PP Extraposition and the Order of Adverbials in English

Ad Neeleman (UCL) and Amanda Payne (University of Delaware)

In English, adverbs may intervene between the verb and a selected PP. This fact can be explained in two ways: through extraposition of the PP or through raising of the verb. We explore whether the order among multiple postverbal adverbials can be used to force a decision between these two analyses, as well as a third mixed analysis that assumes both verb raising and PP extraposition. Adverbial order was first identified as a diagnostic by Pesetsky (1989), who uses it to argue that a mixed analysis is necessary. Further exploration of the data shows, however, that no approach is empirically adequate as it stands. There is a simple way out of this stalemate, as the extraposition analysis, but not the verb raising or mixed analyses, can be amended successfully. The required auxiliary hypothesis is that certain adverbials can adjoin to other adverbials (see also Rohrbacher 1994 and Williams 2014).

Keywords: PP extraposition, verb raising, adverbial hierarchy, scope, Amazon Mechanical Turk

1. Introduction

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 decide between three potential analyses of the alternation in (1). The first analysis assumes that the position of the PP in (1a) and (1b) varies, either as a result of movement or through base generation (see (2)). We will call this the extraposition analysis.

(2)   a.   [[V PP] Adv]   b.   [[[V (t_{PP})] Adv] PP]

The second analysis assumes that the position of the PP is constant. It attributes the alternation in (1b) to two factors: verb raising and variation in the linearization of the adverb (see (3)). We will call this the verb raising analysis.

(3)   a.   [V [[t_V PP] Adv]]   b.   [V [Adv [t_V PP]]]

The third analysis assumes both verb raising and PP extraposition, with the consequence that there are two derivations that yield the order in (1b) (see (4)). We will call this the mixed analysis.

(4)   a.   [V [[t_V PP] Adv]]   b.   [V [Adv [t_V PP]]]

                                                 c.   [V [[t_V (t_{PP})] Adv] PP]

The main criterion we will use to force a choice between these analyses 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)). (Here and below, we assume that adverbials in English mirror around the verb's base position, as already noted in Quirk et al. 1985.)

(5)   a.   [V [<Adv$_2$> [<Adv$_1$> [t_V PP] <Adv$_1$>]<Adv$_2$>]]

       b.   [[<Adv$_2$> [<Adv$_1$> [V (t_{PP})] <Adv$_1$>] <Adv$_2$>] PP]

The mixed analysis in principle allows adverbials between verb and PP to surface in either descending or ascending order. Indeed, if more than two adverbials appear between V and PP their order could be initially decending and subsequently ascending; (6) permits Adv$_3$–Adv$_1$–Adv$_2$ and Adv$_2$–Adv$_1$–Adv$_3$:

(6) $[V [<Adv_3> [<Adv_2> [<Adv_1> t_V (t_{PP}) <Adv_1>] <Adv_2>] <Adv_3>] PP]$

However, it is possible that the PP has access to positions higher than the verb's landing site. If so, there may be high adverbials that must follow other adverbials sandwiched between verb and PP (compare Adv$_3$ in (7a)). 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$_3$ in (7b)).

(7) a. $[[<Adv_3> [V [<Adv_2> [<Adv_1> t_V (t_{PP}) <Adv_1>] <Adv_2>]] \textbf{<Adv_3>}] PP]$

b. $[V [\textbf{<Adv_3>} [[<Adv_2> [<Adv_1> t_V (t_{PP}) <Adv_1>] <Adv_2>] PP] <Adv_3>]]$

In sum, there is not one, but a family of mixed analyses with slightly different 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 he reports as being ambiguous. On one reading, *intentionally* takes scope over *twice* (as a result of verb movement); on the other *twice* takes scope over *intentionally* (as a result of PP extraposition).[1]

We re-examine this conclusion. One reason for doing so is the existence of analyses not considered by Pesetsky (see in particular section 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

---

[1] Pesetsky treats PP extraposition as an instance of heavy XP shift. We do not adopt this analysis. First, the heaviness restriction on extraposed DPs is more severe than that on extraposed PPs (compare *I met yesterday that man* with *I met yesterday with John*; see Stallings et al. 1998 and Stallings and MacDonald 2011 for experimental work on the relevant notion of length). Second, PP extraposition can take place out of dependents of V, but heavy XP shift cannot (cf. *I saw a photo <*of> yesterday <of> the largest planet in system LMx10*). Third, heavy XP shift is a focus construction, but PP extraposition is possible in the absence of focus. An example is given in (i), where *him* in the underlined PP refers back to *Kasbo*, the topic of the utterance.

