THE SYNTACTIC STRUCTURE OF
WH-SYNTACTIC AMALGAMS

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Wh-Syntactic amalgams (wh-SAs) (e.g., John ate I don’t know what,) inspire empirical and theoretical interest because the underlined expression—I don’t know what—displays their complex syntactic and semantic properties. This study focuses on three basic properties of wh-SAs—the underlined expression’s opacity, the wh-phrase’s visibility to the matrix, and the categorial matching between the underlined clause and the wh-phrase. We review Kluck’s (2011, 2014) sluicing analysis of wh-SAs and identify several empirical problems that it encounters. In spirit of Huddleston and Pullum (2002), we propose an alternative analysis of wh-SAs considering what to be the syntactic and semantic head of the whole expression and the rest—I don’t know—to be a type of parenthetical.*

Keywords: Content Kernel, Interrupting Clause, Parenthetical, Par-Merge, Unselective Binding

1. Introduction

The empirical scope of this paper is wh-syntactic amalgams (wh-SAs) exemplified in (1a–c), which were first discussed by Lakoff (1974).¹

(1) a. John made [I don’t know how many mistakes].
    b. We ate [I don’t know what].
    c. John invited [you’ll never guess how many people] to his party.

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¹ The term wh-syntactic amalgam is adapted from Tsubomoto and Whitman (2000).
As the name “amalgam” indicates, the wh-SA seems to combine two separate “propositions” (e.g., John made mistakes + I don’t know how many) into one clause. Thus, (1a, b) are roughly paraphrased as “John made mistakes, though I don’t know how many” and “We ate something, though I don’t know what,” respectively.

These paraphrases indicate that wh-SAs are to a large extent isomorphic with sluicing constructions. Though implementations differ widely, most of the recent studies (Guimarães (2004) and Kluck (2011, 2014), among others) analyze what appears to be merely a wh-phrase (how many mistakes in (1a)) as an interrogative clause whose sentential part is deleted under sluicing like I don’t know how many mistakes John made. In this approach, the bracketed strings in (1a–c), which we will call Interrupting Clauses (IC) hereafter following Kluck (2011), are taken as full-fledged clauses involving sluicing. In contrast, Huddleston and Pullum (2002) suggest that the ICs have neither sluicing nor interrogative clauses. They take the IC in (1a) to be a phrase headed by the boldfaced element (mistake) and the clausal chunk I don’t know to be a modifier to how. Following Kluck (2011), we refer to the boldfaced constituents in (1a–c) as the Content Kernel (CK) because they express content related to what is missing in the matrix clause.

The aim of this paper is twofold. First, we review Kluck’s analysis as a representative of the sluicing approach to wh-SAs and demonstrate that the analysis, in spite of its initial appeal, faces some empirical problems with the idea of sluicing. Second, we extend Huddleston and Pullum’s (henceforth, HP) suggestion and analyze the IC as a phrase headed by the CK and the clausal chunk I don’t know as modifying how as a localized parenthetical of some sort. The clausal chunk is also analyzed as an unselective binder that determines the quantificational force of the wh-expression that follows it. Evidence for that comes from the observation that wh-pronouns within the ICs have universal as well as existential interpretation. A comparison of our alternative with Kluck’s sluicing analysis reveals that our analysis is empirically more adequate than Kluck’s as it can account for a wider range of facts about wh-SAs than hers.

This paper is organized as follows. Section 2 describes three basic properties of wh-SAs based on the literature and our corpus search. Section 3 reviews Kluck’s analysis of wh-SAs and points out its empirical insufficien-

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2 Due to space constraints, we will not provide a detailed review of the previous analyses. See Kluck (2011) for a comprehensive review.
cies. Section 4 develops an alternative analysis of \textit{wh}-SAs based on HP’s (2002) analysis and compares it with Kluck’s analysis. Section 5 concludes the paper.

