Merge Right: An Approach to Constituency Conflicts[*]

Colin Phillips
Massachusetts Institute of Technology

1. Introduction

This paper argues that well-known conflicts between the results of different syntactic constituency tests do not arise if it is assumed that phrase markers are incrementally built from left-to-right, as dictated by the condition MERGE RIGHT. I show that results which have been taken to motivate the existence of both left-branching and right-branching structures for all sentences can be captured in the single left-to-right derivation of a radically right-branching structure. This approach not only avoids the need to posit flexible constituency (Dowty 1988, Pickering & Barry 1993, Steedman 1985, in press) or multiple surface structures (Pesetsky 1995), it also makes it possible to predict the results of different constituency tests based on their linearity properties, and therefore explains *why* constituency diagnostics often give the appearance of contradicting one another.

## 2. The Problem of Contradictory Constituency

It is a well-known fact that the results of different diagnostics of constituency often contradict one another's results. Consider the sentence in (1), and the constituency tests that have been applied to it in (2) and (3). The tests of negative polarity item licensing and coordination in (4–5) point to an extremely *right-branching* VP-structure, such as in (4), given the standard assumptions that NPI licensing requires c-command and that only

constituents can be coordinated. This structure corresponds to the CASCADE structures proposed in Pesetsky 1995.

(1)   John gives candy to children in libraries on weekends

(2)   a.   John gave nothing to any of the children in the library on his birthday.
      b.   John gave candy to none of the children in any library on his birthday.
      c.   John gave candy to children in no library on any public holiday.
      d. * John gave anything to none of the children in the library on his birthday.
      e. * John gave candy to any of the children in no library on his birthday.

(3)   a.   John gives [candy to children on weekends] and [money to homeless people on weekdays.]
      b.   John gives money [to children on weekends] and [to homeless people on weekdays.]
      c.   John gives candy to [children on weekends] and [homeless people on weekdays.]

(4)
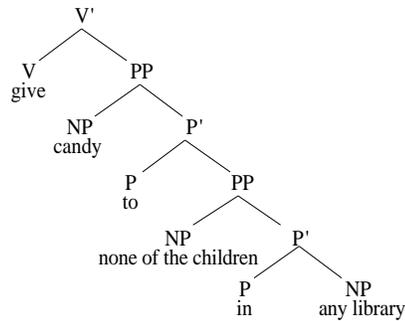
    Contrasting with the evidence for right-branching structures, the VP-fronting examples in (5) point to a left-branching structure for the very same VP (6). The basic generalization in this case is that any string of phrases starting from the *left* edge of VP can be fronted (5a–d).

(5)   John intended to give candy to children in libraries on weekends, ...
      a.   ... and [give candy to children in libraries on weekends] he did.
      b.   ... and [give candy to children in libraries] he did on weekends.
      c.   ... and [give candy to children] he did in libraries on weekends.

d.　　... and [give candy] he did to children in libraries on weekends.

(6)

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                              V'
                          ╱       ╲
                        V'          PP
                     ╱     ╲     on weekends
                   V'        PP
                ╱     ╲   in libraries
              V'        PP
           ╱     ╲   to children
         V          NP
       give       candy
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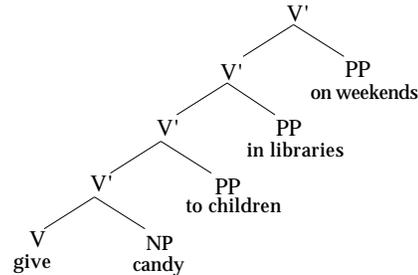
At this point I should highlight a critical step in the reasoning that leads from the results of the movement test in (5) to the left-branching structure in (6). What the test shows is that *give candy* is a constituent, that *give candy to children* is a constituent, that *give candy to children in libraries* is a constituent, and so on. The standard and most straightforward way of representing the fact that each of these strings is a constituent is to assign them the nested, left-branching structure in (6). But this inference is by no means necessary, as the next section shows.