(i) […] Kasbo may no longer be on the Monstercat roster but I spoke yesterday <u>with him</u> over Facebook and he's currently in the works for a new EP […]. (www.youtube.com/watch?v=rI-t2M0t63s; 24 August 2017)

been disputed, especially in Rohrbacher 1994, suggesting that a more systematic approach to data gathering is necessary.

In this paper, 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. Such experiments have been shown to be as rigorous as experiments run in a laboratory setting (Sprouse 2011). Aggregated grammaticality judgments from Amazon Mechanical Turk 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.

A warning regarding the experimental results is necessary, though. Orders predicted to be ungrammatical by the various analyses under consideration are often grammatical on a theoretically irrelevant alternative analysis, with one of the adverbs parenthetical or in dislocation. The consequence is that a difference in judgments often does not directly reflect a difference in grammaticality, but rather the difference between having an initial parse that is grammatical and being forced to backtrack and access an alternative parse when the initial parse fails. For this reason, we take differences in the acceptability of contrasting orders to be more informative than acceptability levels of individual orders, which tend to be relatively high for orders that are dispreferred (see Payne, forthcoming).

Where we explore scope, we resort to judgments from a panel of ten native speaker linguists. This is because we are not convinced that experiments using Amazon Mechanical Turk are a reliable way of uncovering scope preferences (owing to the difficulty of judging grammaticality given a reading forced by context).

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 and Ackema and Neeleman 2002, which reconciles it with our observations

in a fairly straightforward way. Equally successful auxiliary hypotheses cannot be found for competing analyses.

2. Time and manner adverbs

The premise of our first set of experiments is that time adverbials are attached higher than manner adverbials, at the very least as a matter of preference (see Jackendoff 1972, Ernst 2002, and Cinque 1999). We tested the order of adverbials in three conditions, schematized in (8). 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. Representative examples are given in (9) (with our informal grammaticality judgments).

(8) 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

(9) a. Johanna looked <*last night> desperately <last night> for her puppy.

 b. Johanna looked desperately for her puppy last night.

 b'. *Johanna looked last night for her puppy desperately.

 c. Johanna looked for her puppy <*last night> desperately <last night>.

The extraposition analysis predicts that in all three conditions the manner adverbial will precede the time adverbial. 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)   [[[[[V <PP>] Adv_M] <PP>] Adv_T] <PP>]

As 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 adverbials mirror around the base position of the verb, yielding manner adverbials before time adverbials 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:

(11)　　　[V [<Adv_T> [<Adv_M> [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:

(12)　a.　[V [<Adv_T> [[<Adv_M> [t_V <PP>] < Adv_M>] <PP>] < Adv_T>] <PP>]　'equal height'

　　　b.　[V [<Adv_T > [[<Adv_M> [t_V <PP>] < Adv_M>] <PP>] < Adv_T>]]　　　　　'low PP'

　　　c.　[[[V [<Adv_M> [t_V <PP>] < Adv_M>] <PP>] Adv_T] <PP>]　　　　　　'low V'

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. The 'low PP analysis' predicts that time adverbials precede manner adverbials in the sandwiched condition, that both orders of adverbials are available in the straddled condition, and that in the rightmost condition manner adverbials precede time adverbials. Finally, the 'low V analysis' predicts manner adverbials before time adverbials in all three conditions.

