PP Extraposition and the Order of Adverbials in English

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In English, adverbials may intervene between the verb and a selected PP. We consider a range of analyses of this fact. The traditional account is that the PP shifts rightward across a right-adjoined adverbial (Stowell 1981). An alternative account is that the verb moves leftward across a left-adjoined adverbial (Pesetsky 1989, Johnson 1991). A third possibility is a hybrid account that assumes both extraposition and verb raising. Each of these analyses can be implemented in a traditional theory of phrase structure, or in more recent asymmetric/antisymmetric frameworks (Kayne 1994, Haider 2013, Larson 2014). Antisymmetry, for instance, can emulate PP extraposition through roll-up movement around the PP (Abels and Neeleman 2012). We argue that the order of postverbal adverbials favors an extraposition analysis, provided this analysis is combined with the auxiliary hypothesis that certain adverbials can direcly modify other adverbials (Rohrbacher 1994, Williams 2014). We also discuss which version of the extraposition analysis works best, suggesting that its symmetric implementation has the edge.

Keywords: PP extraposition, verb raising, roll-up movement, adverbial hierarchy, scope.

1. Introduction

In English, PP complements may be separated from the verb by adverbials, as (1) shows.

(1)   a.   Susan looked at the telegram pensively.

        b.   Susan looked pensively at the telegram.

The aim of this paper is to determine the source (or sources) of this word order variation. Although the problem appears simple, there is a bewildering array of potential analyses to choose from, depending on one's view of the syntax of adverbials, verbs and PPs, and on the framework the analysis is couched in. All in all, we will consider more than ten accounts.

This means that we must adopt a divide-and-conquer strategy. We will begin, in section 2, by comparing three analyses based on a traditional symmetric theory of phrase structure, that is,

a theory that allows variation in the order of sister nodes. The first analysis assumes extraposition of the PP, the second assumes movement of the verb, and the third is a dual source analysis that assumes both extraposition of the PP and movement of the verb. We argue for the extraposition analysis on the basis of structures containing two adverbials. We show, contra Pesetsky 1989 and in line with Rohrbacher 1994, that in such structures the lower adverbial systematically precedes the higher adverbial, irrespective of the position of the PP (as in (2)). The extraposition analysis provides the simplest account for this pattern.

(2)   V <PP> Adv_{Low} <PP> Adv_{High} <PP>

We then turn, in section 3, to analyses couched in asymmetric theories of phrase structure, that is, theories in which rightward specifiers and rightward adjuncts are ruled out (see Kayne 1994 and Haider 2010, 2013). While a symmetric phrase structure allows a straightforward account of the order of adverbials in (2), asymmetric accounts must assume an additional mechanism. This can be roll-up movement (see Barbiers 1995, Koopman and Szabolcsi 2000 and Cinque 2005, 2010), or a mismatch in the mapping from syntax to semantics (see Larson 2004 and Haider 2004). With these additional mechanisms in place, the order in (1b) can again be derived through variation in the position of the PP, movement of the verb, or both. We will show that, as before, the pattern in (2) favors an account based on variation in the position of the PP – an asymmetric instantiation of the extraposition analysis.

Thus, the data gathered by the end of section 3 favour the extraposition analysis, but cannot be used to force a choice between its symmetric and asymmetric implementations. We therefore consider in section 4 what additional evidence might bear on this choice. This will prompt us to gather additional data regarding adverbials that host a negative polarity item. Our conclusion is these data are best accounted for by the symmetric implementation of the extraposition analysis.

Section 5 explores the implications of this conclusion for the analysis of the English VP.

2. Symmetric accounts of adverbial intervention

2.1 Overview of possible analyses

The traditional account of the alternation in (1), adopted explicitly in Stowell 1981, assumes that the position of the PP varies, either as a result of rightward movement (as in (3b)) or through base generation of the PP above the adverbial (as in (3c)). We will refer to this account as the *extraposition analysis*.

(3)   a.   [[vp V PP] Adv]   b.   [[[vp V *t*pp] Adv] PP]   c.   [vp [V Adv] PP]

An alternative account is to keep the position of the PP constant and to attribute the alternation in (1) to two factors: verb raising and variation in the linearization of the adverb (see (4)). We will call this account the *verb raising analysis*.

(4)   a.   [V [[vp *t*v PP] Adv]]   b.   [V [Adv [vp *t*v PP]]]

A third option is to assume that there are two sources for the order in (1b): extraposition of the PP, as in (3), and raising of the verb, as in (4). We will call this the *mixed analysis*.

The general idea that verb movement may be responsible for the intervention of adverbials between a verb and its complement goes back to Emonds (1978) and Pollock (1989). Its extension to examples like (1b) is due to Johnson (1991) and unpublished, but influential work by Pesetsky (1989).

The main criterion we use to decide between these analysis was first identified in Pesetsky 1989. Pesetsky notes that the extraposition analysis predicts that if more than one adverbial intervenes between verb and PP the lower adverbial should precede the higher one (see (5a)). By contrast, the verb raising analysis predicts that in such sequences the lower adverbial should follow the higher one (see (5b)).

(5)

a. *Verb raising analysis*   b. *Extraposition analysis*
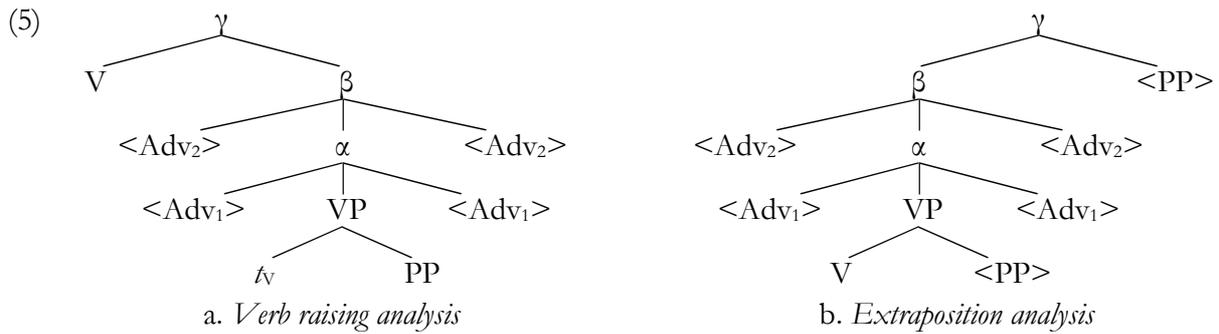
A mixed analysis in principle allows adverbials between verb and PP to surface in either descending or ascending order, depending on whether they are left-adjoined, or right-adjoined and crossed by extraposition:

(6)

Mixed analysis (equal height)
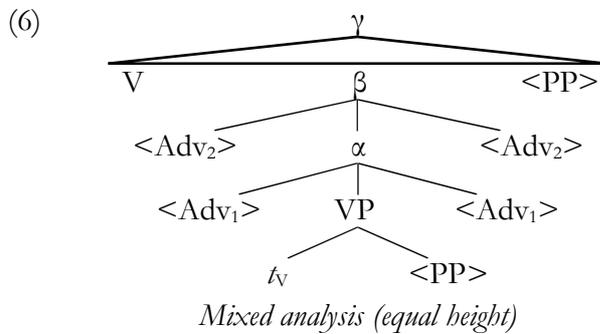
Indeed, if more than two adverbials appear between V and PP, their order could initially be decending and subsequently ascending; (7), which equals (6) with one adverb added, permits Adv_3–Adv_1–Adv_2 and Adv_2–Adv_1–Adv_3:

(7) [V [<Adv_3> [<Adv_2> [<Adv_1> [$_{VP}$ t_V <PP>] <Adv_1>] <Adv_2>] <Adv_3>] <PP>]
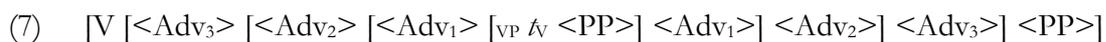
However, it is not a logical necessity that verb and PP move equally high, as in (6). If the PP has access to positions higher than the verb's landing site, there may be high adverbials that must follow other adverbials sandwiched between verb and PP (compare Adv_2 in (8a)). Conversely, if the verb moves higher than the highest position open to the PP, there may be high adverbs that must precede other adverbials in sandwiched adverbial sequences (compare Adv_2 in (8b)).

(8)

a. *Mixed analysis (low V)*   **b.** *Mixed analysis (low PP)*

Tree a (Mixed analysis (low V)):
δ
- γ
  - <Adv$_2$>
  - β
    - V
    - α
      - <Adv$_1$>
      - VP
        - V
        - <PP>
      - <Adv$_1$>
  - <Adv$_2$>
- <PP>

Tree b (Mixed analysis (low PP)):
δ
- V
- γ
  - <Adv$_2$>
  - β
    - α
      - <Adv$_1$>
      - VP
        - t_V
        - <PP>
      - <Adv$_1$>
    - <PP>
  - <Adv$_2$>
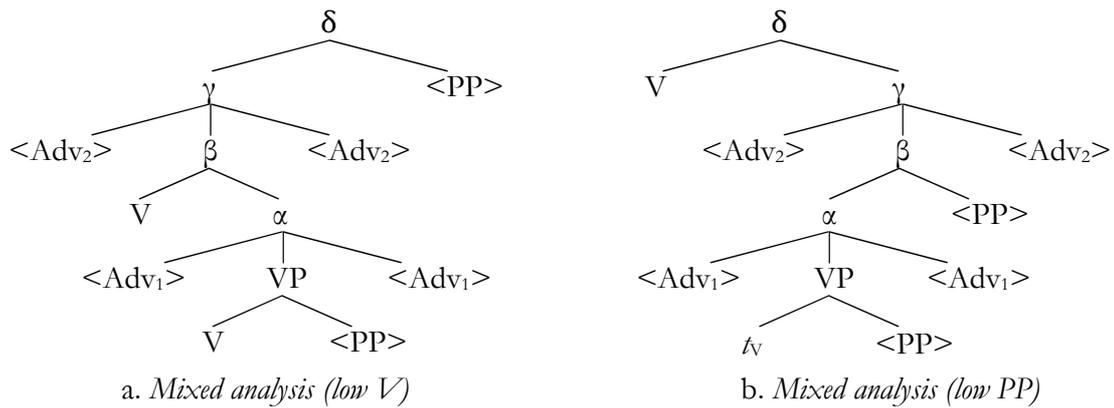
In sum, there is not one, but a family of mixed analyses with varying empirical profiles.

Pesetsky (1989) argues that a mixed analysis is necessary. This conclusion is partly based on examples like *John knocked intentionally twice on the door*, which are ambiguous. On one reading, *intentionally* takes scope over *twice* (by hypothesis as a result of verb movement); on the other *twice* takes scope over *intentionally* (by hypothesis as a result of PP extraposition).

We re-examine this conclusion. One reason for doing so is the existence of analyses not considered by Pesetsky (see in particular section 2.4). Another reason is that sentences involving multiple adverbials are frequently judged as marginal, making informal comparison of different orders challenging. Indeed, various judgments reported in Pesetsky 1989 have been disputed, especially in Rohrbacher 1994, suggesting that a more systematic approach to data gathering is necessary.

In sections 2.2-2.4, we report on several relevant data points involving the order of adverbials and the scopal relations between them. Where we explore adverbial order, we rely on experiments run on Amazon Mechanical Turk (AMT). Such experiments have been shown to be as rigorous as experiments run in a laboratory setting (Sprouse 2011). Aggregated grammaticality judgments from AMT should therefore allow us to compare marginal sentences to other marginal sentences in a reliable way, revealing information that can help us decide between competing theories.

Where we explore scope, we resort to judgments from a panel of ten native-speaker linguists. This is because we have not been able to construct an experimental format that allows

us to uncover scope preferences. (Various attemps have yielded incoherent results.)

As we will see, none of the analyses under consideration is descriptively adequate as it stands. However, the PP extraposition analysis allows an auxiliary hypothesis, adapted from Rohrbacher 1994, Ackema and Neeleman 2002 and Williams 2014, which reconciles it with our observations in a fairly straightforward way. Equally successful auxiliary hypotheses cannot be found for the various competing analyses.

2.2 Time and manner adverbs

The premise of our first word order experiment is that time adverbials are attached higher than manner adverbials, at the very least as a matter of preference (see Jackendoff 1972, Cinque 1999 and Ernst 2002). This makes it possible to test the various analyses under consideration in three conditions, schematized in (9). In the *sandwiched condition*, both adverbials appear between the verb and the PP. In the *straddled condition*, one adverbial precedes the PP and the other follows it. In the *rightmost condition*, both adverbials follow the PP.

