

# Linear Order and Constituency

*Colin Phillips*

This article presents a series of arguments that syntactic structures are built incrementally, in a strict left-to-right order. By assuming incremental structure building it becomes possible to explain the differences in the range of constituents available to different diagnostics of constituency, including movement, ellipsis, coordination, scope, and binding. In an incremental derivation structure building creates new constituents, and in doing so it may destroy existing constituents. The article presents detailed evidence for the prediction of incremental grammar that a syntactic process may refer only to those constituents that are present at the point in the derivation when the process applies.

*Keywords:* phrase structure, constituency, incrementality, coordination, binding, scope, ellipsis, movement

## 1 Introduction

Tests of constituency are basic components of the syntactician's toolbox. By investigating which strings of words can and cannot be moved, deleted, coordinated, or stand in coreference relations, it is possible to draw inferences about the internal structure of sentences. However, it is also well known that the results of different diagnostics of constituency often diverge and sometimes even conflict with one another. The purpose of this article is to show that the varying results of different constituency tests can be understood, even predicted, if we adopt the assumption that syntactic structures are assembled incrementally, from left to right, in the same order that sentences are produced and comprehended (1).

### (1) *Incrementality Hypothesis*

Sentence structures are built incrementally from left to right.

This one change in how syntactic derivations are assumed to proceed allows for substantial improvements in our understanding of constituency tests, and it allows for significant progress in finding answers to the questions in (2).

Many individuals have helped me in developing this article, and I would like to thank the following people in particular for comments on earlier versions and for their many invaluable suggestions: Jonathan Bobaljik, Noam Chomsky, Danny Fox, Ted Gibson, Heidi Harley, Jason Lilley, Alec Marantz, Shigeru Miyagawa, Orin Percus, David Pesetsky, Uli Sauerland, Carson Schütze, Mark Steedman, and Andrea Zukowski. Two anonymous reviewers provided particularly detailed and useful comments on earlier versions, which led to many improvements. Needless to say, none of these people should be held responsible for any of the article's remaining shortcomings. Preparation of the article was supported in part by NSF grant BCS-0196004, Human Frontier Science Program grant RGY0134, and McDonnell-Pew grant CNS99-31.

- (2) a. Why do different structural diagnostics identify contrasting and sometimes overlapping constituents?  
 b. When do pairs of structural diagnostics interact, and when do they operate independently of one another?

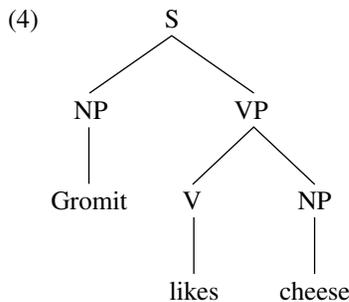
Briefly, the answer to the first question is that incremental building of conventional syntactic structures leads to changes in constituency over the course of a derivation; therefore, different constituents are visible to different syntactic processes, according to when each process applies. The answer to the second question is that syntactic processes only interact when they apply at overlapping stages of an incremental derivation. Detailed evidence for both of these claims is presented below.

The structure of the argument is as follows. Section 2 introduces the problem of discrepancies between tests of constituency, and the kinds of solutions that have been proposed in the past. Section 3 outlines an approach to incremental structure building that predicts the distribution of constituency conflicts. Section 4 then tests the predictions of incremental structure building, showing that the predictions of the theory are confirmed in detail. Section 5 provides a comparison with other accounts of constituency conflicts. Section 6 concludes.

## 2 Constituency Conflicts

A textbook example of how tests of constituent structure work is shown in (3). Different diagnostics all point to the conclusion that the verb phrase in a sentence like *Gromit likes cheese* forms a constituent to the exclusion of the subject. The VP can be coordinated, it can license ellipsis, and it can undergo leftward movement. In addition, tests of anaphor binding indicate that the subject asymmetrically *c*-commands the object. Collectively, these diagnostics all support a structural analysis for the sentence like (4).

- (3) a. Gromit [likes cheese] and [hates cats]. (coordination)  
 b. Gromit [likes cheese] and Wallace does too. (deletion/ellipsis)  
 c. [Like cheese] though Gromit does \_\_\_\_\_, he can't stand Brie. (movement)  
 d. Wallace and Gromit like each other. (reciprocal binding)  
 e. \*Each other like Wallace and Gromit. (illicit reciprocal binding)



Although such model cases of broad agreement between different constituency tests are sometimes found, discrepancies in the results of different tests are also common. For example, many strings can be coordinated that cannot undergo movement or ellipsis. The examples in (5) show that in addition to coordinating stereotypical VPs (5a), it is possible to coordinate the two objects of a double object construction (5b), or the subject and the verb of a transitive clause (5c), or strings that span portions of two clauses (5d). The representation of coordinate structures like these is discussed further in sections 4.1 and 4.4.

- (5) a. Wallace [visited Wendolene] and [bought some wool].  
 b. Wallace gave [Gromit a biscuit] and [Shawn some cheese] for breakfast.  
 c. [Wallace designed] and [Gromit built] an enormous tin moon-rocket.  
 d. Alice [knew that Fred wanted to talk] and [hoped that he wanted to argue] with the president.

However, not every string that can be coordinated can be moved. For example, it is possible to coordinate the two objects of the double object construction, but it is impossible to topicalize them (6a) or to move them rightward (6b). Restrictions on movement are discussed in sections 4.2 and 4.6.

- (6) a. \*[Gromit a biscuit] Wallace gave \_\_\_\_\_ for breakfast.  
 b. \*Wallace gave \_\_\_\_\_ at breakfast-time [his favorite pet beagle an enormous chewy dog-biscuit].

Similarly, many strings that allow coordination cannot undergo ellipsis. Although an entire VP containing an embedded clause may undergo ellipsis (7a), it is impossible for ellipsis to target the matrix verb plus a subpart of the embedded clause (7b). Note that it is precisely such a string that is coordinated in (5d). Constraints on antecedents for ellipsis are discussed in sections 4.1, 4.3, and 4.6.

- (7) a. Alice [knew that Fred wanted to talk with the queen] and Ethel did too.  
 b. \*Alice [knew that Fred wanted to talk] with the queen and Ethel did with the president.

Examples like (5)–(7) indicate that movement and ellipsis target a subset of the strings that coordination can target, but further examples lead to the more troubling conclusion that *overlapping* strings of words may be diagnosed as constituents by some syntactic processes, in apparent contradiction of the basic assumption that sentences have nested hierarchical structures. (8) illustrates this for coordination: in (8a) the two objects of a double object construction are coordinated to the exclusion of a following PP adverbial; in (8b) the second object and the adverbial PP are coordinated to the exclusion of the first object.<sup>1</sup>

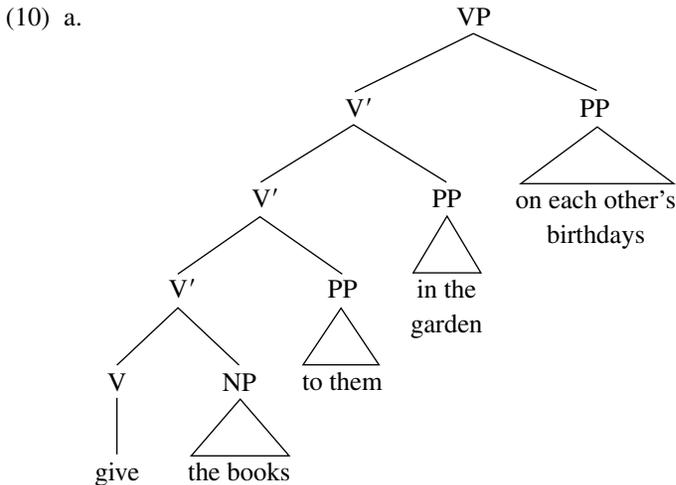
<sup>1</sup> Analogous examples of overlapping constituency arise in well-known cases of *one*-substitution.

(i) A tall athlete from Burundi and also a short one. (one = athlete from Burundi)

- (8) a. Wallace gave [Gromit a biscuit] and [Shawn some cheese] for breakfast.  
 b. Wallace gave Gromit [a biscuit in the morning] and [some cheese just before bed-time].

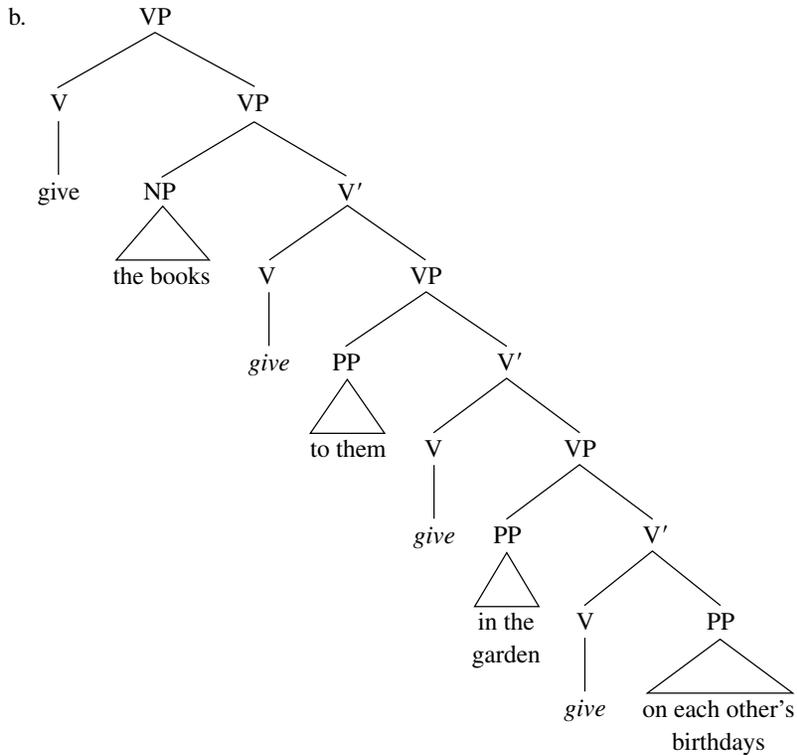
A more striking case, pointed out by Pesetsky (1995), involves a conflict between two different diagnostics applying to the very same sentence. Based on the VP-fronting in (9), which strands VP-modifying material at the right of the sentence, standard reasoning implies that the fronted phrase is a constituent, and therefore by extension that the stranded modifiers c-command the rest of the VP, as in a traditional left-branching VP structure such as (10a). On the other hand, the fact that the stranded adverbials contain an anaphor that is bound by an antecedent inside the fronted predicate suggests that the anaphor is c-commanded by its antecedent, as in the radically right-branching VP structures proposed by Larson and others (Kayne 1984, 1994, Larson 1988, Aoun and Li 1989, Stroik 1990, Pesetsky 1995) (10b). In what follows unpronounced elements are represented as italicized copies.

- (9) a. John wanted to give books to them in the garden, and [give the books to them<sub>i</sub> in the garden] he did \_\_\_\_\_ on each other<sub>i</sub>'s birthdays.  
 b. John wanted to give books to them, and [give the books to them<sub>i</sub>] he did \_\_\_\_\_ in the garden on each other<sub>i</sub>'s birthdays.



- (ii) A tall athlete from Burundi and also one from Kenya. (one = tall athlete)

The standard treatment of such contrasts, which I assume to be correct, is that the alternative structures arise from different orders of adjunction for the adjective and the PP. However, the examples in this article show that instances of overlapping constituency are far more pervasive and cannot be reduced to an order-of-adjunction analysis. Importantly, many of the contrasts involve arguments and are not restricted to adjuncts. Thanks to an anonymous reviewer for drawing these cases to my attention.



Although the syntactic literature contains many excellent characterizations of the range of constituents picked out by individual structural diagnostics, there is no general theory of why particular tests yield the results that they do. As a result, discrepancies between the results of constituency tests have typically not been very informative.

A common response to constituency conflicts is to question the assumption that constituency tests transparently reflect constituenthood and c-command relations. Instead, it is argued that individual syntactic processes reflect more specific and idiosyncratic structural constraints. For example, binding tests have been argued to diagnose precedence and/or m-command relations, rather than c-command relations (Barss and Lasnik 1986, Jackendoff 1990, Ernst 1994). Other recalcitrant findings have been explained by appealing to the presence of phonetically null material. For example, subject-verb coordinations (5c) have been analyzed as disguised clausal coordination (e.g., Ross 1967, Maling 1972, Postal 1974). In general, work in the transformational grammar tradition has placed greater emphasis on structural evidence from movement and binding tests, and less on evidence from coordination.

An alternative reaction to constituency conflicts is to question the assumption that constituency tests provide information about the unique structural description of a sentence. The appearance of overlapping constituents is no longer problematic if we drop the assumption of a single structure and assume instead that sentences may have multiple parallel structures. This approach

has been most extensively explored in certain versions of Combinatory Categorical Grammar (Ades and Steedman 1982, Dowty 1988, Steedman 1997, 2000b), but it has also been pursued in other traditions such as Dependency Grammar (Pickering and Barry 1993) and Transformational Phrase Structure Grammar (Brody 1994, Pesetsky 1995). Flexible constituency approaches are discussed in more detail in section 5 below.

In all previous accounts of constituency conflicts, the contrasts between different constituency diagnostics have been largely stipulated, either by assigning different diagnostics to different levels of representation or by coding in the grammar the details of the differences between the diagnostics. In this article I aim to show that many differences can be explained without extrinsic constraints on which constituents are visible or invisible to individual diagnostics, and without assigning specific diagnostics to specific levels.

### 3 Incremental Structure Building

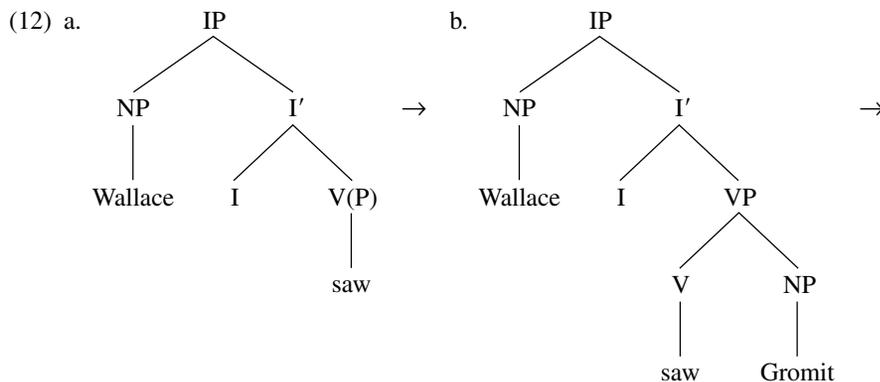
The central thesis of this article is given in (11). I suggest that discrepancies in the results of different constituency tests are primarily due to the incremental manner in which syntactic structures are built up from left to right. By adopting this assumption, it becomes possible to predict which strings of words individual syntactic processes are able to refer to as constituents, and there is no need to assume flexible constituency.

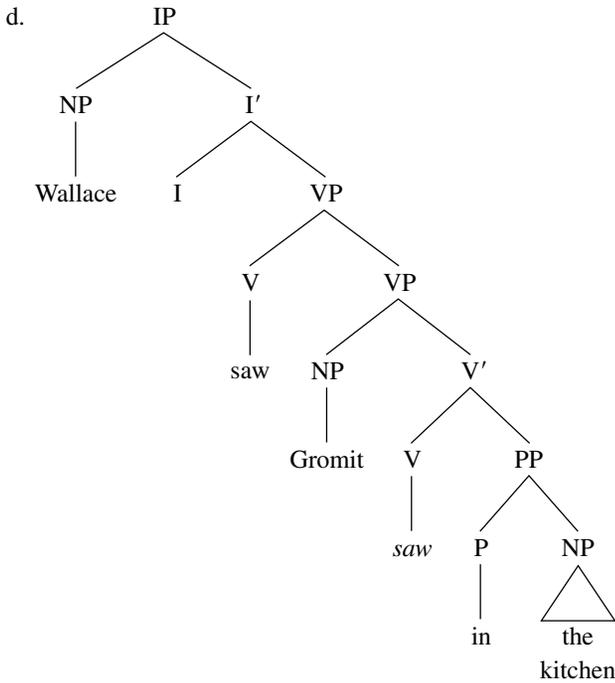
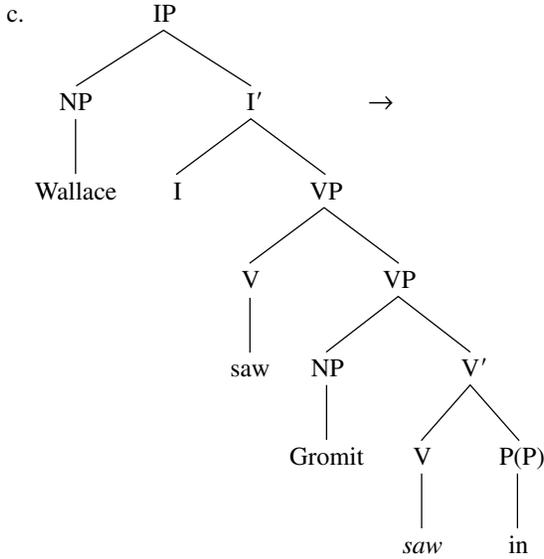
(11) *Incrementality Hypothesis*

Sentence structures are built incrementally from left to right.