Thus, there are the following analyses to consider:

(13) a.　Extraposition analysis

　　 b.　Verb raising analysis

　　 c.　Mixed analyses: (i) Equal height analysis; (ii) Low PP analysis; (iii) Low V analysis

We tested these analyses through Amazon Mechanical Turk using ten sets of examples. Each set consisted of a basic sentence and five alternations, as in the schema in (8). Hence, there were sixty test sentences in all. We recruited twenty-eight 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). 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 manner adverbials preceding time adverbials. (Significance was calculated using two-tailed t-tests, with $p < .05$ as the threshold; The difference in grammaticality between the alternate orders in (14) is not significant among any of the three conditions).

(14)

	Sandwiched	Straddled	Rightmost
$Adv_M - Adv_T$	4.9	5.9536	5.4714
$Adv_T - Adv_M$	3.9714	4.4571	4.2786
Significance	$p < .0001$	$p < .001$	$p < .0001$

These findings are as predicted by the extraposition analysis and the low V analysis. They lead us to reject 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.

The conclusion that all but the extraposition and low V analyses should be rejected is corroborated by the pattern of admissible and inadmissable extraction from the PP complement. Current movement theory is not sufficiently explicit to generate predictions about extraction on the basis of a given theory of PP extraposition. However, as we will

show, the extraction data have a straightforward interpretation on the extraposition and low V analyses, but not on the verb raising analysis or the remaining mixed accounts.

We recruited twenty subjects to test *wh*-extraction out of PPs. The PP appeared in four contexts: to the left/right of a manner adverbial, and to the left/to right of a time adverbial. There were ten sets of examples, so forty test sentences in all. Otherwise, the experimental set up was as above. The results are given in (15) as average scores. All contrasts were significant (p <.05), except for the small constrast between the first two columns.

(15)

V [$_{PP}$ t_{wh}] Adv$_M$	V Adv$_M$ [$_{PP}$ t_{wh}]	V [$_{PP}$ t_{wh}] Adv$_T$	V Adv$_T$ [$_{PP}$ t_{wh}]
5.57	5.6	6.3	3.3

These findings pose a problem for the verb raising analysis and the equal height and low PP analyses, because on these analyses the PP can be parsed as sister of the verb's base position in all four conditions. The sister of V is the traditional complement position and generally assumed to allow subextraction. Consequently, it remains unclear why there should be any constrasts in acceptability among the four conditions. By contrast, the extraposition analysis and the mixed low V analysis can capture the data by assuming that there is a lower domain that hosts manner adverbials and that permits subextraction from PP and a higher domain that hosts time adverbials and that bans subextraction from PP. While details have to be worked out, this is in line with the kind of factors usually assumed to regulate extraction.

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 (16a)). The predictions of the low V analysis shift, though.

In the sandwiched and the straddled conditions, both the lower and the higher adverbial may precede, but in the rightmost condition the higher adverbial must follow (see (16b)).

(16) a. $[[[[[V <PP>] Adv_1] <PP>] Adv_2] <PP>]$

b. $[V [<Adv_2> [[<Adv_1> [t_V <PP>] < Adv_1>] <PP>] < Adv_2>] <PP>]$

Reversible adverb pairs provide one way to test these predictions, given that 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 (17)), 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. The low V analysis predicts ambiguity in the sandwiched and straddled conditions, and right-to-left scope in the rightmost condition.

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

As mentioned in section 1, experiments using Amazon Mechanical Turk may not be a reliable way of uncovering scope preferences (as it is difficult for subjects to judge the grammaticality of a test sentence given a reading forced by context). We therefore asked ten 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 (18). Each set had a different combination of reversible adverbs.

(18) 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 (19)). Neither analysis predicts this pattern. PP extraposition makes the wrong predictions for the sandwiched and rightmost conditions, while the rightmost and straddled conditions prove problematic for the low V analysis.[2]

(19)

	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 judgments for adverb-adverb pairs

These findings are corroborated by further data involving adverbials that are (or can be) merged low. In general, *again* 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, but in the rightmost condition *again* must follow. As these predictions involve order, they can be tested using Amazon Mechanical Turk. In a set up identical to those described above, we therefore presented twenty subjects with five sets of sentences of the type in (20).