(9) a. V Adv_M Adv_T PP   vs.   V Adv_T Adv_M PP sandwiched condition

  b. V Adv_M PP Adv_T vs.   V Adv_T PP Adv_M straddled condition

  c. V PP Adv_M Adv_T vs.   V PP Adv_T Adv_M rightmost condition

The extraposition analysis predicts that in all three conditions the manner adverbial (Adv_1 in (10)) will precede the time adverbial (Adv_2). This is the order in the base, which is preserved whether the PP surfaces adjacent to the verb, is extraposed across one adverbial, or across two:

(10)
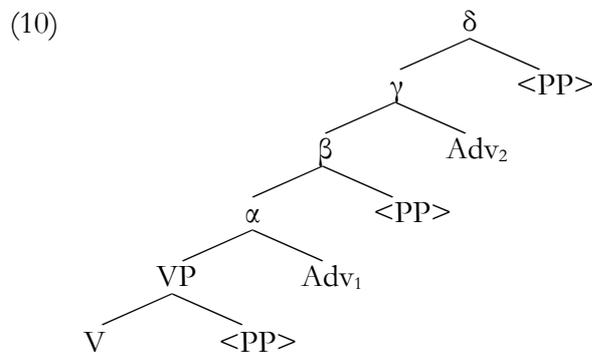
As already mentioned, the verb raising analysis predicts that high adverbials precede low

adverbials when sandwiched between verb and PP. In this condition, time adverbials should therefore precede manner adverbials. The order of adverbials that follow the base position of the verb is the mirror image of the order of their preverbal counterparts, yielding manner adverbial before time adverbial as the predicted order in the rightmost condition. Finally, both manner adverbial before time adverbial and time adverbial before manner adverbial are predicted to be grammatical in the straddled condition (compare (5a), with $Adv_1=Adv_M$, and $Adv_2=Adv_T$):

(11)   [V [<Adv_T> [<Adv_M> [$_{VP}$ t_V PP] <Adv_M>] <Adv_T>]]

There are three mixed analyses to consider, which differ with regard to the height of verb raising and PP extraposition, respectively. The crucial question is whether raised verbs and extraposed PPs c-command time adverbials (compare (6), (8a) and (8b), with $Adv_1=Adv_M$, and $Adv_2=Adv_T$; notice that in (12) an additional landing site for PP extraposition has been added in between the two adverbials):

(12)   a.   [V [<Adv_T> [[<Adv_M> [$_{VP}$ t_V <PP>] < Adv_M>] <PP>] < Adv_T>] <PP>]

b.   [V [<Adv_T > [[<Adv_M> [$_{VP}$ t_V <PP>] < Adv_M>] <PP>] < Adv_T>]]

c.   [[[V [$_\alpha$ <Adv_M> [$_{VP}$ t_V <PP>] < Adv_M>] <PP>] Adv_T] <PP>]

The *equal height analysis*, in which verb raising and extraposition both cross time adverbials, predicts word order variability in the sandwiched and straddled conditions; in the rightmost condition, though, manner adverbials must precede time adverbials (see (12a)). The *low PP analysis* predicts that in the sandwiched condition time adverbials precede manner adverbials, that in the straddled condition both orders of adverbials are available, and that in the rightmost condition manner adverbials precede time adverbials (see (12b)). Finally, the *low V analysis* predicts manner adverbials before time adverbials in all three conditions (see (12c)).

In sum, the aim of our first word order experiment is to test five analyses: the extraposition analysis, the verb raising analysis, and three mixed analyses (the equal height analysis, the low PP analysis, and the low V analysis.

The set-up described above presupposes that selected PPs can follow both manner and time adverbials. While this is uncontroversial for manner adverbials, many speakers find extraposition of light PPs across time adverbials only marginally better than extraposition of light DPs. Both types of extraposition improve when the extraposed complement is heavy:

(13) a.   John looked <??yesterday> at the memorandum <yesterday>.

    b.   John read <*yesterday> the new memorandum <yesterday>.

    c.   John looked <yesterday> at the memorandum from the finance director <yesterday>.

    d.   John read <yesterday> the new memorandum from the finance director <yesterday>.

These informal judgments are corroborated by a baseline experiment run on AMT. Test items consisted of five sets of eight examples that followed the scheme in (13): V-PP_{Light}-Adv_{Time}, V-Adv_T-PP_L, V-PP_{Heavy}-Adv_T, V-Adv_T-PP_H, V-DP_L-Adv_T, V-Adv_T-DP_L, V-DP_H-Adv_T, and V-Adv_T-DP_H. We recruited forty subjects, all native speakers of English with IP addresses in the United States. They judged the various test sentences on a seven-point Likert scale. The order of test sentences was randomized and the test included both grammatical and ungrammatical fillers, as well as questions to check that subjects were paying attention to the task. The results are summarized in (14). (Significance was calculated using two-tailed t-tests, with $p < .05$ as the threshold; standard deviations are given between parentheses; the same general arrangement was used for all AMT experiments reported below).

(14)

Light PP		Heavy PP		Light DP		Heavy DP	
PP-Adv_T	Adv_T-PP	PP-Adv_T	Adv_T-PP	DP-Adv_T	Adv_T-DP	DP-Adv_T	Adv_T-DP
6.70 (0.45)	3.90 (1.11)	6.00 (1.23)	5.10 (1.20)	6.85 (0.51)	2.78 (1.04)	6.20 (0.87)	5.10 (1.42)
$p<0.01$		n.s		$p<0.01$		n.s.	

Acceptability of PPs/DPs preceding/following time adverbials; sentence-final position (n=40)

These data suggest that PP extraposition across time adverbials is an instance of heavy XP shift. However, that cannot be the whole story. Light PP extraposition across temporal adverbials improves considerably in certain contexts, for example when the PP is followed by a coordinate clause that contains a coreferential pronoun, as in (15a). As (15b) shows, this is not the case for

extraposition of light DPs.

(15) a. John looked yesterday at the memorandum, and it made his blood boil.

    b. *John read yesterday the new memorandum, and it made his blood boil.

Again, there is experimental corroboration of these informal judgments. We ran a second baseline experiment with the same set-up as above, but now with each test item followed by a coordinate clause containing a coreferential pronoun, as in (15). This had a clear impact on acceptability scores:

(16)

Light PP		Heavy PP		Light DP		Heavy DP	
PP-Adv$_T$	Adv$_T$-PP	PP-Adv$_T$	Adv$_T$-PP	DP-Adv$_T$	Adv$_T$-DP	DP-Adv$_T$	Adv$_T$-DP
5.90 (1.03)	5.00 (1.15)	5.75 (1.16)	5.50 (1.04)	6.25 (0.79)	3.20 (0.87)	6.10 (0.95)	3.95 (1.31)
p<0.05		n.s.		p<0.001		p<0.001	

Acceptability of PPs/DPs preceding/following time adverbials; non-sentence-final position (n=40)

There are two noticeable effects. The presence of the coordinate clause leads to an increase of the average score for light PP extraposition (which raises from 3.90 to 5.00, a level suggesting grammaticality). At the same time, it inhibits heavy DP shift, bringing the average score down from 5.10 to 3.95. Both effects are highly significant (p < 0.01).

Our take on these data is that there are two distinct interpretations that license intervention of time adverbials operations. In one of these, the PP is in focus, and has possibly undergone heavy XP shift. The nature of the other interpretation is revealed by the intonation of examples like (15a): the PP must be destressed, suggesting that it represents given information, and is most likely a continuing topic in the sense of Lambrecht (1994:132).

The data in (14) and (16) show that any exploration of the interaction of adverbial order and PP extraposition must take account of the circumstances in which PP extraposition across time adverbials is licit. For our word order experiment, we therefore constructed twenty sets of examples, ten in which the PP was heavy and ten in which there was a subsequent coordinate clause. Each set consisted of a basic sentence and five alternations, as (17) and (18) (given with our informal grammaticality judgments). Hence, there were 120 test sentences overall.

(17) a.   Bill talked <softly> last night <*softly> to a very shy neighbor of his.

b.   Bill talked softly to a very shy neighbor of his last night.

c.   *Bill talked last night to a very shy neighbor of his softly.

d.   Bill talked to a very shy neighbor of his <softly> last night <*softly>.

(18) a.   Bill talked <softly> last night <*softly> to his neighbor, and she told him some news.

b.   Bill talked softly to his neighbor last night, and she told him some news.

c.   *Bill talked last night to his neighbor softly, and she told him some news.

d.   Bill talked to his neighbor <softly> last night <*softly>, and she told him some news.

We recruited eighty subjects, each of whom judged either the heavy PP examples or the examples in which there was a subsequent coordinate clause.

The results are summarized in the tables in (19), (20) and (21). They show that the preferred order of adverbials is not affected by the position of the PP. In all three conditions, there is a clear preference for orders in which manner adverbials precede time adverbials.

(19)

	Sandwiched	Straddled	Rightmost
$Adv_M - Adv_T$	5.88 (0.91)	5.38 (1.46)	4.38 (1.34)
$Adv_T - Adv_M$	5.00 (0.99)	3.00 (1.76)	3.25 (1.71)
	$p<0.05$	$p<0.001$	$p<0.05$

Acceptability of adverbial order; manner and time adverbials; heavy PP ($n=40$)

(20)

	Sandwiched	Straddled	Rightmost
$Adv_M - Adv_T$	5.38 (1.36)	5.75 (1.32)	5.00 (0.93)
$Adv_T - Adv_M$	4.25 (1.22)	4.88 (1.04)	4.00 (1.03)
	$p<0.01$	$p<0.01$	$p<0.05$

Acceptability of adverbial order; manner and time adverbials; following clause ($n=40$)

(21)

	Sandwiched	Straddled	Rightmost
$Adv_M - Adv_T$	5.63 (1.16)	5.57 (1.39)	4.69 (1.19)
$Adv_T - Adv_M$	4.63 (1.11)	3.94 (1.49)	3.63 (1.46)
	$p<0.001$	$p<0.001$	$p<0.01$

Overall acceptability of adverbial order; manner and time adverbials ($n=80$)

These findings are as predicted by the extraposition analysis and the low V analysis. They falsify the verb raising analysis and the remaining mixed analyses, which incorrectly predict that in the

sandwiched condition and/or the straddled condition there should not be a preference for manner adverbials to precede time adverbials.

While the pattern in (19), (20) and (21) is robust, the difference in average scores between the two adverbial orders is relatively modest (1.23 on average across all results). This is partly a fact about violations of the adverbial hierarchy: many produce only a limited penalty. But there is a second factor at play. Test sentences with multiple adverbs often appear to be reduced in acceptability, which compresses the Likert scale when testing for adverbial order (see Payne 2018). We can demonstrate the effect by considering the influence of category on the acceptability of sentences with a time and a manner adverbial:

(22) a.   Bill spoke [AdvP eloquently] today.   c.   Bill spoke [PP with eloquence] today.

      b.   ??Bill spoke today [AdvP eloquently].   d.   Bill spoke today [PP with eloquence].

We ran a test with ten sets of example sentences modelled on (22). Each set contained two items in which manner was expressed by an adverb and two in which it was expressed by a PP. Time was always expressed by an adverb or a DP. As it turned out, scores were consistently higher if the manner adverbial was a PP, which confirms that sequences of adverbs come at a cost:

(23)

	Manner–Time	Time–Manner	
M = AdvP	5.25 (0.98)	4.55 (1.04)	p<0.05
M = PP	6.25 (0.87)	6.30 (0.88)	n.s.
	p<0.01	p<0.01	

Acceptability of adverbial order; manner expressed by AdvP/DP or PP (n=40)

One may think that it would therefore be better to run word order tests with manner PPs. However, the data also show that a violation of the adverbial hierarchy reduces the score in the multiple adverb condition, but not in the adverb-PP condition. We would suggest that this is because PP adverbials may themselves be extraposed from an underlying position in which they satisfy the adverbial hierarchy (see also section 4). Whatever the value of that suggestion, it is clear that one should not test effects of the adverbial hierarchy using PPs.

The data discussed above suggest that there are two processes by with adverbials can

separate a verb and a selected PP. The first results in intervening manner adverbials; the second can result in intervening time adverbials, but may presumably also generate V-Adv$_M$-PP orders. (This second process in turn has two variants: one with the PP in focus, the other with the PP a continuing topic.) That intervention of manner adverbials and intervention of time adverbials are different falls out naturally from the low V analysis, as V-Adv$_T$-PP orders must be derived by PP extraposition, while V-Adv$_M$-PP orders can be derived either by PP extraposition or by verb raising. The extraposition analysis requires a different account. We will argue in section 5 that intervention of manner adverbials can result from base generation (as in (3b)), while intervention of time adverbials must result from rightward movement of the PP (as in (3c)).

2.3 Intentionally Twice *and* Continuously Again

From here onward, we restrict discussion to the extraposition and low V analyses. In order to force a decision between these, we must consider structures with two adverbials low enough for the verb to move across (if it does move). The predictions generated by the extraposition analysis remain constant: irrespective of the positition of the PP, the lower of the two adverbs must precede the higher one (see (24a)). However, the predictions of the low V analysis shift towards the equal height analysis. In the rightmost condition the higher adverbial must still follow, but in the sandwiched and the straddled conditions, either the lower or the higher adverbial may precede (see (24b); compare (6)).