This ordering requirement may ultimately reflect an external constraint placed on the syntactic system, owing to the left-to-right ordering of language comprehension and production. In other work I investigate the relation among grammar, parser, and producer in more detail. However, the focus of this article is simply to examine specific syntactic consequences of the incrementality assumption.

The derivation in (12) shows some stages in the incremental construction of the sentence *Wallace saw Gromit in the kitchen* and serves to illustrate the most important consequences of incremental structure building.





(12a) shows the structure constructed from the subject NP *Wallace* and the finite verb *saw*. Notice that at this stage the VP contains only the verb and that the string *Wallace saw* is a constituent. I assume that in the absence of internal structure, VP does not vacuously project separate  $V^0$  and

VP nodes (see Muysken 1982, Kitagawa 1986, Speas 1990, Chomsky 1995a). I also assume that the object position of the transitive verb *see* is not projected until the direct object NP is added to the structure.

The representation of the sequence *Wallace saw* in (12a) is a well-formed stage in the derivation of a longer sentence. Clearly, though, it is not a well-formed complete sentence, because the verb has not yet discharged its internal  $\theta$ -role to a direct object. I make the standard assumption that the combinatorial possibilities of grammatical heads are lexicalized and that it is lexical features that license combinations of syntactic elements. The combination of the subject *Wallace* with the inflectional head is licensed by compatible Case/agreement features, and the combination of the inflectional head with the verb *see* is licensed by compatible selectional features. The need for a direct object is also part of the verb's lexical representation and therefore does not need to be independently represented in the phrase marker of (12a).<sup>2</sup>

In the subsequent step of the derivation, (12b), the object NP *Gromit* is added to the structure, creating a branching VP node. One consequence of creating the VP constituent *saw Gromit* is that the constituency of the string *Wallace saw* is thereby destroyed.<sup>3</sup>

(12c–d) show some of the steps involved in adding the locative PP *in the kitchen* to the structure, forming a right-branching “VP shell” structure (see Larson 1988, Aoun and Li 1989, Stroik 1990). I assume that this structure is created by first generating a copy of the higher V node, merging it with the object NP and projecting the V, and then merging the adverbial PP as the sister of the lower V head.<sup>4</sup> I assume that a VP modifier must be attached as a sister of a projection (minimal or otherwise) of the V that it modifies. This allows in principle either right-branching nested VP structures like (12d) or left-branching VP structures; but I assume in addition that an economy condition forces the more right-branching alternative to be chosen wherever

<sup>2</sup> For a detailed treatment of the lexical feature structures that license incremental structure building in a grammar like the one proposed here, see Schneider 1999, which also provides a fragment of a computational implementation of the system.

<sup>3</sup> Incremental derivations like (12) are clearly “countercyclic,” in the terms of the bottom-up derivations of the minimalist framework (e.g., Chomsky 1995a,b); that is, new material is merged into the structure at positions other than the root node. Note that the primary empirical motivation in the minimalist approach for requiring merger to occur at the root node is to provide a means for implementing intervention constraints (e.g., Relativized Minimality effects) in a derivational framework. A constraint that prevents an element X from intervening between positions A and B in a chain can be implemented derivationally by preventing movement from A to B across X. However, this implementation of the constraint only works if X is already present when the movement occurs. If X can be added to the structure after the movement from A to B occurs, then the intervention constraint cannot be implemented derivationally. The cyclicity constraint closes this loophole for bottom-up derivations.

Although incremental left-to-right structure building entails derivations that are countercyclic in Chomsky's sense, incremental left-to-right derivations also allow for a derivational implementation of intervention constraints. If merger always occurs at the right edge of a structure, then it is impossible to create a sequence [ ... A ... X ... B ... ] by merging X later than B. The requirement for right-edge merger does, however, allow X to intervene between A and B *hierarchically* if X follows both A and B linearly in the order [ ... A ... B ... X ... ]. The consequences of this remaining loophole remain to be explored.

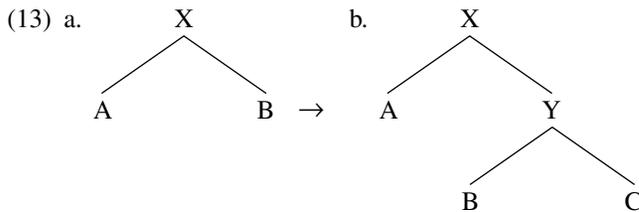
<sup>4</sup> For purposes of this article I will assume that the lower V heads in complex VPs are simple copies of the higher V head, minus phonetic content. However, the lower V heads may also be understood to be the syntactic realization of Davidsonian event indices.

possible.<sup>5</sup> The only situations in which the right-branching option can be avoided are when the left-branching alternative either yields a distinct interpretation or allows a constituent to be targeted that otherwise could not be targeted (on both of these points, see section 4.3).

Again, notice that the effect of expanding the right-branching VP in (12c–d) is to destroy certain constituents that existed at earlier stages. In this case the addition of the preposition destroys the constituency of the verb + object string *saw Gromit*.

Notice two properties of this kind of derivation. First, the final structure that is assembled is not in itself novel. The sentence structures to be discussed below are relatively standard in their final form. Also, combinations of syntactic elements are licensed by exactly the same kinds of syntactic relations (selection, Case, agreement, etc.) that license structure building in standard approaches. The one thing that is unusual here is the stages that the structures pass through as a result of their left-to-right assembly.

The second and for current purposes more interesting consequence of incremental derivations involves the changes in which strings of words are constituents as the derivation progresses. In general, whenever a right-branching structure is assembled incrementally, there are strings that are constituents at some point in the derivation but not in the final structure. (13) shows the general form of constituent creation and destruction. A and B form a constituent of type X at one stage in the derivation (13a), but addition of C forms a new constituent [BC] and destroys the earlier constituent [AB] (13b).



This observation about the creation and destruction of constituents is the key to the explanation of differences between constituency tests, and most of the remainder of this article focuses on verifying specific predictions that follow from this. It is important to note that the destruction of constituents seen in (12)–(13) is an extremely restricted kind of structural change. Changes in constituency only arise as a by-product of merging new elements at nonroot positions. No other structural reorganization occurs. Although merger may destroy constituents, it does not alter precedence or asymmetric c-command relations.

The logic of the argument is as follows.

First, the Incrementality Hypothesis requires that structure building operate in a left-to-right fashion; that is, merger of new material applies only at the right edge of the structure. I also

<sup>5</sup> The economy condition favoring right-branching structures may ultimately be related to the extensively motivated bias for right-branching structures in on-line processing of syntactic ambiguities (Kimball 1973, Fodor and Frazier 1980, Gibson et al. 1996, Phillips and Gibson 1997).

assume that syntactic relations between pairs of constituents are established as soon as the two constituents are both present in the structure and stand in an appropriate configuration. This applies equally to syntactic relations involving movement, ellipsis, coordination, binding, and other relations. It follows from this that syntactic relations between pairs of words or phrases will always be established at a stage in the derivation when one member of the pair is added to the right edge of the structure.<sup>6</sup>

Second, I assume that syntactic relations must respect constituency at the point in the derivation when the relation is established. Provided that this requirement is met, the syntactic relation is licensed. Once it has been licensed, subsequent structure-building operations may change constituency, as in (12)–(13), but they cannot ‘unlicense’ the syntactic relation previously established. As a consequence of this, a syntactic relation provides a ‘snapshot’ of the constituent structure of a sentence *at the stage in the derivation when the syntactic relation was formed*.

Third, different tests of constituency—involving processes such as movement, binding, ellipsis, and coordination—provide snapshots of different derivational stages. This is an automatic consequence of the fact that different tests apply at different stages in an incremental left-to-right derivation. In the general case the constituenthood of a string A is tested by examining the ability of string A to enter into a relation with string B, where A and B appear in the order [ . . . A . . . B . . . ]. If a syntactic relation is possible, then we infer that A is a constituent. However, in an incremental derivation such a test provides a snapshot of the constituency of the sentence only at the point when B was added to the derivation. For example, coordination establishes a relation between adjacent strings and therefore provides a snapshot of the constituency of the sentence shortly after the creation of the first conjunct. In ellipsis, on the other hand, the relation between the antecedent and the ellipsis site is less local, typically spanning a pair of conjoined clauses. Ellipsis therefore provides a snapshot of the constituency of part of the first clause at a stage during the construction of the second clause.

The goal of this article is to show that many differences in the results of constituency tests can be derived from the fact that different tests provide snapshots of different stages in the left-to-right assembly of a structure. If this approach is successful, it becomes possible to explain why constituency diagnostics differ. Constituency diagnostics differ simply because they apply to different points in the linear order of a sentence.

I should note at the outset that the primary goal of the article is to argue for a particular type of syntactic derivation by examining its consequences for constituency. It is not the primary goal of the article to justify a specific theory of completed sentence structures. In particular, I will assume that complex VPs have a right-branching internal structure of the kind proposed by

<sup>6</sup> This generalization is intended to cover situations where the new element is merged into the structure for the first time, and situations where a constituent is merged at the right edge of the structure as a result of a rightward movement operation. Note also that when an element is added to a structure by merger at the right edge, the element need not be in absolute final position. For example, when a complex *wh*-phrase like *which of his brothers* is moved from its clause-initial scope position to its thematic position, the entire phrase is merged at the right edge of the structure, but clearly the pronoun *his* does not occupy sentence-final position.

Larson (1988) and others, but it is not my aim to justify this analysis. Rather, my arguments focus on the stages that syntactic derivations pass through on the way to such structures, and in particular on the question of which syntactic processes can make reference to these intermediate stages.

#### 4 Specific Predictions

This section tests in detail the feasibility of the claim that constituency conflicts can be derived from the incremental nature of syntactic structure building.

##### 4.1 Range of Available Constituents

The first prediction is that the range of constituents that a constituency test can target follows directly from the stage of the derivation at which the test applies. The critical point here is that a syntactic process can only manipulate strings that are constituents at the stage in the derivation when the process applies.

*Prediction 1:* A constituency test may refer only to those strings that are constituents at the point in the incremental derivation when the test applies.

*4.1.1 Coordination* It is well known that coordination is an extremely liberal diagnostic of constituency, allowing coordination of many strings that are not constituents under traditional phrase structure analyses. Moreover, coordination stands alone among constituency diagnostics in this regard. Therefore, coordination evidence has often been ignored in favor of the results of less liberal diagnostics such as movement or binding.

Under an incremental approach to structure building, the reason for the exceptional status of coordination is immediately apparent. The two conjuncts in coordinate structures are almost string adjacent, separated only by the conjunction, and as a result the first conjunct cannot lose its constituency before the second conjunct is built. Therefore, any constituent created during a syntactic derivation should be a candidate for coordination.<sup>7</sup>

(15)–(21) show the stages in the assembly of the phrase structure for the sentence in (14) and verify that all of the constituents present at any point in the derivation may be coordinated.<sup>8</sup> As before, I assume that the complex VP is internally right-branching.

(14) Wallace will give Gromit crackers before breakfast.

(15) a. [Wallace]

b. Wallace and Wendolene will give Gromit crackers before breakfast.

<sup>7</sup> The idea that conjuncts are derivational objects goes back at least to Woods 1970 and is also found more recently in Milward 1994, although the derivational objects used in Woods's and Milward's accounts of coordination are somewhat different from those assumed here.

<sup>8</sup> In this article I will not discuss the structure-building operations internal to the assembly of NPs, although I assume that the assembly of NPs parallels the assembly of VPs and clauses, as presented here. For this reason, I leave aside the interesting question of how conjunction affects the subparts of NPs.

- (16) a. [Wallace will]<sup>9</sup>  
 b. Wallace will and Wendolene probably won't give Gromit crackers before breakfast.
- (17) a. [Wallace [will give]]<sup>10</sup>  
 b. Wallace will give and Wendolene will send some crackers to Gromit for his birthday.  
 c. Wallace will design but won't actually build an exciting new invention for his dog's birthday.
- (18) a. [Wallace [will [give Gromit]]]  
 b. Wallace will give Gromit and Wendolene will give Preston a shining new collar for walking about town.  
 c. Wallace will give Gromit and (will) send Preston a shining new collar for walking about town.
- (19) a. [Wallace [will [give [Gromit crackers]]]]  
 b. Wallace will give Gromit crackers and Wendolene will give Preston dog food before breakfast.  
 c. Wallace will give Gromit crackers and (will) give Preston dog food before breakfast.  
 d. Wallace will give Gromit crackers and Preston dog food before breakfast.
- (20) a. [Wallace [will [give [Gromit [crackers before]]]]  
 b. Wallace will give Gromit crackers before and throw him crackers during the final day of the thrilling cricket match.  
 c. Wallace will give Gromit crackers before and Preston dog food after breakfast.  
 d. Wallace will give Gromit crackers before and biscuits after breakfast.

<sup>9</sup> A reviewer points out that in more complex sequences of auxiliaries, there is interesting variability in the acceptability of coordination, as illustrated by (i)–(iii).

- (i) ??Bill might, and Mary should, have been being followed by our agents.  
 (ii) Bill might have, and Mary should have, been being followed by our agents.  
 (iii) ??Bill might have been, and Mary should have been, being followed by our agents.

I suggest that such variation reflects constraints on the shared material rather than constraints on the conjuncts. The most natural-sounding cases are ones that cut the auxiliary sequence in conformity with its most natural prosodic organization. Examples (iv)–(v) show that the conjuncts in (i) and (iii), respectively, are acceptable when they appear in different auxiliary sequences.

- (iv) Bill might, and Mary should, eat lots of extra vegetables in order to prevent heart disease.  
 (v) Bill might have been, and Mary should have been, waiting in the lobby at the end of the meeting.

<sup>10</sup> (17b–c) illustrate dative constructions. When structures like (17a) arise in the course of assembling a double object construction, certain coordinations are impossible (i).

- (i) \*Wallace will give, but Gromit will just send, Wendolene a gift.

Such examples, which were first pointed out by Hankamer (1971), reflect constraints on the shared double object sequence *Wendolene a gift* rather than constraints on the conjuncts themselves. In Phillips 1996:88–94 I show that this is an instance of a more general constraint on the shared material in right node raising, which may ultimately derive from Stowell's (1981) adjacency condition on Case assignment.

- (21) a. [Wallace [will [give [Gromit [crackers before breakfast]]]]]  
 b. Wallace will give Gromit crackers before breakfast and Wendolene will give Preston dog food after dinner.  
 c. Wallace will give Gromit crackers before breakfast and (will) send Wendolene flowers after lunch.  
 d. Wallace will give Gromit crackers before breakfast and Preston dog food before dinner.  
 e. Wallace will give Gromit crackers before breakfast and toast after lunch.

Many of the constituents that are coordinated in (15)–(21) are no longer present in the final structure in (21a), but this is not a problem, since they are all constituents at the point at which the coordinate structure is initially built. The examples that I represent as coordination of nonfinal constituents correspond to what is normally known as right node raising (RNR). See section 4.4 for further discussion.<sup>11</sup>

Note that although incremental structure building makes a wide range of constituents available for coordination, this does not mean that *any* substring of a sentence can be a conjunct for coordination. Strings that are never constituents at any point during an incremental derivation cannot be coordinated. (22a–b) show that it is impossible to create conjuncts consisting of a subpart of NP and material from a following XP. (22c) shows that it is impossible to create conjuncts consisting of the final NP of a sentence-initial subordinate clause and the subject of the matrix clause.<sup>12</sup>

- (22) a. \*The man [who built the rocket has] and [who studied robots designed] a dog.  
 b. \*Wallace gave his [dog half a dozen] and [sheep a handful of] crackers for breakfast.  
 c. \*After Wallace fed [his dog the postman] and [his sheep the milkman] arrived.