2. Basic Properties of \textit{Wh}-SAs

Based on the literature and our corpus search, this section describes three central properties of \textit{wh}-SAs that any analysis needs to account for.

The IC in each of the examples in (1a–c) appears to be subordinated to the matrix, but it is actually independent of the matrix, as Guimarães (2004) and Kluck (2011, 2014) argue. Crucial evidence for the root status of the IC is that elements in the matrix do not c-command into the IC. For example, in (2a) the R-expression \textit{the professor} in the IC does not trigger disjoint reference with the matrix subject \textit{he}. If the IC was subordinated to the matrix clause, \textit{he} would c-command \textit{the professor} and yield a Condition C violation. For similar reasons, we predict that a pronoun in the IC will not obey Condition B. In (2b), the IC subject \textit{he} corefers with the matrix subject \textit{the professor} without causing a Condition B violation.

(2) a. He it told Bea [the professor, didn’t even remember how many stories]. (Kluck (2014: 3))

b. The professor it told Bea [he, couldn’t remember how many boring stories]. (Kluck (2014: 10))

These facts suggest that the IC is invisible to c-command from the matrix subject. This leads to the conclusion that ICs are root clauses that are independent of the matrix,\(^3\) weakening the analyses of ICs as relative clauses that have been proposed in the literature (Tsubomoto and Whitman (2000) and Grosu (2006)).

While ICs are root clauses which are invisible to the matrix, as we saw above, the CKs inside ICs behave like elements of the matrix. There are several pieces of evidence for this. The first one originates from the fact that the CKs satisfy the selectional restriction of the matrix verb. In (3)

\(^3\) Further support that Kluck (2014: 5) gives for the root status of the IC is the application of root transformations such as negative inversion in the IC, which are commonly restricted to main clauses.

(i) Bob married [never in the world would you believe who] last year. However, this does not constitute clear-cut evidence, since certain subordinate clauses allow negative inversion (Hooper and Thompson (1973: 466)).

(ii) Robert was quite nervous, \textit{because never before had he had to borrow money.}
dollars meets the selectional restriction imposed by the matrix verb pay; therefore, one cannot replace dollars by people or evenings without causing a pragmatic anomaly.

(3) She has a much larger and finer one at home, which she had painted for herself; yes, and paid I don’t know how many hundred dollars for it. (COHA)

Since selectional restrictions are known to be a test for determining semantic rather than syntactic headedness, (3) does not yield clear-cut evidence that the CK is a syntactic element of the matrix. However, syntactic evidence for this is obtained from subject-verb agreement. Consider the following example:

(4) There {are/*is} God knows how many mistakes in this paper. In (4) it is the head noun mistakes that determines the number value of the entire IC. An instance attested in the corpora, example (5), also supports this point.

(5) There are God knows how many homeless people in the evacuation centers, … (Dale Osborne, The Dark Up)

This fact shows that the number form of the CK is determined by the matrix verb, suggesting that the CK is syntactically visible to the matrix.

Additional evidence comes from the coreferential relation between the matrix subject and an element inside the CK. In (6a), the R-expression the professor in the CK, which corefers with the matrix pronominal subject he, leads to a Condition C violation. This indicates that the boldfaced CK is c-commanded by the matrix subject. A Condition B effect also arises as in (6b). The pronoun him inside the CK, which is coreferential with the matrix subject the professor, induces a Condition B violation. This means that the IC does not function as a local domain for binding.

(6) a. *He, told Bea [you can imagine how many stories about the professor]. (Kluck (2014: 4))

b. *The professor, told Bea [you can imagine which story about him]. (Kluck (2014: 10))

The facts observed so far lead to the paradoxical conclusion that while the IC acts as an independent clause that is opaque to the matrix, the CK acts as an element of the matrix.