(24)　a.　[[[[[$_{VP}$ V <PP>] Adv$_1$] <PP>] Adv$_2$] <PP>]

　　　b.　[V [<Adv$_2$> [[<Adv$_1$> [$_{VP}$ t$_V$ <PP>] < Adv$_1$>] <PP>] < Adv$_2$>] <PP>]

Reversible adverb pairs provide one way to test these predictions. (Indeed, the behaviour of such adverb pairs is among the strongest evidence for verb raising in Pesetsky 1989.) As c-command relations between reversible adverbs are not fixed (see (25)), we cannot test the extraposition and low V analyses by looking at word order: both theories predict free word order in all three conditions. However, we can consider scope. The extraposition analysis predicts right-to-left

scope across the board (see (24a)/(10), where c-command among adverbials is right-to-left). The low V analysis predicts ambiguity in the sandwiched and straddled conditions, and right-to-left scope in the rightmost condition (see (24b); compare (6)).

(25)   John <intentionally> twice <intentionally> knocked on the door.

As mentioned in section 1, we have found that experiments using AMT are not a reliable way of uncovering scope preferences (presumably because it is difficult for subjects to judge the grammaticality of a test sentence given a reading forced by context). We therefore asked ten native-speaker linguists for their judgments on adverbial scope in three sets of three pairs of sentences. Each pair corresponded to one of the conditions under discussion, with variation in the order of the adverbs, as in (26). Each set had a different combination of reversible adverbs.

(26)   a.   John knocked <intentionally> twice <intentionally> on the door.

   b.   John knocked intentionally on the door twice.

   b'.   John knocked twice on the door intentionally.

   c.   John knocked on the door <intentionally> twice <intentionally>.

A clear consensus emerged. When the adverbs are adjacent, scope is variable, but when they are separated by a PP, scope is right-to-left (see (27)). Neither analysis predicts this pattern. The extraposition analysis makes the wrong predictions for the sandwiched and rightmost conditions, while the rightmost and straddled conditions are problematic for the low V analysis.[1]

(27)

	Sandwiched			Straddled			Rightmost		
	L > R	L < > R	L < R	L > R	L < > R	L < R	L > R	L < > R	L < R
	0	10	0	0	1	9	1	9	0

Scope among pairs of reversible adverbs (n=10)

These findings are corroborated by further data involving *again*. While this adverb can be merged

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[1] The data regarding the rightmost condition go against the long-standing claim that scope among sentence-final adverbs is right-to-left; see Andrews 1983 and much subsequent work. However, this generalization has been called into doubt, most recently by Bobaljik 2017. Our findings corroborate Bobaljik's assessment of the data.

low, it cannot appear in the scope of manner adverbs like *continuously*. This means that the extraposition and low V analyses make diverging predictions for sentences containing a manner adverb and *again*. The extraposition analysis predicts that the manner adverb will systematically precede *again*. The low V analysis predicts free order in the sandwiched and straddled conditions, where c-command between the adverbials is variable, but in the rightmost condition *again* must follow the manner adverb, as c-command is right-to-left only. As these word order predictions can be tested using AMT, we ran an experiment in which we presented twenty subjects with five sets of sentences of the type in (28).

(28) a. John knocked <continuously> again <continuously> on the door.

b. John knocked continuously on the door again.

b'. John knocked again on the door continuously.

c. John knocked on the door <continuously> again <continuously>.

The results mirror those in (27). When the adverbs are adjacent, there is no significant preference for one order over another; however, when they are separated by a PP, there is a preference for *again*, the higher adverb, to follow the lower manner adverb:

(29)

	Sandwiched	Straddled	Rightmost
Adv_M – *again*	4.25 (1.33)	5.75 (1.01)	4.50 (1.15)
again – Adv_M	4.88 (1.28)	5.0 (1.20)	4.88 (1.16)
	n.s.	$p < 0.05$	n.s.

Acceptability of adverbial order; *again* and manner adverbials (*n*=20)

As before, the sandwiched and rightmost conditions are problematic for the extraposition analysis, while the low V analysis makes the wrong predictions for the rightmost and straddled conditions.

2.4 Amending the extraposition analysis: Adverbial clustering

Both the extraposition analysis and the low V analysis need to invoke some auxiliary hypothesis to capture the findings of section 2.3. One option compatible with the extraposition analysis is that some adverbials may left-adjoin to other adverbials (see Rohrbacher 1994 and Ackema and

Neeleman 2002; see also Williams 2014).[2] The problematic data then follow if we assume that the adjoined adverbial takes scope over its host. When the adverbs are adjacent, they may have merged independently, yielding right-to-left scope (see (30a,c), or the first may have merged with the second, yielding left-to-right scope (see (30a',c'). When the adverbs are separated by a PP, however, they must have been attached independently, so that only right-to-left scope is available (see (30b)).

(30) a. $[[[V\ PP]\ Adv_1]\ Adv_2]$ c. $[[[V\ Adv_1]\ Adv_2]\ PP]$

a'. $[[V\ PP]\ [Adv_2\ Adv_1]]$ c'. $[[V\ [Adv_2\ Adv_1]]\ PP]$

b. $[[[V\ Adv_1]\ PP]\ Adv_2]$

An evaluation of the extraposition analysis in conjunction with this auxiliary hypothesis must address three core issues. The first is whether there is any empirical evidence for adverbial clustering (see section 2.4.1), the second is how adverbial clusters are interpreted (see sections 2.4.2 and 2.4.3), and the third is how adverbial clustering can be constrained so as to preserve the account of the data discussed in section 2.2 (see section 2.4.4).

2.4.1 Basic evidence

An observation that may bear on the first of these these questions comes from clefting. While a combination of a time adverbial and a manner adverbial resists clefting (see (31a)), *intentionally twice* can be clefted (see (31b)). This suggests that *intentionally twice*, but not *last night desperately* can comprise a syntactic unit. Note that, in line with expectations, *intentionally* must take scope over *twice* when clefted: (31b) implies that John had the intention to knock twice on the door).

(31) a.   *It was last night DESPERATELY that Mary looked for her puppy.

b.   It was intentionally TWICE that John knocked on the door.

---

[2] We assume that adverbs must precede adverbs they modify. While we do not know why this should be so, it is consistent with the observation that adverbs precede adjectives that they are adjoined to:

(i)   He saw his face in the mirror – sad and [<suddenly> old <*suddenly>].

It is also predicted, correctly as it turns out, that *again continuously* can undergo clefting. However, what we can conclude from this observation is unclear, as *again* in (32) could be an independent modifier in the top part of the cleft, something that is unlikely to be true of *intentionally* in (31b). (Note, though, that (32) is grammatical on the reading in which *again* modifies *continuously*; see section 2.4.3)

(32) It was again CONTINUOUSLY that John knocked on the door.

A second way to test our auxiliary hypothesis is to replace the initial adverb in a pair of adverbs that permit post-verbal left-to-right scope with a near-synonymous PP. While in the structures at hand adverbs must precede the category they modify, PP modifiers tend to follow in almost all circumstances. Therefore, judgments are predicted to change when a PP replaces the first modifier in an adverb-adverb sequence. Adverbial clustering is ruled out, and so a pattern of judgments should emerge that is reminiscent of judgments for pairs of time and manner adverbials.

Indeed, when *intentionally* in (31) is replaced by *with intention*, the result is degraded:

(33) *It was with intention TWICE that John knocked on the door.

The effect extends to adverbial scope in the sandwiched, straddled and rightmost conditions. We asked the same ten linguists that contributed the data in (27) to judge scope between a PP modifier and an adverb in three sets of three examples (one of which is given in (34)). The expected change in judgments was evident, as all ten reported that they could only get right-to-left scope, irrespective of condition (see (35)). This is of course exactly as predicted by the amended extraposition analysis. (N.B. The number of test sentences was relatively low, as there are few PPs whose meaning approximates that of relevant adverbs.)

(34) a. John knocked with intention twice on the door.

b. John knocked with intention on the door twice.

c. John knocked on the door with intention twice.

(35)	Sandwiched			Straddled			Rightmost		
	L > R	L < > R	L < R	L > R	L < > R	L < R	L > R	L < > R	L < R
	0	0	10	0	0	10	0	0	10

Scope judgments for PP_{mod}-adverb pairs (n=10)

A second time is an expression whose interpretation approximates *again*, but which cannot directly modify other adverbials, as shown by the ungrammaticality of (36).

(36) *It was a second time CONTINUOUSLY that John knocked on the door.

The amended extraposition analysis therefore predicts that when *again* in the examples in (28) is replaced by *a second time* only the orders that do not rely on adverbial clustering will survive. Informal judgments suggest that this is correct. Irrespective of condition, *continuously a second time* is the only acceptable order for the native speakers we have consulted:

(37) a. John knocked <continuously> a second time <*continuously> on the door.

b. John knocked continuously on the door a second time.

b'. *John knocked a second time on the door continuously.

c. John knocked on the door <continuously> a second time <*continuously>.

In order to validate these judgements, we ran a test on AMT (with twenty participants and a set up parallel to the tests reported above). The results show that there is a significant preference in all conditions for the order in which *a second time* follows the adverb, as expected:

(38)	Sandwiched	Straddled	Rightmost
Adv_M – *a second time*	4.2 (0.77)	4.7 (0.89)	5.0 (1.02)
a second time – Adv_M	3.3 (0.74)	3.5 (0.94)	3.7 (0.93)
	p<.01	p < .01	p<.01

Acceptability of adverbial order; manner adverbial and *a second time* (n=20)

We conclude that there is sufficient empirical support for adverbial clustering and now turn to the semantic effects of attaching one modifier directly to another.[3]

---

[3] Pesetsky (1989) claims that reducing the weight of the extraposed PP favors left-to-right scope among adverbials sandwiched between it and the verb. If this is so, we would suggest the following explanation. As is well known,

2.4.2 Interpretive effects: *Intentionally twice*

We begin with adverbial clusters introduced by an adverb like *intentionally* (as in *intentionally twice*). We claim that *intentionally* and its kin allow association with focus. This is not a novel claim. Williams (2014) argues the point in some detail. The effect is easy to see with *accidentally*, the antonym of *intentionally* and the adverb we concentrate on below. Take an example like *John accidentally murdered BILL*. Murder is an intentional act, and so one would expect this sentence to be a contradiction. Its coherence is due to *accidentally* associating with *BILL*. The ordinary value of the sentence is that John murdered Bill; its focus value consists of the presupposition that there is an alternative x to Bill, such that John intended to kill x.

The role of focus can be illustrated with the examples in (39).

(39)   a.   Susan accidentally gave Bill A SCI-FI NOVEL.

       b.   Susan accidentally gave BILL a sci-fi novel.

The sentence in (39a) permits the interpretation in (40a), but not that in (40b). Conversely, the sentence in (39b) permits the interpretation in (40b), but not that in (40a). (There are other interpretations of these examples that are not relevant here; they could, for instance, be used when speaker and addressee know that Bill hates sci-fi novels, but Susan was not aware of this.)

(40)   a.   (i) Susan gave Bill a sci-fi novel; (ii) $\exists x$, x an alternative to a sci-fi novel, Susan intended to give Bill x.

English is subject to Behaghel's *Gesetz der wachsenden Glieder*: in the postverbal domain, heavier constituents are preferably placed after lighter constituents (see Kayne 1985). We assume that this effect is prosodic in nature. With this in mind, consider the prosody of the examples in (i) (with breaks and primary and secondary stress indicated).

(i)   a.   {John knocked **continuously** again} {on the **DOOR**}

      b.   {John knocked} {again **continuously**} {on the **DOOR**}

In (ia), *continuously* and *again* are merged independently, yielding right-to-left scope. In (ib), the adverbs cluster, yielding left-to-right scope. The thing to note is that the second example has a more balanced prosody than the first, where the PP follows a large prosodic unit. This would favour adverbial clustering, especially if the PP is light.

b. (i) Susan gave Bill a sci-fi novel; (ii) ∃x, x an alternative to Bill, Susan intended to give x a sci-fi novel.

The same pattern can be observed in examples more directly relevant to the question under discussion. On a parse of the examples in (41) in which *accidentally* takes scope over *twice*, (41a) comes with the presupposition that Susan intended to knock twice on something other than the door, while (41b) presupposes that Susan intended to knock on the door, but either fewer or more times than two.

(41) a. Susan accidentally [knocked on the DOOR twice].

b. Susan accidentally [knocked on the door TWICE].

Adverbials that associate with focus may often directly attach to the focused constituent (*only* is a prime example; see Rooth 1985). We suggest that this is what lies behind adverbial clustering with *accidentally*: this adverb may merge with a second adverbial if the latter comprises its associated focus. Thus, when *accidentally* is merged with *twice* in (42a), the interpretation that obtains is parallel to that in (41b) (see (42b); for related discussion, see Bobaljik 2016).

