15a, b) and (16a, b).

- (15) a. Peter used a knife.  
 b. Whose knife<sub>i</sub> did Peter use *t<sub>i</sub>*?  
 (16) a. Peter sliced the salami with a knife.  
 b. Whose knife did Peter slice the salami with *t<sub>i</sub>*? (Bresnan 1971: 272)

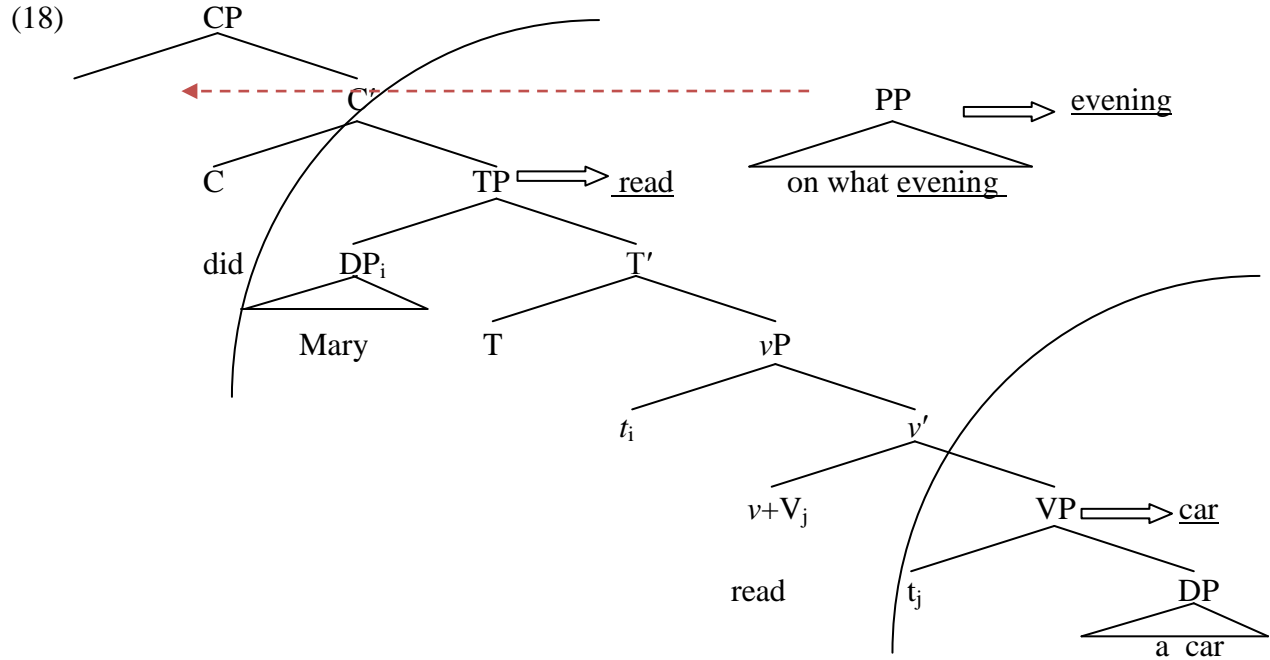
The stress pattern in (15a, b) is predicted under Bresnan's account. The object *knife* is assigned stress before it undergoes movement into [Spec, CP]. This analysis, however, does not account for the stress pattern in (16a, b). It predicts that stress falls on *knife* in (16b) since it falls on *knife* in (16a). The same problem arises under Legate's account, which would wrongly predict that stress falls on *knife* in (16b) since this element undergoes movement from within a VP-final position into the edge of the *vP* phase, which is standardly taken to be *outside of* the *vP* phase for the purposes of syntactic computation. Our analysis can accommodate the contrasting behavior in (15a, b) and (16a, b) as follows. It is important that the contrast regarding "stress inheritability" here is controlled by the argument vs. adjunct distinction: when the underlying rightmost element is a complement of the verb, it appears in its surface position with stress. When it is an adjunct to the verb, another phrase to the left of the element receives stress. Another pair of examples below, mentioned by Bresnan, also illustrates the same observation.

- (17) a. Mary found a car on Thursday  
 b. On what evening<sub>i</sub> did Mary find a car *t<sub>i</sub>*? (Bresnan 1971: 272, 274)

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<sup>2</sup> Thanks to an anonymous reviewer for making this point and directing my attention to the two problems raised by Bresnan. See section 4.4 for a solution to the other problem.

Goodall (1987), Uriagereka (1999) and Chomsky (2004) propose that adjuncts are constructed in a derivational workspace separate from the main derivational cascade that consists of a uniformly right-branching derivation (including a head, its complement, and its specifier) but somehow manage to be communicated with the cascade. Consider the derivation of (17b) in (18).



In the main workspace, when the VP is Spelled-Out, stress falls on *car*. A separate derivational workspace constructs the PP and Spells-Out the chunk to phonology, which assigns stress on *evening*. At the point when the C merges with TP, the Spelled-Out PP manages to enter the main derivational workspace somehow to be integrated into [Spec, CP]. The TP is then Spelled-Out and stress is assigned on *read* in phonology. We saw exactly this situation in the calculation of stress for cases with sentential/phasal subjects. The information at the TP phase of the main derivational workspace (*read*) is canceled since it is inconsistent with the information at the earlier vP phase of the same workspace (*car*). It is also inconsistent with the information at the adjunct workspace (*evening*). On the other hand, there is no inheriting derivational ordering between the two pieces of information (*car* and *evening*) because they are constructed in two independent workspaces. Recall here that our stress assignment rule is a phonological operation that is sensitive to the phonological edge (rightmost vs. leftmost). When all the individually constructed phasal objects are combined together at the phonological component, only the object *car* is located at the right edge: the PP-final element *evening* is not at the left or right edge. Thus, phonology assigns primary stress to *car*.<sup>3</sup>

<sup>3</sup> Kahnemuyipour (2004) mentions the stress pattern in topicalized sentences as in (i) as a problem for Legate's analysis. The logic is that stress should fall on the topicalized element in (ia) since stress falls on the object in (ib). An anonymous reviewer comments that the same pattern is also problematic for our analysis.

### 3.2. Cinque's (1993) "Null" Theory of Nuclear Stress

Cinque (1993) proposes that the nuclear sentence stress falls on the most deeply embedded constituent. In Cinque's system, the application of the stress assignment is sensitive to surface structure. This is intended to account for the fact that the indefinite vs. definite choice of an object affects the position of nuclear stress, as shown by the following examples from German; see Kahnemuyipour (2004) for the analogous data from Persian and Eastern Armenian.

- (19) a. [DP Der Arzt [C' wird [AgrP [VP einen Patiënten untersuchen]]]].  
           the doctor will a patient examine  
           'The doctor will examine a patient.'
- b. [DP Der Arzt [C' wird [AgrP den Patiënten<sub>i</sub> [VP t<sub>i</sub> untersuchen]]]].  
           the doctor will the patient examine  
           'The doctor will examine the patient.' (Cinque 1993: 254, 255)

In (19a), stress falls on the direct object because it is the most deeply embedded constituent. This is not the case in (19b), where the direct object moves out of the VP into [Spec, AgrOP]. As a result, the verb becomes the most deeply embedded element and hence receives stress.

Several problems arise with Cinque's analysis. I mention only problem that I take to be serious; see Kahnemuyipour (2004) for a variety of other problems that arise under Cinque's analysis (see section 3.3 for detailed discussion). Specifically, Cinque's system fails to account for the stress pattern in unaccusative and passive sentences. It has been acknowledged in the literature (Schmerling 1976; Bing 1979; Selkirk 1984; Faber 1987) that nuclear stress falls on the string-initial surface subject. Some examples are in (20a, b) and (21a, b).

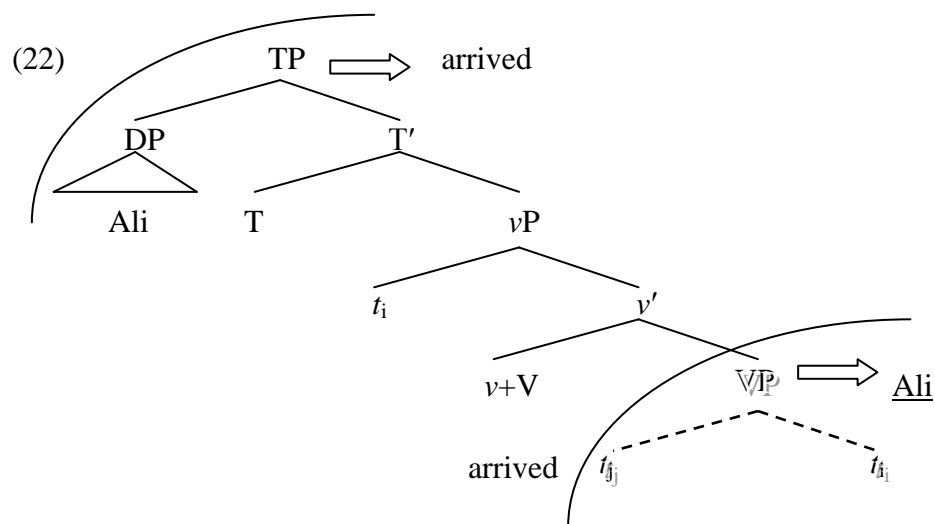
- (20) a. Ali arrived.  
       b. The ice melted.

- 
- (i) a. Beans, I like.  
       b. I like beans.  
       c. \* Beans, I like. (under the topicalized reading) (Kahnemuyipour 2004: 56)

I find this argument ill-conceived because (ia) with the stress on the verb is only grammatical with contrastive reading of the subject. Thus, (ia) means something like "I like beans, but not other ingredients in the discourse (e.g. carrots, lettuce, etc). It is known that contrastive stress may fall on any narrowly focused element within the sentence. Therefore, the stress pattern in (i) undermines neither Legate's (2003) nor our proposed analysis.

- (21) a. My bike was stolen.  
 b. The governor has been kidnapped.

Cinque's system wrongly predicts that stress falls on the verb because it is the most deeply embedded element in the surface structure. It might be tempting to save his analysis as follows: stress is assigned not to the derived element but its overall chain, with independent principles in phonology determining which link of the chain is to receive stress in the final representation. This move does not do because it is unclear in which case stress assignment is sensitive to the head or tail of the chain. Our analysis, however, correctly predicts the non-final stress pattern. Consider the derivation of (20a).