(20) 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>.

---

[2] 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 2016. Our findings corroborate Bobaljik's claim that scope is variable (see section 4 for further discussion).

The results mirror those in (19). 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:

(21)

	Sandwiched	Straddled	Rightmost
Adv_M – *again*	4.25	5.75	4.50
again – Adv_M	4.88	5.0	4.88
Significance	n.s.	$p < .05$	n.s.

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.

4. Amending the PP extraposition analysis: Adverbial clustering

Both the extraposition analysis and the low V analysis need to invoke some auxiliary hypothesis to capture the findings of the previous section. 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).[3] 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 (22a,c), or the first may have merged with the second, yielding left-to-right scope (see (22a',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 (22b)).

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

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

---

[3] 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>].

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 4.1), the second is how adverbial clusters are interpreted (see sections 4.2 and 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 (see section 4.4).

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 (23a)), *intentionally twice* can be clefted (see (23b)). 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: (23b) implies that John had the intention to knock twice on the door).

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

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

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 (24) could be an independent modifier in the top part of the cleft, something that is unlikely to be true of *intentionally* in (23b).

(24) 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

12

follow in almost all circumstances. Therefore, judgments are predicted to shift when a PP replaces the first modifier in an adverb-adverb sequence. Adverbial clustering is ruled out, and consequently a pattern of judgments should emerge that is reminiscent of pairs of time and manner adverbials.

Indeed, when *intentionally* in (23) is replaced by *with intention*, the result is degraded:

(25)   *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 (19) to judge scope between a PP modifier and an adverb in three sets of three examples (one of which is given in (26)). The expected shift in judgments was evident, as all ten reported that they could only get right-to-left scope, irrespective of condition (see (27)). 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.)

(26) 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.

(27)

	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

A second time is an expression whose interpretation approximates *again*, but which cannot directly modify other adverbials, as shown by the ungrammaticality of (28).

(28)   *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 (20) 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:

(29) 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 Amazon Mechanical Turk (with twenty participants and a set up parallel to the tests reported above). The results showed that there is a significant preference in all conditions for the order in which *a second time* followed the adverb, as expected:

(30)

	Sandwiched	Straddled	Rightmost
Adv_M – *a second time*	4.2	4.7	5.0
a second time – Adv_M	3.3	3.5	3.7
Significance	p<.01	p < .01	p<.01

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.[4]

---

[4] Pesetsky (1989) claims that reducing the weight of the extraposed PP favours left-to-right scope among adverbials sandwiched between it and the verb. In his terms, this is because light PPs cannot undergo heavy XP shift (but see note 1). We have not tested this generalization. If it is correct, we would suggest the following explanation. As is well known, 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 for examples and discussion). We assume that this effect is prosodic in nature. With this in mind, consider the prosodic phrasing 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**}

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 (31).

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

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

The sentence in (31a) permits the interpretation in (32a), but not that in (32b). Conversely, the sentence in (31b) permits the interpretation in (32b), but not that in (32a). (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.)

(32) 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.

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

In (ia), *continuously* and *again* are merged independently, yielding right-to-left scope. In (ib), the adverbs cluster, yielding left ro 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 when the PP is light.

The same pattern can be observed in examples more directly relevant to the question under discussion. On a parse of the examples in (33) in which *accidentally* takes scope over *twice*, (33a) comes with the presupposition that Susan intended to knock twice on something other than the door, while (33b) presupposes that Susan intended to knock on the door, but either fewer or more times than two.

(33) 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; 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 (34a), the interpretation that obtains is parallel to that in (33b) (see (34b); for related discussion, see Bobaljik 2016).