(42) a. Susan knocked <on the door> [accidentally twice] <on the door>.

b. (i) Susan gave two knocks on the door; (ii) ∃n, n an alternative to 2, Susan intended to give n knocks on the door.

Again, we follow Williams (2014) here. Williams argues that focus-sensitive adverbs may either be merged in their scopal position or attach to the associated focus.[4]

We may contrast (42b) with the interpretation that results when *accidentally* and *twice* are merged independently (in a left-braching configuration). In that case, *twice* takes scope over

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[4] Notice that there are syntactic restrictions on attachment to the focus. As argued in the main text, *accidentally* can form an adverbial cluster with *twice*. However, it cannot attach to a DP argument (cf. **John murdered accidentally BILL*). We do not know whether this should be modelled as a c-selectional requirement, or can be derived from more general principles.

accidentally, yielding the presupposition that Susan intended to perform an action other than knocking on the door (the nature of this action is partly dependent on where stress is placed within *knock on the door*):

(43) a. Susan [[knocked <on the door> accidentally] twice] <on the door>.

b. (i) On two occasions, Susan knocked on the door; (ii) on each occasion ∃*a*, *a* an alternative to *knock on the door*, Susan intended to perform *a*.

The assumption that *accidentally* may merge with a focussed adverbial predicts that *Susan knocked accidentally twice on the door* and *Susan knocked on the door accidentally twice* do not permit an interpretation on a par with (41a), where *accidentally* triggers the presupposition that Susan intended to give two knocks on some object other than the door. This is because *accidentally* can only take scope over *twice* if it is attached to it, ruling out focus association with *the door*. The relevant reading is indeed unavailable for these examples, as confirmed by the unanimous judgment of our panel of ten native-speaker linguists.

2.3.3 Interpretive effects: *Again continuously*

We next consider adverbial clusters introduced by *again* (such as *again continuously*). Like *accidentally*, *again* triggers a presupposition. As argued extensively in the literature, one crucial factor that governs the nature of this presupposition is the c-command domain of the adverb. Of particular interest here is the contrast in the interpretation of (44a) and (44b).[5,6]

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[5] Although there is an extensive literature on *again*, the readings of interest here are rarely discussed (and deserve further exploration). There is general agreement, however, that the attachment site of *again* (co-)determines the presupposition it triggers. For discussion and references, see Beck and Johnson 2004 and Pedersen 2015.

[6] The string in (44b) can also be derived by rightward extraposition of *to Louise*:

(i) Oliver [[[showed the second book] again] to Louise]

This, however, would not yield the interpretation discussed below, but rather one in which Oliver showed the second book to Louise and previously showed the second book to someone other than Louise (on a par with *Oliver showed the second book again, this time to Louise*).

(44) a. Oliver [again [showed the second book to Louise]].

    b. Oliver showed the second book [again [to Louise]].

Suppose that Oliver is a rare-book seller who has two antique tomes on offer. He shows these to a select group of customers, one of whom is Louise. In that context, (44a) can have the interpretation in (45a), but not that in (45b). By contrast, (44b) has the interpretation in (45b), as well as that in (45a). The latter is harder to access. (These judgments and the others in this section are supported unanimously by our panel of ten native-speaker linguists.)

(45) a. (i) Oliver showed the second book to Louise; (ii) Oliver previously showed the second book to Louise.

    b. (i) Oliver showed the second book to Louise; (ii) Oliver previously showed the first book to Louise.

The example in (44a) is unremarkable. *Again* is attached to the bracketed constituent, and therefore triggers the presupposition that Oliver previously carried out the action described by this constituent. We assume that in (44b) *again* is attached to *to Louise*. This means that the VP is not part of *again's* c-command domain, so that the presupposition triggered is that Oliver previously preformed some unspecified action directed towards Louise. In the context at hand, this action is most easily construed as *show the first book*. It may also be construed as *show the second book*, but this is pragmatically odd, as that construal is explicitly encoded by (44a).

The underspecified nature of the presupposition triggered by *again* in examples like (44b) is brought to the fore by the contrast in (46).

(46) a. Oliver seems to be showering Louise with attention and ignoring everyone else. He introduced himself to Louise. Then he read a poem to Louise. #And then he [again [showed pictures of a romantic sunset to Louise]].

b. Oliver seems to be showering Louise with attention and ignoring everyone else. He introduced himself to Louise. Then he read a poem to Louise. And then he showed pictures of a romantic sunset [again [to Louise]].

The final sentence in (46a) requires accommodation of some sort, as the context does not provide an earlier instance of *show pictures of a romantic sunset to Louise*. There is no such effect in (46b), where *again* merely signals that Oliver previously performed actions directed towards Louise, a presupposition supported by the context given.

It is a small step to assume that adverbial clustering with *again* is motivated by the same interpretative effect. If so, we expect that structures whose wellformedness relies on clustering will not imply that there is a previous instance of the action described by VP. This is correct. Suppose that Field Commander Cohen was our most important spy, and that in the course of one of his adventures he agreed to knock on two doors in a particular manner to signal whether the coast was clear. In this context, (47a) can have the interpretation in (47b).

(47) a. Cohen knocked <on the second door> [again continuously] <on the second door>.

 b. (i) Cohen knocked on the second door continuously; (ii) Cohen previously knocked on the first door continuously.

As before, Cohen's earlier actions are left unspecified, so that the following is felicitous:

(48) Cohen talked continuously for an hour. Then he played the piano continuously for 45 minutes. And then he knocked <on the door> [again continuously] <on the door>.

These examples can be contrasted with examples in which *continuously* and *again* are merged separately. In such examples, the VP is part of the c-command domain of *again* and must therefore be mapped to the presupposition. Thus, (49a) requires that Cohen previously knocked on the second door continuously, as stated in (49b).

(49) a. Cohen [<again> [knocked on the second door continuously] <again>].

    b. (i) Cohen knocked on the second door continuously; (ii) Cohen previously knocked on the second door continuously.

In line with this, the final sentence in (50) is awkward and requires accommodation.

(50) Cohen talked continuously for an hour. Then he played the piano continuously for 45 minutes. #And then he [<again> [knocked on the door continuously] <again>].

The examples of independent attachment of *again* and *continuously* all involve structures without PP extraposition. However, it is important to also look at structures with PP extraposition, as this may place the PP outside the c-command domain of *again*, thereby removing the obligation to map it to the presupposition. Thus, in the scenario sketched above, (51a) permits either of the interpretations in (51b,b').

(51) a. Cohen [<again> [knocked continuously] <again>] on the second door.

    b. (i) Cohen knocked continuously on the second door; (ii) Cohen previously knocked continuously on the second door.

    b'. (i) Cohen knocked continuously on the second door; (ii) Cohen previously knocked continuously on the first door.

This implies that the data in (47) provide evidence for the interpretive effects of adverbial clustering in the rightmost condition, but not in the sandwiched condition. For that, we must consider whether the verb is obligatorily mapped onto the presupposition. This should be the case under independent attachment of *again* and *continuously*, but not under adverbial clustering. The data in (52) are in line with this: the final sentence in (52a) requires accommodation, but the final sentence in (52b) does not.

(52) a. Cohen knocked continuously on the window. #Then he [<again> [banged continuously] <again>] on the door.

b. Cohen knocked continuously on the window. Then he banged [again continuously] on the door.

2.4.4 Time adverbials

The conclusion from sections 2.4.2 and 2.4.3 is that there are clear interpretive effects of adverbial clustering with *accidentally* and *again*, which have to do with the presuppositions triggered by these elements. We propose that it is these effects that license adverbial clustering in the first place.

We are now in a position to consider whether the extraposition analysis can still account for the data of section 2.2 if combined with the auxiliary hypothesis that adverbials may cluster. This hypothesis explained the existence of left-to-right scope in the sandwiched and rightmost conditions with adverbs like *accidentally* and *again*.

The data in section 2.2 involved pairs of time and manner adverbials, and the core observation was that time adverbials follow manner adverbials irrespective of condition (that is, whether the adverbials are sandwiched between V and PP, are separated by the PP, or appear sentence-finally). In order to account for this, we must assume that time adverbials cannot adjoin to other adverbials to form an adverbial cluster. We have already seen, in (31a), that this assumption is correct.

The findings of sections 2.4.2 and 2.4.3 give a clear sense of *why* time adverbials should resist adverbial clustering. Such adverbials do not trigger the kind of presuppositions associated with *accidentally* and *again*; they simply specify the time at which a proposition holds. Therefore, they cannot have the kind of privileged relationship with a second adverbial that *accidentally* and *again* may enter into. And in the absence of an interpretive license for adverbial clustering, temporal adverbials must be merged with an appropriate category in the extended verbal projection.

2.5 Amending the low V analysis

The unamended extraposition analysis made incorrect predictions in the sandwiched and rightmost conditions for pairs of two manner adverbs or a manner adverb and *again*. A single

auxiliary hypothesis could fix these problems, as the relevant conditions are similar in one important respect: the adverbials are adjacent. The low V analysis makes incorrect predictions for the same pairs of adverbs in the straddled and rightmost conditions. However, there is no obvious factor shared by these conditions (to the exclusion of the sandwiched condition). This makes it hard to make do with a single auxiliary hypothesis.

Recall the basic shape of the account. (i) There are three (relevant) adverbial attachment sites (labelled ①, ② and ③ in (53)), each of which may be linearized to the left or right of its sister. (ii) Positions ① and ② are not open to time adverbials; position ③ is reserved for time adverbials. (iii) The PP may extrapose across any of these adverbial positions. (iv) The verb moves across ②$_L$, but not across ③$_L$.

(53)
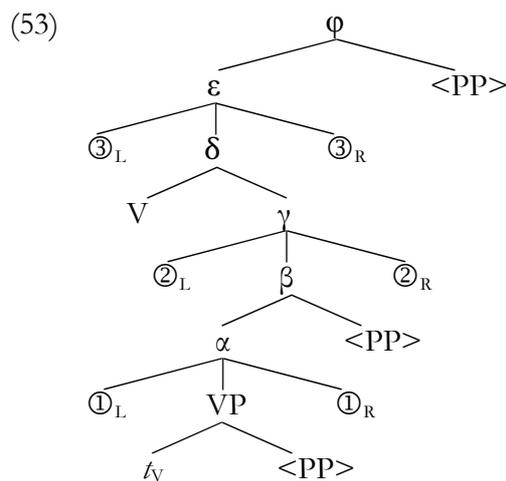
This correctly predicts the distribution of time adverbials, but does not capture the existence of descending pairs of adverbs in the rightmost condition, nor the absence of such pairs in the straddled condition – one possible order is V-②$_L$-PP-①$_R$.

There is a way to reconcile the low V analysis with the facts of section 3. To begin with, one could allow verb raising to pied-pipe the PP complement, as in (54). This has the consequence that descending pairs of non-time adverbials may now appear sentence-finally, which fixes the problem with the rightmost condition (as V-PP-②$_L$-①$_L$ can now be generated).

(54)

ε
③L δ ③R
VP γ
V PP ②L α ②R
①L t_{VP} ①R
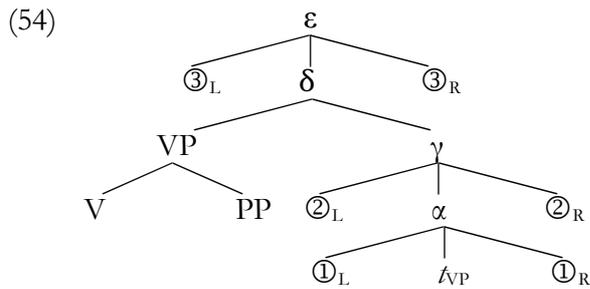
A second auxiliary hypothesis is required for the straddled condition. A simple solution for the absence of descending pairs of adverbs in this condition is to remove one of the adverbial positions in (53) and (54), namely ①R. This yields the following schemes for bare verb raising and pied-piping, respectively:

(55)

φ
ε <PP>
③L δ ③R
V γ
②L β ②R
α <PP>
①L VP
t_V <PP>

a. *Low V analysis (verb raising scheme)*

ε
③L δ ③R
VP γ
V PP ②L α ②R
①L t_{VP}

b. *Low V analysis (pied piping scheme)*
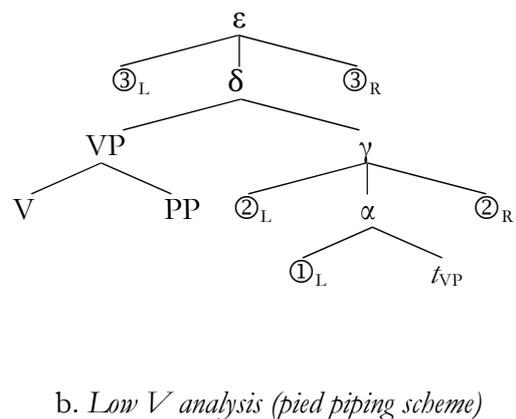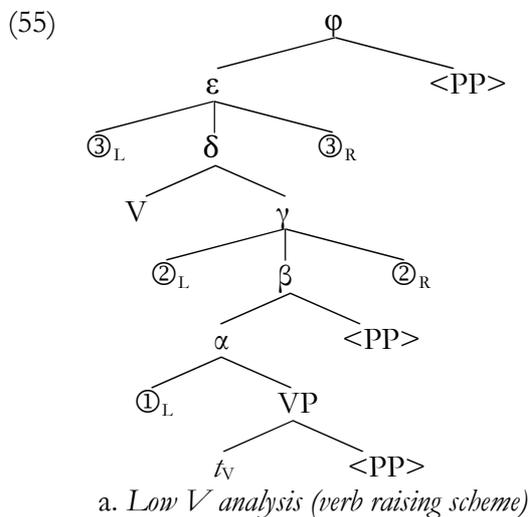
The resulting analysis captures the problematic data.