When the VP is Spelled-Out, stress is assigned to *Ali*. When the whole derivation is completed, the TP/CP is Spelled-Out. Stress is assigned to *arrived*. Since the first piece of information (Ali) is obtained earlier than the second piece of information (arrived), nuclear stress falls upon *Ali*.

### 3.3. Kahnemuyipour's (2004) Phase-Based Theory of Nuclear Stress

Kahnemuyipour (2004) proposes a phase-based reformulation of the nuclear sentence stress rule whereby stress is assigned to the highest element of the complement domain of the phase heads. Following Chomsky (2000, 2001), Kahnemuyipour assumes that only CPs and  $v^*P$  (transitive and experience verbs) constitute phases. His phase-based sentence stress rule is given in (23).

- (23) Sentential Stress Rule (Kahnemuyipour 2004: 88)

Sentential stress is assigned at the phase to the highest element (i.e. the phonological border) of the spelled out constituent or the SPELLEE.

[<sub>HP</sub> XP [H YP]]: If HP is a phase, YP = SPELEE

### 3.3.1. Core Arguments for Kahnemuyipour's Analysis

Kahnemuyipour's core arguments in favor of (23) comes from various facts concerning nuclear stress in Persian, Dutch, Eastern Armenian, and German, such as the following.

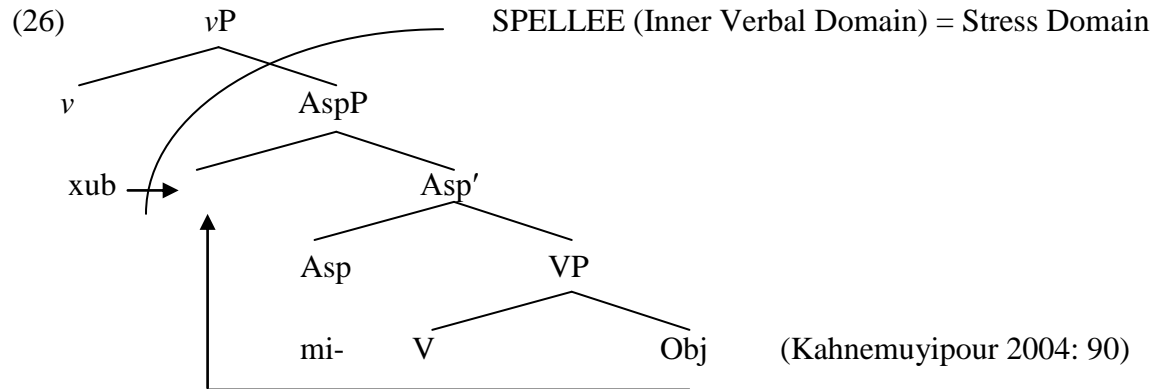
- (24)
- a. Leftmost nuclear stress patterns in Persian/Eastern Armenian (a-d)
  - b. Specific vs. non-specific objects in Persian/German/Eastern Armenian/Dutch (a-d)
  - c. V-final ditransitive sentences in Persian/Eastern Armenian/German (a-d)

I illustrate these arguments in turn in Persian for reasons of space: See Kahenemuyipour (2004: ch4) for comparable data from the other languages that make the same point. First of all, (25a-d) show that nuclear sentence stress falls on the highest element within the AspP.

- (25)
- a. Ali [AspP xord]  
Ali ate  
'Ali was eating.'
  - b. Ali [AspP mi-xord]  
Ali dur.-ate  
'Ali would eat/was eating.'
  - c. Ali [AspP qazaa xord]  
Ali food ate  
'Ali ate food.'
  - d. Ali [AspP xub qazaa xord]  
Ali well food ate  
'Ali ate well.'

(Persian: Kahnemuyipour 2004: 91)

This paradigm naturally falls out under Kahnemuyipour's system given the following derivation.



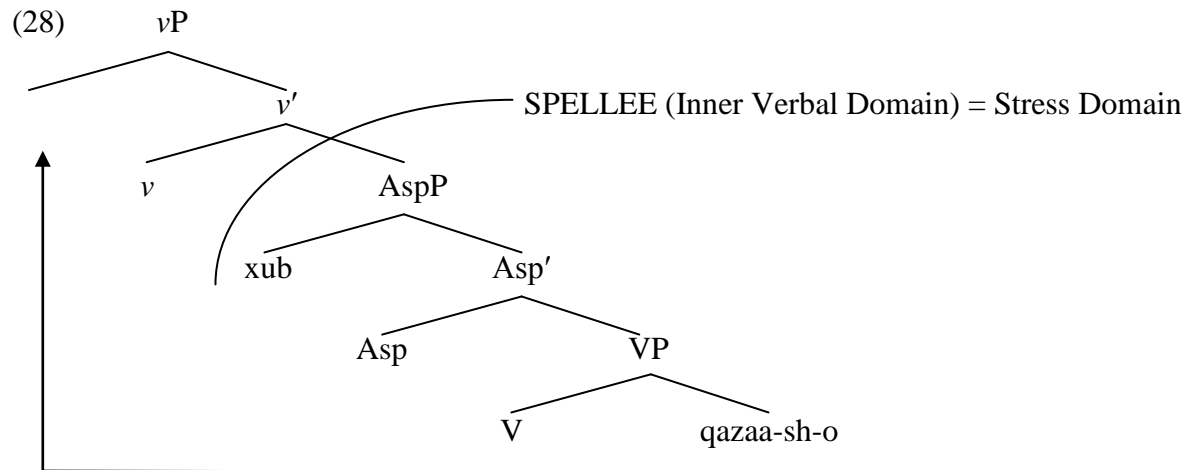
Stress falls on the verb in (25a) since it is the only element available within the AspP. The stress in (25b) with the durative *mi-* is also accounted for if the prefix occupies the head of AspP. The stress on the object in (25c) also makes sense since it is the highest element within the SPELLLEE after Object Shift. Finally, the stress on the adverb in (25d) falls out if it marks the edge of the verbal domain/AspP. See Kahnemuyipour (2004: his (72, 76)) for analogous data from Eastern Armenian.

Second, Persian, German, Dutch, and Eastern Armenian all show a striking contrast between the stress pattern of a non-specific direct object and a specific object. Examples from Persian in (27a-d) illustrate this point. See Kahnemuyipour (2004: 97, 147, 148, his (10, 11, 73) for analogous data from German, Dutch, and Eastern Armenian.

- (27)
- a. Ali [AspP qazaa xord] (=1c)  
 Ali food ate  
 'Ali ate food.'
- b. Ali qazaa-ro [AspP xord]  
 Ali food-Acc ate  
 'Ali ate the food.'
- c. Ali [AspP xub qazaa xord]  
 Ali well food ate  
 'Ali ate food well.'
- d. Ali qazaa-sh-o [AspP xub xord]  
 Ali food-his-Acc well ate  
 'Ali ate his food well.'

(Persian: Kahnemuyipour 2004: 96)

In (27a), stress falls on the highest element within AspP, namely, the direct object *qazaa*. When this object is replaced with the definite *qazaa-ro*, stress falls on the verb (27b). A similar pattern obtains in (27c, d). The pattern here falls out if the specific object undergoes Object Shift out of the stress domain and escape stress, as shown in the following derivation for (27d).



Finally, Kahnemuyipour observes that stress falls on the direct object in V-final ditransitive constructions, as in (29a-d) from Persian. See Kahnemuyipour (2004: his 43, 45) for German examples.

- (29) a. Ali [AspP ye tup be Hassan daad]  
 Ali a ball to Hassan gave  
 ‘Ali gave a ball to Hassan.’
- b. Ali tup-o [AspP be Hassan daad]  
 Ali ball-Acc to Hassan gave  
 ‘Ali gave the ball to Hassan.’
- c. Ali [AspP xub tup be Hassan daad]  
 Ali well ball to Hassan gave  
 ‘Ali assisted Hassan in the (soccer) game well. ‘ (Lit. Ali gave ball to Hassan well.)
- d. Ali tup-o [AspP xub be Hassan daad]  
 Ali ball-Acc well to Hassan gave  
 ‘Ali gave (passed) the ball to Hassan well.’ (Kahnemuyipour 2004: 121)

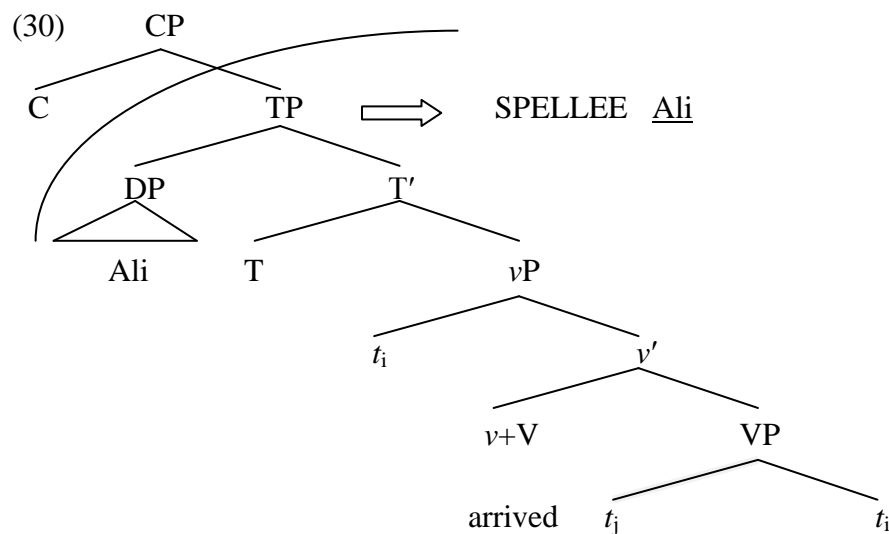


The stress pattern here is exactly what is predicted under Kahnemuyipour's analysis. Stress falls on the indefinite direct object *ye tup* 'a ball' in (29a) since this object is the leftmost/highest element within the SPELEE. Stress falls on the indirect object *Hassan* in (29b), however, because the specific object undergoes Object Shift out of the SPELEE into the edge of the  $\nu$ P phase. A similar analysis holds for the contrast in stress position between (29c) and (29d).