There is one more interesting aspect of wh-SAs that we would like to draw attention to. As was first observed by Grosu (2006), ICs are not limited to cases whose CKs are nominal. The following examples show that the boldfaced CK can be adjectival (7a, b) or adverbial (7c, d).
(7) a. From Australia it would be God knows how long. (BNC)
   b. Bob got a you can imagine how expensive car. (Kluck (2014: 33))
   c. … plunging God knows how deep into the mucky subsoil beneath Decatur Street. (BNC)
   d. I yawned I don’t know why, just to be doing something, … (COCA)

These examples suggest that the position in which an IC appears depends upon the category of the CK. If the CK is nominal, the IC must be in an argument positon (8), and if the CK is adjectival, the IC must be in a predicative (7a) or prenominal position (9).

(8) John wrote a letter I don’t know (*what/why).
(9) John bought an I don’t know how {expensive/*what} car.

To summarize, we have described the three properties of wh-SA: (i) the IC is a root clause that is opaque to the matrix, (ii) the CK behaves as a part of the matrix, and (iii) there is categorial matching between the CK and the IC. In particular, (i) and (ii) raise the following question: How is the CK related to the matrix despite the fact that the IC is opaque to the matrix? Two leading solutions to this question have been proposed in the literature: Guimarães’s (2004) multidominance approach and Kluck’s (2011, 2014) sluicing approach. Due to space constraints, in the next section we will focus on the latter and show that the analysis faces a number of problems (see Kluck (2011) for a comprehensive review of Guimarães (2004)).

3. Kluck (2011, 2014)

3.1. Kluck’s Sluicing Approach to Wh-SAs

Kluck tries to assimilate the IC of a wh-SA to a parenthetical clause with a sluiced wh-phrase like the one in (10a). Like the IC of a wh-SA such as (10b), the parenthetical you’ll never guess who in (10a) involves a sluiced remnant (who) whose clausal parts (Bill hit in the face) are elided. However, there is one obvious difference between the two: the overt anchor of the sluicing remnant (someone) is present in the matrix in (10a) but is absent in (10b). Based on this, she assumes that the wh-SA has a null anchor in the matrix corresponding to someone, which is represented by e as in (10c). This anchor is specified by the IC in the same way that the overt anchor someone is. The anchor acts like a missing constituent in the matrix.
(10) a. Bea hit someone—you’ll never guess who—in the face.
b. Bea hit [you’ll never guess who] in the face.
c. Bea hit e [you’ll never guess who] in the face.

To capture the opacity of the IC, Kluck adopts de Vries’s (2007) idea of Par (enthetic) Merge, which creates a paratactic hierarchy in contrast with regular Merge, which creates a subordinate hierarchy. Par-Merge applies to a parenthetical head that she dubs Par, a coordinator head that selects for an appositive and its anchor. Par has two roles. First, Par, like coordinative heads, is categorially underspecified and inherits its categorial features from its specifier. Thus, if the anchor in Spec ParP is a DP, the ParP functions as a DP. Second, Par renders the relation between anchor and appositive specificational. To illustrate this, consider an appositive relative clause such as in the sentence John, who is my neighbor, is a good guy, the relevant parts of which are represented as in (11).

(11) \[
\begin{array}{c}
\text{ParP} \\
\text{DP} \\
\text{John} \\
\end{array}
\]

Here, the anchor (John) occupies Spec ParP and the appositive clause occupies the complement to Par. ParP counts as a DP because its categorial status is inherited from John in Spec ParP. The relation between the anchor and the appositive clause is made specificational via a Par head. This provides an explanation for why appositive clauses are always adjacent to their anchors.

The output of Par-Merge does not dominate its input (Par and its complement). Taking c-command to depend on “Dominance-Inclusion,” ParP does not c-command Par or its complement, because these are not dominated by ParP. Par-Merge results in an absence of c-command relations between the complement to Par and any constituents that dominate Par′. In (11), the dashed branches represent the absence of a dominance relation between the ParP and its daughters. One motivation for this lies in the well-known fact that a quantifier in the matrix fails to bind a pronoun in the appositive clause (12). Everyone in the matrix does not c-command he in the appositive clause because Par and its complement are invisible to the output of Par-Merge.