However, this is not enough. Our discussion of adverbial clustering has uncovered several new facts. Since these fall out from the amended PP extraposition analysis, it is reasonable to ask whether they also have a place in the amended low V analysis.

If one accepts our conclusion that there is adverbial clustering, one must reject the low V analysis. This is because adverbial clustering removes the evidence for verb raising by providing an alternative analysis of descending adverbial pairs in the sandwiched condition. Therefore, if one wishes to maintain the low V analysis, one must provide an alternative account of the data in sections 2.4.1–2.4.3.

We will not discuss this matter in detail, but simply note that finding such an alternative acount may not be straightforward. As an example of the difficulties that present themselves, consider how the following sentences are analyzed on the the amended low V analysis ((56b) is a variant of (47a)):

(56) a. Cohen knocked continuously on the second door again.

b. Cohen knocked on the second door again continuously.

The sentence in (56a) is a verb raising structure, with *continuously* in ①$_L$ and *again* in ②$_R$. The sentence in (56b) is derived by raising of VP; *continuously* still appears in ①$_L$, while *again* appears in ②$_L$. Thus, the sentences are identical in terms of their underlying syntax; they differ only in the linearization of *continuously* and in whether or not PP is pied-piped. As linearization and pied-piping are typically irrelevant for interpretation, one would expect the two sentences to have the same meaning. That is not the case, however: (56a) triggers the presupposition that Cohen previously knocked continuously on the second door, but as shown in section 2.4.3, (56b) does not. Contrasts of this type remain unexplained and therefore require additional assumptions.

2.5 Conclusion

We have shown that, if suitably amended, both the extraposition and the low V analysis can capture the order of adverbials in the sandwiched, straddled and rightmost conditions as described in section 2.2 and 2.3. The extraposition analysis must be combined with an auxiliary hypothesis of adverbial clustering:

(57) a. PP complements can extrapose across right-adjoined adverbials.

b. Adverbs may left-adjoin to other adverbials (if there is an interpretive license).

The low V analysis is a mixed analysis that assumes verb raising, as well as PP extraposition. In addition, in order to capture the data in sections 2.2 and 2.3, it must rely on two auxiliary hypothesis, given in (58c) and (58d)).

(58) a. The verb moves leftward across manner, but not time adverbials.

b. PP complements can extrapose across right-adjoined adverbials.

c. Verb raising may pied-pipe PP complements.

d. The lowest VP-external adverbial position precedes VP.

As things stand, the data in section 2.4 receive an explanation under the (amended) extraposition analysis, but not under the low V analysis.

Two conclusions can be drawn regarding symmetric analyses of adverbial intervention. First, the fact that certain adverbial pairs may come in descending order in the sandwiched condition does not provide evidence for verb raising, as a plausible alternative analysis is available. Second, of the two analyses that can capture the data, the PP extraposition analysis is to be preferred, all else being equal, because it covers more ground using fewer assumptions.

3. Asymmetric accounts of adverbial intervention

3.1 Overview

The analyses considered so far assume that syntactic structure is symmetric: the order between sister nodes is subject to cross-linguistic and language-internal variation. This predicts that the order of postverbal adverbials is the reverse of that of preverbal adverbials (absent verb raising):

(59) $[<\text{Adv}_2> [<\text{Adv}_1> [V] <\text{Adv}_1>] <\text{Adv}_2>]$

Neutral order in English indeed shows mirror image effects (see Quirk et al. 1985, Haider 2004, and Cinque 2004). For example, preverbal time adverbials precede preverbal manner adverbials, while postverbal time adverbial follow postverbal manner adverbials:

(60) a. Yesterday John quietly left the meeting.

b. *<John> quietly <John> yesterday <John> left the meeting.

c. ??John left the meeting yesterday quietly.

d. John left the meeting quietly yesterday.

In the same vein, scope is left-to-right among preverbal adverbials, but typically right-to-left for adverbials that follow the verb's base position. (We have argued that exceptions to the second

part of this generalization result from adverbials directly modifying other adverbials; a second source of exceptions is discussed in section 4.)

In this section, we evaluate analyses of PP extraposition that reject the assumption of symmetry. The background to this is the rise in the 1990s of theories postulating that syntactic structure is fundamentally asymmetric, with constituents further to the right located lower in the tree. The best-known proposal of this type is the antisymmetry framework developed in Kayne 1994, but other important work in the same vein can be found in Haider 2010, 2013 and Larson 2014. (We use the term 'asymmetric' to refer to this larger family of theories, reserving 'antisymmetric' for analyses based on Kayne 1994.)

Asymmetric analyses of word order cannot account for the order of postverbal adverbials through base generation. They must postulate an alternative mechanism that explains why higher adverbials follow lower adverbials. One option, dicussed in section 3.2, is to use roll-up movement. As we will demonstrate, roll-up movement is a way of generating ascending surface structures given a descending base, and therefore its output approximates the symmetric structure in (59). The alternative, discussed in section 3.3, is to introduce an interpretive mechanism that associates a descending syntactic structure with an ascending semantic representation. Thus, all accounts of adverbial order – whether symmetric or asymmetric – assign postverbal adverbial sequences an ascending structure at some level of representation.

We show that, as a consequence, asymmetric theories allow implementations of the extraposition analysis, the verb raising analysis and the three mixed analyses. Unsurprisingly, the data gathered in section 2 favour an asymmetric implementation of the extraposition analysis over other asymmetric accounts.

3.2 Mirroring though roll-up movement

Cinque (1999) argues that adverbials are specifiers licensed by functional heads whose order of merger is dictated by the adverbial hierarchy. As specifiers precede the node they combine with, how do adverbials end up in postverbal position? This may be the result of the verb (or VP)

moving leftward across one or more adverbials, leaving their order intact. Alternatively, the order of verb and adverbials is reversed through a movement regime known as roll-up movement (see Barbiers 1995, Koopman and Szabolcsi 2000 and Cinque 2005, 2010). For example, a sequence of two ascending postverbal adverbials can be generated by VP moving across the lower adverbial, followed by movement across the higher adverbial of a constituent containing VP and the lower adverbial. Thus, the base structure is 'rolled up', as in (61).[7]

(61)
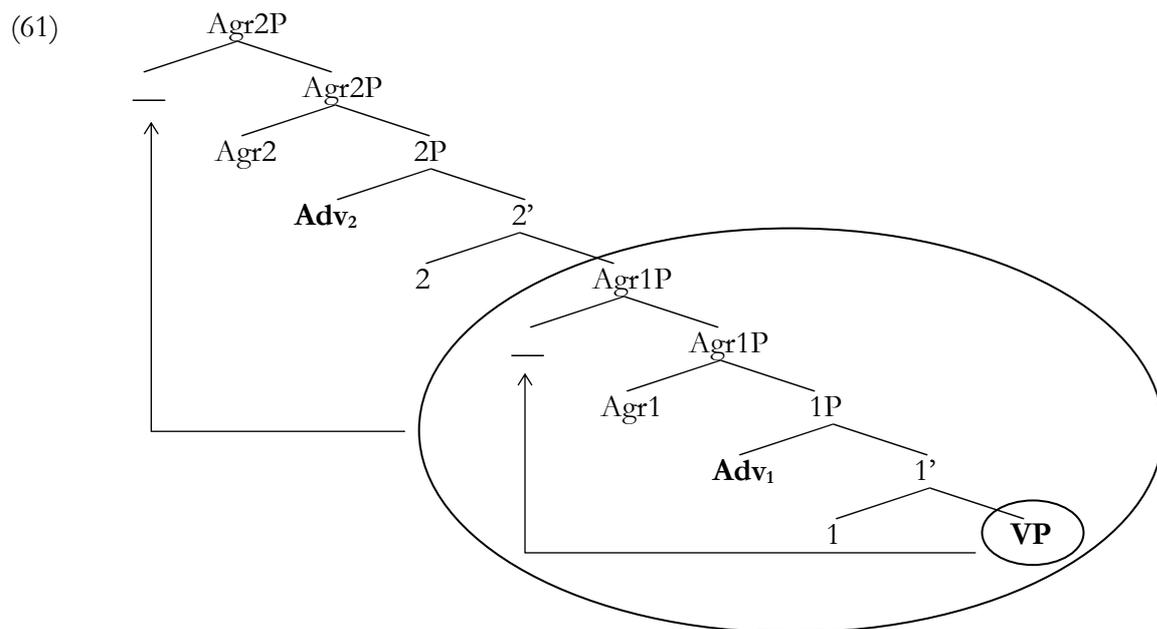
Roll-up movement derives a representation very similar to the structure base-generated in symmetric theories. To begin with, it does not add or remove c-command relations between elements attached in the verb's extended projection. In (62a), for example, Adv_1 does not c-command Adv_2, while (after reconstruction) Adv_2 c-commands Adv_1. Hence, (62a) and (62b) will behave alike for phenomena reliant on c-command between VP, Adv_1 and Adv_2.

Moreover, roll-up movement groups material together in exactly the same way as traditional left-branching analyses. This is easy to see when the output of the movements in (61) is compared with a left-adjunction structure: (62a) and (62b) have the same gross constituency.

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[7] For reasons explained in Cinque 2005, roll-up movement is limited to categories that contain the lexical head of an extended projection. All derivations given in this section adhere to this restriction.

(62) a. $[_{\text{Agr2P}} [_{\text{Agr1P}} \textbf{VP} [_{\text{1P}} \textbf{Adv}_1 \; t_{\text{VP}}]] [_{\text{2P}} \textbf{Adv}_2 \; t_{\text{Agr1P}}]]$

   b. [[**VP**   **Adv₁**   ]   **Adv₂**   ]

Indeed, Abels and Neeleman (2009) demonstrate that as a consequence of roll-up movement each symmetric structure has an antisymmetric counterpart that assigns the same gross constituency to overt material and traces of long movement. (The proof is based on two automatic dominance-preserving procedures that can be used to translate one analysis into another; see Abels and Neeleman 2009:67–73 for details).

Consequently, each of the symmetric analyses discussed in section 2 can be paired with a parallel antisymmetric counterpart. For concreteness' sake, we assume that selected PPs surface in the specifier of a functional projection ПP, whose position with respect to functional projections hosting adverbials is variable. It is immaterial for our current purposes whether PPs move to spec-ПP. It is also immaterial whether ПP is decomposed into a range of functional projections, each with a fixed position in the verbal spine.

The antisymmetric counterpart of the extraposition analysis is based on the assumption that separation of V and PP is entirely the result of variation in the position of PP:

(63) *Extraposition analysis (asymmetric)*: (i) Roll-up movement around adverbials is optional; (ii) roll-up movement around PPs is obligatory; (iii) selected PPs can shift (leftward) across manner and time adverbials.

Given a base structure [Adv₂ [Adv₁ [PP VP]]], roll-up movement around the PP and the adverbials generates the surface representation in (64a), which is identical in order, gross constituency, and c-command relations to the traditional left-branching structure in (64b). Given a base structure [Adv₂ [PP [Adv₁ VP]]], roll-up movement generates (64c), which is equivalent to the traditional structure in (64d). Finally, given a base structure [PP [Adv₂ [Adv₁ VP]]], roll-up movement creates (64e), which is equivalent to (64f).

(64)   a. $[_{Agr2P}$ $[_{Agr1P}$ $[_{AgrIIP}$ **VP** $[_{\Gamma IP}$ **PP** t_{VP}]] $[_{1P}$ **Adv₁** t_{Agr1P}]] $[_{2P}$ **Adv₂** t_{Agr1P}]]

b.   [[[**V**   **PP**   ]   **Adv₁**   ]   **Adv₂**   ]

c. $[_{Agr2P}$ $[_{AgrIIP}$ $[_{Agr1P}$ **VP** $[_{1P}$ **Adv₁** t_{VP}]] $[_{\Gamma IP}$ **PP** t_{Agr1P}]] $[_{2P}$ **Adv₂** t_{AgrIIP}]]

d.   [[[**V**   **Adv₁**   ]   **PP**   ]   **Adv₂**   ]

e. $[_{AgrIIP}$ $[_{Agr2P}$ $[_{Agr1P}$ **VP** $[_{1P}$ **Adv₁** t_{VP}]] $[_{2P}$ **Adv₂** t_{Agr1P}]] $[_{\Gamma IP}$ **PP** t_{Agr2P}]]

f.   [[[**V**   **Adv₁**   ]   **Adv₂**   ]   **PP**   ]

Therefore, the analysis in (63), like its symmetric counterpart, predicts ascending order for any pair of adverbs in the sandwiched, straddled and rightmost conditions.