It is to be noted that all the core cases that led Kahnemuyipour to (23) are accommodated under our phase-based alternative once we assume that Persian chooses the *leftmost* value of the edge parameter for phase-based stress calculation. This result is not surprising since the highest constituent in Kahnemuyipour's system is synonymous with the leftmost constituent in our system.

### 3.3.2. Problems with Kahnemuyipour's Analysis

There are several problems with Kahnemuyipour's analysis that can be naturally resolved under our alternative. The first problem concerns his treatment of the stress pattern in unaccusative and passive constructions across languages. Kahnemuyipour assumes, contra to Legate (2003), that unaccusative and passive  $\nu$ Ps are *not* phases. He argues that the nuclear stress in (20a, b) and (21a, b) is correctly predicted in his system because it becomes the highest element within the TP, which is the only SPELEE, as shown in (30).



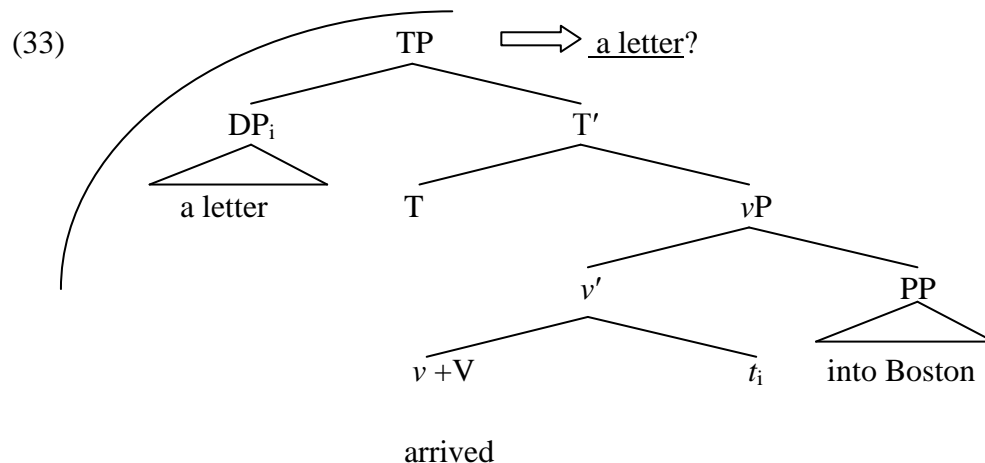
This analysis, however, seems problematic in light of the nuclear stress pattern in unaccusative sentences in Italian, Spanish, and French, as illustrated in (31a-c).

- (31) a. E'morto            Johnson.  
is dead            Johnson  
'Johnson died.'  
(Italian: Cinque 1993: 260)
- b. Llegó            el correo.  
arrived            the courier  
'The courier arrived.'  
(Spanish: Kahnemuyipour 2004: 142)
- c. Le        courier        est        arrivé.  
the        courier        is        arrived  
'The courier has arrived.'  
(French: Kahnemuyipour 2004: 143)

Given that the post-verbal subject in Italian and Spanish remains VP-internally whereas V raises to T, Kahnemuyipour's analysis predicts that stress should fall on the verb. His analysis also predicts that stress should fall on the derived subject in (31c). Kahnemuyipour (p. 144) suggests that unaccusative verbs *are* phases in Italian/Spanish/French. It is not clear whether this move can be sustained on the following grounds. First, it is not clear whether there is independent evidence that the phasal status of unaccusative verbs is subject to parametric variation in this way, an issue Kahnemuyipour leaves as a question for future research. Second, granted that we have found independent reason that unaccusative verbs are phases in Romance, his account of the stress pattern in (31a-c) is admittedly speculative. To take (31c), the first SPELLEE is the VP domain. Under the standard assumption that verbs in French raise out of the V into T (Pollock 1989), the stress domains becomes void of any phonologically overt material that qualify for stress assignment. Kahnemuyipour suggests that in this case, stress falls on the "closest non-null element" (p. 145). This move not only significantly undermines the generality of his stress rule in (23) but also begs the question of why there is such a seemingly ad hoc rule in natural language. Our analysis, however, directly accounts for the string-final sentence stress in (31a-c) if Romance languages select the *rightmost* value of the edge parameter.

In fact, Kahemenuyipour's analysis breaks down even in English once we examine cases where a VP consists of an unaccusative verb and its argumental PP. Consider (32) and its relevant part of the derivation in (33). (Details about the exact attachment site do not matter to the present discussion, as long as VP complements cannot be attached as high as to TP.)

- (32) A letter arrived into Boston.



Kahnemuyipour's system predicts that stress should fall on the subject. TP is the only SPELEE in (32) since he assumes that unaccusative verbs like *arrive* in English do not induce phase boundaries. However, this prediction is incorrect. Kahnemuyipour (p. 137-141) does suggest that verbs like *arrive* become phasal in English when additional structure is involved by way of adverbial modification, citing Alexiadou and Anagnostopoulou's (2001) argument for "incomplete semantic domains." However, it is not obvious whether there is independent evidence that adding an *argumental* PP changes the phasal status of unaccusative verbs in English. Our analysis correctly predicts the pattern in (32) since the PP is the rightmost element within the TP.

The second problem with Kahnemuyipour's analysis arises from stress patterns in Japanese, another SOV language that is typologically different from Persian, Eastern Armenian, and German. As pointed out by Ishihara (2000, 2001) (see also McCawley 1977), nuclear stress falls on the immediately preverbal phrase in Japanese. This pattern is illustrated below.

- (34)
- |    |                       |                 |               |                |
|----|-----------------------|-----------------|---------------|----------------|
| a. | Ben-ga                | [ <sub>vP</sub> | <u>susi-o</u> | tabeta].       |
|    | Ben-Nom               |                 | Sushi-Acc     | ate            |
|    | 'Ben ate Sushi.'      |                 |               |                |
| b. | Ben-ga                | [ <sub>vP</sub> | susi-o        | <u>joozuni</u> |
|    | Ben-Nom               |                 | Sushi-Acc     | well           |
|    | 'Ben ate Sushi well.' |                 |               |                |
| c. | Ben-ga                | [ <sub>vP</sub> | joozuni       | <u>susi-o</u>  |
|    | Ben-Nom               |                 | well          | Sushi-Acc      |
|    | 'Ben ate Sushi well.' |                 |               |                |

- d. Ben-ga [vP susi-o joozuni haside tabeta].  
 Ben-Nom Sushi-Acc well with chopstick ate  
 ‘Ben ate Sushi with chopsticks well.’
- e. Ben-ga [vP susi-o haside joozuni tabeta].  
 Ben-Nom Sushi-Acc with chopstick well ate  
 ‘same as (d)’
- f. Ben-ga [vP haside susi-o joozuni tabeta].  
 Ben-Nom with chopstick Sushi-Acc well ate  
 ‘same as (d)’
- g. Ben-ga [vP haside joozuni susi-o tabeta].  
 Ben-Nom with chopstick well Sushi-Acc ate  
 ‘‘same as (d)’
- h. Ben-ga [vP joozuni susi-o haside tabeta].  
 Ben-Nom well Sushi-Acc with chopstick ate  
 ‘same as (d)’
- i. Ben-ga [vP joozuni haside susi-o tabeta].  
 Ben-Nom well with chopstick Sushi-Acc ate  
 ‘‘same as (d)’

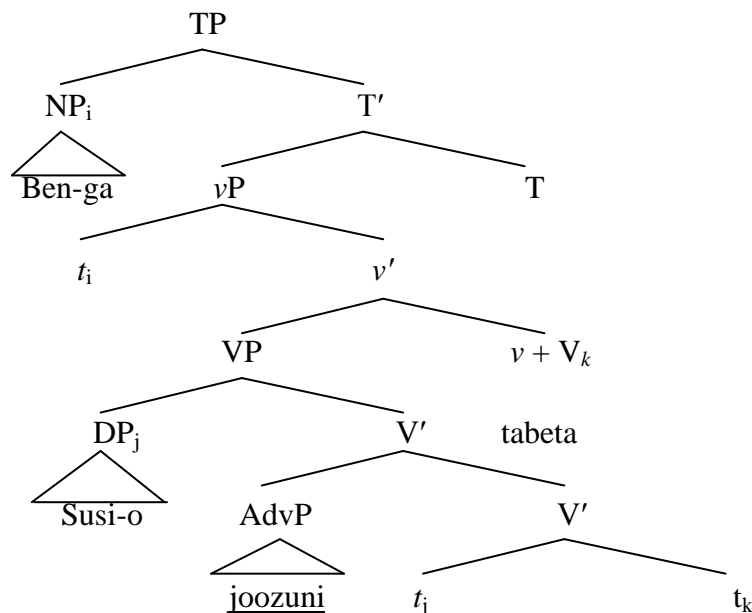
In (34a), stress falls on the object. When the adverb *joozuni* ‘well’ is added between the direct object and the verb, as in (34b), stress now falls on this adverb. (34c) results if we switch the order between the adverb and the object: in this case, stress falls on the immediately preverbal element, namely, the verb. In (34d), which is formed by adding the PP *haside* ‘with chopsticks’ to (34b), stress again falls on the preverbal element, namely, the PP. Japanese is a free word order language. Thus, all the six permutations of the direct object, the adverb, and the PP are possible, as shown in (34d-i), as long as the verb remains sentence-finally. In all these cases, however, stress consistently falls upon the immediately preverbal element.

The same characterization also holds for V-final ditransitive constructions in Japanese, as shown in (35a-h), where stress always falls on the preverbal element, no matter what linear order the direct object *booru-o* ‘ball-Acc’, the indirect object *Mie-ni* ‘to-Mie’, and the adverb *joozuni* ‘well’ may appear in.