3. Constituency in Structure Building

Consider what happens if we assume that syntactic structures are built in a strictly left-to-right fashion, so that new material is always added at the right-hand edge of a tree.[1] Let us assume that this requirement is imposed by the condition MERGE RIGHT, given in (7).

(7)　　　　MERGE RIGHT
　　　　　　New items must be introduced at the right edge of a structure.

I also assume that structure building is constrained by the condition BRANCH RIGHT, which forces structures to be as right-branching as possible.[2]

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[1] This approach contrasts with the more bottom-up derivations of phrase markers proposed in Chomsky 1995.

[2] By 'right-branching' I mean a structure in which there is complete correspondence between precedence relations among terminal elements and c-command relations among terminal elements. While complete correspondence between precedence and c-command relations is the extreme situation, we can talk about one structuring of a given set of terminals as being *more right-branching* than another structuring of the same set of elements if there is *greater* correspondence between precedence and c-command relations among terminals.

(8)   BRANCH RIGHT[3]
        Where a terminal can be attached to more than one position in the existing structure with no effect on interpretation, the attachment that results in the more right-branching structure must be chosen.

(9) shows the steps involved in building the complex VP from the sentence in (1) from left-to-right. The derivation of the VP begins with the verb *give* in (9a). The verb does not project until the noun phrase *candy* is merged to the right of the verb as its sister. At this point in the derivation the verb may discharge one of its theta roles to the NP.

(9)   a.   b.

                                                           VP
                                                          / \
          V(P)   V   NP
          give   give   candy

The next step in the derivation involves the addition of the PP *to children*, and is shown in (9c–e). The PP could in principle be merged with the constituent *give candy* in (9b) to form the structure [[give candy] to children]. However, there is an alternative way of adding the PP to the structure which receives the same interpretation and is more right-branching, and therefore is preferred by Branch Right. First a null copy of the verb *give* is generated, which merges at the right of the phrase marker as the sister of the NP *candy* (9c). This null copy of *give* is then projected to create an attachment site for the preposition *to* (9d). Then the preposition *to* is projected to allow attachment of the NP *children* as its sister (9e). At this point in the derivation the thematic relations between the V and the PP and between the P and the NP may be discharged under sisterhood.

(9)   c.   d.   e.
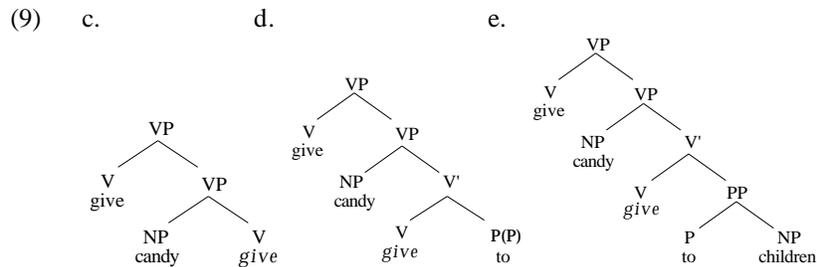
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        [3]   See Phillips 1995, Phillips & Gibson *to appear* for evidence that a condition essentially the same as Branch Right can account for a wide variety of structural biases in sentence parsing. Branch Right is closely related to the principle of *Right Association* proposed by Kimball 1973 to account for the preferred low attachment resolution of ambiguities like *John said that Bill left yesterday*.

The steps involved in the addition of additional adverbial PPs are shown in abbreviated form in (9f–g). As in (9c–e) the adverbial PPs are merged with the existing phrase marker in such a way as to maximize precedence/c-command correspondences, in accordance with Branch Right.

(9) f.   g.

Therefore, the structure that emerges is very similar to the radically right-branching Cascade structures proposed by Pesetsky 1995. However, by building right-branching phrase markers from left-to-right, the Merge Right system does not require the left-branching LAYERED SYNTAX representations that form the second part of Pesetsky's Dual System. This is because all of the strings that are constituents in left-branching structures are constituents in the derivation of the right-branching structure (although these strings are not always constituents in the final structure). For example, *give candy* is a constituent in (9b), but is no longer a constituent from (9c) onwards.