The illegal constituents in (22) are ruled out for the same reason they are ruled out in standard

<sup>11</sup> A reviewer suggests that it is inappropriate to conflate the RNR variety of coordination with more standard forms of coordination, given that RNR typically requires the second conjunct to be surrounded by clear prosodic boundaries, whereas other forms of coordination do not. Although attention has often been drawn to the special prosodic properties of RNR, the contrast with other forms of coordination may have been overestimated. The second conjunct of a ‘standard’ coordination appears in sentence-final position, where it is associated with the default focus in English. Thus, prosodically marked focus is a property of all varieties of coordination.

<sup>12</sup> Certain conjuncts that cross an upward clause boundary are impossible, as a reviewer points out (i). However, the constraint in question does not apply when the conjuncts continue beyond the matrix subject position, as in (ii).

(i) \*When John arrives Susan, and when Bill arrives Mary—likes to relax in the Jacuzzi.

(ii) When John arrives Susan DOES, and when Bill arrives Susan DOESN’T—like to relax in the Jacuzzi.

The contrast between (i) and (ii) can be explained by assuming that the matrix subject cannot merge directly with the embedded clause, since the subject and the embedded clause do not stand in any direct syntactic relation with each other. The subject can only combine with the embedded clause by first merging with an inflectional head to form an IP projection, which can then merge with the embedded clause. See Schneider 1999 for further discussion of the structure-building operations that add specifiers into phrase structures.

approaches: a pair of syntactic elements may combine when the combination establishes some feature-checking relation between the two elements; otherwise, no combination is possible.<sup>13</sup>

*4.1.2 Deletion/Ellipsis* Ellipsis processes are rather more restrictive than coordination. Incrementality explains this restrictiveness as follows. Given the standard assumption that deletion or ellipsis is licensed by the presence of a constituent that serves as an antecedent, we predict that the only possible antecedents for ellipsis are those constituents that are still constituents at the stage when the ellipsis site is licensed. Since the antecedent and the gap in ellipsis constructions are typically in different conjoined sentences, an antecedent for ellipsis must survive as a constituent at least until the end of the first conjoined sentence.

To take a concrete example, consider the following contrast between coordination and pseudogapping (Levin 1979, Jayaseelan 1990, Lasnik 1995). In sequences consisting of a verb followed by a prepositional phrase it is possible to coordinate the verb + preposition sequence to the exclusion of the NP complement of the preposition (23), but as Postal and Baltin have observed (Postal 1986, Baltin and Postal 1996), it is impossible for the verb + preposition sequence to serve as an antecedent for ellipsis in the pseudogapping construction (24)–(25).<sup>14</sup>

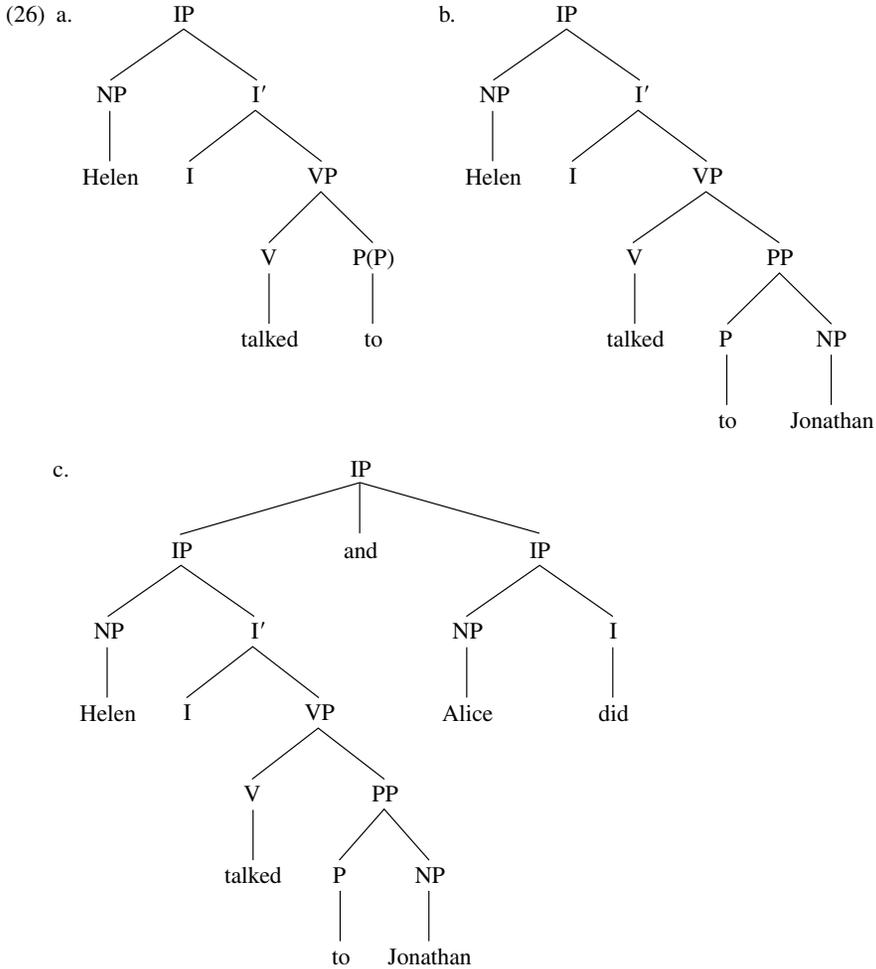
- (23) a. John [talked to] and [gossiped about] the kid who sprayed paint on his car.  
 b. The cat [looked at] and then [slept on] the rug in the middle of the living room.
- (24) a. Helen talked to Jonathan, and Alice did \_\_\_\_ \*(to) Matthew.  
 b. The cat slept on the mat, and the dog did \_\_\_\_ \*(on) the chair.
- (25) a. Helen talked to Jonathan more often than Alice did \_\_\_\_ \*(to) Matthew.  
 b. The cat slept on the mat more often than the dog did \_\_\_\_ \*(on) the chair.

The reason for the contrast is as follows. In the course of the incremental assembly of the verb + PP sequence, the verb + preposition sequence is a temporary constituent (26a). This is sufficient to make it a possible conjunct. However, the verb + preposition constituent is destroyed by the addition of the NP, which creates a branching PP constituent (26b). This presents no problem for coordination, since coordination occurs before the NP is added to the structure, but it makes pseudogapping in a subsequent clause impossible, because the verb + preposition constituent no longer exists at the point when the gap needs to be licensed (26c).

<sup>13</sup> Note that this requirement applies to combinations of *syntactic* elements, and not to combinations of phonological forms. Thus, although coordinations of double object sequences like (8) appear to violate the requirement, since the two objects do not license one another directly, a VP shell analysis of such constructions treats such sequences as the result of two separate mergers of an NP with a (phonologically null) projection of the verb. Both of these merger operations are licensed by a feature-checking relation between the verb and the NP.

<sup>14</sup> Kuno (1976) showed that in gapping the acceptability of verb + preposition gaps can be improved by a supporting context that establishes an appropriate theme, such as a *wh*-question. However, the same appears not to be the case for the pseudogapping examples in (24)–(25). The *wh*-question in (i) improves the acceptability of gapping in (ii), but does not improve pseudogapping in (iii), according to my informants.

- (i) What did each of the pets sleep on?  
 (ii) The cat slept on the mat, and the dog, the chair.  
 (iii) \*The cat slept on the mat and the dog did the chair.



This example provides a direct illustration of how incremental structure building makes different constituents available to different syntactic processes. Additional examples involving ellipsis processes are discussed in sections 4.3 and 4.6.

#### 4.2 Explaining Constituency Conflicts

A second prediction that can be derived from the Incrementality Hypothesis is that apparent contradictions between different constituency tests must be artifacts of the way in which constituency changes over the course of a derivation. If different tests diagnose overlapping constituents, then it must be that those tests make reference to different stages in an incremental derivation.

*Prediction 2:* Contradictions between constituency tests arise when those tests apply at different stages in the incremental derivation of a sentence.

One example consistent with this prediction has already been seen above: incrementality can account for the fact that coordination can apply to overlapping constituents. (27)–(28) repeat examples from (19)–(21) that show coordination of overlapping constituents in complex VPs. Coordination of the two objects of *give* to the exclusion of the sentence-final PP (27b) is possible when coordination applies to a structure like (27a). Coordination of the second object and the sentence-final PP (28b) is possible when coordination applies to a structure like (28a).

- (27) a. [Wallace [will [<sub>VP</sub> give [<sub>VP</sub> Gromit [<sub>V'</sub> V<sub>give</sub> crackers]]]]]  
 b. Wallace will give Gromit crackers and Preston dog food for breakfast.
- (28) a. [Wallace [will [<sub>VP</sub> give [<sub>VP</sub> Gromit V<sub>give</sub> [crackers [<sub>V'</sub> V<sub>give</sub> for breakfast]]]]]]]  
 b. Wallace will give Gromit crackers for breakfast and toast for lunch.

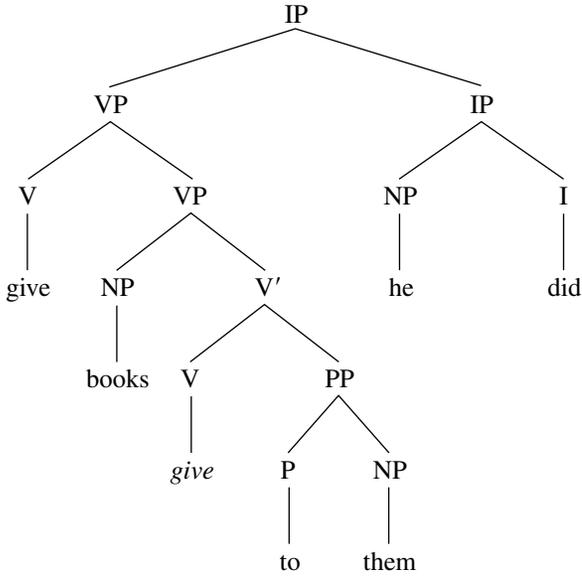
More interestingly, incremental structure building provides a way of dealing with Pesetsky's examples involving apparent constituency conflicts within an individual sentence. Recall that the puzzle that examples like (29), repeated from (9), present for standard assumptions about constituency is as follows. The fact that the fronted predicate can strand an adverbial PP implies that the VP has an underlying structure in which the PP c-commands the predicate. This entails that the anaphor is not c-commanded by its antecedent. Meanwhile, the fact that the anaphor is successfully bound implies that the anaphor is c-commanded by the pronoun. Hence the contradiction.

- (29) a. . . . and [give the books to them<sub>i</sub> in the garden] he did \_\_\_\_\_ on each other<sub>i</sub>'s birthdays.  
 b. . . . and [give the books to them<sub>i</sub>] he did \_\_\_\_\_ in the garden on each other<sub>i</sub>'s birthdays.

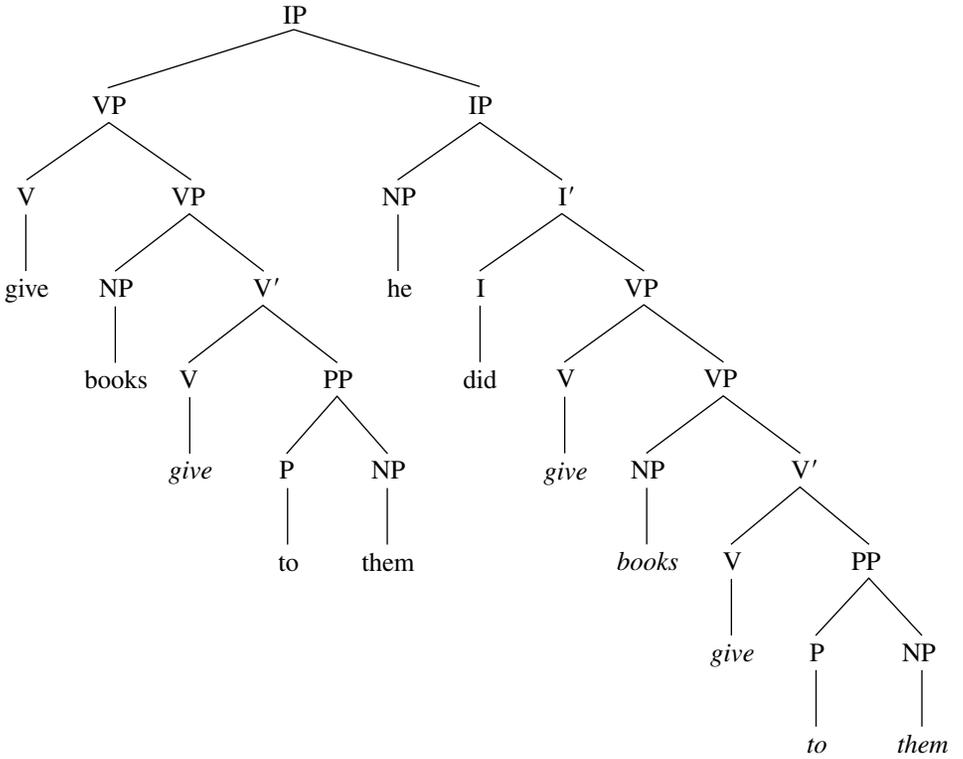
(30) shows the critical steps in the incremental derivation of (29b). (30a) shows the structure at the point in the derivation when the fronted VP material, the subject, and the auxiliary have been built. I assume that the fronted constituent is an internally right-branching VP. (30b) shows the result of copying the VP into its underlying position, enabling  $\theta$ -role assignment. Note that movement operations in left-to-right derivations contrast with standard approaches only with respect to their order. I assume that movement operations apply freely, except that they must respect standard requirements on feature checking, c-command, and island constraints. Whereas in a standard bottom-up approach a movement operation might apply in order to satisfy the Case or scope requirements of a  $\theta$ -marked element, in an incremental derivation a movement operation might equally apply in order to satisfy the thematic requirements of a Case-marked or scope-marked element. Finally, in (30c) the stranded PP containing the anaphor *each other* is added to the right of the reconstructed VP, at the bottom of the right-branching VP. This creates a structure in which the anaphor *each other* is c-commanded by its antecedent.<sup>15</sup> It also has the effect of destroying the constituency of the copied VP, but this is unproblematic, since the movement chain was licensed at an earlier stage.

<sup>15</sup> In order to guarantee literal c-command between the pronoun and the reflexive in (30c), I assume that the PP *to them* is split by addition of a further maximal projection, following Pesetsky (1995). See Pesetsky 1995 and Phillips 1996 for further discussion of such structures. However, none of the arguments in this article depend on this assumption about PP structure.

(30) a.



b.





the syntactic process applies to it. This section presents evidence for the related prediction that once a constituent has been destroyed, it is no longer available to any syntactic processes.

*Prediction 3:* Constituents become invisible to syntactic processes as soon as they have been destroyed.

4.3.1 *A Contrast between Ellipsis and Movement* Support for prediction 3 comes from a contrast between VP-fronting and VP-ellipsis, a pair of constructions that are otherwise extremely similar in the range of constituents they can apply to.

(31) shows that VP-fronting can apply to sequences of phrases starting at the left edge of a complex VP, stranding varying amounts of material at the right edge of the sentence.

- (31) a. . . . and [give money to politicians in secret before elections] he did.  
 b. . . . and [give money to politicians in secret] he did before elections.  
 c. . . . and [give money to politicians] he did in secret before elections.  
 d. . . . and [give money] he did to politicians in secret before elections.

(32) shows that the same subparts of VP that can be fronted can also be antecedents for ellipsis.

- (32) a. Corporations give money to politicians in secret before elections, and unions do (too).  
 b. Corporations give money to politicians in secret before elections, and unions do before key congressional votes.  
 c. Corporations give money to politicians in secret before elections, and unions do in public before key congressional votes.

(33)–(34) show that standard tests for right-branching VP structure involving binding succeed when they are applied to material inside the fronted or elided portion of VP.

- (33) a. . . . and [introduce the children<sub>i</sub> to each other<sub>i</sub>] the teacher did.  
 b. . . . and [congratulate everybody<sub>i</sub> on his<sub>i</sub> birthday] he did.  
 (34) a. The principal introduced the children<sub>i</sub> to each other<sub>i</sub>, and then the teacher did (too).  
 b. The boss congratulated everybody<sub>i</sub> on his<sub>i</sub> birthday, and the receptionist did (too).

However, VP-fronting and VP-ellipsis constructions diverge in their ability to pass tests of right-branching VP structure when the tests span the fronted/deleted portion of VP and the stranded material.