(12) *Everybody, laughed at Mary, who he, saw last week.
Kluck extends *Par*-Merge to account for the root nature of the IC. As we mentioned above, she takes the IC to be a parenthetical clause with the null anchor of the sluicing remnant. On this assumption, the relevant parts of (10b) will be represented as in (13).

(13) \[ \begin{array}{c}
V \\
\text{hit} \\
\text{DP} \\
\text{Par} \\
\text{CP} \\
\text{C} \\
\text{TP} \\
\text{DP} \\
\text{T} \\
\text{VP} \\
\text{will never} \\
\text{V'} \\
\text{guess} \\
\text{DP} \\
\text{C'} \\
\text{TP} \\
\text{Bea} \\
\text{hit} \\
\text{what} \\
\text{in} \\
\text{the} \\
\text{face}
\end{array} \]

Kluck follows Merchant’s (2001) PF-deletion approach to sluicing in assuming that the sluiced *wh*-remnant *what* moves out of the elided TP (represented in italics) to Spec CP, and the elliptical TP is present at the relevant syntactic level.

One direct consequence of this analysis is that it can account for the opacity of the IC with respect to Condition C/B. (2a) and (2b) will be represented in simplified form as in (14a, b), respectively.

(14) a. He, told Bea [\textit{\textcolor{red}{\text{ParP}}} e [\textit{\textcolor{red}{\text{CP}}} the \textit{\textcolor{red}{\text{professor}}} i didn’t even remember \textit{\textcolor{red}{\text{CP}}} how many boring stories [\textit{\textcolor{red}{\text{he told Bea how many boring stories}}]}]].

b. The professor, told Bea [\textit{\textcolor{red}{\text{ParP}}} e [\textit{\textcolor{red}{\text{CP}}} he, couldn’t remember \textit{\textcolor{red}{\text{CP}}} how many boring stories [\textit{\textcolor{red}{\text{TP}}} the \textit{\textcolor{red}{\text{professor}}} told Bea how many boring stories]]]].

Recall that complements to *Par* are invisible to elements merged higher up in the structure with respect to c-command. In (14a), the *professor* is not c-commanded by the matrix subject *he*, because the CP complements to *Par* and any constituents that *Par*’ dominates are not by definition dominated by *ParP*. Hence Condition C is satisfied. For a similar reason, in (14b), the IC subject *he* is not c-commanded by the matrix subject *the professor*. 
Thus, *he* is free within its local domain, satisfying Condition B.4

The transparency of the CK with respect to Condition C ((6a)) is taken as a reconstruction effect of the sluiced *wh*-phrase. The boldfaced *wh*-phrase is moved out of the elliptical TP to Spec CP, leaving behind its copy (represented in italics) in its original position, thus deriving the structure in (15) below.

\[
(15) * \text{He} \text{told Bea} [\text{Par} \text{e} [\text{CP you can imagine} [\text{CP how many stories about the professor;} \text{he} \text{told Bea how many stories about the professor}]]].
\]

Notice that the matrix subject *He* does not c-command *the professor* inside the boldfaced *wh*-phrase because any elements that *Par*′ dominates are invisible to elements merged higher up in the structure. The only possibility of capturing the Condition C effect is to consider *the professor* inside the italicized *wh*-phrase to be c-commanded by *he* in the elliptical TP. A similar account is carried over to the Condition B effect ((6b)). Example (6b) will have the following representation:

\[
(16) * \text{The professor} \text{told Bea} [\text{Par} \text{e} [\text{CP you can imagine} [\text{CP which story about him;} \text{the professor told Bea which story about him}]]].
\]

In (16), the pronoun *him* inside the boldfaced *wh*-phrase is not in the same local domain (TP) as the matrix subject *the professor*; Condition B would be wrongly satisfied. However, in the elliptical TP, *him* is c-commanded by *the professor*, and the two are in the same local domain (TP); Condition B is violated.