- (35) a. Ben-ga [vP booru-o Mie-ni watasita].  
 Ben-Nom ball-Acc Mie-to passed  
 ‘Ben passed a ball to Mie.’
- b. Ben-ga [vP Mie-ni booru-o watasita].  
 Ben-Nom Mie-to ball-Acc passed  
 ‘same as (a)’
- c. Ben-ga [vP booru-o Mie-ni joozuni watasita].  
 Ben-Nom ball-Acc Mie-to well passed  
 ‘Ben passed a ball to Mie well.’
- d. Ben-ga [vP booru-o joozuni Mie-ni watasita].  
 Ben-Nom ball-Acc well Mie-to passed  
 ‘same as (c)’
- e. Ben-ga [vP Mie-ni booru-o joozuni watasita].  
 Ben-Nom Mie-to ball-Acc well passed  
 ‘same as (c)’
- f. Ben-ga [vP Mie-ni joozuni booru-o watasita].  
 Ben-Nom Mie-to well ball-Acc passed  
 ‘same as (c)’
- g. Ben-ga [vP joozuni booru-o Mie-ni watasita].  
 Ben-Nom well ball-Acc Mie-to passed  
 ‘same as (c)’
- h. Ben-ga [vP joozuni Mie-ni booru-o watasita].  
 Ben-Nom well Mie-to ball-Acc passed  
 ‘same as (c)’

Ishihara proposes to derive the generalization, illustrated in (34a-i) and (35a-h), from Cinque’s theory of nuclear stress reviewed in section 3.2. For example, the stress pattern in (34b) is derived as in (35).

(36)



In this derivation, the direct object < adverb order is derived by scrambling the object over the adverb. Under the standard analysis of Japanese whereby subjects move into [Spec, TP] for Case-checking or EPP reasons and that they cannot undergo scrambling (Saito 1985), the object lands somewhere within the VP/vP region, as shown. Now, the stress on the adverb in (34b) falls out since it is the most embedded constituent after V-raising to  $v$  (or to T or C) (Koizumi 1995; Miyagawa 2001). This analysis generalizes to all the other examples in (34) and (35).

Our analysis derives the same generalization once we assume Japanese selects the *right edge value* of the edge parameter for the stress domain like French, Italian, and Spanish but unlike Persian, Eastern Armenian, and German. The nuclear stress in Japanese, thus, falls on the rightmost element within the VP domain, which is the complement of the phase head  $v$ . This “rightmost” generalization, however, is quite problematic Kahnemuyipour’s theory because it makes the opposite prediction that primary stress falls on the leftmost element within the VP domain in this language. Of course, it may be tempting to save his “highest/leftmost” theory by saying that all the VP-internal elements vacate the VP by scrambling leaving one element, thereby assigning this remnant with primary stress. This move seems unlikely, if not impossible, because it is not clear whether all these movements are independently motivated in Japanese, or, from the deterministic perspective of the Minimalist Program, justified. Unless such evidence is presented, I take it that Kahnemuyipour’s theory of nuclear stress is difficult to maintain in face of the uniformly rightmost pattern of stress assignment exhibited by Japanese.

Notice that examples in (37a, b) and (38a, b), which involve unaccusative and passive verbs, indicate that our phase-based theory is superior to Cinque/Ishihara’s surface-based stress theory.

- (37) a. Taroo-ga                      tuita.  
           Taroo-Nom                    arrived  
           ‘Taro arrived.’
- b. Koori-ga                      toketa.  
           ice-Nom                      melted  
           ‘The ice melted’.
- (38) a. Bokuno                      jitensha-ga                      nusum-are-ta.  
           my                              bike-Nom                      steal-Pass-Past  
           ‘My bike was stolen.’
- b. Shuuchiji-ga                      yuukais-are-ta.  
           governor-Nom                      kidnap-Pass-Past  
           ‘The governor has been kidnapped.’

These examples illustrate that stress falls on the derived subject in unaccusative and passive constructions in Japanese, like English but unlike French. Our analysis correctly derives this pattern because the subject receives stress within the stress domain (namely VP) and this information is prioritized in phonology over any other conflicting information on stress assignment within the next/higher stress domain (TP/CP). Ishihara’s theory incorrectly predicts that stress falls on the sentence-final verb because it draws on Cinque’s analysis of stress assignment that is sensitive to the depth of embedding in surface/derived syntactic structure.

### 3.4. *Section Summary*

In this section, we have compared our proposed analysis with three prominent existing alternative analyses of nuclear sentence stress: Bresnan (1971)/Legate (2003), Cinque (1993), and Kahnemuyipour (2004). I have shown that each of these analyses is faced with a different set of empirical problems that can be naturally resolved in our proposed analysis. Our analysis draws on important insights with the previous analyses, especially with Bresnan and Kahnemuyipour, the most important being that nuclear stress assignment is a cyclic/phase-based operation. This claim has been supported by the non-final stress pattern in unaccusative and passive constructions. The strength/originality of our proposed analysis, however, lies in the idea that stress assignment is also constrained by independently motivated domain-specific notions such as right vs. left-edges in the phonology (Halle and Vergnaud 1987; Selkirk 1986; Cheng 1987). This idea stands to reason under the most natural assumption that stress/pitch is assigned in the syntax-external phonological component. Our comparative investigation of the stress pattern in Persian and Japanese provides strong evidence that the left vs. right edge value of the

stress assignment parameter is an independent choice languages make other than the syntactic head parameter since Japanese and Persian show the conflicting edge effects in stress assignment (right edge for Japanese; left edge for Persian) despite the fact that they are both SOV languages.

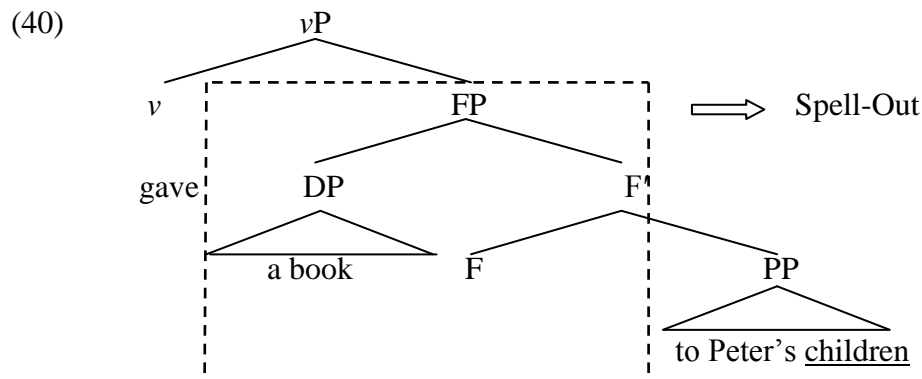
#### 4. Stress Assignment in More Controversial Cases

In this section, I examine stress patterns in other more complex constructions than those examined in the previous sections, specifically, double object constructions (section 4.1), non-D-linked *wh*-questions (section 4.2), and stage-level vs. individual-level predicate constructions (section 4.3), and see how stress patterns in these constructions can fall out from our proposed system.

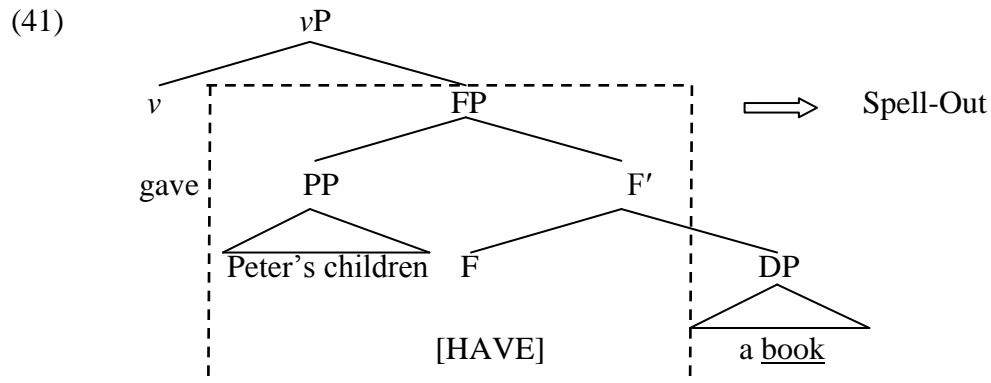
##### 4.1. Double Object Constructions

There is a vast amount of literature on the syntactic derivation of ditransitive and dative object constructions (see Larson 1988, Aoun and Li 1989, Pesetsky 1995, Harley 1995, 2003, Pylkkänen 2002, Beck and Johnson 2005, and many other references cited therein). It goes well beyond the scope of this article to review pros and cons of all these analyses of double object constructions. For the purposes of this paper, based on a variety of evidence presented in Pesetsky (1995), Harley (2003), Pylkkänen (2002), and Beck and Johnson (2005), I assume that the two ditransitive and dative variants are not transformationally related but rather represent two separate derivations. Adopting this assumption, I propose that the two variants, shown in (39a, b), have the partial derivations in (40) and (41), respectively, where *F* constitutes a phase head, as do *v* and *C*. (I remain agnostic about the identity of *F*; it may well be one variety of the Applicative heads.)

- (39) a. Mary gave a book to Peter's children  
 b. Mary gave Peter's children a book. ((a) from Bresnan 1971: 274))