Derivations such as (9) therefore make it possible to describe contradictory constituency effects without adopting a parallel structure or flexible constituency theory of syntax. More interestingly, though, this approach to constituency generates a series of novel predictions about the relation between structural diagnostics and their results.

The first prediction derives from the fact that although constituency can change over the course of a derivation, c-command relations are never destroyed once they have been created. This means that we should *not* expect to find conflicts among structural diagnostics which probe for c-command relations. Given the effects of Branch Right we expect that c-command tests will almost exclusively diagnose right-branching structures.

(10)   PREDICTION I
          Constituency changes during the course of a derivation, c-command relations do not. Therefore, tests involving c-command relations should not conflict with one another.

This prediction is borne out by the results of c-command tests such as anaphor binding, polarity item licensing (cf. (2) above), bound variable anaphora, weak crossover and superiority. As shown by Barss & Lasnik 1986, Jackendoff 1990, Stroik 1990, and Pesetsky 1995 for a variety of complex VP constructions, these tests all point to right-branching structures. Since the relevant examples are relatively well-known I do not repeat them here, and refer the reader to the works cited for extensive discussion.[4]

The second and third predictions derive from the fact that although left-edge constituents are constituents during the derivation of a right-branching structure, these constituents are often destroyed once material is added on their right. Once a left-edge constituent has been destroyed, it should be impossible to refer to it at any subsequent point in the derivation. This implies Prediction II, which is tested in Section 4.

(11)   PREDICTION II
         Left-edge constituents are destroyed when material is added on the right. Therefore, evidence for left-edge constituents should be restricted to relations established before the constituency-destroying material is added on the right.

Prediction III extends this logic to constructions which impose parallelism requirements across two conjuncts. Since parallelism constraints can be checked no earlier than during the construction of the second conjunct, they should only be able to apply to the *final* properties of the first conjunct, and should not have access to any properties of the first conjunct which were destroyed in the course of its derivation. A consequence of this is that contradictory constituency effects should be blocked in constructions requiring parallelism across two conjuncts.

(12)   PREDICTION III
         Parallelism requirements should block contradictory constituency effects.

Section 5 argues that this prediction is correct, based on a contrast between movement and ellipsis constructions.

4. Linear Order and Left-edge Constituents

VP-fronting constructions appear to support the existence of a left-branching structure for VP, because strings starting at the left-edge of VP

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[4] A possible exception to this generalization involves the relative scope of multiple postverbal modifiers, which have been claimed to show obligatory right-to-left scope (Andrews 1983, Ernst 1994, Pesetsky 1995). See Phillips 1996 for discussion of these cases and reasons to doubt the scope generalization.

can be fronted, stranding material on the right-hand side of VP. The relevant examples were already presented in (5) in Section 2.

The examples in (13), taken from Pesetsky 1995 (p.230) are like the examples in (5), except that a pronoun in the fronted portion of VP binds a reciprocal in the stranded part of VP. This kind of binding relation is what we would expect to find if the fronted portion of VP were in its *unfronted* position, and if the entire VP were right-branching.

(13)   a.   ...and [give the book to them$_i$ in the garden] he did ___ on each other$_i$'s birthdays.

          b.   ...and [give the book to them$_i$] he did ___ in the garden on each other$_i$'s birthdays.

(14) shows how these apparently contradictory facts can be captured in the left-to-right derivation of a right-branching structure. In (14a) the fronted portion of VP is first built, in its fronted position. It is internally right-branching, and is the result of a derivation like (9a–e) above. Next, in (14b) and (14c), the subject and *do* are added to the structure, and a null copy of the fronted VP is inserted in the base position of the VP. I assume that the movement chain is licensed at this point in the derivation, and not later. Subsequently in (14d), the temporal adverbial *on each others birthdays* is added to the right of VP. The adverbial is inserted at the bottom of a right-branching VP, both creating the c-command relation necessary to license the reciprocal binding relationship, destroying the constituency of the crossed-out string *give the book to them*.