How is the transparency of the CK with respect to number agreement ((4)) captured under Kluck’s analysis? Under recent minimalist assumptions (Chomsky (2000)), number agreement is captured through the local

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4 One might argue that the representation (14b) would result in a Condition C violation because *the professor* in the elliptical TP is c-commanded by the higher IC subject *he*. As an anonymous reviewer pointed out, this violation is obviated by vehicle change (Fiengo and May (1994: 218)), which allows an R-expression in an ellipsis context to be interpreted as a pronoun with the same index as the R-expression. Given vehicle change, the representation for (2b) will be given in (i), where the R-expression *the professor* in the elliptical TP is realized as a pronoun that has the same index as *the professor*.

\[
(i) \text{The professor} \text{told Bea} [\text{Par} \text{e} \text{he couldn’t remember} [\text{CP how many boring stories;} \text{he told Bea how many boring stories}]]].
\]

Note that the pronoun *he* preserves the indexical information of *the professor* and no violation of Condition C or B arises.
relation of agreement between the probe and the goal. Kluck’s analysis would give example (4) the following structure shown in skeletal form:

\[
\text{(17) There are } [\text{Par}_P e \text{ God knows } [\text{CP how many mistakes } [\text{there} \text{are how many mistakes}]]].
\]

At first blush, in (17) the IC verb \text{knows} intervenes between the matrix verb \text{are} and the CK \text{mistakes}, which would block \text{are} from agreeing with \text{mistakes}. Given the PF deletion approach to sluicing, this problem will be resolved. In the elliptical TP (represented in italics), the verb \text{are} is close enough to agree with \text{mistakes} inside the copied \text{wh}-phrase. Notice that there is no intervening head between \text{are} and \text{mistakes}.

3.2. Problems

Though Kluck’s analysis seems successful, it undergoes some difficulties. First of all, the \text{Par-Merge} approach to \text{wh-SAs} predicts that extraction out of the CK will be impossible. However, extraction out of the CK seems possible (18a), as Kluck herself (2011: 93) points out. Given the null operator analysis of a relative clause, the relevant parts of (18a) will have a representation like that in (18b) under Kluck’s analysis.

\[
\text{(18) a. Tolkien is the author } [\text{Bob read } [\text{you can imagine how many books by } \_ \_]]].
\]

\[
\text{b. Tolkien is the author } [\text{CP Op}_i \text{ Bob read } [\text{Par}_P e [\text{CP you can imagine } [\text{CP how many books by } t_i [\text{TP } \text{Bob read how many books by } t_i]]]]].
\]

Recall that complements to \text{Par} and any elements that \text{Par}’ dominates are invisible to elements merged higher up in the structure. Since the \text{wh}-phrase \text{how many books by} out of which a null operator is extracted is dominated by \text{Par}’, it is invisible to a higher syntactic operation. This would prevent \text{Op} from moving up to the Spec of a relative CP. Hence Kluck’s analysis wrongly predicts that (18a) will be ill-formed.

The PF-deletion approach to sluicing on which Kluck rests is also problematic in some respects. It has been well-known since Ross (1969: 252) that sluiced \text{wh-phrases} pied-pipe or strand prepositions (19). As Guimarães (2004: 101) observes, however, the \text{wh}-phrase in the IC can strand but cannot pied-pipe a preposition (20a, b).

\[
\text{(19) He is writing something, but you can’t imagine } (\{\text{to/with/for}\}) \text{ whom he is writing}
\]

\[
\text{(20) a. Mr. Smith was talking to I forgot who after the meeting.}
\]

\[
\text{b. *Mr. Smith was speaking I forgot to whom after the meeting.}
\]

Under the assumption that the sluiced \text{wh-remnant} moves out of the sluiced
TP to Spec, CP as in (13) above, Kluck would predict (20b) to be grammatical, contrary to fact.