The antisymmetric counterpart of the verb raising analysis is based on the following core assumptions:

(65)   *Verb raising analysis (antisymmetric)*: (i) Roll-up movement around adverbials is optional; (ii) roll-up movement around PPs is obligatory; (iii) the verb moves across manner and time adverbials.

This analysis starts out with an underlying representation [Adv₂ [Adv₁ [PP VP]]]. Both adverbs will surface sentence-finally if full roll-up takes place, as in (66a). The PP will be preceded and followed by an adverbial if the structure is rolled up around the PP and one of the adverbials, as in (66c) and (66e). Verb movement will then cross the remaining adverbial. Finally, both adverbials will surface between the verb and the PP if roll-up is around the PP alone, while subsequent verb movement crosses the two adverbials, as in (66g). Like the traditional verb raising analysis (see (66b,d,f,h)), this account predicts ascending adverbial order in the rightmost condition, variable order in the straddled condition and descending order in the sandwiched condition.

(66)   a.   **V** $[_{Agr2P}$ $[_{Agr1P}$ $[_{AgrIIP}$ $[_{VP}$ t_V] $[_{\Gamma IP}$ **PP** t_{VP}]] $[_{1P}$ **Adv₁** t_{Agr1P}]] $[_{2P}$ **Adv₂** t_{Agr1P}]]

b.   **V** [[[t_V **PP**   ]   **Adv₁**   ]   **Adv₂**   ]

c. **V** [$_{Agr2P}$ [$_{2p}$ **Adv₂** [$_{Agr1P}$ [$_{AgrIIP}$ [$_{VP}$ *t*$_V$] [$_{IIP}$ **PP** *t*$_{VP}$]] [$_{1P}$ **Adv1** *t*$_{AgrIIP}$]]]]

d. **V** [　　　　**Adv₂** [　[　　　　*t*$_V$　　**PP**　　]　**Adv1**　　　　]]

e. **V** [$_{Agr2P}$ [$_{Agr1P}$ [$_{1P}$ **Adv₁** [$_{AgrIIP}$ [$_{VP}$ *t*$_V$] [$_{IIP}$ **PP** *t*$_{VP}$]]]] [$_{2P}$ **Adv2** *t*$_{Agr1P}$]]

f. **V** [　　[　　　**Adv1** [　　　*t*$_V$　　**PP**　　]]　**Adv₂**　　　　]

g. **V** [$_{Agr2P}$ [$_{2P}$ **Adv₂** [$_{Agr1P}$ [$_{1P}$ **Adv1** [$_{AgrPP}$ [$_{VP}$ *t*$_V$] [$_{PP}$ **PP** *t*$_{VP}$]]]]]]

h. **V** [　　　**Adv₂** [　　　**Adv1** [　　　*t*$_V$　　**PP**　　]]]

The various mixed analyses we have discussed also have antisymmetric counterparts, based on the assumptions in (67). As before, each of these analyses makes the same predictions about word order as its symmetric counterpart.

(67)　a.　*Equal height analysis (antisymmetric)*: (i) Roll-up movement around adverbials is optional; (ii) roll-up movement around PPs is obligatory; (iii) selected PPs can shift (leftward) across manner and time adverbials; (iv) the verb moves across manner and time adverbials.

　　b.　*Low PP analysis (antisymmetric)*: (i) Roll-up movement around adverbials is optional; (ii) roll-up movement around PPs is obligatory; (iii) selected PPs can shift (leftward) across manner but not time adverbials; (iv) the verb moves across manner and time adverbials.

　　c.　*Low V analysis (antisymmetric)*: (i) Roll-up movement around adverbials is optional; (ii) roll-up movement around PPs is obligatory; (iii) selected PPs can shift (leftward) across manner and time adverbials; (iv) the verb optionally moves across manner but not time adverbials.

In sum, roll-up movement allows antisymmetric counterparts of all symmetric analyses discussed in section 2. The evidence gathered in section 2 favors the antisymmetric counterpart of the extraposition analysis over other asymmetric analyses, for the exact same reasons that it favored the traditional extraposition analysis over its symmetric competitors.

3.3 Mirroring though semantic reversal

As we have shown, asymmetric phrase structure must be paired with a mechanism that guarantees ascending adverbial order in the postverbal domain. Roll-up movement is one such mechanism, but the literature also contains nonsyntactic alternatives, to which we now turn.

If roll-up movement is rejected, c-command relations between pairs of pre- and postverbal adverbials are reversed, yielding word order symmetry in an asymmetric representation:

(68)   [Adv_2 [Adv_1 [V [Adv_1 [t_V Adv_2]]]]

One analysis of this pattern is given in Larson 2004, 2014. Larson aims to explain how, in a descending structure, a sentence-final adverb can take scope over preceding adverbs.

The solution comes in two steps. First, Larson argues that postverbal adverbials are predicates that take an event variable as their subject. If so, the order in which they are attached does not encode scope. Second, Larson adopts a variant of Diesing's (1992) Mapping Hypothesis, given in (69), from which the left-to-right scope effect follows.

(69)   The lowest material from VP is mapped to the nuclear scope. The residue is mapped into a restrictive clause.

The principle in (65) implies that (66a) and (67a) must be interpreted such that the rightmost adverbial is mapped to the nuclear scope, while the immediately preceding adverbial is mapped to the restriction (marked by boldface and underlining, respectively). This yields the semantic representations in (66b) and (67b) (the details of which we skip over here).

(70)   a.   <u>John</u> [<u>knocked</u> [<u>on the door</u> [t_V <u>intentionally</u> [t_V **twice**]]]]

        b. $\exists E [\forall e [Ee \rightarrow$ knocking (j,d,e) & intentional(e)]] (two(E))

(71)   a.   <u>John</u> [<u>knocked</u> [<u>on the door</u> [t_V <u>twice</u> [t_V **intentionally**]]]]

        b. $\exists E [\forall e [Ee \rightarrow$ knocking (j,d,e)] & two(E)] (intentional(E))

Thus, the right-to-left scope effect follows, even though the structure is rightward descending.

Larson's proposal does not cover all the data we are interested in. To begin with, it does not extend to non-reversible adverbials. For example, it is not clear why manner adverbials should precede time adverbials in the postverbal domain.[8] Moreover, it applies to reversible adverbials in overly restricted circumstances, as we will now show.

For the proposal to be testable, there must be an independent criterion that determines whether material is part of the restriction or the nuclear scope. This criterion is that the restriction is presupposed/background-entailed, while the nuclear scope is asserted/in focus. Hence, the Mapping Hypothesis in (69) yields right-to-left postverbal scope among adverbials when the rightmost adverbial is clause-final and in focus while the preceding adverbial is backgrounded. However, postverbal scope remains solidly right-to-left under information-structural permutations that fall outside these restrictions.

In (72), the clause-final temporal modifier *on Thursday* is in focus, while the material preceding it is given.[9] Nonetheless, (72a) is felicitous in the context given, while (72b) is not.

(72)   [Mark doesn't mind that you knock on his door, but if you do you should give a single knock – otherwise he gets annoyed. I know that one day this week John intentionally knocked twice on Mark's door, but I don't know whether that happened on Wednesday or Thursday. Mary is sure, however, that …]

   a.   John knocked twice on the door intentionally **on Thursday**. (intentionally > twice)

   b.   #John knocked intentionally on the door twice **on Thursday**. (twice > intentionally)

---

[8] Richard Larson (p.c.) confirms that this is the case, but rejects adverbial mirroring nonetheless, given the existence of semantic asymmetries between pre- and postverbal adverbials (some already noted in Jackendoff 1972). We cannot account for for these asymmetries here, other than to say that postverbal adverbials either occupy the lowest position in a VP-shell structure or are right-adjoined higher up in the tree (see section 5), whereas preverbal adverbials consistently appear in the left-hand counterpart of the higher position.

[9] In order to exclude direct adverbial modification, we restrict the discussion to examples in which the relevant adverbials are either separated by other material, or the first adverbial is a PP.

These judgments are confirmed by our panel of native-speaker linguists, who unanimously agreed that the readings indicated in (72) are the only ones available, so that the felicity of (72a) and the infelicity of (72b) in the context given follows.

In (73) and (74), both postverbal adverbials are in focus. The context in (73) requires *once* to take wide scope, while *unintentionally/without intention* must take wide scope in (74). As it turns out, *once* must follow *unintentionally/without intention* in (73), but *unintentionally/without intention* must follow *once* in (74).

(73) [Mark doesn't like it when you knock on his door. He is angry at John, because John knocked on his door on Monday and on Tuesday. However, I'm not sure that on both of those days he knocked on Mark's door intentionally. In fact, I'm pretty sure that…]

    a. <u>John knocked on the door</u> **without intention once**. (once > unintentionally)

    b. <u>John knocked</u> **unintentionally** <u>on the door</u> **once**. (once > unintentionally)

    c. #<u>John knocked</u> **once** <u>on the door</u> **unintentionally**. (unintentionally > once)

(74) [Giving one knock on the door of the safehouse means 'danger – do not open', while giving two knocks means 'all clear – please open'. John wanted to enter the safehouse and knocked on the door. To his surprise no-one opened. He was perplexed. However, I'm pretty sure that…]

    a. #<u>John knocked on the door</u> **without intention once**. (once > unintentionally)

    b. #<u>John knocked</u> **unintentionally** <u>on the door</u> **once**. (once > unintentionally)

    c. <u>John knocked</u> **once** <u>on the door</u> **unintentionally**. (unintentionally > once)

Again, our panel of native-speaker linguists unanimouly or by a large majority agreed with the interpretations given for the examples in (73) and (74). Correspondingly, (73a,b) and (74c) were judged felicitous in the context given, while (73c) and (74a,b) were judged infelicitous:

(75)

	(a)			(b)			(c)		
	U > 1	U < > 1	U < 1	U > 1	U < > 1	U < 1	U > 1	U < > 1	U < 1
(69)	0	0	10	0	0	10	8	2	0
(74)	0	0	10	0	1	9	10	0	0

Scope judgments for {*unintentionally/without intention*, *once*} in (69) and (74) (*n*=10)

In the example in (76) scope and information-structural requirements clash. The context given requires that *intentionally*, which is given, takes scope over *five times*, which is in focus. As the contrast between (76a) and (76b) shows, order is dictated by right-to-left scope, rather than information structure. As before, this judgment is confirmed by our panel of native-speaker linguists, who unanimously agree with the scopal readings indicated in (76).

(76) [Mark doesn't mind that you knock on his door, but if you do you should give a single knock – otherwise he gets annoyed. Bill and John, however, like to annoy Mark, and so they always deliberately give multiple knocks. On Monday, Bill knocked twice on the door intentionally, and on Tuesday …]

   a. John (even) knocked **five times** on the door intentionally. (intentionally > 5 times)

   b. #John (even) knocked intentionally on the door **five times**. (5 times > intentionally)

Like Larson, Haider (2004, 2013) argues that while preverbal adverbials are adjoined to the category they modify, postverbal adverbials are associated with their semantic targets through predication. And like Larson, he proposes a mechanism of semantic reversal to explain why higher adverbials follow lower adverbials in the postverbal domain. However, the mechanism is more general than the one suggested by Larson.

To begin with, Haider postulates a domain in English (and other languages) that hosts extraposed material. This domain can be distinguished from the regular extended verbal projection, because it is not headed by the verb, but rather by one or more verbal heads that lack phonological and semantic content. Presumably as a consequence of this, standard compositionality is suspended in the extraposition domain, which makes it possible for adverbials to associate with categories that they semantically select, but that they do not combine

with syntactically. Thus, it is possible for Adv_3 in (77) to associate with α, and for Adv_4 to associate with β, in line with the mirror image effects mentioned above. However, it is in principle also possible for Adv_3 to associate with β, and for Adv_4 to associate with α, which would give rise to the unattested anti-mirror image order.