(14)   a.   ... and [give [the book [to them]]]

          b.   ... and [give [the book [to them]]] he did

          c.   ... and [give [the book [to them]]] he did [~~give [the book [to them]]~~]

          d.   ... and [give [the book [to them]]] he did [~~give [the book [to~~ [~~them~~ [on each other's birthdays]]]]]
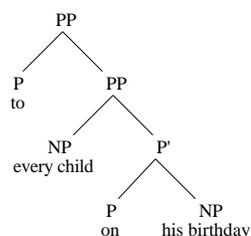
It is important to note that this way of achieving the effects of contradictory constituency from a single derivation is crucially dependent on the left-to-right character of the derivations that I am assuming here. In a derivation in which movement was upwards, the entire right-branching VP would be built before the VP-fronting operation could apply. But this would mean that by the time the VP-fronting operation could apply, the portion of VP that is fronted in (14) would no longer be a constituent, and therefore would not be able to move.

The interaction of binding and movement processes involving PPs shows a conflict similar to what we have seen with VPs, but with an interesting additional twist.

As we have already seen in (2) above, the binding properties of noun phrases inside PPs motivate right-branching structures in which the NP is

not the sister of the preposition that selects it, and instead forms a constituent with the category that follows it. (15) shows the structure of a 'split' PP.

(15)

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              PP
             /  \
           P      PP
           to    /  \
               NP     P'
          every child / \
                     P    NP
                     on  his birthday
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A P-NP combination that has been split up in the manner shown in (15) is not a constituent, and therefore should not be a candidate for movement. Clearly, though, leftward movement of PPs presents no problems, as the examples in (16) indicate, implying that the P-NP combination *is* a constituent after all. Moreover, the kind of binding out of a PP which motivated the PP-splitting structures is still possible when the PP containing the binder is fronted.

(16) a. To each of the girls$_i$ John gave money for her$_i$ college fees.
      b. To which pair of boys$_i$ did John accidentally give money on each other$_i$'s birthdays?

The interaction of movement and binding with PPs thus gives rise to the same constituency contradiction that we saw with VP-fronting. The apparent contradiction can be explained in exactly the same way that the VP-fronting facts were explained, because both links of the movement chain can be established prior to the addition of the phrase that leads to PP-splitting and the creation of the c-command relation required for binding. The relevant steps of the derivation of sentence (16a) are given in (17).

(17) a. [to [each of the girls]]
      b. [to [each of the girls]] John gave money
      c. [to [each of the girls]] John gave money [~~to [each of the girls~~]]
      d. [to [each of the girls]] John gave money [~~to [[each of the girls~~] for her college fees]]

Thus far the PP movement facts are entirely parallel to the VP-fronting facts in (13). However, we have not yet directly tested the prediction that once a constituent is destroyed it cannot be referred to again later in the derivation. This prediction can be tested with PPs, since PPs can be moved both leftwards and rightwards (i.e. Heavy PP Shift). For the purposes of

this discussion it does not matter whether Heavy Shift is assumed to be upward or downward movement.

Now consider the structure in (15), repeated below as (18a).

(18)   a.   b.
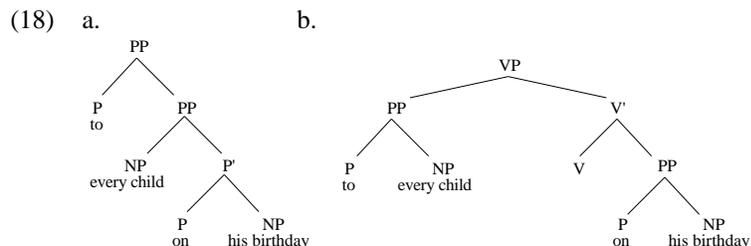
Structure (18a) is quite consistent with *leftward* movement of the PP *to every child*, because PP-splitting occurs only after the movement chain has been completed. But structure (18a) should be incompatible with *rightward* movement of the PP *to every child* across the PP *on his birthday*, because it is not a constituent at the point when rightward movement would occur.