(35) repeats and expands the examples of VP-fronting discussed in section 4.2 and shows that it is possible to establish an anaphor-binding relation (35a) or a variable-binding relation (35b) between an NP in the fronted VP and an NP inside a stranded PP. (35c) shows that it is also possible to obtain either collective or distributive scope readings for the fronted object NP and the stranded modifier. The collective reading asserts that it was the sum of all the books that was read quickly, and the distributive reading asserts that each of the individual book-readings was quick. I assume that the distributive scope reading requires a right-branching VP structure

in which the manner adverbial is c-commanded by the quantificational NP. Thus, VP-fronting appears not to interfere with tests of right-branching structure.

- (35) a. John said he would give books to them,  
       . . . and give books to them he did [on each other's birthdays].  
       b. Mary said she would congratulate every boy,  
       . . . and congratulate every boy she did [at his graduation].  
       c. John said he would read every book,  
       . . . and read every book he did [at breakneck speed]. (collective and distributive  
       scope readings)

Comparable tests involving anaphor binding, bound variable anaphora, and scope do not, however, yield the same results for VP-ellipsis. (36a) shows failure of anaphor binding when the antecedent of the anaphor undergoes ellipsis; (36b) shows failure of bound variable anaphora under the same circumstances.

- (36) a. \*John gave books to them<sub>i</sub> on each other<sub>i</sub>'s birthdays,  
       and Mary did [on each other<sub>i</sub>'s first day of school].  
       b. \*Mary congratulated every boy<sub>i</sub> at his<sub>i</sub> graduation,  
       and Sue did [at his<sub>i</sub> 21st birthday party].

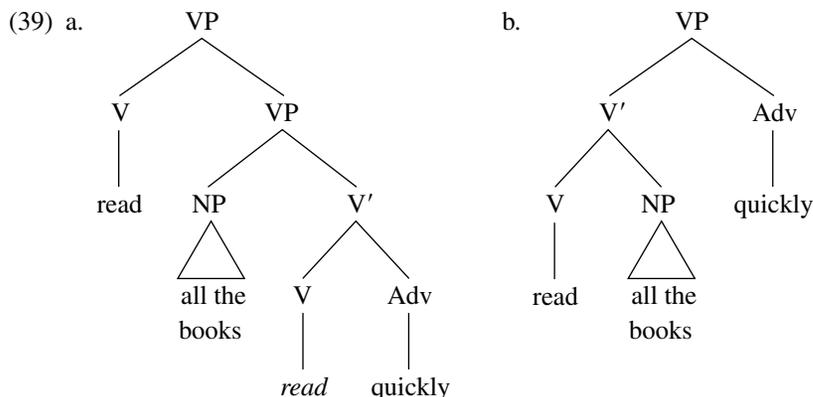
(37)–(38) illustrate the effect of partial VP-ellipsis on the possible scope relations between an elided object and a stranded modifier. The monoclausal sentence in (37) admits both a collective reading and a distributive reading. However, when the verb and the object NP undergo ellipsis, stranding the manner adverbial, the distributive reading disappears and only a collective reading is available (38).<sup>16</sup>

- (37) Mary read all the books quickly. (collective and distributive scope readings)  
 (38) Mary read all the books quickly, and John did slowly. (collective reading only)

Thus, (35)–(38) show that VP-ellipsis—in contrast to VP-fronting—bleeds processes that test for right-branching structure. This contrast follows from prediction 3, owing to differences in how the two processes apply. We have already seen in section 4.2 that partial VP-fronting does not conflict with right-branching VP structures because the movement chain is completed before the test of scope or binding is applied, and therefore no conflict arises.

In the case of VP-ellipsis, I assume that a right-branching VP structure like (39a) is built in cases where the direct object NP binds into or takes scope over an adverbial, and that a left-branching VP structure like (39b) yields a collective scope reading and does not allow the direct object to license an anaphor or a bound variable pronoun inside the adverbial.

<sup>16</sup> An almost identical paradigm of loss of distributive scope readings is found in the Japanese *soo su* VP-ellipsis construction. See Phillips 1996 for details.



If the right-branching structure in (39a) is built in the first conjunct, then the verb + direct object constituent is destroyed as soon as the adverbial is added to the structure, and therefore it cannot be an antecedent for ellipsis in the second conjunct. This explains the impossibility of sentences requiring a right-branching VP, such as (36) and (38). If, on the other hand, a left-branching VP like (39b) is constructed in the first conjunct, then the verb + direct object constituent survives long enough to serve as an antecedent for ellipsis. The availability of left-branching structures for adverbials like (39b) explains why partial VP-ellipsis is possible at all, but it also explains why binding tests fail and only collective scope readings are available in partial VP-ellipsis. Structures in which the two conjuncts show mismatching scope readings are not excluded by incremental derivations. However, I adopt the standard assumption that they are excluded by an independent parallelism constraint.

The contrast between VP-fronting and VP-ellipsis is expected given prediction 3. Movement targets the verb + direct object constituent before it is destroyed; ellipsis targets it too late. Therefore, the contrast follows directly from the contrasting linear order properties of movement and ellipsis processes. This in turn lends support to the incrementality-based account of constituency conflicts given in section 4.2. In a more traditional approach to constituency it is relatively straightforward to give an account of the VP-fronting facts by assuming a strict left-branching structure, or to give an account of the VP-ellipsis facts by assuming a right-branching VP structure. However, in such approaches it is much less straightforward to explain the contrast between VP-fronting and VP-ellipsis. Therefore, it should be emphasized that the achievement of the incremental approach lies in its treatment of the contrast between VP-fronting and VP-ellipsis, and not in its treatment of either of these constructions individually.<sup>17</sup>

<sup>17</sup> A reviewer suggests an alternative account of the contrast between VP-fronting and VP-ellipsis. The reviewer proposes that in VP-ellipsis the stranding of adverbial phrases reflects deletion of constituents smaller than VP, as assumed here, but that stranding in VP-fronting arises from the interaction of two processes: (a) copying of the entire VP, which may be right-branching, and (b) selective nonpronunciation of the copies, such that adverbial phrases may be pronounced

Note that according to the account presented here, the failure of tests of right-branching structure in VP-ellipsis depends on the position of the adverbial that destroys the verb-object constituent, and does not depend on the fact that ellipsis targets the second conjunct rather than the first. Therefore, the same failure of tests of right-branching structure is predicted in constructions in which ellipsis targets the first clause (40).

(40) Because John did, Bill read all the books.

In this form of ellipsis the stranding of adverbials is only marginally acceptable for many speakers, but for those speakers who accept this form of ellipsis, the example in (41) shows the same scope properties as (38), allowing just the collective reading. The dummy verb *did* has a VP gap as its complement, which must be licensed by an antecedent in a subsequent clause.<sup>18</sup> The only option for the stranded adverbial is to attach by adjunction to the VP gap, yielding a collective scope reading.<sup>19</sup>

(41) Because Mary did quickly, Bill read all the books slowly. (collective reading only)

**4.3.2 Comparative Ellipsis** The point of this section is to show that the contrast between VP-fronting and VP-ellipsis illustrated in the previous section can be replicated internal to the comparative ellipsis construction (Guéron and May 1984, Heim 1985, Diesing 1992, Wold 1995). The valuable property of comparative ellipsis for current purposes is that it allows an adverbial stranded by ellipsis to appear with or without a corresponding adverbial in the antecedent VP, as shown

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either as a part of the fronted VP copy or as a part of the underlying VP copy. Under this account, therefore, the liberality of VP-fronting reflects the fact that fronting does not in fact target a subpart of VP.

Although this is a possible account of the contrasts in this subsection, it does not generalize to other contrasts presented here. It is too restrictive to explain examples of comparative ellipsis in section 4.3.2 that show properties of right-branching VP structure. It is too liberal to explain cases of VP-fronting in which tests of right-branching VP structure fail (e.g., example (97)). Also, an analysis that explains the VP-ellipsis/VP-fronting contrast in terms of constituency-sensitive versus constituency-insensitive processes will be unable to explain contrasts among different types of constituency-sensitive processes, such as the contrast between coordination and pseudogapping presented in section 4.2.

<sup>18</sup> I assume that in backward ellipsis and forward ellipsis alike, the relation between the ellipsis site and its antecedent is established as soon as both elements are present in the structure, consistent with the general discussion of incremental derivations in section 3. However, I leave open the question of whether the interpretive relation between the gap and the antecedent in backward ellipsis is resolved by a backward copying operation or by some other interpretive mechanism.

<sup>19</sup> I focus here on quantificational expressions like *all* and *every* because they allow quantificational ambiguities. When the expression *all the books* is replaced with the obligatorily distributive *each of the books* in sentences like (i) and (ii), some speakers find the result ungrammatical, while others find the distributive reading somewhat acceptable.

- (i) Mary read each of the books quickly, and Bill did slowly.
- (ii) Because Bill did quickly, Mary read each of the books slowly.

I assume that for those speakers who accept the distributive reading in (i) and (ii), while continuing to reject the distributive reading in counterparts with *all* or *every*, an additional mechanism is available to generate distributive scope readings for *each*. For discussion of scope-taking mechanisms specific to *each*, see Agüero-Bautista 2000.

by (42).<sup>20</sup> This allows the creation of minimal pairs that provide stronger tests of the claim that loss of scope and binding possibilities in VP-ellipsis reflects destruction of the antecedent in an incremental derivation.

- (42) a. John read as many books as Bill did on Thursday.  
 b. John read as many books on Tuesday as Bill did on Thursday.

I assume that the *as*-clause containing the ellipsis site is initially attached in a VP-internal position, possibly adjoined to the NP containing the *as many N* expression. This is supported by the fact that the *as*-clause can undergo VP-fronting together with preceding VP material (43) and the fact that the *as*-clause can be coordinated along with the *as many NP* (44).

(43) . . . and read as many books as Sue did, he surely must have.

(44) John read as many novels as Sue did and as many magazines as Mary did.

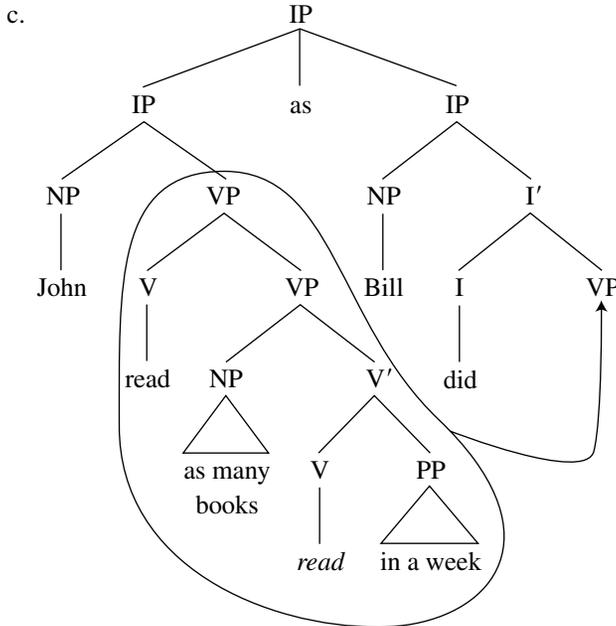
However, I assume that the *as*-clause is subsequently raised to form a coordinate structure and that it is at this point that the antecedent VP is copied to the ellipsis site. The raising operation avoids the infinite regress problem that has been extensively discussed in the literature on antecedent-contained deletion (e.g., May 1985). This analysis and the structures below essentially follow the proposals for comparative structures made by Guéron and May (1984), Heim (1985), and Wold (1995), adapted to the demands of a left-to-right syntax.<sup>21</sup>

First, (45) verifies that when the entire VP is the antecedent for comparative ellipsis, collective and distributive scope readings (45a) and bound variable pronouns (45b) are available. This parallels what has already been seen above for ellipsis of entire VPs. Nothing prevents the direct object from c-commanding the clause-final adverbial, because the antecedent for ellipsis is the entire VP. (45c) shows the critical step of the derivation of the distributive reading in which the antecedent of ellipsis is copied into the *as*-clause.

- (45) a. John read as many books in a week as Bill did. (collective and distributive readings both OK)  
 b. The provost met as many students<sub>i</sub> when they<sub>i</sub> were first entering the university as the dean did.

<sup>20</sup> The relevant reading in (42a) is one in which the stranded adverbial in the second conjunct is construed with *both* conjuncts—that is, the “RNR” interpretation.

<sup>21</sup> These operations transforming the surface structure of a comparative ellipsis construction correspond to what would be LF operations in standard transformational models. However, since incremental derivations have the effect that almost all syntactic operations on a syntactic element follow the phonological expression of that element, it is not possible to isolate a unique LF level in the normal manner.



(46) shows that when the verb + direct object is the antecedent for ellipsis, and there is an overt adverbial in both clauses, distributive scope readings are lost and variable binding fails. This replicates the properties of normal VP-ellipsis in (36) and (38). Accordingly, I assume that this is due to the fact that the verb + object constituent is destroyed in the first clause when a right-branching VP containing the adverbial is created.<sup>22</sup>

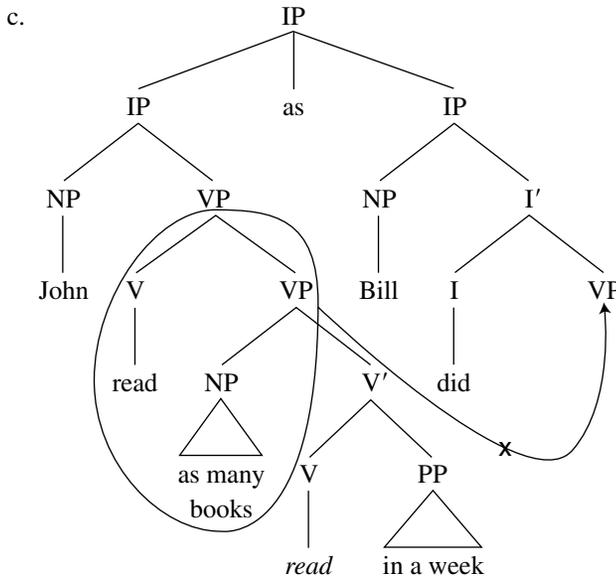
- (46) a. John read as many books in a week as Bill did in a month. (collective reading OK, distributive reading impossible)  
 b. \*The provost met as many students<sub>i</sub> when they<sub>i</sub> were first entering the university as the dean did when they<sub>j≠i</sub> were graduating.

<sup>22</sup> Two comments are in order here.

First, the use of two indices on the pronouns in (46b) and (47b) is intended and is important for the current argument. The relevant reading in (46b) is one in which the provost met as many entering students as the dean met graduating students, with the two groups of students potentially being drawn from different sets. This is the reading that should obtain if the two instances of the bound variable pronoun *they* are bound by separate copies of the quantificational NP *as many students*, as is expected if the ellipsis is resolved by a verb + direct object constituent. The relevant reading in (47b) is one in which the dean and the provost met the same number of entering students, but these could have been different groups of entering students. The pronoun *they* in (47b) is, in effect, bound by both copies of *as many students*.

Second, a reviewer points out that examples like (46a) allow a distributive scope reading once *each* is added (i). I suggest that this additional reading arises because an expression like *in a week each* can be treated as a rate adverbial, whereas an adverbial like *in a week* cannot.

- (i) John read as many books in a week each as Bill did in a month each.



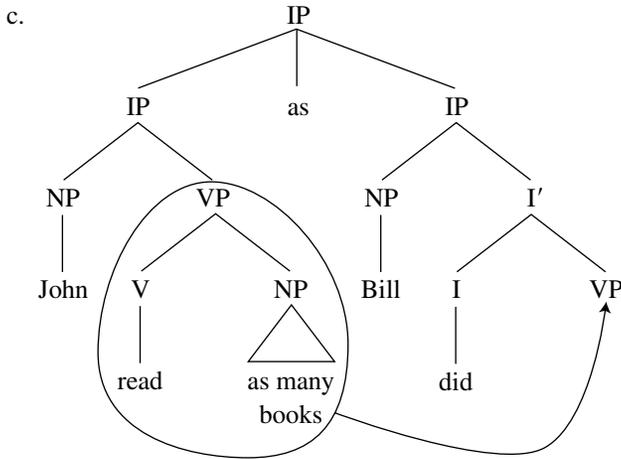
With (45)–(46) as background, the critical test of incrementality is shown in (47), in which the verb + object sequence is again the antecedent for ellipsis, but the adverbial is present only in the second conjunct. The relevant test involves the readings that are available for the stranded adverbial when it is interpreted in *both* clauses. In this case distributive scope readings and variable binding are again available. These examples match the possibilities seen in VP-fronting examples like (35), in which the movement chain is established prior to attachment of the stranded adverbial.<sup>23</sup>

- (47) a. John read as many books as Bill did in a week. (collective and distributive readings both OK)
- b. (?)The provost met as many students<sub>i</sub> as the dean did when they<sub>i,j</sub>:  $j \neq i$  were first entering the university.