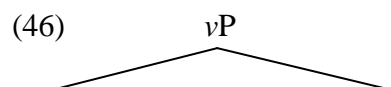
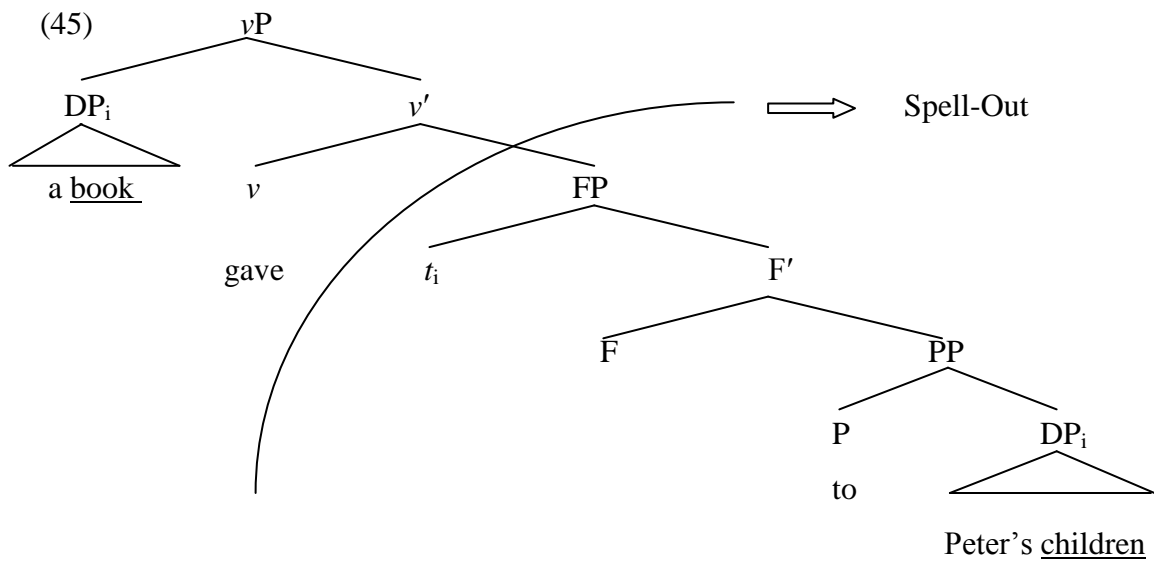
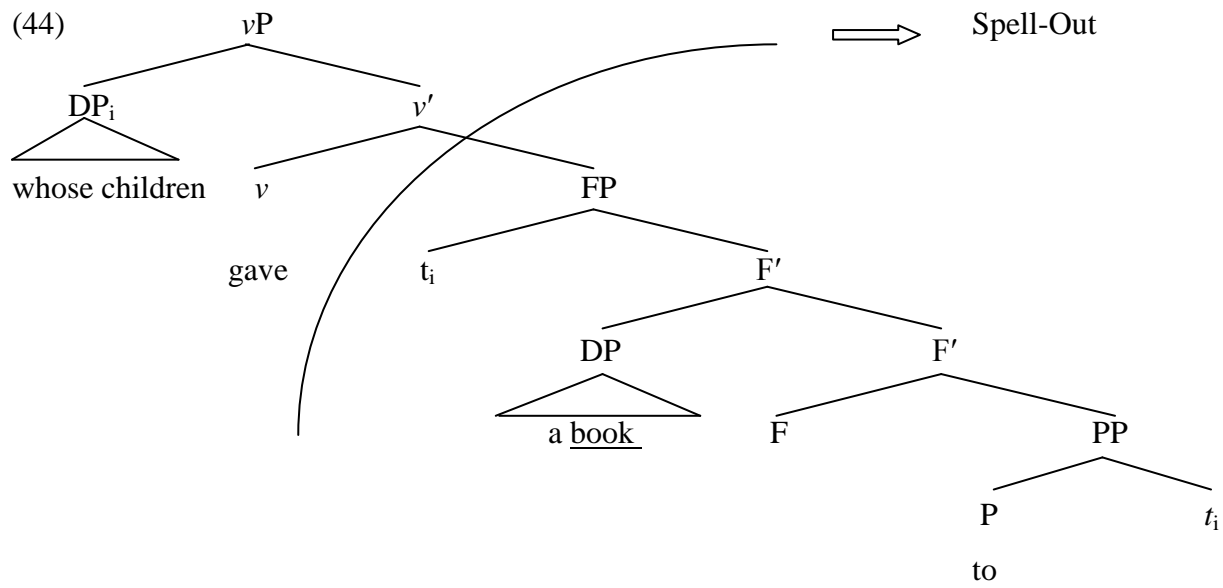


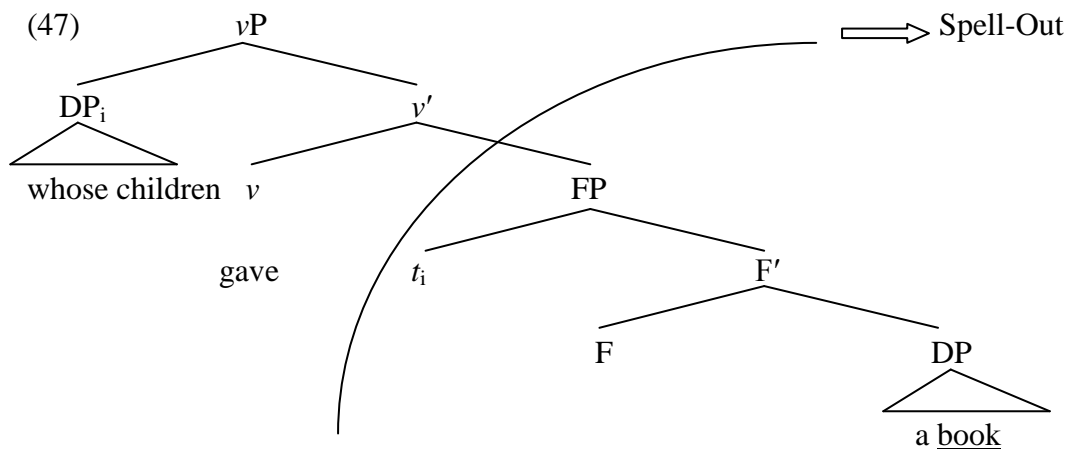
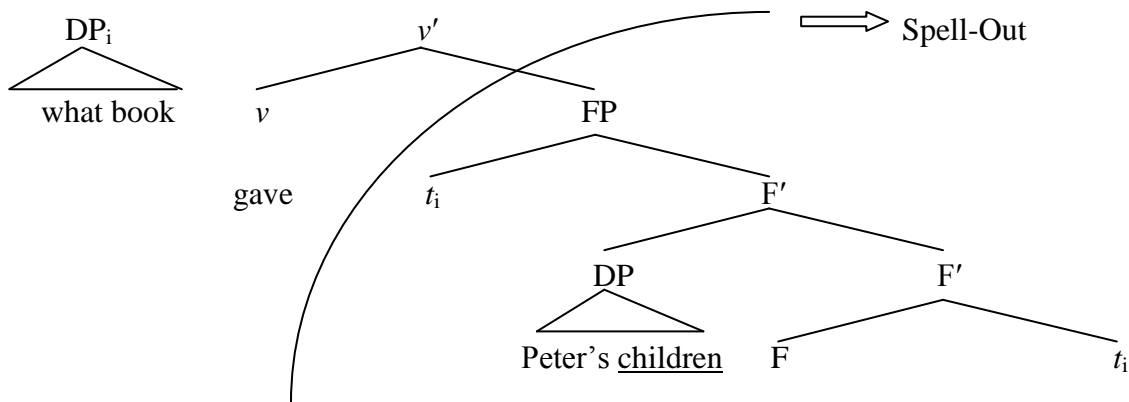
Following Harley's (1995, 2003) proposal, two different varieties of F (P in Harley's terms) are involved in the two derivations. F in (40) corresponds to the two-place predicate GO which selects the Goal and Theme arguments as its specifier and complement, respectively. On the other hand, F in (41) corresponds to the predicate HAVE which selects the Possessor and Goal arguments as its specifier and complement, respectively. Under an extensional interface-based definition of phases used by Chomsky (2000, 2001, 2004), the FP can be considered to be a phase because it instantiates a "propositional content" (X GO TO Y) and (Y HAVE X). Now, the present analysis predicts that stress should fall on the indirect object in the dative variant as in (39a) and on the direct object in the ditransitive variant as in (39b). This prediction is correct, as shown.

An interesting pattern arises once we examine the stress pattern in *wh*-questions derived from (39a, b). The question counterparts are given in (42a, b) and (43a, b) with nuclear stress underlined.

- (42) a. Whose children<sub>i</sub> did Mary give a book to *t<sub>i</sub>*?  
 b. What book did Mary give *t<sub>i</sub>* to Peter's children?
- (43) a. What book<sub>i</sub> did Mary give Peter's children *t<sub>i</sub>*?  
 b. Whose children did Mary give *t<sub>i</sub>* a book? ((42a), (43a) from Bresnan 1971: 274)

According to our analysis of stress patterns in *wh*-questions, the rightmost element within the VP receives stress at the VP domain before it is moved into [Spec, CP]. This analysis, we showed, allowed for a straightforward updating of Bresnan's analysis within Phase Theory. The question now is why this preservation of stress pattern breaks down in double object constructions. Stress should fall on *children* in (42a, b) and on a *book* in (43a), respectively, because in the underived forms, stress falls on *children* and *book*, as in (39a, b). The question receives an answer once we take seriously the role of the syntactic edge at the syntax-phonology interface. Under Chomsky's (2000, 2001, 2004) theory of phases, elements at the edge of a phase are evaluated not at the current phase but at the next higher phase. Adger (2006: 264) speculates that the phasal edge serves the same role as extrametricality in phonology in that elements in the edge are unparsed for the purposes of stress assignment until the next phase. With this in mind, consider the derivations of (42a, b) and (43a, b) shown below.





I assume that, as an idiosyncratic lexical property of double object verbs, F attains the phasal status only after it merges with the upper  $v$ . This assumption is granted given that the full argument structure of *give* is instantiated only at the  $vP$  phase after the external argument is introduced. In (44), the indirect object *whose children* first moves into the outer edge of the FP and then into the edge of the  $vP$  phase. When the  $vP$  phase is completed, the complement domain of the  $v$  head is Spelled-Out. Within this domain, the direct object *a book* occupies the rightmost position. As a result, stress falls on *book* (42a). In (45), the direct object *a book* undergoes movement into the edge of  $vP$  phase. When the FP undergoes Spell-Out as the stress domain, the indirect object *Peter's children* occupies the rightmost position within the FP. Thus, stress falls on *children* (42b). In (46), the direct object *what book* undergoes movement into the outer edge of the FP over the indirect object *Peter's children*. The direct object then moves further into the edge of the  $vP$  phase. Within the stress domain/FP, *Peter's children* occupies the rightmost position and hence receives stress (43a). In (47), the direct object *a book* occupies its base position whereas the indirect object *whose children* moves from the edge of the FP phase to the edge of the  $vP$  phase. Stress falls on *book* since it occupies the right edge within the FP (43b).