If, on the other hand, the PP fails to undergo PP-splitting and remains a constituent when a subsequent PP enters the derivation, yielding the slightly less right-branching VP-structure in (18b), then the PP should be fully capable of participating in a rightward movement chain. The price of failing to undergo PP-splitting, however, is that the NP *every child* should no longer be able to act as a binder, because it cannot c-command out of PP. This prediction appears to be correct, as the following examples show.

(19) shows that Heavy NP Shift allows 'reconstruction' effects for the purposes of binding, using an example from Baltin & Postal 1996. (20) and (21) show that when a PP that allows binding when *in-situ* (20a, 21a) undergoes Heavy PP Shift, the binding is no longer possible, as expected under the Merge Right approach to constituency.

(19)   a.   I described [the victim whose sight had been impaired by the explosion] to himself.
       b.   I described ___ to himself [the victim whose sight had been impaired by the explosion].

(20)   a.   I gave money to every boy on his birthday.
       b.   * I gave money ___ on his birthday to every boy who had helped me clean the yard.

(21)   a.   I gave money to the boys for themselves.
       b.   * I gave money ___ for themselves to the boys who had helped me clean the yard.

5. Constituency Conflicts and Parallelism

This section demonstrates a contrast between VP-fronting constructions and VP-ellipsis constructions. The two constructions are superficially similar, in that they involve replacement of a VP by *do* and allow stranding of adverbial phrases. The puzzle is that while the VP-fronting construction (VPF) shows contradictory constituency effects, as Section 4 showed, the VP-ellipsis (VPE) construction does not.

Both VPF and VPE allow fronting/ellipsis of strings of phrases starting at the left edge of VP, and stranding of material from the right edge of VP. Examples are shown in (22–23).

(22) a. ... and [give candy to children in libraries on weekends] he did.
b. ... and [give candy to children in libraries] he did on weekends.
c. ... and [give candy to children] he did in libraries on weekends.
d. ... and [give candy] he did to children in libraries on weekends.

(23) a. John gives candy to children in libraries on weekends, and Mary does (too).
b. John gives candy to children in libraries on weekends and Mary does on federal holidays.
c. John gives candy to children in libraries on weekends and Mary does in urban parks on federal holidays.

Both VPF and VPE show evidence for right-branching structure *within* the fronted/elided portion of VP, as shown in (24–25) in which no VP-material is stranded.

(24) a. ... and [introduce the children$_i$ to each other$_i$] the teacher proceeded to do.
b. ... and [congratulate everybody$_i$ on his$_i$ birthday] he did.

(25) a. The principal introduced the children$_i$ to each other$_i$, and then the teacher did (too).
b. The boss congratulated everybody$_i$ on his$_i$ birthday, and the receptionist did (too).

Thus far VPF and VPE are identical. However, the constructions differ with respect to the relations they allow between the fronted/elided portion of VP and the stranded VP-material. The examples in (26) show that the fronted portion of VP has the binding properties that it would have if it were *in-situ* in a right-branching VP. Material in the fronted portion of VP is able to bind reciprocals or bound variable pronouns in the stranded portion of VP (26a–b), and a quantificational direct object is able to take wide scope with respect to a stranded adverbial, as demonstrated by the availability of a distributive reading for (26c).

(26) a. John said he would give books to them$_i$,
          ... and give books to them$_i$ he did on each other$_i$'s birthdays.
      b. Mary said she would congratulate every boy$_i$,
          ... and congratulate every boy$_i$ she did at his$_i$ graduation.
      c. John said he would read every book,
          ... and read every book he did at breakneck speed.

In corresponding examples involving VPE, on the other hand, we do not find the effects of right-branching structure seen for VPF in (26). Material inside the elided portion of VP is not able to license anaphors or bound variables in the stranded portion of VP, as (27a–b) show.