<sup>23</sup> In all of the examples of comparative ellipsis in the text, I have shown *as*-raising applying as early as possible in the derivation, in order to show where verb + direct object constituents are available as antecedents for ellipsis. However, there are circumstances where *as*-raising should be delayed, such as in (i), which is adapted from an example pointed out by a reviewer.

- (i) John read as many books [as Bill does in a month] in only a week. (collective reading only)

If *as*-raising applies immediately in (i), both collective and distributive readings are available, just as in (47a), but it becomes impossible to merge the adverbial *in only a week* into its clause when it is introduced into the derivation. On the other hand, if *as*-raising is delayed until after the phrase *in only a week* is merged into the structure, then the availability of *read n many books* as an antecedent for ellipsis depends on the scope of the adverbial *in only a week*. If the adverbial yields a distributive scope reading, the verb + object sequence is not a constituent and cannot be an antecedent for ellipsis. On the other hand, if the adverbial yields a collective scope reading, the verb + object sequence is a constituent and can license ellipsis. Thus, only the collective scope reading is available.



(46)–(47) show that it is possible to replicate internal to comparative ellipsis the same contrast already seen between VP-fronting and VP-ellipsis. This lends support to the incremental account of the contrast, and it leaves no apparent advantage to a theory that attributes the contrast between ellipsis and fronting to an independent difference between fronting and ellipsis. For example, Lechner (to appear) presents an alternative account of the contrasts between VP-fronting and VP-ellipsis discussed in section 4.3.1. However, by attributing the contrasts to constructional properties of VP-fronting and VP-ellipsis, Lechner’s account fails to predict the contrasts internal to comparative ellipsis presented here.

*4.3.3 Relation to Other Loss-of-Scope Effects in Ellipsis* It is tempting to attempt to relate the loss-of-scope effect in partial VP-ellipsis shown above to a loss-of-scope effect in full VP-ellipsis that was first discussed by Sag (1976) and Williams (1977) and that has received a good deal of attention in subsequent literature (e.g., Tomioka 1997, Fox 2000). However, it can be shown that the loss-of-scope facts introduced above are independent of the more familiar loss-of-scope paradigm.

In the more familiar scope-in-ellipsis paradigm, the scope ambiguity observed in simple transitive clauses like (48) disappears when such clauses are placed in VP-ellipsis contexts like (49). The universally quantified object NP in (49) cannot take wide scope with respect to the existentially quantified subject NP. As pointed out by Hirschbühler (1982), the scope ambiguity is preserved if the clause targeted by ellipsis has an existentially quantified subject (50), such that both clauses contain a potential scope ambiguity.

(48) Some linguistics student won every award. ( $\exists > \forall, \forall > \exists$ )

(49) Some linguistics student won every award, and Wallace did too. ( $\exists > \forall, *\forall > \exists$ )

(50) Some linguistics student won every award, and some computer scientist did too.  
( $\exists > \forall, \forall > \exists$ )

There are a number of differences between the paradigm in (48)–(50), which involves the relative

scope of subjects and objects, and the loss-of-scope paradigm presented above, which involves the relative scope of objects and adverbials.

First, in full VP-ellipsis there is no subject-object scope ambiguity when the clause targeted by ellipsis has a nonquantificational subject and hence no potential scope ambiguity (49). The scope ambiguity reappears when the subject is quantificational (50). In the partial VP-ellipsis examples discussed above, on the other hand, scope ambiguities are blocked, even though both clauses show a potential scope ambiguity. Moreover, the object-adverbial ambiguity is still unavailable when both clauses have quantificational subjects (51). The use of indefinite subjects creates the potential for additional ambiguity, but the existentially quantified subject obligatorily takes wide scope with respect to the universally quantified object, and the distributive reading is still unavailable. (51) therefore contrasts with Hirschbühler's effect illustrated in (50).

- (51) Some girl finished every book quickly, and some boy did slowly. (subject-object:  $\exists > \forall$ ,  $*\forall > \exists$ ; object-adverbial: collective reading only)

Second, the examples in sections 4.3.1 and 4.3.2 showed that partial VP-ellipsis does not always lead to loss of scope readings. Loss-of-scope effects occur when an adverbial is first introduced to the left of the ellipsis site ((38) and (46a)), but not when the adverbial is first introduced to the right of the ellipsis site (47a). This pattern of scope readings is expected under the incremental structure-building approach, but it is not expected under an approach that assumes that ellipsis has a general scope-freezing effect.

Third, partial VP-ellipsis affects both scope and binding possibilities. Mechanisms specific to scope assignment cannot explain the loss of reciprocal binding and bound variable pronoun licensing possibilities seen in (36).

Fourth, it has been observed in the literature on scope in VP-ellipsis that deaccenting of VP material has very similar interpretive effects to deletion of VP material (Tancredi 1992, Tomioka 1997). (52) shows that whether VP is deleted (52a) or deaccented (52b) in a clause with a referential subject, a wide scope reading for the object is unavailable. However, deletion and deaccenting have contrasting effects on object-adverbial scope relations. (53) shows that deaccenting of a verb + object sequence under identity with a prior VP does not block the distributive scope reading (53b), whereas deletion of the same string does block the distributive scope reading (53a). Similarly, deaccenting of verb + object sequences does not block reciprocal binding or bound variable anaphora, again in contrast to deletion of the same strings. The parallel between ellipsis and deaccenting in (52) has been argued to show that loss-of-scope effects in full VP-ellipsis reflect constraints on focus. The nonparallels between partial VP-ellipsis and partial VP-deaccenting in (53)–(54) suggest that focus is not responsible for the loss-of-scope effects in these examples.

- (52) a. Some linguistics student won every award, and Wallace did too. ( $\exists > \forall$ ,  $*\forall > \exists$ )  
 b. Some linguistics student won every award, and Wallace won every award too.  
 ( $\exists > \forall$ ,  $*\forall > \exists$ )
- (53) a. Mary read all the books quickly, and John did slowly. (collective scope only)  
 b. Mary read all the books quickly, and John read all the books slowly. (collective and distributive scope readings both OK)

- (54) a. John gave books to them<sub>i</sub> on each other<sub>i</sub>'s birthdays, and Mary gave books to them<sub>i</sub> [on each other<sub>i</sub>'s first day of school]. (reciprocal binding OK)  
 b. Mary congratulated every boy<sub>i</sub> at his<sub>i</sub> graduation, and Sue congratulated every boy<sub>i</sub> [at his<sub>i</sub> 21st birthday party]. (variable binding OK)

All of these considerations point to the conclusion that the facts about VP-fronting and VP-ellipsis in sections 4.3.1–4.3.2 require a different explanation from the more well-known loss-of-scope examples in (48)–(50). An account based on constituency in incremental derivations fares well.

#### 4.4 *Right Node Raising and Movement*

As a fourth test of the Incrementality Hypothesis, this section shows that the normally liberal character of coordination is constrained in situations where coordination and movement processes are combined. The two conjuncts of a coordinate structure are normally adjacent to one another. For this reason, coordination may apply to any constituent of a derivation, because coordination applies before the constituent is destroyed. The best test of this analysis of coordination is a situation where the two conjuncts are not adjacent, and where intervening material destroys the constituency of the first conjunct before the second conjunct is built. Right node raising provides just such a test case.

Right node raising (RNR) is a name given to coordinations that should not be possible under standard assumptions about constituency, because they involve coordination of strings that are generally assumed not to be constituents, such as subject-verb sequences (55).

- (55) a. Mary liked but Sue hated the documentary about animals in the Serengeti.  
 b. John read carefully and Bill barely skimmed the chapter about binding theory.

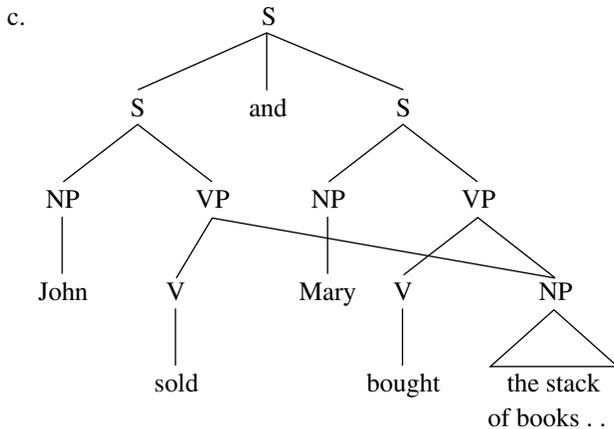
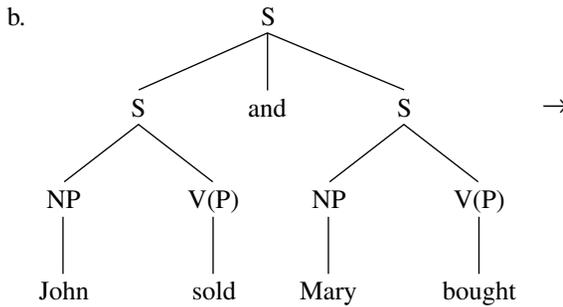
I assume that RNR is simply coordination of nonfinal constituents in an incremental derivation. Sequences of words that are constituents at some point during a derivation may be RNR conjuncts; sequences of words that are never constituents cannot be RNR conjuncts, as shown in (15)–(22).

This approach contrasts with other accounts of RNR that have reconciled the properties of RNR with standard views of constituency by treating it as a form of disguised clausal coordination. In the classic analysis RNR involves clausal coordination followed by across-the-board rightward extraction of the object NP from the two clauses (e.g., Ross 1967, Maling 1972, Postal 1974) or its nontransformational equivalent (e.g., Gazdar 1981). A second class of analyses assumes that RNR involves clausal coordination plus ellipsis of a phrase in the first conjunct, which yields the appearance of nonconstituent coordination (Gleitman 1965, Wexler and Culicover 1980, van Oirsouw 1987, Kayne 1994, Wilder 1994, 1997, Bošković 1996, Johannessen 1998). A third class of accounts treats RNR as clausal coordination in which the sentence-final shared material is literally shared between two clausal conjuncts. This is made possible by assuming ‘‘clausal factorization’’ (Williams 1978, Erteschik-Shir 1987), ‘‘phrase marker union’’ (Goodall 1987), or ‘‘three-dimensional phrase markers’’ (Muadz 1991, Moltmann 1992). The analyses in this third class share the assumption that RNR is the result of superimposing two partially identical sentences

or “factors” upon one another: where the two sentences are identical, there is just one representation for both occurrences.

The approach to RNR adopted here does not analyze RNR as disguised clausal coordination.<sup>24</sup> Instead, RNR involves regular constituent coordination, followed by destruction of the relevant constituents when the shared material is added to the derivation. I assume that the shared material combines with the two conjuncts in such a way that it is interpreted as an in-situ phrase in both conjuncts. In order to achieve this, some version of discontinuous constituency (McCawley 1982) or three-dimensional structures (Goodall 1987, Muadz 1991, Moltmann 1992) is required, in order to explain how the shared material occupies an appropriate syntactic position in both conjuncts. (56) shows a two-dimensional representation of the two critical steps in the derivation of an RNR sentence. Addition of the shared material changes the constituency of the first conjunct, but it does so without violating the requirement that new material always be added at the right edge of the structure.

(56) a. John sold and Mary bought the stack of books required for Linguistics 101.



<sup>24</sup> In combinatory categorial grammars it is also possible to analyze RNR as constituent coordination without resorting to a disguised clausal coordination approach (Dowty 1988, Steedman 2000b).

A critical test of this view of RNR is shown in prediction 4. If the conjuncts of RNR are fleeting constituents in an incremental derivation, which are destroyed by the addition of the shared material to their right, then it should not be possible for any syntactic process to refer to these constituents after the shared material has been added.

*Prediction 4:* If right node raising is coordination of constituents that do not survive until the end of the derivation, then no syntactic process should be able to refer to the conjuncts of RNR structures after the shared material has been added to the structure.

Prediction 4 is trivially satisfied in standard cases of RNR, in which the conjuncts are string adjacent and the shared material is sentence-final, but it becomes a substantive prediction once we consider ‘noncoordinate RNR’ (Hudson 1976, Postal 1994), a more exotic variety of RNR that does not require the two conjuncts to be string adjacent. In noncoordinate RNR the role of conjunctions like *and* or *but* can be taken by any of a variety of verbal or prepositional expressions. In the examples in (57) and (58) the strings filling the role of ‘conjunctions’ are italicized.

- (57) a. Of the people questioned, [those who liked] *outnumbered by two to one* [those who disliked] the way in which the devaluation of the pound had been handled.  
 b. I’d have said he was sitting [on the edge of] *rather than* [in the middle of] the puddle.  
 c. It’s interesting to compare [the people who like] *with* [the people who dislike] the power of the unions.  
 (Hudson 1976)
- (58) a. [Politicians who have fought for] *may well snub* [those who have fought against] animal rights.  
 b. [People who are learning to speak (in)] *may hate* [those who already can speak (in)] that little-known language.  
 c. [Spies who learn *when*] *can be more valuable than* [those able to learn *where*] major troop movements are going to occur.  
 (Postal 1994)

The most interesting property of noncoordinate RNR for our purposes is that unlike other kinds of coordination it escapes the Coordinate Structure Constraint (CSC), which in standard coordination prevents movement of one conjunct independent of the other (Ross 1967, Schachter 1977, Gazdar 1981). (59) illustrates standard CSC violations, whereas (60) shows that in noncoordinate RNR the processes of passivization, raising, unaccusative raising, *wh*-movement, and topicalization can all affect the first conjunct without affecting the second conjunct. Therefore, it becomes possible to create a stronger test of prediction 4, in which we examine the ability of movement processes to target the conjuncts of noncoordinate RNR either before or after addition of the shared material.

- (59) a. \*The syntacticians seemed \_\_\_\_\_ and the semanticists to far outnumber the phonologists.

- b. \*The syntacticians were easily outnumbered \_\_\_\_\_ and the semanticists by the phonologists.
- c. \*Who did the marauding invaders outnumber \_\_\_\_\_ and the Celts?
- d. \*The Saxons, the marauding invaders outnumbered \_\_\_\_\_ and the Celts.
- (60) a. [The people who liked] *easily outnumbered* the people who disliked the movie.
- b. [The people who liked] *must* \_\_\_\_\_ *have easily outnumbered* the people who disliked the movie.
- c. [The people who liked] *seemed* \_\_\_\_\_ *to have far outnumbered* the people who disliked the movie.
- d. [The people who like] *are easily outnumbered* \_\_\_\_\_ *by* the people who dislike the movie.
- e. [The people who liked] *arrived* \_\_\_\_\_ *much earlier than* the people who disliked the movie.
- f. [Which voter group that liked] \_\_\_\_\_ *outnumbered* which voter group that disliked the infomercial?
- g. [The group that liked], the producer thought \_\_\_\_\_ *probably outnumbered* [the group that disliked] the movie.

All of the acceptable cases of movement in (60) share two properties: the conjunct that is fronted is the left-hand conjunct, and the shared material follows both conjuncts. Consequently, movement applies to the leftmost conjunct before the shared material is added to the structure, consistent with prediction 4.

Even though noncoordinate RNR tolerates CSC violations, the movement possibilities for the conjuncts are restricted. (61) and (62) show this for subject-to-subject raising and *wh*-movement, respectively. The well-formed (a)-examples show movement of the left conjunct with the shared material in clause-final position, as in (60), and present no problem. Problems arise in the (b)-examples, in which both conjuncts precede the shared material, but the underlying position of the moved conjunct follows the shared material. In the ungrammatical (c)-examples the moved phrase includes the shared material and has an underlying position that follows the unmoved conjunct.<sup>25</sup> The problem with the (b)- and (c)-examples is that the movement operation applies after the shared material has been added to the structure. At this stage in the derivation the conjuncts can no longer be targeted, as expected under prediction 4, because they are no longer constituents.

<sup>25</sup> I assume that (62b–c) are not independently ruled out as Superiority violations. Although movement of one *wh*-phrase across another is generally impossible, this restriction is absent or substantially weaker for *which*-phrases, as the contrast between (i) and (ii) shows (Cinque 1990, Pesetsky 1987).

(i) \*What did who read?

(ii) Which books did which people read?

Even if there is some residual awkwardness in extraction of *which*-phrases, the relevant observation about (62b–c) is that they are clearly worse than control examples in which no RNR occurs, such as (iii).

(iii) [Which voter group that disliked the infomercial] did [which voter group that liked it] outnumber?