To the best of my knowledge, the account given above is the first attempt to elucidate the stress pattern in a double object construction that is consistent with the most recent structural analysis of it. It is not clear whether the existing analyses of nuclear stress could accommodate stress patterns

discussed in this subsection. First, the pattern is exactly what Bresnan mentioned as a residual problem for her cyclic theory of stress assignment (see Bresnan 1971: p. 272-274) since her theory predicts that, once stress is assigned to an element within a transformational cycle/domain, that stress should be inherited by the higher copy of the element. The same criticism applies to Legate's phase-based reformulation of Bresnan's theory. Second, Kahnemuyipour's analysis also seems to face a difficulty with the stress pattern in double object constructions. Assuming the structural analysis of the dative alternation along the lines suggested above, his theory predicts that stress should fall on *a book* in (39a) since he assumes that direct objects in English undergo movement into [Spec, AspP], thereby becoming the highest element within this domain. This prediction is incorrect. The stress contour in (42a) and (43a, b) is also problematic for his analysis since, as we will see shortly in the following subsection, his analysis is so designed as to predict that stress falls on non-D-linked *wh*-phrases, contrary to facts. Finally, Cinque's (1993) theory also cannot account for the derived stress pattern observed in (42b), since it falsely predicts the stress to fall on the string final element in the surface syntactic structure (namely, *children*). Based on these considerations, I conclude the stress pattern in double object constructions highlights an important empirical contribution brought in by the present analysis relative to the previous ones presented by Bresnan, Legate, and Kahnemuyipour.

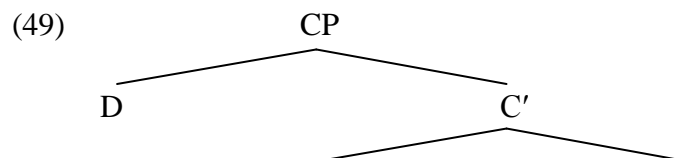
#### 4.2. *Simplex vs. Complex Wh-Phrases*

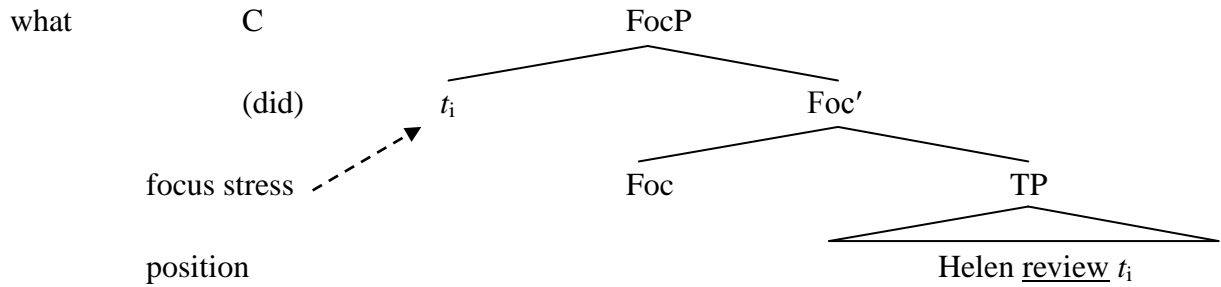
This subsection is concerned with the difference in the position of nuclear stress in questions with D-linked vs. non-D-linked *wh*-phrases. As first noted by Bresnan (1971: 259), simplex, non-D-linked *wh*-phrases such as *what* do not receive sentence stress whereas D-linked *wh*-phrases do receive nuclear on the head noun. This contrast is shown in (48a-c).

- (48) a. What did Helen review?  
 b. \* What did Helen review?  
 c. Which book did Helen review? (Kahnemuyipour 2004: 194, 201)

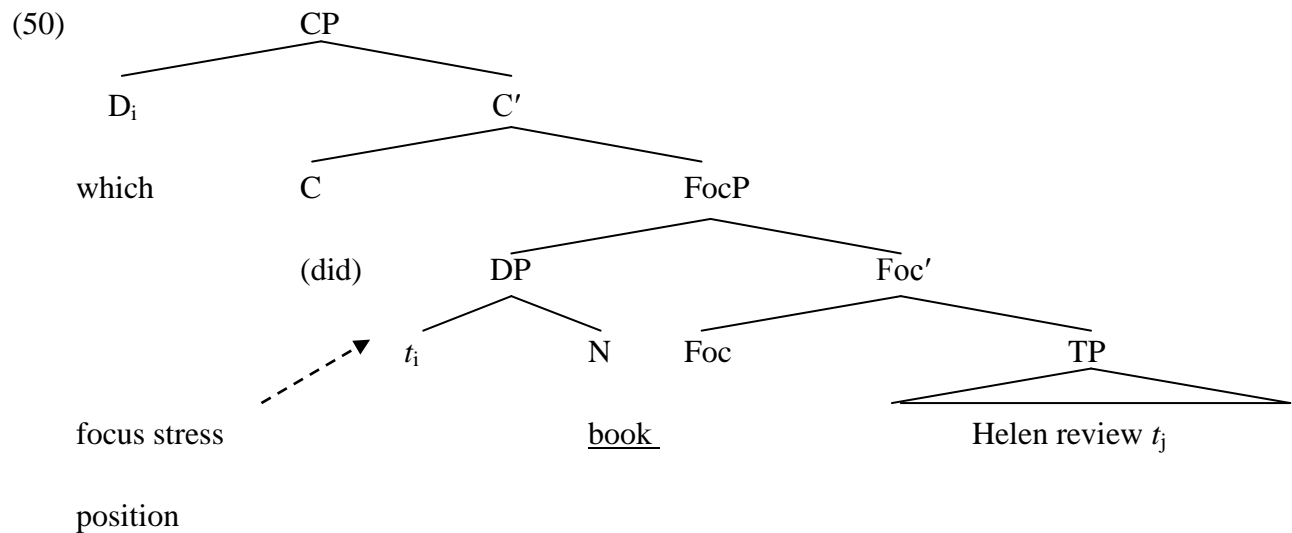
I first review Kahnemuyipour's (2004) recent analysis of the stress pattern in (48a-c) and point out problems with it. I then show that Bresnan's (1971) original account of the pattern can be readily reformulated under our proposed analysis.

Kahnemuyipour argues that nuclear stress does not fall on the non-D-linked *wh*-phrase *what* in (48a) because it moves into [Spec, CP], thereby escaping the focused position, as shown in (49).





The focus position becomes empty as the result of *wh*-movement. Thus, the stress rule (see section 3.3) assigns stress to *reviewed* since the verb is the highest element within the SPELLEE. For D-linked *wh*-questions like (48c), Kahnemuyipour proposes the following derivation.



In this derivation, the entire *wh*-phrase *which book* moves from its merge position within the TP into the specifier of FocP, a position for focus stress. This movement is followed by the movement of the *wh*-word *which* alone into [Spec, CP]. Stress falls on *book* since it remains in the focus/stress position. Kahnemuyipour provides independent evidence for the intermediate focus position between the C and TP based on binding facts such as those illustrated in (51a, b).

- (51) a. \* Kate and Tom thought Helen reviewed books about each other.  
b. Kate and Tom wonder which books about each other Helen reviewed.

(51a) is bad because it violates Condition (A) of the Binding Theory: the reciprocal is too far from its potential antecedent *Kate and Tom* due to the intervention of the singular subject *Helen*. The grammaticality of (51b), then, indicates that a D-linked *wh*-phrase may move to a certain position, which is at least higher than the singular subject ([Spec, TP]). Kahnemuyipour takes this position to correspond to the specifier of FocP (see also den Dikken 2003).

However, two problems remain unresolved with this particular analysis. First, as is widely known, English obeys the Left Branch Condition (Ross 1967), which prohibits any NP on the left branch of another noun phrase from being extracted, as illustrated in (52a, b).

- (52) a. \* [<sub>D</sub> whose]<sub>i</sub> did you review *t<sub>i</sub>* book?  
 b. \* [<sub>D</sub> which]<sub>i</sub> did you write *t<sub>i</sub>* book?

Thus, the question is why this D-splitting, an otherwise ungrammatical option in English grammar, is allowed in the particular context of D-linked *wh*-questions like (47c). Kahnemuyipour does seek empirical support for this option from Polish, Russian, Mohawk and Greek where a *wh*-word appears separated from the head noun, as shown in (53) from Polish.

- (53) Jaki<sub>1</sub>                wykreçiles    [e<sub>1</sub>    numer]  
       which                you-dialed                number

‘Which number did you dial? (Cover 1990: 330, as cited in Kahnemuyipour 2004: 201)

However, this argument seems orthogonal to answering the question we started with in the first place: why is the left branch condition lifted under D-linked *wh*-questions in *English*? As suggested by Kahnemuyipour (p. 20) (see also Chomsky 1995), one might resort to some late PF process, such as PF merger under adjacency (Bobaljik 1995). The merger of the head noun to the *wh*-word is blocked by the intervening material (*did, you, review*) in (52a, b). The same merger is not blocked in (48c) if *did* is in the head position of Fin in the elaborated CP structure suggested by Rizzi (1997) (namely, Force P < TopP < FocP < TopP < Fin P < IP...]), which is lower than the specifier position of FocP. However, it would be ideal if we could find an independent morphological factor that forces such merger because neither *which* nor *book* is an affix in the standard sense of the term. The second problem with Kahnemuyipour’s analysis is that it does not answer what blocks the movement of the entire *wh*-phrase in (50). In other words, why is “D-splitting” obligatory in D-linked *wh*-questions? The pied-piping strategy must be blocked for an independent reason under Kahnemuyipour’s system, for otherwise we would falsely predict that stress should fall on the verb *reviewed* in (48c), just as in

(48a), because the focus/stress position becomes empty as the result of the movement of the entire *wh*-phrase into the specifier of CP. However, this question remains unaddressed.

Bresnan (1971) already presented an intriguing account for the contrasting stress pattern observed in (48a, c). Our analysis here crucially draws on her analysis. Her crucial observation is that the stress pattern in (47a, c) mirrors the stress pattern in (54a, b), respectively.

- (54) a. Helen had reviewed something.  
b. Helen had reviewed some books. (Bresnan 1971: 261, with a slight modification)

It is commonly held that a nominal *wh*-word consists of the *wh*-feature and its nominal indefinite or *pro* (Kuroda 1965). Then, the stress pattern in (48a, c) directly falls out. In (48a), stress cannot be assigned to *what* within the VP domain because the indefinite part of the *wh*-word prohibits it from receiving stress. As a result, stress falls on *reviewed* since this is then the rightmost element within the TP. On the other hand, in (48c), stress must be assigned to *book* within the VP domain because, as shown in (54b), *books* is not an indefinite expression and located at the right edge within the VP. Although I do not know why indefinite expressions resist stress (see Bolinger 1972 for a suggestive approach in terms of newsworthiness vs. predictability; see also section 4.4), we can still see the fundamental principle at work in calculation of nuclear stress, namely, that stress assignment is a cyclic operation sensitive to the underlying stage of the derivation.