(27) a. * John gave books to them$_i$ on each other$_i$'s birthdays, and Mary did on each other$_i$'s first day of school.
      b. * Mary congratulated every boy$_i$ at his$_i$ graduation, and Sue did at his$_i$ 21st birthday party.

In VPE a stranded adverbial must take wide scope with respect to an elided object NP. The single clause in (28a) allows both a collective reading in which it is the reading of all of the books which took place quickly, or a distributive reading, in which the reading of each individual book was fast. When sentences like (28a) are embedded in a VP-ellipsis context, though, the only possible reading for (28b) is the collective reading, in which what was quick (or slow) was the reading of the entire set of books, and not individual book-readings.
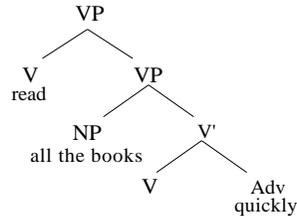
(84) a. Mary finished every book quickly.   (ambiguous)
      b. Mary finished every book quickly, and John did slowly.
                                        (collective reading only)

This loss of ambiguity is particularly striking because it involves the loss of the reading that is generally *preferred* in the simple sentence in (28a), with the consequence that many speakers experience a 'garden path' kind of misanalysis when they first read through examples like (28b).[5]
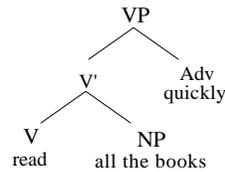
I assume that the two scopal readings available in (28a) are associated with the two VP structures in (29). The distributive reading is obtained when the object c-commands the adverbial (29a), and the collective reading is obtained when the adverbial c-commands the object (29b).

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[5] More familiar instances showing loss of scopal readings in ellipsis involve the loss of the reading that is dispreferred in simple sentences (cf. Sag 1976, Fox 1995 and references cited therein).

(29) a.   b.

VP
├ V
│ read
└ VP
   ├ NP
   │ all the books
   └ V'
      ├ V
      └ Adv
         quickly

VP
├ V'
│ ├ V
│ │ read
│ └ NP
│   all the books
└ Adv
   quickly

Therefore, a fronted partial VP has the binding properties that it would have if it was *in-situ* in its underlying position and formed part of a *right-branching* VP structure. An elided partial VP, on the other hand, has the binding properties that it would have if it was replaced in its underlying position and formed a part of a more *left-branching* VP.

Section 4 already showed how I assume that contradictory constituency effects are made possible in VPF constructions. The derivation is repeated in (30).

(30) a.   ... and [give [the book [to them]]]
      b.   ... and [give [the book [to them]]] he did
      c.   ... and [give [the book [to them]]] he did [give [the book [to them]]]
      d.   ... and [give [the book [to them]]] he did [give [the book [to [them [on each other's birthdays]]]]]

Because the movement chain is completed before the binding relation is established in the derivation in (30), we can resolve the apparent contradiction between the kinds of partial VPs that can be fronted, which give the appearance of a left-branching structure, and the possibility of the scope and binding relations of a right-branching structure.

Next consider what happens if we try to derive similar effects in VPE. I focus on the loss of the distributive scope reading shown in (28b), but the analysis applies equally to the impossibility of binding relations shown in (27). In a strictly left-to-right derivation the first conjunct of the VPE construction will be built in its entirety before the second conjunct is built. Let us suppose that there are two possible ways of deriving the first conjunct, corresponding to the two structures in (29). Just as I assumed that only *constituents* of VP may be fronted (although they need not be *final* constituents), I adopt the standard assumption that only constituents may undergo ellipsis, and that they must also be identical to a constituent of VP in the first conjunct.

If a left-branching VP like (29b) is formed in the first conjunct then the verb and the direct object form a constituent in the final structure for that conjunct. Therefore, ellipsis of the verb and the direct object will be licensed in the second conjunct when it is built.