(77) $[Adv_2 \ [_\beta \ Adv_1 \ [_\alpha \ V \ [Adv_3 \ [_e \ Adv_4]]]]]$

Therefore, an additional assumption must be made that militates against the wrong association pattern. This additional assumption introduces a linear notion into the theory. The idea is that the parser attempts to close interpretive domains as quickly as possible (that is, at the earliest point in the string). However, this process is restricted by the constraint that higher domains cannot be closed before the lower domains they contain have been closed as well. If Adv_3 is associated with α and Adv_4 with β, then α can be closed after Adv_3, and β can be closed after Adv_4. However, if Adv_3 is associated with β and Adv_4 with α, then neither domain can be closed until Adv_4 has been processed. This is less efficient overall, and so parsing favors the mirrored postverbal order.[10]

In sum, the syntactic structure in (77) admits the semantic associations represented as a tree in (78); crossing semantic associations are ruled out, by the standard no tangling constraint in the preverbal domain, and by the notion of incremental interpretation in the postverbal domain.

(78)

$$
\begin{array}{c}
\beta \\
| \\
Adv_2 \quad \alpha \quad Adv_4 \\
| \\
Adv_1 \quad V \quad Adv_3
\end{array}
$$
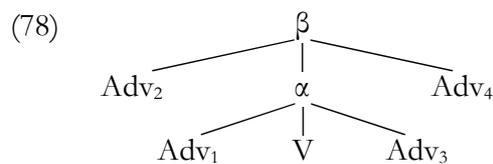
Haider's framework allows different analyses of PP extraposition, which can be seen as counterparts of the symmetric analyses outlined in section 2. Haider himself adopts a variant of the extraposition analysis. He suggests that PPs can be separated from the verb because they can

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[10] Haider has formulated the same general idea in slightly different ways. We have presented it here in terms of closure as this explains most transparently why the parsing constraint does not apply preverbally. In the preverbal domain, no closure is possible, as the verbal predicate is still absent in the developing syntactic representation.

appear in the extraposition domain. If their position within the extraposition domain is variable, the word order data discussed in section 2 follow straightforwardly.

A variant of the verb raising analysis would assume that PPs cannot appear in the extraposition domain (where adverbials appear in ascending order). Therefore, verb and PPs could only be separated by preverbal adverbials crossed by verb raising. Like the symmetric verb raising analysis, this predicts that sandwiched adverbials come in descending order. A mixed analysis can be created by allowing PPs to appear in the extraposition domain and by assuming verb raising away from the PP. Like symmetric mixed analyses, this predicts variable order for sandwiched adverbials.

As before, the evidence gathered in section 2 supports the extraposition analysis.

3.4 Conclusion

In this section, we have identified two asymmetric analyses that successfully capture adverbial order in structures of PP complementation: an account based on roll-up movement around adverbials and PPs, and Haider's proposal, which regulates postverbal adverbial order through incremental interpretation and allows PPs to appear in the extraposition domain. These three analysis share two core analytical components with the symmetric extraposition analysis. They assume an ascending structure for postverbal adverbials at some level of representation (overt syntax and semantics, respectively). And they assume variation in the position of PP complements with respect to adverbials. This does not imply that the three implementations of the extraposition analysis are notational variants – it simply shows that the same idea can be expressed in different frameworks.

4. Negative Polarity and Adverbial Order

We will now explore whether it is possible to decide between the three implementations of the extraposition analysis outlined in sections 2 and 3.

In other domains, arguments have been advanced against roll-up movement, based on problems with movement theory (see Abels and Neeleman 2012) and problems resulting from

the increased tree size required by antisymmetry (see Neeleman 2017). Similarly, Neeleman (2018) argues that Haider's notion of incremental interpretation faces difficulties in capturing the ubiquity of the Universal 20 pattern (the observation that in a given domain pre-head order is fixed, while post-head order varies; see Greenberg 1963, Cinque 2005 and Abels and Neeleman 2012).

The symmetric account also has costs attached. It has been observed that in the postverbal domain grammatical dependencies such as reflexive binding and the licensing of negative polarity items (NPIs) tend to be left-to-right (see Barss and Lasnik 1986). That is, the dependent category typically follows the category that licenses it. On standard assumptions, this suggests that VP has a rightward descending structure (see Larson 1988, 1990). Alternative accounts of the Barss and Lasnik data require that grammatical dependencies are conditioned by precedence and/or a looser structural notion than c-command (for relevant discussion, see Jackendoff 1990, Ernst 1994, Williams 1997, Barker 2012, Janke and Neeleman 2012, and Bruening 2014).[11]

For reasons of space, we cannot review this issue in full, but we will look in some detail at data relevant to adverbials. As Larson (2004) points out, examples like (79a) are acceptable. Here, the NPI in the clause-final PP is licensed by the preceding adverbial. It is widely assumed that

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[11] The impression that one may get from the literature is that postverbal scope is systematically left-to-right. This is not true for pairs of adverbials (see in section 2). It is also not true for pairs of arguments or for combinations of an argument and an adverbial. For example, dative constructions and double-PP construction allow right-to-left variable binding, as long as Williams' (1997) General Pattern of Anaphoric Dependence is satisfied (see (ia,b); see also Bruening 2001). Notice that the same possibility does not exist in double-object constructions (see (ic)), suggesting that these must have a descending structure (as argued by Larson 1988; see Janke and Neeleman 2012 for discussion).

(i)   a.   I [$_{VP}$ [gave a flower [that Peter said she$_1$ would like]] to [every girl in my class]$_1$].

        b.   I [$_{VP}$ [talked about a girl [that I knew he$_1$ liked]] with [every soldier in the hospital]$_1$].

        c.   *I [showed [$_{VP}$ the boy [who wrote it$_1$ last summer] [$_{V}$ [every essay I corrected]$_1$]]].

NPIs are licensed in the scope of their trigger (see Ladusaw 1979, Zwarts 1995, Giannakidou 1998 and De Swart 1998, among others). If so, (79a) requires left-to-right scope, suggesting a structure in which the PP is lower in the clause than the adverbial. This conclusion is strengthened by the fact that reversing the order of the PP and the adverbial renders the example unacceptable (see (79b)).

(79)   a.   Geoffrey gets up [AdvP only rarely] [PP at any time before nine].

       b.   *Geoffrey gets up [PP at any time before nine] [AdvP only rarely].

These data run counter to the conclusion drawn above that adverbial order and scope require an ascending structure at some level of representation. Indeed, none of the analyses under consideration can capture the data in (79) making use of the derivations discussed so far.

   We first consider why the example in (79b) should be ungrammatical. On all three analyses under consideration the example at least permits a structure in which the NPI can be interpreted in the scope of its licenser. In the analysis we advocate, this is consequence of rightward ascent (see (80a)). On the antisymmetric analysis, roll-up movement delivers right-to-left scope (see (80b,c)). On Haider's analysis, the preferred incremental interpretation of postverbal adverbials has the same effect (see (80d,e)).

(80)   a.   *Geoffrey [[gets up [PP at any time before nine]] [AdvP only rarely]]

       b.   Geoffrey [[AdvP only rarely] [[PP at any time before nine] [gets up]]] →

       c.   *Geoffrey [[[gets up]₁ [[PP at any time before nine] t_1]]₂ [[AdvP only rarely] t_2]]

       d.   Geoffrey [gets up] [[PP at any time before nine] [e [AdvP only rarely]]] →

       e.   *Geoffrey [[⟦gets up⟧ ⟦at any time before nine⟧] ⟦only rarely⟧]

So, an additional assumption must be made to explain the ungrammaticality of (79b). All three analyses could rely on a constraint requiring that an NPI is preceded by its trigger (see Jackendoff 1972, Ladusaw 1979 and Aquaviva 2002). The antisymmetric analysis and Haider's proposal could alternatively insist that the NPI must be c-commanded by its trigger, given that

only rarely does not c-command *any* in (80c) and (80e) (see e.g. Klima 1964 and Progovac 1994).

These additional licensing conditions are unsatisfactory as they stand. First, they face a number of empirical challenges (see, for instance, Hoeksema 2000). Second, they are stipulative. Precedence and c-command have been proposed as factors that regulate dependencies between syntactic constituents. However, the licensing of NPIs does not involve a direct relation with the trigger. Rather, the trigger endows a domain with semantic properties that in turn license NPIs contained within it. These issues require work, but they do not distinguish between the three accounts under discussion.

We next turn to the question why (79a) is grammatical. The problem that this example poses is that, on the derivations explored so far, all three analyses under discussion locate the NPI outside the scope of its trigger. In a symmetric syntax, this is a consequence of rightward ascent (see (81a)). On the roll-up account of postverbal adverbials, the higher modifier ends up to the right of the lower one, with scope encoded in the underlying representation (see (81b,c)). On Haider's account, incremental interpretation maps a descending syntax onto an ascending semantics (see (81d,e)).

(81) a. Geoffrey [[gets up [$_{\text{AdvP}}$ only rarely]] [$_{\text{PP}}$ at any time before nine]].

b. Geoffrey [[$_{\text{AdvP}}$ only rarely] [[$_{\text{PP}}$ at any time before nine] [gets up]]] →

c. Geoffrey [[[gets up]$_1$ [[$_{\text{AdvP}}$ only rarely] t_1]]$_2$ [[$_{\text{PP}}$ at any time before nine] t_2]]

d. Geoffrey [gets up] [[$_{\text{AdvP}}$ only rarely] [e [$_{\text{PP}}$ at any time before nine]]] →

e. Geoffrey [[⟦gets up⟧ ⟦only rarely⟧] ⟦at any time before nine⟧]

The clash between the grammaticality of (79a) and the evidence for an ascending structure for adverbials is only apparent, though. The accounts of adverbial sequences discussed in sections 2 and 3 are intended to capture neutral word order, but in many examples of the type in (79a) the adverbials come in a marked order. For example, the trigger may be a time adverbial, while the constituent containing the NPI is a manner adverbial (see (84b), (85b) and (86b) below). In

marked structures, different derivations are available, and these do explain why (79a) is grammatical.

A hypothesis compatible with the symmetric extraposition analysis is that the PP containing the NPI is extraposed from a position below the triggering adverbial (see (82a,b)). This generates a linear order in which the trigger precedes the NPI, and at the same time it allows the PP, and therefore the NPI, to be interpreted in the scope of the trigger after reconstruction. On the antisymmetric account one could assume that roll-up movement around adverbials is the default way of deriving postverbal order, while non-snowballing VP movement is available as a marked option. This will yield left-to-right scope, as required (see (82c,d)). Haider characterizes incremental interpretation as the least costly way of processing postverbal adverbial sequences. This of course leaves open anti-incremental interpretation as a marked alternative used in examples like (79a) (see (82e,f)).

(82) a. Geoffrey [[gets up [$_{PP}$ at any time before nine]] [$_{AdvP}$ only rarely]] →

b. Geoffrey [[[gets up t_{PP}] [$_{AdvP}$ only rarely]] [$_{PP}$ at any time before nine]]

c. Geoffrey [[$_{AdvP}$ only rarely] [[$_{PP}$ at any time before nine] [gets up]]] →

d. Geoffrey [[gets up]$_1$ [[$_{AdvP}$ only rarely] [t_1 [[$_{PP}$ at any time before nine] t_1]]]

e. Geoffrey [gets up] [[$_{AdvP}$ only rarely] [e [$_{PP}$ at any time before nine]]] →

f. Geoffrey [[⟦gets up⟧ ⟦at any time before nine⟧] ⟦only rarely⟧]

These proposals are not on a par. By hypothesis, extraposition affects PPs, but not adverbials that belong to other categories (see also (23)). Therefore, the symmetric account predicts that the sequence V–trigger–[$_{XP}$… NPI …] will be grammatical only if XP is prepositional. The alternative asymmetric accounts make no such prediction. In fact, they predict that the category of XP is irrelevant to the grammaticality of the structure – rightward descent is fundamental to the syntax and independent of category.

The data support the symmetric account. In each of the example sets in (83)–(87), a

preverbal adverbial trigger can licence an NPI contained in a postverbal adverbial, irrespective of the category of that adverbial. However, a postverbal adverbial trigger can only license NPIs contained in an adverbial if that adverbial is a PP:

(83) a. I <rarely> stay <*rarely> anywhere interesting.

    b. I <rarely> stay <rarely> in any major city.

(84) a. John <rarely> speaks <*rarely> any clearer than that.

    b. John <rarely> speaks <rarely> with any clarity.

(85) a. Susan has <only once> played Gwendolen <*only once> any less wooden.

    b. Susan has <only once> played Gwendolen <only once> with any flair.

(86) a. The Great Gonzo <only rarely> performs <*only rarely> anymore.

    b. The Great Gonzo <only rarely> performs <only rarely> with any conviction.

(87) a. Geoffrey <only rarely> gets up <*only rarely> any earlier than nine.

    b. Geoffrey <only rarely> gets up <only rarely> at any time before nine.

These judgments are confirmed by our panel of native-speaker linguists. In (88) we report judgments for the acceptability of each example. There is a clear pattern: when the adverbial trigger appears preverbally, all examples are judged grammatical, unanimously or by a large majority of panel members. When the trigger is postverbal, however, the category of the constituent containing the NPI matters. If that constituent is a PP, examples are still judged grammatical, but when it is not, they are judged ungrammatical, again unanimously or by a large majority.