I end this subsection by addressing one question, raised by an anonymous reviewer, that concerns the interface between information structure and prosody in *wh*-questions. It has been commonly held (Chomsky 1971, Jackendoff 1972) that the narrowly focused constituent of a sentence, namely, the non-presupposed part of the sentence, receives the maximal prominence in English as well as in other languages; see also Zubizarreta (1998) for much relevant discussion and background). For example, given the sentence in (55a) as the presupposition, *John* receives stress in (55b) because the subject is the focus/non-presupposed part.

- (55) a. Someone loved Mie.  
b. [<sub>F</sub>Ben] loved Mie. (narrow focus)

Within this background in mind, it is quite puzzling that simplex *wh*-words do not receive stress in *wh*-questions, as illustrated in (48a). The reviewer points out that the inability of *wh*-words to bear stress cannot be due to their inherent lexical property based on Kahnemuyipour's observation (p. 194) that in-situ *wh*-words do receive stress in multiple *wh*-questions and echo questions, as shown in (56a) and (56b), respectively.

- (56) a. Who reviewed what?

- b. (I didn't quite catch you!) Who reviewed the book? (Kahnemuyipour 2004: 200)

Kahnemuyipour attempted to derive the stress pattern here by having the *wh*-words bear stress in [Spec, FocP]. The question, then, is why *wh*-words exceptionally receive focus stress in their in-situ positions in these two particular constructions. I suspect that the stress pattern here falls within the purview of a stress assignment rule in (57) proposed by Erteschik-Shir (1986), which is independent of the default primary sentence stress assignment rule one argued for thus far in this paper. The notion of *dominance* is defined as in (58).

- (57) Dominant Stress Rule (Erteschik-Shir 1986: 121, her Sentential Stress Rule)

Place primary stress on the Dominant constituent of the sentence.

- (58) Dominance (Erteschik-Shir 1986: 120)

DOM: A constituent *c*, of a sentence *S*, is dominant in *S* if and only if the speaker intends to direct the attention of his/her hearer(s) to the intension of *c*, by uttering *S*.

The stress pattern in (56a, b) can be accounted for as follows. The only possible context in which (56a) makes sense is one in which there is a pre-determined set of people who reviewed a set of things. The intension of the speaker in uttering this question is solely to direct the attention of his/her hearer to the correct pairing of people and things. Since *what* is dominant (the other dominant element is *who*), it receives focus stress in (56a) due to the rule in (57).<sup>4</sup> Similarly, an echo question could only be uttered when a sentence has previously occurred that constitutes the answer to that question. Thus, the intention of the speaker in uttering (56b) lies not so much in identifying the value of a person who reviewed the book as in directing the attention of the listener to the previously identified but inadequately communicated person. Importantly, Erteschik-Shir develops arguments that the *wh*-phrase is not the focus in *wh*-questions, contrary to the standard assumption since Chomsky (1971), and that the two exceptions to this claim are precisely echo and multiple *wh*-questions as illustrated in (56a, b). The fact that we see “irregular” stress pattern in these two constructions, therefore, strongly suggests that a different stress assignment rule as in (57) is at work in deriving the stress contour in question.

#### 4.3. Stage-Level vs. Individual-Level Predicates

It has been acknowledged that individual-level and stage-level predicates (Carlson 1977; Kratzer 1995; Diesing 1992) differ in the location of primary sentence stress: see Gussenhoven (1983, 1992), Sasse (1987), Selkirk (1995), Rosengren (1997), and references cited therein. Stage-level predicates denote properties that hold temporarily of an individual, whereas individual-level predicates denote

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<sup>4</sup> My point here is to account for why stress can fall on the in-situ *wh*-word in (56a, b). Erteschik-Shir notes her theory correctly predicts that primary stress falls on both *wh*-word based on her judgment for the sentence in (i), which is different from the judgment reported by Kahnemuyipour.

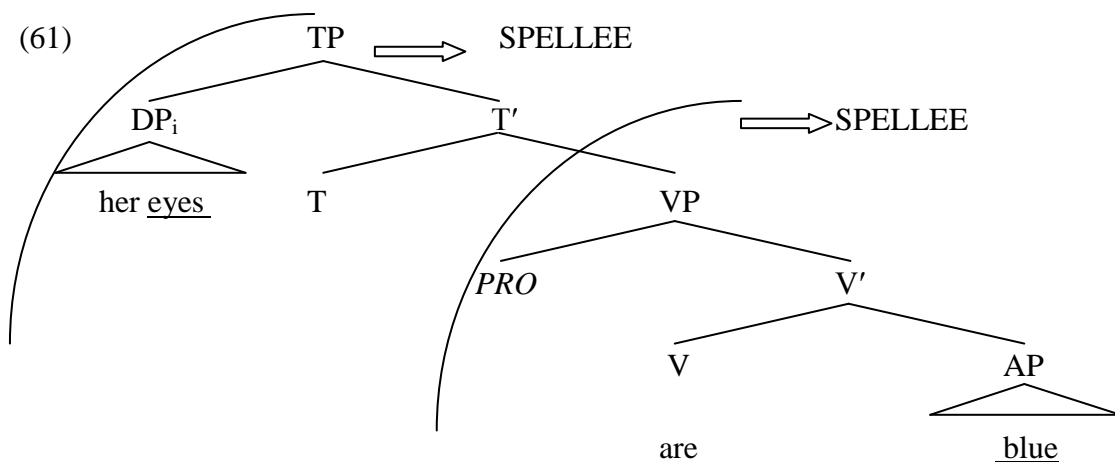
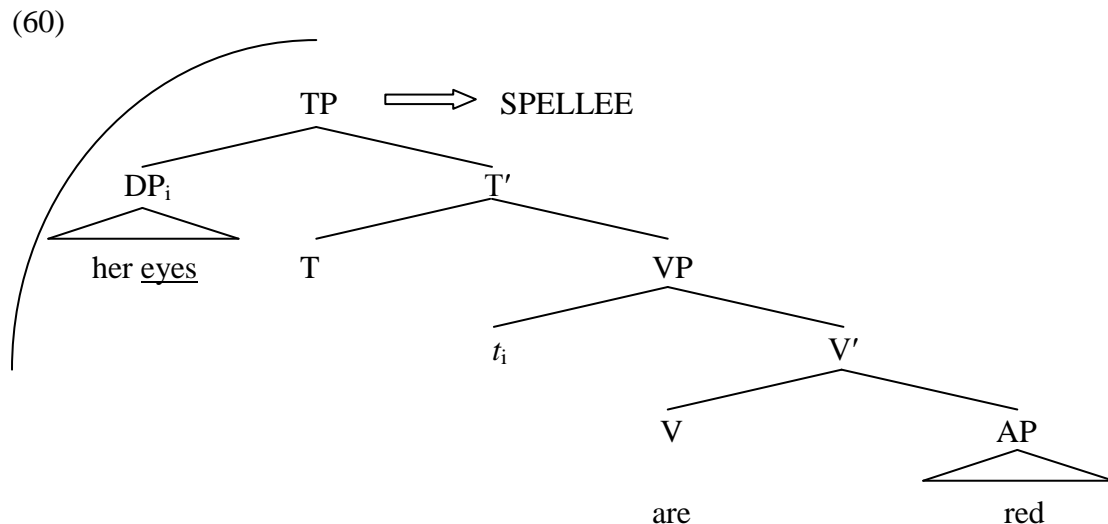
- (i) Who ate what?



properties that hold permanently of an individual. The following examples show that stress falls on the predicate in the individual-level predication (with secondary stress on the subject; see Bing 1979 and Sasse 1987, for example) but on the subject in the stage-level predication.

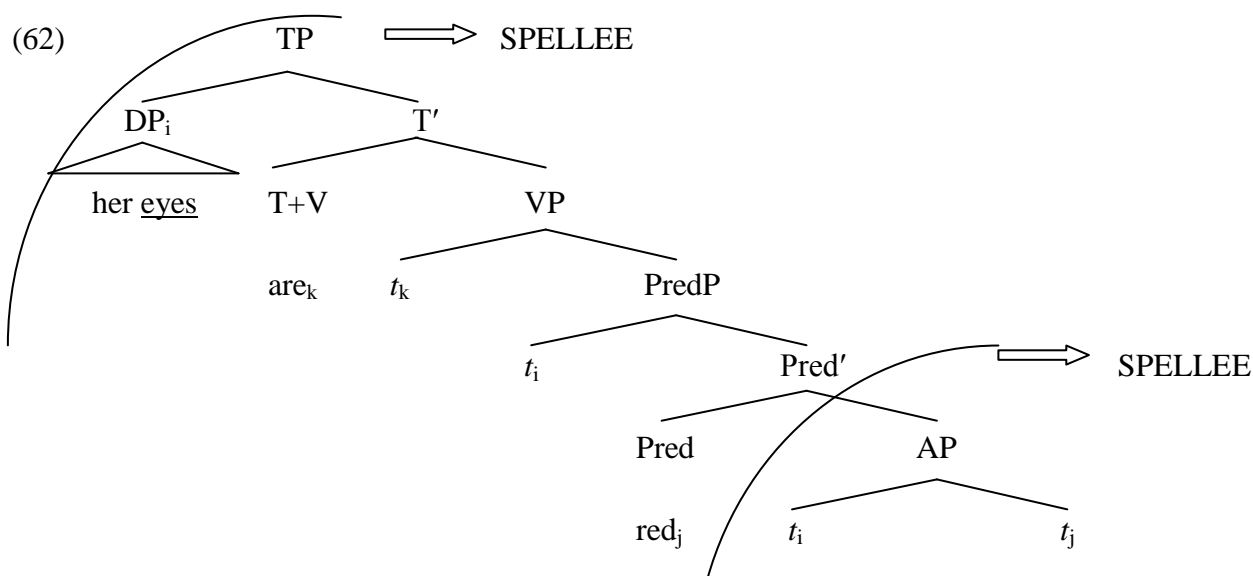
- (59) a. Her eyes are blue.  
 b. Her eyes are red.