- (61) a. [The people who liked] seemed \_\_\_\_\_ to have offended the people who disliked the movie about Reagan's childhood.
- b. \*[The people who liked] seemed to the people who disliked the movie about Reagan's childhood \_\_\_\_\_ to be complete fools.
- c. \*[The people who liked the movie about Reagan's childhood] seemed to the people who disliked \_\_\_\_\_ to be complete fools.
- (62) a. [Which voter group that liked] \_\_\_\_\_ outnumbered which voter group that disliked the infomercial?
- b. \*[Which voter group that disliked] did which voter group that liked the infomercial outnumber \_\_\_\_\_ ?
- c. \*[Which voter group that disliked the infomercial] did which voter group that liked outnumber \_\_\_\_\_ ?

A number of control examples are needed, in order to demonstrate that it is indeed illicit movement that rules out the examples in (61b–c) and (62b–c). (63) shows that the ungrammatical examples in (61)–(62) are not ruled out simply because the shared material appears in sentence-medial position. (63b) shows the two conjuncts in the same positions as in the ungrammatical example in (61b), the only difference being that (61b) involves movement. In (63c) the first conjunct participates in a control dependency, contrasting with the movement dependency in (61b–c).

- (63) a. [The people who liked] told [the people who disliked] the movie that it was hard to see why anybody wouldn't love it.
- b. [The people who liked] said to [the people who disliked] the movie that it was sure to win over a lot of undecided voters.
- c. [The people who liked] told [the people who disliked] the movie to go jump in the lake.
- d. [The people who liked] thought that [the people who disliked] the movie had ceased to love their country.

As a further control, the examples in (64) show that *wh*-movement in noncoordinate RNR is degraded specifically when one conjunct crosses the other—the contrast between (64b) and (64c) is the crucial one—and also show that noncoordinate RNR is compatible with subject-auxiliary inversion.

- (64) a. They compared [the group that LIKED] with [the group that HATED] the movie.
- b. ?[Which group that LIKED] did they compare \_\_\_\_\_ with [which group that HATED] the movie?
- c. \*[Which group that LIKED] did they compare [which group that HATED] the movie with \_\_\_\_\_ ?
- d. \*[Which group that LIKED] the movie did they compare [which group that HATED] with \_\_\_\_\_ ?

In all of the acceptable examples in (61)–(64) the shared material follows the surface and the underlying position of both conjuncts. If the shared material precedes any of the positions of either conjunct, the sentence becomes impossible. This generalization confirms prediction 4: since adding the shared material destroys the constituency of the conjuncts, movement of a conjunct is predicted to be impossible at any point following the shared material. In all of the unacceptable examples, the shared material precedes the surface or underlying position of one of the conjuncts.<sup>26</sup>

The array of facts in (60)–(64) is predicted by the analysis of RNR as coordination of nonfinal constituents, but it is unexpected under approaches that treat RNR as disguised clausal coordination with first conjunct ellipsis. The surface positions of the impossible conjuncts in (61b), (62b), and (64c) conform to the pattern for first conjunct ellipsis, and the underlying positions of the impossible conjuncts in (61c), (62c), and (64d) conform to the same pattern.

#### 4.5 *Constituency versus Hierarchy Tests*

A fifth prediction of incremental structure building concerns a difference between two broad classes of structural diagnostics: tests based on constituency and tests based on c-command relations. Up to this point I have focused on the fact that in incremental derivations certain constituents are destroyed as a result of creating new constituents. However, whereas constituency changes nonmonotonically (i.e., structure building both creates and destroys constituents), incremental structure building is predicted to add c-command relations in a near monotonic fashion. All left-to-right c-command relations are preserved once created, and the only destruction of right-to-left c-command relations involves symmetrical relations between sisters. Therefore, whereas tests of constituency may conflict, we predict that tests based on c-command relations should never conflict with one another.

*Prediction 5:* Constituency changes during the course of a derivation, but most c-command relations do not. Therefore, tests involving c-command relations should not conflict with one another.

(65)–(69) repeat a familiar paradigm, which shows that c-command tests like anaphor binding, negative polarity item licensing, and weak crossover all diagnose right-branching structures

<sup>26</sup> There are additional constraints on noncoordinate RNR that I do not address here. For example, a reviewer points out that (i) is impossible, although no movement is involved. I suggest that (i) reflects a constraint that blocks oblique arguments as the first conjunct in noncoordinate RNR. Another constraint on noncoordinate RNR is that the shared material must appear in situ in at least one of the conjuncts, as shown by the impossibility of (ii), which was also pointed out by a reviewer.

(i) \*It seemed to the people who liked that the people who disliked the movie about Reagan didn't love their country.

(ii) \*Which voter group that disliked did which voter group that liked outnumber \_\_\_\_\_ the movie?

There are also constraints on the types of predicates that may serve as ‘‘conjunctions’’ in noncoordinate RNR. The predicates that work best as ‘‘conjunctions’’ involve verbs of comparison and verbs of emotion (see Postal 1994 for many examples). However, these additional constraints do not undermine the analysis presented above, which focuses on contrasts among examples that satisfy all of these additional constraints.

in double object and dative constructions (see Barss and Lasnik 1986, Jackendoff 1990). Elements toward the left of VP behave as if they c-command elements on their right, and not vice versa.

(65) *Reflexive binding*

- a. I showed John himself in the mirror.
- b. \*I showed himself John in the mirror.
- c. I showed the children<sub>i</sub> to each other<sub>i</sub> in the mirror.
- d. \*I showed each other<sub>i</sub> to the children<sub>i</sub> in the mirror.

(66) *Bound variable anaphora*

- a. I denied each worker<sub>i</sub> his<sub>i</sub> paycheck.
- b. \*I denied it<sub>i</sub>'s owner every paycheck<sub>i</sub>.
- c. I gave every paycheck<sub>i</sub> to it<sub>i</sub>'s owner.
- d. \*I gave his<sub>i</sub> paycheck to every worker<sub>i</sub>.

(67) *Negative polarity item licensing* (Klima 1964)

- a. I gave no one anything.
- b. \*I gave anyone nothing.
- c. I gave nothing to anyone.
- d. \*I gave anything to nobody.

(68) *Weak crossover*<sup>27</sup> (Postal 1971, Wasow 1972)

- a. Who<sub>i</sub> did you show his<sub>i</sub> reflection in the mirror?
- b. \*Which movie<sub>i</sub> did you show it<sub>i</sub>'s fans?

(69) *Superiority* (Chomsky 1973)

- a. Who did you give which book?
- b. \*Which book did you give who?

The agreement among different c-command tests shown by examples like (65)–(69) provides promising initial support for the prediction that c-command tests should not show conflicts.

The small differences among these tests are of a benign nature. Negative polarity item licensing and variable binding typically allow a possessor to command out of the NP that contains it (70a–b), whereas this is not possible for Conditions A and C of the binding theory (70c–d). At deeper levels of embedding inside a subject NP, the differences between these tests disappear (71). (70)–(71) show that the structural relations relevant for Conditions A and C are a subset of those relevant for negative polarity item licensing and variable binding, but no conflict is shown.

<sup>27</sup> The contrasts in (68)–(69) are expected only among those speakers of English who accept extraction of the first object in a double object construction. Some speakers disallow the extractions in (68a) and (69a) independent of weak crossover and superiority.

- (70) a. Nobody's parents complained about anything.  
 b. Everybody<sub>i</sub>'s mother warned him<sub>i</sub> about the forbidden fruit.  
 c. \*Wallace<sub>i</sub>'s friends admire himself<sub>i</sub>.  
 d. His<sub>i</sub> friends admire Wallace<sub>i</sub>.
- (71) a. \*The stories about nobody scared anybody.  
 b. \*The stories about everybody<sub>i</sub> amazed him<sub>i</sub>.  
 c. \*The stories about Wallace<sub>i</sub> amused himself<sub>i</sub>.  
 d. The stories about him<sub>i</sub> amused Wallace<sub>i</sub>.

A more serious concern for prediction 5 is raised by sequences of VP adverbials, which have been reported to show scope relations that conflict with binding relations. In pairs of sentences like those in (72)–(74), the first adverbial and the rest of the VP are preferentially interpreted as taking narrow scope with respect to the second adverbial. Reversing the order of the adverbials reverses the preferred interpretation. For example, (72a) is most naturally understood as meaning that the frequent kissing was willing, whereas (72b) is most naturally understood as meaning that willing kissing was frequent. Similarly, (74a) and (74b) differ with respect to whether the car sale or the selling price is in the scope of *reluctantly*. Facts like these have been taken to motivate left-branching VP structures as the basis for adverbial interpretation (Ernst 1994, Pesetsky 1995).

- (72) a. She kissed him many times willingly.  
 b. She kissed him willingly many times.
- (73) a. Kremer plays concertos in foreign countries on weekends.  
 b. Kremer plays concertos on weekends in foreign countries.  
 (Pesetsky 1995)
- (74) a. Henry sold his car reluctantly for a thousand bucks.  
 b. Henry sold his car for a thousand bucks reluctantly.

Strikingly, the right-to-left scope interpretations that have been used to argue for left-branching structures are available even in the presence of a left-to-right variable binding dependency of the kind that has been used to motivate *right*-branching structures (75)–(76) (Ernst 1994, Phillips 1995). This state of affairs appears to violate the prediction that there should be no conflicts among c-command tests.

- (75) a. I misled everyone<sub>i</sub> on purpose the day before his<sub>i</sub> briefing.  
 b. She kissed everyone<sub>i</sub> willingly on his<sub>i</sub> cheek.  
 (Ernst 1994)
- (76) a. Kremer plays quartets in foreign countries<sub>i</sub> on their<sub>i</sub> national holidays.  
 b. Kremer plays quartets on new federal holidays<sub>i</sub> in their<sub>i</sub> first 5 years of existence.  
 (Phillips 1995)

However, the argument based on sentences like (75)–(76) fails to control for the independent effect on interpretation of default sentence-final focal stress. Once this effect is controlled for by

adding a third adverbial (77)–(78), we find that the strong right-to-left scope preference seen among the first two adverbials in (75)–(76) no longer obtains. In (77a) it is much easier than in (72b) to obtain a reading in which it is kissing many times that was done willingly (left-to-right scope), although the reading in which there were many individual willing kisses (right-to-left scope) is also still available. In (78a) it is easier than in (74a) to understand the selling price of the car within the scope of *reluctantly*.

- (77) a. Sue kissed him willingly many times in front of the boss.  
 b. Kremer plays concertos in foreign countries on weekends at the height of the season.
- (78) a. Henry sold his car reluctantly for a thousand bucks before he moved to Paris.  
 b. Henry sold his car for a thousand bucks reluctantly before he moved to Paris.

The fact that the interpretation of sequences of adverbials is not fixed by their linear order, as the examples in (77)–(78) indicate, is consistent with prediction 5. It suggests that the facts in (72)–(74) do not reflect obligatory right-to-left c-command among multiple adverbial phrases, but instead reflect the independent effect of focal stress assignment, which associates by default with a sentence-final adverbial. Therefore, if the scope readings in (72)–(74) are not indicative of c-command relations, then the examples in (75)–(76) do not challenge the generalization that the results of different c-command tests should be consistent with one another.

#### 4.6 *Argument Stranding in Right Node Raising, Movement, and Ellipsis*

**4.6.1 Prediction** A central claim of this article is that tests of constituency differ in the range of strings they target because the tests differ in terms of the derivational “snapshot” that they have access to. Processes that apply early in a derivation can see constituents that are no longer present later in the derivation. These transient constituents include incomplete phrases and clauses. However, I have assumed throughout that the transient constituents have neither privileged nor inferior status with regard to their ability to participate in syntactic processes. This leads to the following prediction:

*Prediction 6:* Transient constituents have no special status. Therefore, any syntactic process that applies at an appropriately early stage of the derivation should be able to target transient constituents.

This prediction implies that the grammar cannot impose an extrinsic requirement that a given syntactic process apply only to final, nontransient constituents. If a constituency test can only target final, nontransient constituents, the test should be one that applies to a late stage in the derivation.

Argument stranding presents a *prima facie* challenge to prediction 6 and therefore merits closer scrutiny. This section examines contrasts in argument-stranding possibilities across RNR, movement, and ellipsis, and shows that the contrasts are consistent with prediction 6.

As already seen above, fronting or ellipsis of a verb and its arguments may strand nonselected adverbial PPs (79).

- (79) a. . . . and [give children candy] he did in libraries on weekends.  
 b. John gave the children candy in libraries on weekends, and Sue did \_\_\_\_\_ in shopping malls on national holidays.

However, fronting or ellipsis that strands argument NPs (80) or that strands the NP of a subcategorized or adverbial PP is impossible (81)–(82).<sup>28</sup>

- (80) a. \* . . . and [give the children] he did candy in libraries on weekends.  
 b. \*John gave the children candy in libraries on weekends, and Sue did \_\_\_\_\_ bagels in shopping malls on national holidays.
- (81) a. \* . . . and [give candy to] he did the children in libraries on weekends.  
 b. \*John gave candy to the children in libraries on weekends, and Sue did \_\_\_\_\_ the babies in shopping malls on national holidays.
- (82) a. \* . . . and [give candy to the children in] he did libraries on weekends.  
 b. \*John gave candy to the children in libraries on weekends, and Sue did \_\_\_\_\_ shopping malls on national holidays.

By contrast, each of the subparts of VP that resist movement and ellipsis in (80)–(81) can be a possible conjunct for RNR (83b–d).

- (83) a. John gave children candy and showed babies balloons at the county fair on Memorial Day.  
 b. John gave children and showed babies big red balloons at the county fair on Memorial Day.  
 c. John gave stickers to and took gum from the excited children as they entered the museum.  
 d. John handed bills to parents before and gave stickers to children after the demonstration of the amazing new brain enhancer.

Thus, it appears that whereas RNR allows argument stranding, VP-ellipsis and VP-fronting do not. In terms of incremental derivations, RNR has access to intermediate stages in the construction of VP that are invisible to both VP-ellipsis and VP-fronting. We must therefore explain this contrast in the possibility of argument stranding, but without merely stipulating that VP-ellipsis and VP-fronting apply only to later stages in the construction of VP. Section 4.6.2 provides a more precise characterization of the constraints on stranding, and sections 4.6.3 and 4.6.4 explain how those constraints are predicted under the incremental structure-building approach.

<sup>28</sup> An anonymous reviewer correctly points out that parallel examples containing modal auxiliaries are somewhat improved, although still marginal for many speakers, as in (i).

(i) ?Wallace might have eaten bagels, and Gromit might cheese.

I suggest that such examples may reflect a form of gapping, which freely allows argument stranding, rather than VP-ellipsis. I have nothing to say about gapping in this article. The examples of VP-ellipsis in this section all use the auxiliary *do*, in order to avoid the possible confound of a gapping analysis.

4.6.2 *Potential Complete VP Constraint* This section argues that VP-ellipsis and VP-fronting do not resist stranding of all arguments; rather, they resist stranding of obligatory arguments, owing to a constraint that allows VP-ellipsis and VP-fronting to target only ‘potential complete VP’ constituents.

(80) already shows that the second object of a double object construction cannot be stranded by ellipsis or movement. (84) shows that the locative PP argument of the locative verb *put* also cannot be stranded. Nevertheless, not all locative PPs resist stranding as strongly as the locative PP argument of *put*. With locative PPs, the possibility of partial VP-fronting and partial VP-ellipsis improves as the locative PP becomes less obligatory (85)–(86), although there is a residual awkwardness to the construction even with fully optional locative PPs. The examples in (85)–(86) are ordered according to the degree of optionality of the locative PP argument.

- (84) a. \*... and put the book he did on the table during the climax of the game.  
 b. \*John put the book on the table during the climax of the game, and Sue did under the bed when she started to get sleepy.
- (85) a. ?\*... and stand the candle he did on the table at the party.  
 b. ?\*... and nail the diploma he did to the wall on the weekend.  
 c. ??... and attach the diploma he did to the wall on the weekend.  
 d. ??... and pour the wine he did into the glasses before the toast.  
 e. (?)... and stow the trunk he did under the bed before the enemy arrived.  
 f. (?)... and dump the garbage he did on the street after nightfall.  
 g. (?)... and spill the milk he did on the table at the party.
- (86) a. \*John stood the candle on the table at the party, and Sue did on the floor at the séance.  
 b. ?\*John nailed the diploma to the wall on the weekend, and Sue did to the door the day after her graduation.  
 c. ??John attached the diploma to the wall on the weekend, and Sue did to the fridge when she came home from work.  
 d. ??John poured some wine into the glasses and Sue did into the cafe.  
 e. ??John stowed a trunk under the bed and Sue did in the basement.  
 f. ?John dumped the garbage on the street after nightfall, and Sue did on the neighbor’s driveway at dawn.  
 g. (?)John spilled the milk on the table at the party, and Sue did on the floor at breakfast.