(88)

		(83)		(84)		(85)		(86)		(87)	
		Tr–V	V–Tr	Tr–V	V–Tr	Tr–V	V–Tr	Tr–V	V–Tr	Tr–V	V–Tr
a.	✓	10	0	10	0	9	0	9	0	9	0
	?	0	0	0	0	1	1	1	4	1	2
	*	0	10	0	10	0	9	0	6	0	8
b.	✓	10	8	10	9	10	10	9	9	10	10
	?	0	2	0	1	0	0	1	1	0	0
	*	0	0	0	0	0	0	0	0	0	0

Acceptability of trigger-verb order (Tr–V) and verb-trigger order (V–Tr) in (83a,b)–(87a,b) (n=10)

The pattern in (88) is as predicted by the symmetric analysis, but unexpected on the two asymmetric accounts under consideration. This is a striking outcome. Grammatical dependencies in the postverbal domain are widely seen as providing the strongest argument for rightward descending structures, but here the licensing of NPIs supports a more traditional rightward ascending structure.

If the above is correct, one would expect that other types of extraposition license NPIs, too. This is certainly true of heavy XP shift. The contrast in (89) run parallels that in (79) (data from Huang 2011).

(89) a. The evidence presented so far [[supports t_{DP}] in no way] [$_{DP}$ any of the claims made by the plaintiffs].

b. *The evidence presented so far [[supports [$_{DP}$ any of the claims made by the plaintiffs]] in no way].

We do not want to suggest that the data in (88) settle the issue – many questions remain. However, on balance the symmetric extraposition analysis seems to have the edge.

5. The bigger picture

We close this paper with a discussion of how our findings can be integrated into a more comprehensive account of the English VP. The nature of this section is different from its predecesors, as a detailed comparison of alternative analyses of VP would take up too much space. Instead, we simply present proposals that fit well with the symmetric extraposition analysis.

It is likely that PP extraposition is not a unitary operation. We have shown in section 2 that extraposition across time adverbials, as opposed to extraposition across manner adverbials, comes with specific information-structural demands. This suggests that at least two processes are at play. The simplest of these, we suggest, consists of variation in the base position of a PP with respect to a manner adverbial, as in (90) (where XP marks the position of the adverbial).

(90) a.

```
                    VP
                  /    \
               VP       XP
             /    \
            V      PP
```

b.

```
                    VP
                  /    \
               V'       PP
             /    \
            V      XP
```
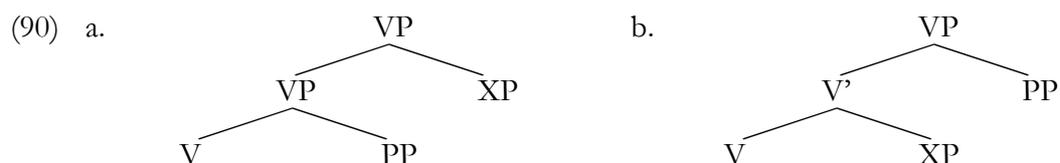
Evidence for this analysis comes from *do so* ellipsis. Crucially, the constituent replaced by *so* cannot contain a trace bound from outside the ellipsis site (see Haddican 2007 and references mentioned there). We illustrate this restriction for *wh*-movement in (91a) and for heavy XP shift in (91b). But if *so* cannot contain a trace, the PP in (91c) cannot have escaped the ellipsis site through movement – it must have been base-generated outside of it.

(91) a. A: I [read a novel]$_1$ every week without fail.

B: Really? *So, [which novel] did you do [so]$_1$ last week?

b. *John [read t_2 carefully]$_1$ [most of Ecclesiastes]$_2$ and Bill did [so]$_1$ [the entire Song of Solomon].

c. Jordan [met secretely]$_1$ [with his lawyer], and William did [so]$_1$ [with his accountant].

If this is correct, why is it not possible for manner adverbials to intervene between the verb and a selected DP? Janke and Neeleman (2012) argue, following Stowell 1981, that this is a consequence of case adjacency, which they formulate as in (92). (This condition must be supplemented with a language-specific constraint that requires rightward case licensing.)

(92) a. The assignment domain of a case-marked DP consists of that DP and any category linearly intervening between it and the case-assigning head.

b. No XP can precede DP in its assignment domain.

If the verb first merges with a DP and subsequently with an adverbial, the resulting ascending structure satisfies case adjacency (see (93a)). However, if the order of merger is reversed, a simple ascending structure will not do – the DP in (93b) is preceded in its case domain by AdvP. This does not imply that selected DPs cannot be generated higher than manner adverbials. The problem with case adjacency can be solved by merger of the accusative DP to the left of V',

followed by verb movement across it. In the VP-shell structure thus derived, the accusative DP is right-adjacent to the verb, as required (see (93c)).

(93) a.
```
          VP
        /    \
      VP      XP
     /  \
    V    DP
```

b. *
```
          VP
        /    \
      V'      DP
     /  \
    V    XP
```

c.
```
        VP
       /  \
      V    VP
          /  \
        DP    V'
             /  \
            tᵥ    XP
```
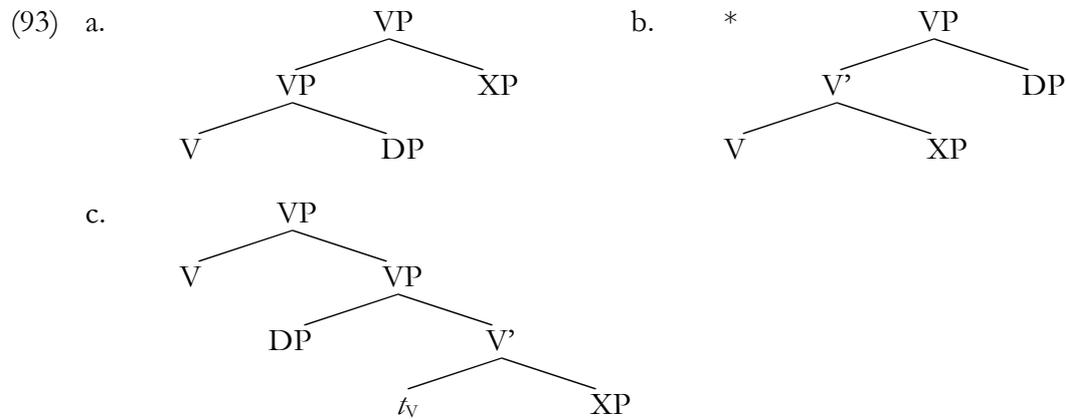
Janke and Neeleman argue that VP-shell formation in general is case-driven. A VP shell is generated whenever a selected DP is not the first constituent to merge with the verb. In all other circumstances, VP-shell formation is blocked by economy considerations. If so, verbs that select a PP do not move.

The distribution of particles provides independent evidence for the conclusion that verbs may move in the context of selected DPs, but not in the context of selected PPs. It is widely assumed that separation of verb and particle is a function of verb raising (see Koster 1975 and much subsequent work; see Larsen 2014 for an overview of recent literature on particle constructions). If so, the contrast in (94) seems highly relevant:

(94) a. John looked <up> the information <up>.

b. John walked <out> on Mary <*out>.

Janke and Neeleman develop the argument as follows. They assume (i) that particles form a complex predicate with the verb (see Johnson 1991 and Roeper & Keyser 1992), and (ii) that particles project optionally. This allows for two structures, [V Prt] and [V PrtP], each of which can merge with a selected DP or PP. If a particle verb selects a DP and the particle does not project, as in (95a), case adjacency is satisfied (notice that (95) specifically mentions XPs, which implies that only intervening maximal projections trigger case adjaceny violations). If in the same

structure the particle were to project, case adjacency would be violated. As before, English responds to this threat by generating a VP-shell (see (95b,c)).

(95) a. John [$_{VP}$ [$_V$ looked up$_{Prt}$] the information].

b. *John [$_{VP}$ [$_V$ looked up$_{PrtP}$] the information].

c. John [$_{V'}$ looked [$_{VP}$ the information [$_V$ t_V up$_{PrtP}$]]].

As only particles that project can host modifiers and complements, it follows that any such extra material is excluded in the V-Prt-DP order, but permitted in the V-DP-Prt order. We illustrate the effect below using the prepositional modifier *right* (see Den Dikken 1995):

(96) a. *John [$_{VP}$ [$_V$ looked [$_{PrtP}$ right up]] the information].

b. John [$_{V'}$ looked [$_{VP}$ the information [$_V$ t_V [$_{PrtP}$ right up]]]].

If a particle verb selects a PP, case adjacency does not come into play. This has two implications. First, there is no longer a trigger for VP-shell formation, not even when the particle projects. In the absence of a trigger, verb movement is blocked, so that the particle must surface adjacent to the verb. Second, modification of the particle is unproblematic, even though it appears between the verb and a selected category:

(97) a. John [$_{VP}$ [$_V$ walked (right) out] on Mary]].

b. *John [$_{V'}$ walked [$_{VP}$ on Mary [$_V$ t_V (right) out]]].

The hypothesis that VP shell formation is case-driven has many other implications, which we cannot discuss here. What is important in the current context is that it reconciles the evidence for verb movement in English (from Larson 1988 and work building on Larson's insights) with our conclusion that verb movement plays no role in the generation of V-Adv-PP orders.

In addition to PP extraposition resulting from base generation, there is evidence for PP extraposition resulting from movement. Recall that from section 2.2 that PP extraposition across time adverbials requires an interpretive license, with the PP acting as a focus or a (continuing) topic. This is suggestive of movement, which in turn implies that time adverbials cannot be

merged before selected categories, or at least that this order of merger comes with a penalty.

The distribution of floating quantifiers confirms this aversion to low attachment of time adverbials. Janke and Neeleman (2012) argue that object-oriented floating quantifiers appear in descending structures like (93c), but not in ascending ones like (93a) (because floating quantifiers must be c-commanded by the category they associate with). This explains an observation by Maling (1976), namely that object-oriented floating quantifiers are grammatical in the presence of object-oriented, but not subject-oriented depictives. Object-oriented depictives must be merged before the object they associate with (given the c-command requirement on predication; Williams 1980). They therefore trigger VP-shell formation, which in turn maks it possible to license an object-oriented floating quantifier (see (98a)). By contrast, subject-oriented floating quantifiers are merged above the object, which means that they appear in a traditional ascending structure that cannot host an object-oriented floating quantifier (see (98b)).

(98) a.   Henry$_1$ ate [$_{VP}$ [the fish]$_2$ [both$_2$ [$_{A'}$ raw$_2$]]].

  b.   *Henry$_1$ [$_{VP}$ [[ate [the fish]$_2$] both$_2$] drunk$_1$].

If object-oriented floating quantifiers indeed diagnose descending structures, then the hypothesis that temporal adverbials resist merger below selected categories predicts that there should be a constrast between the acceptability of (99a) and (99b), on a par with the constrast between PP extraposition across manner and time adverbials.

(99) a.   John studied the letters both carefully.

  b.   ??John studied the letters both yesterday.

We ran an AMT experiment to test this, with ten pairs of test sentences and forty participants. The results show that, as expected, object-oriented floating quantifiers are less acceptable in the presence of a time adverbial:

(100)	V-DP-FQ-Adv$_M$	V-DP-FQ-Adv$_T$
	4.22 (1.04)	3.11 (1.21)

$$p<0.05$$

Accaptability of object-oriented FQs followed by a manner/time adverbial (n=40).

An aversion to low merger of time adverbials explains why speakers analyze V-Adv$_T$-PP order as resulting from rightward movement of the PP – on a movement analysis, the time adverbial is not merged below a selected category. The movement in turn requires an interpretive license.

The second piece of evidence for PP extraposition through movement was presented in the previous section, where we argued that an NPI contained in a PP adverbial can be licensed by a postverbal trigger if the PP moves rightward from below that trigger. This movement makes it possible for the NPI to appear in the scope of the trigger (under reconstruction), while at the same time meeting the constraint that the trigger precede the polarity item. The same derivation allows a postverbal trigger to license an NPI contained in a selected PP:

(101) a.   I [[communicated t_{PP}] at no point] [$_{PP}$ with any of them].

   b.   *I [[communicated [$_{PP}$ with any of them]] at no point].

PP extraposition deserves further attention, but we think the above provides a good starting point. This is partly because there is an intruiging parallel between PP extraposition and the by-now standard view of scrambling in OV languages. We have argued that PP extraposition can result from base generation or rightward movement; in the latter case, the PP must contain a focus, a continuing topic or a scopally dependent category. Scrambling comes in two types: A-scrambling, which is frequently analyzed as base-generated (see Fanselow 2001, 2003 and references mentioned there), and A'-scrambling, which is typically licensed if the scrambled category is a contrastive topic, a contrastive focus or a quantifier taking scope in its derived position. The parallel is not perfect, but it seems plausible that the differences can be traced back to the fact that scrambling is a leftward shift, while PP extraposition is rightward.

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2 April 2018