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

     b. (i) Susan gave two knocks on the door; (ii) $\exists n$, 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.[5]

We may contrast (34b) with the interpretation that results when *accidentally* and *twice* are merged independently (in a left-braching configuration). In that case, *twice* takes scope over *accidentally*, yielding the presupposition that Susan intended to perform an action other

---

[5] 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 general principles.

than knocking on the door (the nature of this action is partly dependent on where stress is placed within *knock on the door*):

(35) 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 (33a), where *accidentally* triggers the presupposition that Susan intended to give two knocks on some object other than the door. That reading is indeed unavailable for these examples, as confirmed by the unanimous judgment of our panel of ten native speaker linguists.

4.3 Interpretive effects: Again continuously

We next consider adverbial clusters introduced by *again* (such as *again continously*). 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 (36a) and (36b).[6,7]

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

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

---

[6] 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* determines (or co-determines) the presupposition it triggers. For discussion and references, see Beck and Johnsson 2004 and Pedersen 2015.

[7] The string in (36b) 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*).

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, (36a) can have the interpretation in (37a), but not that in (37b). By contrast, (36b) has the interpretation in (37b), as well as that in (37a). 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.)

(37) 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 (36a) 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 (36b) *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 in (36a).

The underspecified nature of the presupposition triggered by *again* in examples like (36b) is brought to the fore by the contrast in (38).

(38) 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]].

18

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 (38a) 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 (38b), 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, (39a) can have the interpretation in (39b).

(39) 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:

(40) Cohen talked continuously for an hour. Then he played the piano continuously for 45 minutes. And then he knocked <on the door> [again continously] <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, (41a) requires that Cohen previously knocked on the second door continuously, as stated in (41b).

(41) 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 (42) is awkward and requires accommodation.

(42) Cohen talked continuously for an hour. Then he played the piano continuously for 45 minutes. #And then he [<again> [knocked on the door continously] <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, (43a) permits either of the interpretations in (43b,b').

(43) 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 (39) 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 (44) are as predicted: the final sentence in (44a) requires accommodation, but the final sentence in (44b) does not.

(44) 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.

4.4 Time adverbials

The conclusion from sections 4.2 and 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 assume 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 account for the data of section 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 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 (23a), that this assumption is correct.

The findings of sections 4.2 and 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.

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, which 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 (45)), 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 $③_L$.

(45) $[[<③_L> [V [[<②_L> [[<①_L> [t_V <PP>] <①_R>] <PP>] <②_R>] <PP>]] <③_R>] <PP>]$

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.

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 (46). This has the

22

consequence that descending pairs of non-time adverbials may now appear sentence-finally, which fixes the problem with the rightmost condition.

(46) $[<③_L> [[V\ PP]\ [<②_L> [<①_L> t_{VP} <①_R>] <②_R>]] <③_R>]$

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 (45) and (46), namely $①_R$. This yields the following schemes for bare verb raising and pied-piping, respectively:

(47) a. $[[<③_L> [V\ [[<②_L> [<①_L> [t_V <PP>]]\ <②_R>]\ <PP>]]\ <③_R>]\ <PP>]$

b. $[<③_L> [[V\ PP]\ [<②_L> [<①_L> t_{VP}]\ <②_R>]]\ <③_R>]$

The resulting analysis captures the problematic data.

However, this is not enough. The discussion of adverbial clustering in sections 4.1-4.3 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 4.1-4.3.

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 ((48b) is a variant of (39a)):

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

b. Cohen knocked on the second door again continuously.

The sentence in (48a) is a verb raising structure, with *continuously* in $①_L$ and *again* in $②_R$. The sentence in (48b) 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 irrelevant for interpretation, one would expect the two sentences to have the same meaning. That is not the case, however: (48a) triggers the presupposition that Cohen previously knocked continuously on the second door, but as shown in section 4.3, (48b) does not. Contrasts of this type remain unexplained and therefore require additional assumptions.

6. Conclusion

In sum, we have shown that, if suitably amended, both the PP extraposition and the low V analysis can capture the order of adverbials in the sandwiched, straddled and rightmost conditions as described in section 2 and 3. The PP extraposition analysis must be combined with an auxiliary hypothesis of adverbial clustering:

(49) 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 and 3, it must rely on two auxiliary hypothesis, given in (50c) and (50d)).