In the case of VPs that contain control infinitivals as arguments, stranding of the infinitival by means of ellipsis or fronting is impossible (87)–(88).

- (87) a. \*... and persuade Bill he did to leave.  
 b. \*... and promise Mary he did to leave.
- (88) a. \*John persuaded Bill to leave, and Sue did to sell his Porsche.  
 b. \*John promised Mary to leave, and Sue did to write more poetry.

Benefactive PPs, which are generally optional, are (relatively) freely stranded by VP-ellipsis or VP-fronting (89). Goal PPs vary slightly in their ability to tolerate being stranded, according to the degree of optionality of the PP (90)–(91).

- (89) a. (?) . . . and bake a cake he did for the party in less than an hour.  
 b. ??John baked a cake for the party in less than an hour, and Sue did for the team meeting in about an hour and a half.
- (90) a. ?\* . . . and hand candy he did to the children at the birthday party.  
 b. ?? . . . and slip messages he did to the girl sitting at the desk next to him.  
 c. (?) . . . and give candy he did to the children at the birthday party.  
 d. (?) . . . and mail letters he did to the starving children.  
 e. (?) . . . and send a telegram he did to the queen on her 70th birthday.
- (91) a. ?\*John handed candy to the children at the birthday party, and Sue did to the toddlers at the supermarket.  
 b. ??John slipped messages to the girl at the desk next to him, and Sue did to the boy at the back of the classroom.  
 c. ?John gave candy to the children at the birthday party, and Sue did to the toddlers at the supermarket.  
 d. (?)John mailed letters to the starving children, and Sue did to the intransigent congressmen.  
 e. John sent a telegram to the queen, and Sue did to the prime minister.

Therefore, the constraint on partial VP-fronting or VP-ellipsis is that the fronted or deleted constituent must be large enough to be a potential complete VP, with the consequence that strictly subcategorized VP material cannot be stranded.<sup>29</sup> Thus, the constraint on VP-fronting and VP-ellipsis is a constraint on what may be fronted or elided, rather than a constraint on what may be stranded.

*4.6.3 VP-Ellipsis* The generalization that restricts VP-fronting and VP-ellipsis to potential complete VP constituents may be explained as follows. I assume that the strictly subcategorized arguments of a verb must be organized in a right-branching VP shell structure. In section 4.3 it was proposed that adverbial phrases exhibit flexibility in their positioning. They are attached inside a right-branching VP structure wherever possible, but under certain circumstances they may also be right-adjoined to VP in a left-branching structure. This flexibility accounts for the possibility of adverbial stranding in VP-ellipsis and for the loss of certain scope and binding

<sup>29</sup> There may be an additional requirement that prevents locative PPs subcategorized by locative verbs from being stranded, even if they are not obligatory. This additional constraint is reminiscent of the distinction drawn by Culicover and Wilkins (1984) between an inner V1 constituent of VP (including strictly subcategorized arguments of the verb, locative PP arguments, and control infinitival complements) and an outer V2 constituent (including goal and benefactive PPs). Thanks to Carson Schütze for valuable suggestions on this point.

possibilities in VP-ellipsis. I assume that the flexibility allowed in the attachment of adverbial phrases is not available to strictly subcategorized arguments.<sup>30</sup>

If we assume that for strictly subcategorized phrases the right-branching VP structure is the only possible structure, then the impossibility of argument stranding in VP-ellipsis is predicted as follows. A VP-ellipsis site must have a constituent as its antecedent, as is standardly assumed. In a completed right-branching VP structure (e.g., the completed first conjunct), the smallest constituent containing the verb and *any* of its internal arguments is a constituent that contains the verb and *all* of its realized internal arguments. Therefore, the smallest potential antecedent for VP-ellipsis is the constituent containing the verb and all of its strictly subcategorized arguments.<sup>31</sup> If we assume that arguments that are not strictly subcategorized have the same structural possibilities as adverbial phrases, then the paradigm in (84)–(91) for VP-ellipsis follows.

RNR is not subject to the same restriction as VP-ellipsis because coordination applies to constituents that are present before the entire VP has been constructed. VP-ellipsis, on the other hand, applies at a stage in the derivation when the entire VP has been constructed in the antecedent clause, with the consequence that fewer constituents are available as antecedents for ellipsis.

Support for this account of the restriction on argument stranding comes from comparative ellipsis. As seen in section 4.3, comparative ellipsis allows stranded phrases to be present in the clause targeted by ellipsis, without corresponding phrases in the clause containing the antecedent, (92) shows that argument stranding is possible when no counterpart to the stranded phrase precedes the ellipsis site. In contrast, (93) shows that argument stranding becomes impossible when a counterpart to the stranded phrase precedes the ellipsis site. This contrast is exactly as predicted by the incremental structure-building approach, and it parallels the paradigm shown for the loss of scope and binding possibilities when adverbial phrases are stranded by comparative ellipsis (45)–(47).<sup>32</sup>

- (92) a. John put more books than Bill did on the table.  
 b. Wallace stood more buckets than Gromit did in the garage.  
 c. Sarah gave more children than Susan did candy.
- (93) a. ?\*John put more books on the table than Bill did on the floor.  
 b. ?\*Wallace stood more buckets in the garage than Gromit did in the basement.  
 c. \*Sarah gave more children candy than Susan did cookies.

<sup>30</sup> This distinction between argument and adjunct expressions is similar to a distinction built into Pesetsky's (1995) Layered Syntax VP structures. However, whereas Pesetsky's ternary-branching *V'* structures make it impossible for ellipsis or movement to ever strand an argument in a ditransitive VP, the present system preserves the possibility of argument stranding in limited environments, such as the examples of comparative ellipsis below.

<sup>31</sup> It is also possible for the verb alone to be the antecedent for deletion. Verb-only ellipsis is usually considered under the heading of pseudogapping.

<sup>32</sup> The examples in (93) are not as bad as the corresponding examples of regular VP-ellipsis in (94) and (86); also, changing the comparative from *more . . . than* to *as many . . . as* further improves the deletions in (93). These improvements do not follow from incrementality and must be left as an unsolved puzzle at this point.

4.6.4 *VP-Fronting* We also need an explanation for the restriction on argument stranding in VP-fronting. In order to explain this restriction, we must consider the antecedents that are required for the VP-fronting construction. The fronted portion of VP in VP-fronting constructions corresponds to a constituent in the antecedent clause of these constructions. If the fronted VP constituent corresponds to the entire VP in the antecedent clause, then it follows that the fronted VP must be a potential complete VP, since its antecedent must be a complete VP. This is why the examples in (94), which are based on the ungrammatical (80a) and (82a), are impossible. Not surprisingly, therefore, the acceptability of VP-fronting improves as a function of how acceptable the fronted constituent is as a complete VP.<sup>33</sup>

- (94) a. \*John intended to give the children, and give the children he did . . .  
 b. \*John intended to give candy to, and give candy to he did . . .  
 c. \*John intended to give candy to children in, and give candy to children in he did . . .

However, the fronted VP constituent may also correspond to a subpart of the antecedent VP (95). Therefore, we must explain why the fronted portion of VP must nevertheless correspond to a potential complete VP and why it may not strand arguments (96).

- (95) a. Marion wanted to win five medals in the Olympics, and win five medals she did.  
 b. John had intended to give candy to the children on the weekend, and give candy to the children he did, but not until Monday.
- (96) a. \*John intended to give the children something nice to eat, and give the children he did a generous handful of candy.  
 b. \*Andrew wanted to stand the lamp on the bookcase, and stand the lamp he did.

Although (95) shows that the fronted phrase need not correspond to the entire VP in the antecedent clause, I assume that the fronted phrase must nevertheless correspond to a constituent in the antecedent clause. Therefore, the examples in (96) are ruled out because the fronted portion of VP does not correspond to a constituent in the completed antecedent clause. Recall that in a right-

<sup>33</sup> Predicate fronting in concessive clauses does not depend on a matching predicate in an antecedent clause. Therefore, it should be easier to violate the constraints on predicate fronting illustrated above. The contrast between (87) and (i) lends support to this (Chomsky 1981:146, attributed to Mark Baltin; Radford 1988:322).

(i) Persuade her though I may to resign, I can't imagine I'll persuade her to leave town.

Predicate fronting that strands argument PPs is also somewhat improved in concessive clauses (ii)–(iv), although the improvement is not as striking as the contrast between coordinate VP-ellipsis and comparative ellipsis. Stranding of a theme NP in double object constructions is still impossible (v). Thanks to Jason Lilley for bringing these contrasts to my attention.

(ii) ?[Put the book] though he did on the table during the climax of the game, . . .  
 (iii) ?[Stand the candle] though he did on the table at the party, . . .  
 (iv) [Nail the diploma] though he did to the wall on the weekend, . . .  
 (v) \*[Give the children] though he did candy in libraries on weekends, . . .

branching VP structure the smallest constituent containing the verb and any of its arguments is a constituent that contains the verb and all of its arguments.

Independent support for this assumption about constituency comes from examples like (97), in which the fronted VP corresponds to a subpart of the VP in the antecedent clause. Only the collective scope reading is available, as is expected if the fronted phrase must correspond to a *constituent* of the antecedent VP. Given the assumptions about scope and constituency in section 4.3, the string *read all the books* in the antecedent clause forms a constituent only under the collective reading.<sup>34</sup>

- (97) John wanted to read all the books in less than a week, and read all the books he did, but in way more than a week. (collective reading only)

The impossibility of fronting or deleting a VP constituent containing a preposition but not its complement (e.g., (81), (82), (94b–c)) can be explained in the same manner as the restriction on argument stranding. Prepositions can be separated from their complements by coordination, indicating that the relevant constituents do exist, but the relevant constituents never survive for long enough to serve as antecedents for VP-fronting or VP-ellipsis.

Thus, the contrast between RNR on the one hand and VP-ellipsis and VP-fronting on the other hand with respect to which subparts of VP are available as constituents receives a natural explanation, and the explanation follows substantially from the range of constituents made available during an incremental derivation, plus the standard assumption that VP-fronting and VP-ellipsis processes are licensed by antecedents that are constituents. Thus, the contrasts in argument-stranding possibilities are compatible with prediction 6.

It is important to be able to independently derive the distribution of restrictions on argument stranding in an incremental structure-building approach, because such facts have been used elsewhere as key motivation for a distinction between argument-sensitive and argument-insensitive VP representations (Pesetsky 1995).

<sup>34</sup> A reviewer correctly points out that the same argument does not follow when using reciprocal binding rather than scope as a diagnostic of right-branching structure, since (i) is entirely acceptable. Whereas in (97) the fronted VP in the second clause restricts the scope interpretations in the first clause, in (i) the fronted VP fails to block the reciprocal binding relation established in the first clause.

- (i) John had intended to give candy to the children on each other's birthdays, and give candy to the children he did, but not until Christmas.

Although I cannot provide a conclusive account of this contrast at present, I should note that this is an instance of a more general phenomenon: binding relations in an antecedent clause cannot be blocked or rescued by the constituency requirements of a subsequent clause. (ii)–(iii) illustrate this with VP-ellipsis for Conditions A and C, respectively. Examples like (iii) were first brought to my attention by Uli Sauerland, and examples like (ii) are discussed by Lechner (to appear).

- (ii) Mary talked to the children on each other's birthdays, and Sue did on the day after Labor Day.

- (iii) Mary talked to him<sub>i</sub> on John<sub>i</sub>'s birthday, and Sue did on the day after Labor Day.

Note that we cannot explain (i)–(iii) by assuming that the adverbial PPs are adjoined to VP and that the binding relations are established under m-command. To do so would sacrifice the account of all of the ellipsis and fronting contrasts in sections 4.2, 4.3, and 4.6. One possibility is that retroactive adjustment of the structure of the first conjunct to accommodate ellipsis and fronting fails to cancel previously established binding relations.

## 5 Alternative Approaches: Flexible Constituency

In direct response to the problems raised by constituency conflicts, notions of flexible constituency have been incorporated into a number of syntactic theories. Although there are many differences among flexible constituency theories, they share the assumption that the complete structural description of an individual sentence may consist of two or more different surface structures for the sentence. If different syntactic processes can refer to different surface structures for the same sentence, then results that lead to contradictions for theories that assume a single structure are no longer contradictory. This section compares the results of flexible constituency approaches with the results based on incremental structure building.<sup>35</sup>

### 5.1 Combinatory Categorical Grammar

In many versions of Categorical Grammar, rules have been proposed that allow the words of a given sentence to be combined in a number of different ways. I focus here on the Combinatory Categorical Grammar (CCG) approach developed by Steedman and others (e.g., Ades and Steedman 1982, Hepple 1990, Jacobson 1990, Steedman 1993, 1997, 2000b, Wood 1993). A sentence may be derived by means of function application alone, using only the rules of forward application (>) and backward application (<) (98), as in the derivation of the sentence *Leo saw Elliot* in (99). In the examples below, underlines indicate combinatorial operations and are roughly equivalent to nodes in a phrase marker; annotations on the underlines indicate the rule that is used to combine the underlined categories.

- (98) a. *Forward application* (>)  
 $X/Y \ Y \Rightarrow X$   
 b. *Backward application* (<)  
 $Y \ X \backslash Y \Rightarrow X$
- (99) Leo saw Elliot  
 $\frac{\quad}{NP} \ \frac{\quad}{(S \backslash NP) / NP} \ \frac{\quad}{NP}$   
 $\frac{\quad}{S \backslash NP} \ >$   
 $\frac{\quad}{S} \ <$

The addition of type-raising and function composition rules makes it possible to combine a given set of terminal categories in more than one order, by allowing categories to combine that

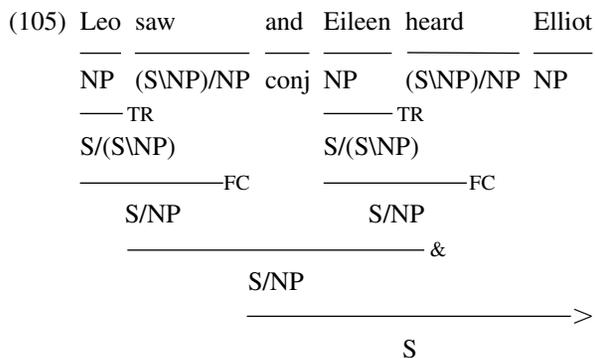
<sup>35</sup> In the transformational and phrase structure grammar traditions the most common response to the problem of constituency conflicts has been to attribute the conflicts to idiosyncrasies of individual structural diagnostics. For example, the apparent liberality of coordination is attributed to the possibility of disguised clausal coordination, and surprising binding results (e.g., Barss and Lasnik 1986, Ernst 1994) have been taken to indicate that binding diagnoses m-command rather than c-command. I do not discuss these approaches in detail here, but I hope to have shown that approaches that attribute conflicts to idiosyncrasies of individual structural diagnostics miss important generalizations about *why* different structural diagnostics yield contrasting results.

cannot combine by forward or backward application alone. For example, by taking advantage of the rules of *type raising* (100) and *forward function composition* (101), the sentence *Leo saw Elliot* can be derived in a different order, combining the subject and the verb before the object (102).

- (100) *Type raising* (TR)  
 a.  $X \Rightarrow Y/(Y \setminus X)$  *general form*  
 b.  $NP \Rightarrow S/(S \setminus NP)$  *specific case*
- (101) *Forward function composition* (FC)  
 a.  $X/Y \quad Y/Z \Rightarrow X/Z$  *general form*  
 b.  $S/(S \setminus NP) \quad (S \setminus NP)/NP \Rightarrow S/NP$  *specific case*
- (102) Leo saw                  Elliot  
 \_\_\_\_\_  
 NP (S \ NP)/NP NP  
 — TR  
 S/(S \ NP)  
 \_\_\_\_\_ FC  
 S/NP  
 \_\_\_\_\_>  
 S

Type raising and function composition therefore allow multiple structures for a single sentence. As the length of a sentence increases, the number of possible derivations increases. The availability of different derivations for a single sentence makes the description of overlapping constituents relatively straightforward. If most sentences have multiple possible derivations, then it is not surprising that conflicting constituency results are observed. Examples (104)–(105) show that it is easy to derive both VP-coordination and RNR sentences, given the apparatus already introduced and the coordination rule in (103). The only difference between the two derivations is that the RNR derivation in (105) invokes type raising and forward composition in order to allow the verb and the subject to combine before they combine with the object.