If, on the other hand, a right-branching VP is formed in the first conjunct (29a), then the verb and the direct object will not form a constituent in the final structure of the first conjunct, and therefore they will not be a candidate for ellipsis in the second conjunct. The fact that the verb and the direct object in the first conjunct *had* been a constituent at an earlier point in the derivation is irrelevant, because this stage in the derivation is invisible at the point where the constituency condition on ellipsis applies.

Therefore, only the left-branching VP (29a) licenses VP-ellipsis, and this is why left-to-right binding relations are impossible between an elided VP and stranded material (cf. 27) and why only the collective reading is available in examples like (28b).

If this characterization of the contrast between VP-fronting and VP-ellipsis is correct, then it provides one of the strongest pieces of evidence in favor of the Merge Right approach to structure building. There are ways of accounting for the VPE facts *or* the VPF facts in a theory with bottom-to-top derivations or no derivations at all, but the contrast between VPE and VPF will be extremely difficult to capture.

However, I have not yet ruled out the possibility that there is some other difference between fronting and ellipsis which allows c-command from the null portion of VP into the stranded portion of VP in VPF, but not in VPE. If this is what is responsible for the contrast, then it would just be an accident that the stranded portion of VP that we are interested in is present in the first conjunct in VPE but not in VPF.

A slightly different variety of VP-ellipsis makes it possible to show that the presence of the adverbial in the first conjunct is the crucial factor in allowing or blocking effects of right-branching structures in the second conjunct, rather than some independent difference between VPF and VPE. This is Antecedent Contained Deletion (ACD) in comparative constructions,[6] which allows for an adverbial stranded by ellipsis to be either present or absent in the antecedent VP, as shown by (31).[7]

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

The Merge Right approach to structure building predicts that the presence or absence of the adverbial in the main clause should affect the availability of right-branching VP structures, leading to just the same contrast as was observed between VPE and VPF. Only when the adverbial is absent from the first conjunct should it be possible to find evidence for a

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[6] See Wold 1995 for a proposal for how ACD in comparatives is interpreted.

[7] The relevant reading that I focus on for sentences like (31a) is one in which the adverbial that is stranded in the second conjunct is construed with *both* conjuncts.

right-branching VP structure in the second conjunct. This prediction is confirmed by the examples in (32–33).

(32) a. John read as many books as Bill did in a week.
           (collective and distributive readings both OK)
     b. John read as many books in a week as Bill did in a month.
           (collective reading OK, distributive reading impossible)

(33) a. (?) John met as many students$_i$ as Bill did when they$_i$ were first entering the university.
     b. * John met as many students$_i$ when they$_i$ were first entering the university as Bill did when they$_j$ were graduating.

The possibility of a distributive reading in (32a) and the possibility of pronoun binding in (33a) indicates that 'reconstruction' into right-branching VP structures is not excluded in ellipsis constructions. Given this, the fact that adding an adverbial to the first conjunct blocks the distributive reading in (32b) and renders pronoun binding in (33b) impossible lends further support to the Merge Right account of the contrast between VPE and VPF. Since the same contrast that we observed between VPE and VPF is also found internal to ACD comparative ellipsis constructions, then we can rule out the possibility that the VPE/VPF contrast is due to some as yet unspecified difference between fronting and ellipsis.

6. Conclusion

I have presented a number of reasons in support of adopting the condition Merge Right as a principle of grammar. The arguments have all been based on the claim that left-to-right derivations of phrase markers provide a better account of constituency facts in English than is otherwise available. First, because of the way in which constituency changes over the course of building a right-branching structure, it is possible to describe the conflicting results of different constituency tests, without needing to posit multiple parallel representations for all sentences. Second, and more importantly, the strictly ordered derivations proposed here make clear predictions about when in a derivation different kinds of constituents should be available, and therefore also which kinds of diagnostics should be able to refer to which kinds of constituents. This makes it possible to explain *why* different kinds of constituency diagnostics yield apparently conflicting results.

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