(50) 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 4 receive an explanation under the extraposition analysis, but not under the low V analysis.

Two conclusions can be drawn. First, the fact that certain adverb 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, because it covers more ground using fewer assumptions.

These conclusions should not be understood as a general case against verb raising in English. There is in fact strong evidence for such movement in double object constructions and other VP-shell structures. However, our discussion does suggest that there may not be a general rule of verb movement, and in particular it suggests that the verb does not move away from PP complements.

There is independent evidence for this. As is well known, a verb and associated particle may be separated when the verb takes a DP complement, but not when it takes a PP complement (see Larsen 2014 for a recent overview of the literature on particles):

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

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

These data are in line with our findings if separation of verb and particle is a function of verb raising (as assumed in much work on Germanic syntax since Koster 1975).

Of course, one may wonder why verb raising should be sensitive to the category of the verb's complement. We cannot go into this here, but for a theory of VP-shells predicting exactly this sensitivity, see Janke and Neeleman 2012.

References

Ackema, Peter, and Ad Neeleman. 2002. Effects of short term storage in processing rightward movement. In: Sieb Nooteboom et al. (eds.) *Storage and Computation in the Language Faculty* (1–51). Dordrecht: Kluwer.

Andrews, Avery. 1983. A note on the constituent structure of modifiers. *Linguistic Inquiry* 14: 695–697

Beck, Sigrid, and Kyle Johnson. 2004. Double objects again. *Linguistic Inquiry* 35: 97–123.

Bobaljik, Jonathan. 2016. Knocking twice intentionally. To appear in Halpert et al. (eds.) *The Pesky Set*, MITWPL (2017).

Cinque, Guglielmo. 1999. *Adverbs and Functional Heads: A Cross-Linguistic Perspective*. Oxford: Oxford University Press.

Jackendoff, Ray. 1972. *Semantic Interpretation in Generative Grammar*. Cambridge, MA: MIT Press.

Janke, Vikki, and Ad Neeleman. 2012. Ascending and descending VPs in English. *Linguistic Inquiry* 43: 151-190..

Koster, Jan. 1975. Dutch as an SOV language. *Linguistic Analysis* 1: 111-136.

Larsen, Darrell. 2014. *Particles and Particle-verb Constructions in English and Other Germanic Languages*. PhD dissertation, University of Delaware.

Ernst, Thomas. 2002. *The Syntax of Adjuncts*. Cambridge: Cambridge University Press.

Payne, Amanda. Forthcoming. *Adverb Typology: A Computational Characterization*. PhD dissertation, University of Delaware.

Pedersen, Walter. 2015. A scalar analysis of *again*-ambiguities. *Journal of Semantics* 32: 373–424.

Pesetsky, David. 1989. Language-particular processes and the Earliness Principle. Ms., MIT.

Quirk, Randolph, Sidney Greenbaum, Geoffrey Leech and Jan Svartvik. 1985. *A Comprehensive Grammar of the English Language*. London: Longman.

Rohrbacher, Bernhard. 1994. English main verbs move never. Ms. University of Pennsylvania.

Rooth, Mats. 1985. *Association with Focus*. PhD dissertation, University of Massachusetts, Amherst.

Sprouse, Jon. 2011. A validation of Amazon Mechanical Turk for the collection of acceptability judgments in linguistic theory. *Behavior Research Methods*. 43: 155–167.

Stallings Lynne, Maryellen MacDonald, and Padraig O'Seaghdha. 1998. Phrasal ordering constraints in sentence production: Phrase length and verb disposition in heavy-NP shift. *Journal of Memory and Language*. 39: 392–417.

Stallings, Lynne, and Maryellen MacDonald. 2011. It's not Just the "Heavy NP": Relative Phrase Length Modulates the Production of Heavy-NP Shift. *Journal of Psycholinguistic Research* 40:177–187.

Williams, Edwin. 2014. Compositionality and Derivation. Ms. Princeton University. (available at http://semanticsarchive.net/Archive/GYzZmI5O/paper.pdf)

8 September 2017