- (103) a. *Coordination* (&)  
 $X \text{ CONJ } X \Rightarrow X$   
 b. and: CONJ
- (104) Leo saw                  Elliot and heard                  Eileen  
 \_\_\_\_\_  
 NP (S \ NP)/NP NP conj (S \ NP)/NP NP  
 \_\_\_\_\_>                  \_\_\_\_\_>  
 S \ NP                                  S \ NP  
 \_\_\_\_\_&  
 S/NP  
 \_\_\_\_\_<  
 S



These examples provide only the most basic illustrations of how CCGs may account for the variety of strings that syntactic processes may refer to (for more details see Wood 1993, Steedman 1993, 1997, 2000b, and references cited therein). For the purposes of this discussion we may assume that combinatory categorial grammars are able to refer to the full range of constituent types needed to account for contradictory constituency effects. In this respect CCGs fare better than most existing syntactic theories, which cannot generate the necessary constituents. However, the more interesting question here is whether the descriptive power of CCGs also provides answers to the questions we have focused on here, concerning *why* different syntactic processes pick out different strings as constituents, and when different syntactic processes do and do not interact to block one another's application.

CCGs successfully account for the liberality of coordination: essentially any string of words that may combine to form a CCG constituent may be coordinated. Constraints on rules such as type raising can be invoked to prevent the generation of impossible coordinations such as (22).

However, it is less clear in a CCG approach why other syntactic processes are not as liberal as coordination. Consider, for example, the contrast between coordination and pseudogapping discussed in section 4.1.2. In order to account for the coordination of verb + preposition sequences, a CCG approach must assume that V + P may form a constituent. Under the incremental approach adopted here, this V + P constituent is a temporary constituent that is subsequently destroyed when an NP is added. Under this approach the fleeting nature of the V + P constituent explains why it is unavailable to pseudogapping. Under the CCG approach, on the other hand, the V + P constituent should have the same status as any other VP constituent, and therefore the fact that it cannot be targeted by pseudogapping remains unexplained.

CCG also differs from the incremental approach in its answer to why constituency tests show less uniform results than binding tests (section 4.5). Although there is substantial variation in the kinds of constituents that different syntactic processes may refer to, there is much less variation in the kinds of c-command relations that different syntactic processes refer to. This basic asymmetry follows naturally from the Incrementality Hypothesis, because structure building leads to nonmonotonic changes in constituency, whereas c-command relations are added monotonically. In CCG a different explanation for this asymmetry is needed, because constituents are added monotonically in any individual derivation (although flexible constituency of course allows multi-

ple derivations for a single sentence). The effect of this is that nonstandard constituents entail nonstandard command relations. Steedman (1997) recognizes this issue and argues that the *c*-command relations relevant for binding should not be computed from surface constituent structures, but should instead be computed from independent predicate-argument structures, which represent the positions of the predicates and arguments of a sentence on an obliqueness hierarchy. Although a given sentence may have multiple possible constituent structures, it will have only one predicate-argument structure.

By imposing this division of labor between constituent structures and predicate-argument structures, Steedman imposes a strong asymmetry between constituency relations on the one hand and *c*-command relations for binding on the other hand. This means that it should be straightforward for CCG to account for the apparent conflicts between results of movement and binding tests pointed out by Pesetsky (1995) and discussed in section 4.2. However, by attributing binding relations to a level of representation that is entirely separated from the level of representation responsible for movement and coordination phenomena, the CCG approach predicts that movement and coordination should have no effect on binding relations. This conclusion is probably too strong, for a number of reasons.

First, there are instances of *wh*-movement that bleed Condition C. Relative clause modifiers of *wh*-phrases that induce Condition C violations when in situ (106a) fail to induce Condition C violations when the entire *wh*-phrase is fronted (106b) (Freidin 1986, Lebeaux 1988). On the assumption that the in-situ *wh*-phrase in (106a) and its fronted counterpart in (106b) occupy identical positions in predicate-argument structure, no contrast in acceptability is predicted by CCG.

- (106) a. \*Who thinks that he<sub>i</sub> believes which argument that John<sub>i</sub> made?  
 b. Which argument that John<sub>i</sub> made does somebody think that he<sub>i</sub> believes?

Second, the literature on scrambling operations in free word order languages shows that many instances of scrambling feed or bleed binding constraints (Webelhuth 1989, 1992, Mahajan 1990, Saito 1992).

While it should be straightforward for a CCG theory to account for the noninteraction of predicate-fronting processes with tests of scope and binding (section 4.2), it should be correspondingly difficult for such a theory to account for the interaction of VP-ellipsis processes with scope and binding (section 4.3). If we assume that in CCG ellipsis targets the same kinds of surface structure constituents targeted in VP-fronting, a CCG approach would predict scope and binding to be equally independent in VP-fronting and VP-ellipsis. Section 4.3.1 shows that such a prediction would be incorrect. On the other hand, if we assume that in CCG ellipsis targets the constituents of the predicate-argument structure representations used to represent binding relations, the wrong results still obtain. Section 4.3.2 showed that comparative ellipsis sometimes interacts with scope and binding possibilities, and sometimes does not. We have seen that these interactions between processes can be explained in terms of the stages of a derivation that each syntactic process targets. Therefore, the manner in which Steedman captures the asymmetry between constituency and *c*-command in CCG appears to impose too strong an independence between syntactic

processes that refer to constituents (movement, coordination) and syntactic processes that refer to c-command relations (binding, scope). Assigning ellipsis to either of these two categories creates problems.

A CCG approach also predicts interactions between processes that do not seem to occur. Steedman (2000a,b) shows that CCG flexible constituency allows for close matches between syntactic and phonological constituency in examples like (107). The relevant constituent structure can be derived by a combination of type raising and function composition, as in (105). Such matches between syntactic and phonological constituency are a distinct advantage of CCG, since they are unavailable in standard phrase structure grammars.

- (107) What city does Francine like most, and what city does she not like at all?  
(Francine LIKES) (SEATTLE) . . .

Since the same constituent structure is responsible for prosodic phrasing and coordination in CCG, it should be impossible to coordinate the VP *likes Seattle* in a sentence that has the prosodic structure in (107), since it does not correspond to a constituent. However, this coordination *is* possible, as (108) shows.<sup>36</sup>

- (108) What city does Francine like most, and what city does she not like at all?  
(Francine LIKES) (SEATTLE), and (HATES) (BOSTON)

Such contrasts between prosodic structure and coordination are predicted under the incremental structure-building approach proposed here. The creation of a subject-verb constituent at an early point in a derivation does not block the existence of a verb-object constituent at a later stage in the derivation. Although I have not provided a detailed account of prosodic constituency here, it is possible to show that the constituency of incremental derivations allows for a close match between syntactic and phonological constituency (Phillips 1996, Guimaraes 1999).

In general, CCG provides the tools needed to describe many different constituents, probably all that are needed; and it also has mechanisms that block reference to strings that should never be treated as constituents. But the CCG approach makes rather different predictions from the Incrementality Hypothesis about the range of constituents that individual syntactic processes may refer to.

It should also be noted that the flexible constituency allowed by CCG has the effect of allowing incremental left-to-right structure building. However, CCG derivations add constituents monotonically, meaning that structure building always creates new constituents and never destroys existing constituents, with the consequence that left-to-right derivations in CCG are forced to

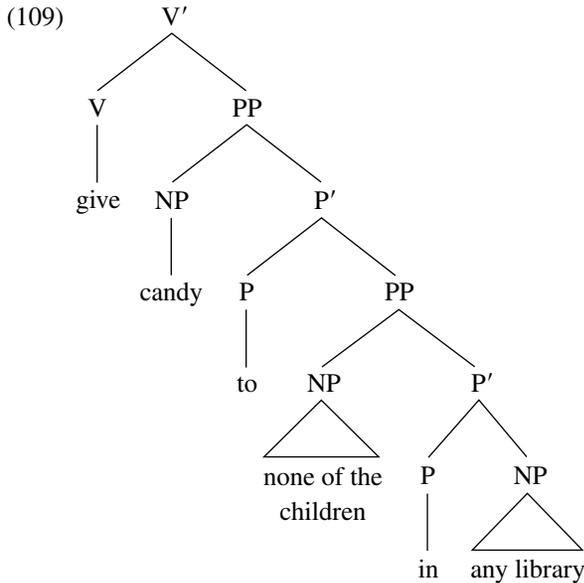
<sup>36</sup> Note that although CCG blocks VP-coordination in a sentence with the prosodic *structure* of (107), it does not necessarily block VP-coordination in a sentence with the prosodic *form* of (107). Steedman (2000a:679, fn. 36) explicitly acknowledges examples like (108) and suggests that they may arise from an alternative prosodic structure in which the subject and the verb do not form a prosodic constituent, thereby allowing the VP-coordination. In support of this analysis, Steedman argues that the Rhythm Rule (Selkirk 1981, Gussenhoven 1983) does not apply to the subject in examples like (108), shifting stress leftward to the first syllable of the name. I disagree with this observation. The fact that stress *can* be shifted to the first syllable of *Francine* in (108) shows that the indicated prosodic bracketing is sometimes needed.

yield the equivalent of left-branching structures, as the derivations in (102) and (105) illustrate. It is therefore impossible in CCG to incrementally construct a right-branching structure from left to right. Thus, both incrementality and nonstandard constituents are available in CCG—just as they are in the approach presented here—but in CCG these two features are mutually incompatible.

## 5.2 *Parallel Structures*

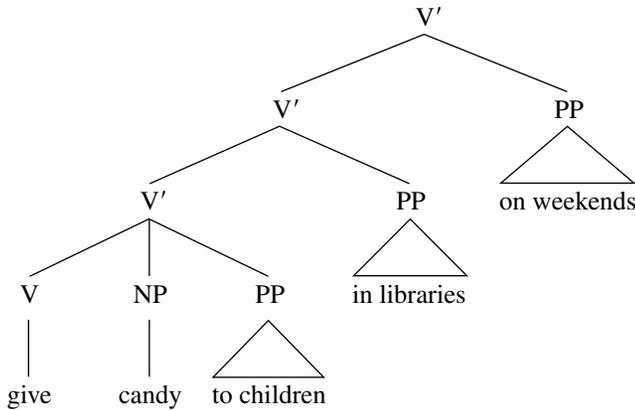
Pesetsky (1995) presents an account of constituency conflicts in a transformational phrase structure grammar framework. As in CCG approaches, Pesetsky assumes that discrepancies in the results of different constituency tests indicate that individual sentences have more than one phrase structure. However, in contrast to the flexible constituency of CCG approaches, Pesetsky assumes a narrower version of flexible constituency in which every sentence has exactly two constituent structures and in which differences are restricted to the internal structure of VP.

The first mode of representation in Pesetsky's theory is right-branching Cascade VP structures like (109).



These structures are strictly binary branching, and they are just like the structures that I assume here, except that Cascade structures do not contain multiple copies of the verbal head. The second mode of representation is left-branching Layered VP structures like (110). These structures are also binary branching, except that arguments in multiple complement constructions are assumed to be daughters of an n-ary branching V' constituent. Pesetsky assumes that both structures are represented for all sentences and that there is a fixed division of labor between the two representations, such that one set of syntactic processes refers to the constituents of Cascade structures and another set of processes refers to the constituents of Layered structures (111).

(110)



- (111) a. *Layered Syntax*: XP-movement, island conditions on XP-movement, XP-ellipsis, interpretation of modification relations  
 b. *Cascade Syntax*: everything else (binding, polarity item licensing, coordination, etc.)

An important contribution of Pesetsky’s theory is the idea that the differences among syntactic processes are systematic and that the structures they refer to may be divided into a small number of classes. The approach proposed here builds upon the notion that differences between structural diagnostics are systematic. However, Pesetsky’s theory has a number of limitations.

First, I have assumed here that constituency conflicts may arise anywhere in a sentence where a constituent formed during the course of structure building does not survive to the final completed structure for the sentence. This allows, for example, for a subject-verb constituent to be formed to the exclusion of the direct object, while still allowing a negative quantifier in subject position to license a polarity item in object position, implying that the subject c-commands the object (112). In Pesetsky’s approach, however, constituency conflicts are predicted to be restricted to VP.<sup>37</sup>

- (112) Few people liked and nobody really enjoyed any of the dishes that Harold had spent all day preparing.

Second, like CCG approaches, Pesetsky’s theory takes the different structures that yield constituency conflicts to be independent representations, and therefore interactions between different processes are unexpected. Pesetsky’s approach is ideally suited to accounting for the facts discussed in section 4.2, which show apparent simultaneous evidence for left-branching and right-branching VP structure; but for the same reason, it fails to predict that VP-ellipsis should bleed scope and binding possibilities.

<sup>37</sup> It would of course be possible to account for examples like (112) in Pesetsky’s approach by adopting a traditional analysis of RNR as disguised clausal coordination.

One aspect of Pesetsky's Layered Syntax representations that is incorporated into the current theory is the assumption that there is a difference between strictly subcategorized arguments and other VP-internal phrases. In both theories this difference allows an account of argument/adjunct contrasts in the possibility of stranding in VP-fronting and VP-ellipsis. However, section 4.6 showed that the constraint blocking argument stranding in VP-ellipsis is escaped in certain forms of comparative ellipsis, precisely where predicted by the Incrementality Hypothesis. Since the block on argument stranding is 'hardwired' into Pesetsky's Layered structures, it is unlikely that the special status of comparative ellipsis could be captured.

Finally, and perhaps most importantly, although Pesetsky's system makes the important contribution of systematizing different constituency tests according to the kinds of structures that they refer to, it remains somewhat arbitrary *why* particular tests yield the specific results that they do. In contrast, I have attempted to show here that the kinds of structures that a given diagnostic picks out are to a large extent predictable from the way in which the diagnostic applies.

## 6 Conclusion

What I have tried to do here is develop a general theory of constituency and constituency diagnostics, with the goal of explaining why different tests work the way they do and why they often produce contrasting or even conflicting results. Although many theories have dealt with some of the contrasts between different structural diagnostics, I know of no general predictive theory of what these contrasts are and why they exist.

The critical ingredient of the theory proposed here is the claim that syntactic structures are built up incrementally by the grammar, in a strictly left-to-right order. The effect of this for constituency is that there are strings that are constituents at some point during a syntactic derivation, but are not constituents at later stages of the derivation. This, in turn, restricts the range of constituents that a given structural test can see: only strings that are constituents at the point when the test applies can be seen by that test. On the basis of differences in which derivational stages individual syntactic processes can see, we can explain a substantial amount of the variation among constituency diagnostics. The list in (113) summarizes the main results explained by the Incrementality Hypothesis here.

- (113) a. Coordination is a more liberal diagnostic of constituency than other processes (section 4.1).  
 b. Verb + preposition sequences can be coordinated but resist pseudogapping (section 4.1).  
 c. VP-ellipsis bleeds scope/binding possibilities; VP-fronting does not (sections 4.2 and 4.3).  
 d. Comparative ellipsis both does and does not bleed scope/binding possibilities, depending on word order (section 4.3).  
 e. Conjuncts in noncoordinate RNR may undergo movement, provided that all movement precedes addition of shared material (section 4.4).  
 f. C-command tests do not give rise to constituency conflicts (section 4.5).

- g. Argument stranding is disallowed in VP-fronting and VP-ellipsis, but not in comparative ellipsis and RNR (section 4.6).

As a result, not only can we explain constituency conflicts without recourse to flexible constituency—thereby retaining the assumption of a single structure for any given sentence—we can also explain where we expect to observe constituency conflicts and where we do not expect to find them. Furthermore, we can do this without assuming any principled difference between tests, in contrast to other accounts of constituency conflicts. In an incremental derivation, the differences between constituency tests simply follow from the differences in when the tests apply.

Finally, it should not be forgotten that incremental left-to-right structure building is a mechanism that is already extremely well motivated from studies of language production and comprehension (e.g., Marslen-Wilson 1975, Frazier 1978, Levelt 1989, Tanenhaus et al. 1995, Ferreira 1996). An incremental left-to-right structure-building mechanism is therefore a necessary component of the language faculty, independent of the grammatical considerations raised here. It should also be noted that the nonincrementality of standard models of grammar provided one of the primary arguments for separation of grammatical and processing systems in the 1960s and 1970s (see Fodor, Bever, and Garrett 1974, Levelt 1974). If the current proposal is correct, then this particular argument for separation of grammar and processing systems disappears.

From the perspective of a general theory of the language faculty, therefore, the innovation of left-to-right structure building is not really an innovation at all; it is something that we already know to be available. All that is novel here is the claim that this property of syntax does rather more explanatory work than is generally assumed.

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*Department of Linguistics*  
*University of Maryland*  
*1401 Marie Mount Hall*  
*College Park, Maryland 20742*  
*colin@glue.umd.edu*