Kahnemuyipour argues that the difference here falls out from his system, coupled with Diesing's (1992) analysis, if the individual-level predicate, but not the stage-level predicate, induces a phasal boundary. Diesing proposes that the surface subject of a stage-level predicate is generated within the VP and moved to [Spec, TP] whereas the surface subject of an individual-level predicate is directly base-generated in [Spec, TP] and controls a PRO within the VP. The relevant parts of the structures proposed by Diesing for these two types of predicate are shown in (60) and (61), respectively.

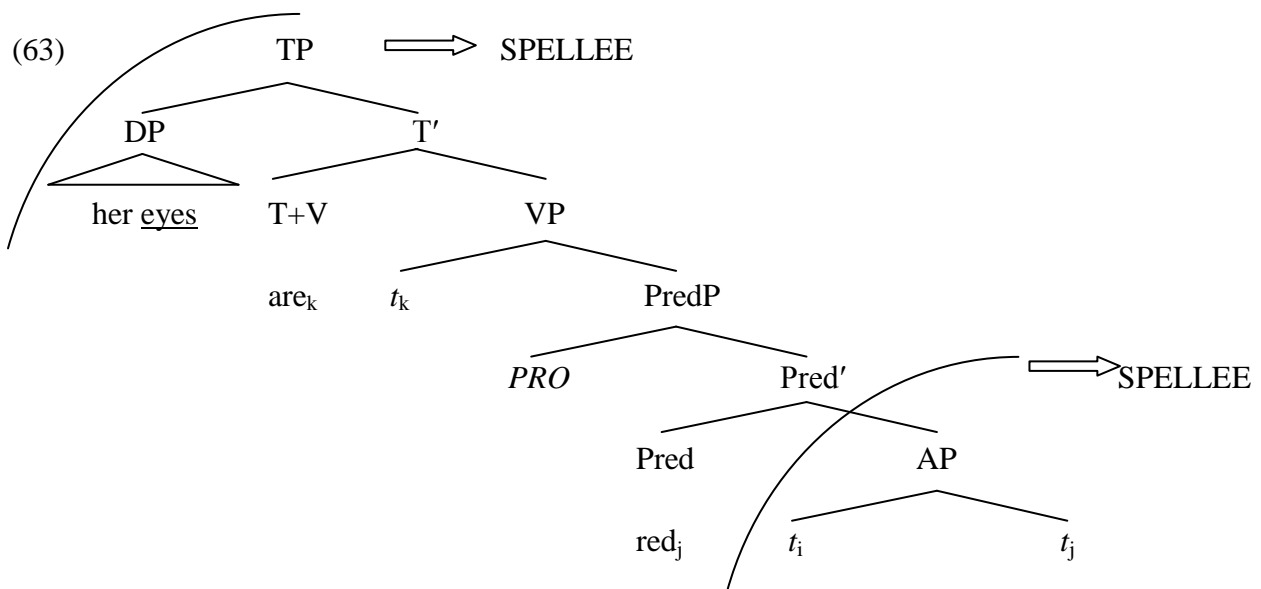


In (60), the whole TP (or the root CP) becomes the SPELLEE. The stress falls on the subject because it is the highest element within this domain. In (61), there is a phase boundary (triggered either by the extra  $\nu$ P layer or by the lexical property of *be*), which creates two SPELLEEs. Stress thus falls on the subject and the predicate: the stress on the former is realized as primary stress, as per the convention that the element within the first SPELLEE receives the most prominent stress. Kahemuyipour argues that the stress pattern in (59a) is a problem for Legate's analysis. Assuming the derivation in (60), her analysis wrongly predicts that stress falls on *red*, which is the most deeply embedded constituent within the TP/VP. The same pattern also appears to be problematic for our analysis, which predicts stress to fall on the predicate, since it is the rightmost element within the VP/TP. I suggest one solution to this problem below.

Let me first point out that there is no reason to have to maintain that the subject of a stage-level predicate has to be generated in the specifier of VP, as Diesing originally assumed. All the facts Diesing presents in favor of her structural analysis of the two types of predicates (e.g. extraction possibilities, generic vs. existential readings of bare plural subjects) can still be maintained as long as the subject of a stage-level predicate is merged *somewhere within* the VP. In fact, the Predicate Internal Hypothesis forces the subject of such a predicate to be merged within the AP. Then, let us propose that all subject-predicate relations, including that of small clauses, must be mediated by a phase, namely, PredP (Bowers 1993). den Dikken (2006) provides arguments based on his detailed study of predicate inversion for the idea that subject-predicate structures are inherently phasal. Then, the derivation for (59a) will be as in (62).



In this derivation, *her eyes* merges with *red*. When the Pred is introduced into the derivation, the predicate moves to Pred. Suppose that Spell-Out applies at this point to ship off the AP. At this mid-derivational point, the subject occupies the rightmost position within the SPELLEE/AP. The derivation further ensues until the TP is constructed, as shown. When the C merges with the TP, the latter undergoes Spell-Out. Since the information regarding stress assignment within the earliest domain takes priority, nuclear stress falls on *eyes*. Consider now the derivation for (59b) in (63).



What is crucial in (63) is that the reversal of the subject and the adjective that we just saw took place at the PredP phase in (62) does not obtain at any single point of the derivation. This is because, under Diesing's analysis, the subject of the predication is PRO, with the surface subject being directly base-generated in the specifier of TP. Thus, our analysis correctly predicts stress to fall on *blue* since this is the rightmost element within the AP. The result here, therefore, suggests that the information regarding stress assignment must be read off at some mid-derivational point of the syntactic derivation, not after the whole syntactic derivation has been completed.

#### 4.4. *Stress, Presupposition, Predictability, and Destressing*

This section briefly addresses the stress pattern in (64a, b), which was noted by Bresnan (1971) as a second problem for her treatment of nuclear sentence stress (cf. section 3.1).

- (64) a. Peter had plans for dinner.  
 b. Peter had clams for dinner. (Bresnan 1971: 274)

Bresnan notes that the difference in stress position here is about the proper formulation of the nuclear stress rule rather than about the cyclicity of the stress assignment. The stress pattern observed in (64a, b) is maintained in complex structures that embed them, as shown in (65a, b): secondary stress falls on *dinner* in (65a) but on *clams* in (65b).

- (65) a. The plans Peter had for dinner didn't come off.  
 b. The clams Peter had for dinner didn't come off. (Bresnan 1971: 274)

I suspect, following the insight of Bolinger (1972), that the stress is shifted to *clams* in (64b) by some notion of semantic weight/predictability, not by the nuclear stress rule. When one eats something, the most natural supposition is that s/he eats for breakfast, lunch, or dinner. As a result, the PP *for dinner* in (64b) is taken as the presupposed part of the whole sentence, and hence behaves essentially like anaphoric elements, which are independently known to undergo distressing (see Reinhart 2006 for relevant discussion). As a result, stress ends up on the new information/focused element *clams*. That the stress pattern in (64b) is controlled by this type of lexically induced semantic principle is evidenced by the fact that, when we switch *dinner* with *snacks*, the stress shifts rightward to *snacks*, as shown in (66).

(66) Peter had clams for snacks. (Bolinger 1972: 638, with modifications)

In fact, this shift is quite systematic, as shown by the minimal pairs in (67-69). The (a) examples and (b) examples have the identical syntactic structures, the only difference being that of lexical choice: *solve* vs. *computerize*, *make* vs. *emphasize*, and *cover* vs. *elucidate*.

- (67) a. The end of the chapter is reserved for various problems to solve.  
b. The end of the chapter is reserved for various problems to computerize.
- (68) a. I have a point to make.  
b. I have a point to emphasize.
- (69) a. I can't finish in an hour – there are simply too many topics to cover.  
b. I can't finish in an hour – there are simply too many topics to elucidate.

(Bolinger 1972: 633, 634)

Thus, the ultimate formulation of the nuclear sentence stress pattern needs reference to some notion of distressing caused by lexical choices *prior to* the application of the nuclear stress rule. Therefore, I conclude that these examples can be ultimately accounted for on a par with those in (54a) and (48a), wherein the effect of the regular application of the nuclear stress rule is also masked by anaphoricity and its accompanying distressing.

## 5. Conclusions

I have proposed a new analysis of the location of the default nuclear sentence stress within a phase-theoretic approach to the syntax-phonology interface with special attention to the stress pattern in English. Our analysis stands on several recent proposals that have been independently motivated: a)

the domain of a phase head is mapped onto a domain within which phonological interpretation, including stress assignment, is computed (Dobashi 2003; Kanemuyipour 2004), b) syntactic derivation proceeds in a series of small mid-derivational chunks (Chomsky 2000, 2001, 2004; Uriagereka 1999), c) the information that is obtained at a particular phase cannot be destroyed by the conflicting information that is obtained at a derivationally late phase (Fox and Pesetsky 2005), and d) adjuncts are constructed in a separate workspace/phase/dimension from the main derivational cascade (Goodall 1987; Uriagereka 1999). On a theoretical side, our analysis suggests that the syntactic derivation itself proceeds phase by phase but the corresponding phonological interpretation seems partially global in that in certain cases (involving complex phasal subjects), the calculation of nuclear stress must be conducted only after all the information have been submitted to the phonological component in an informationally encapsulated manner. This may well be the best phonology can do: the literature on the syntax-phonology interface (see Selkirk 1980, for example) amasses considerable evidence that prosody-theoretic notions, such as intonational phrases, do not match exactly any unit of syntactic derivation. Presented with phasally defined information, phonology uses whatever domain-specific notions it can to assign primary stress to the output of syntactic derivation. Under this view of phonology, the edge-sensitive nature of our proposed stress assignment, thus, comes as no surprise. On an empirical side, our proposed analysis has more empirical coverage than any other analysis proposed in the literature. First, it correctly accounts for the core data from various languages that led Bresnan (1971), Legate (2003), Cinque (1993), and Kanemuyipour (2004) to the particular analyses they proposed: they include stress patterns in *wh*-questions in English, specific vs. non-specific object constructions in German, Dutch, Persian, and Eastern Armenian, V-final ditransitive constructions in German and Persian. Second, our analysis also resolves many empirical problems with the accounts proposed by these researchers, including, but not limited to: the non-final stress pattern in unaccusative and passives (for Cinque 1993), the right-most stress generalization in Japanese and the sentence-final stress pattern in Romance unaccusatives (for Kanemuyipour 2004), the stress contour in double object constructions and verb-particle constructions in English and/or Japanese (for Bresnan 1971 and Legate 2003).

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