Another problem with the sluicing approach concerns the obligatoriness/optionality of sluicing (cf. Grosu (2008: 26)). Unlike standard sluiced constructions such as (21a), “sluicing” is obligatory inside the IC of a wh-SA (21b).

(21) a. He is writing something, but you can’t imagine what (he is writing).  
    (Ross (1969: 1))

b. He is writing you can’t imagine what (*he is writing).

The difference in (21) is unexpected under Kluck’s analysis, which predicts that wh-SAs should pattern with sluicing constructions. In order for the analysis to capture the obligatoriness of “sluicing,” a construction-specific mechanism of sluicing would be required for wh-SAs, leading to explanatory inadequacy.

To summarize, Kluck’s analysis has difficulties in accounting for extraction out of the CK, the impossibility of sluiced wh-phrases to pied-pipe a preposition, and the obligatoriness of “sluicing” in wh-SAs. What is clear from the discussion above is that an adequate analysis of wh-SAs should avoid taking the IC to involve sluicing.\(^5\) In the next section, we pursue an

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\(^5\) Grosu (2006: 1) observes that swiping, a phenomenon in which the order of a sluiced wh-phrase and the preposition is inverted, is also possible in wh-SAs:

(i) Bill has been involved [you will never guess who with] since August.

Since swiping is impossible in non-sluiced interrogatives (Merchant (2001: 65)), the availability of swiping in (i) serves as evidence for the involvement of sluicing in the IC.

Grosu recognizes, however, that the acceptability of wh-SAs with swiping varies from person to person. In fact, Guimarães (2004: 96) reports that swiping is not available for wh-SAs:

(ii) *John danced I don’t remember who with at the party.  
    (Guimarães (2004: 96))

The variation of acceptability on swiping in the wh-SAs seems to be due to the fact that swiping is a highly idiosyncratic construction. Culicover (1999) offers two arguments for this. First, the acceptable combinations of wh-words with prepositions in swiping are severely limited: who occurs with about, by, for, from, of, on, to, and with; and what with at, about, for, from, of, on, and with. Second, there are cases that cannot be derived by wh-movement and deletion, as assumed in Merchant’s approach to sluicing.

(iii) He was writing a book about someone, but I couldn’t figure out {*who about/ who he was writing a book about}.  
    (Culicover (1999: 136))

In (iii) the combination of who and about is unacceptable under swiping but the stranding of about by replacement of who is acceptable. Example (iii) shows that swiping is difficult to derive from a full clause by wh-movement and deletion, indicating that swiping is a construction that is independent of sluicing. This being so, the possibility of swiping in (i) does not constitute evidence that the IC involves sluicing.
alternative analysis that does not appeal to sluicing.

4. An Alternative Analysis

In this section, we present an alternative analysis of wh-SA that is based on HP’s (2002) suggestion that the CK is a head of the IC and discuss empirical and theoretical issues that will arise from this analysis.

4.1. Proposal

Unlike Kluck, HP (2002) suggest that (i) the IC is a phrase headed by the CK and (ii) the clausal chunk functions as “an irregular type of modifier” of the wh-phrase that follows it. Since these two suggestions are less motivated, we need to provide independent motivations.

One strong argument that the CK is the head of the IC comes from the categorial matching between the IC and the CK that we observed in section 2. Under the present proposal, this effect derives automatically from the endocentricity requirement of X-bar theory (Jackendoff (1977: 34)), which requires that a head and its projection bear the same categorial specification. For example, if the head of the IC is specified as [+N], then the whole IC must also be specified as [+N]. If the head of the IC is specified as [+A], then the whole IC must be [+A], and so on. Thus, the analysis provides a straightforward account of the matching effect; no special assumption is needed.

Another basis of support for the headedness of the CK can be obtained from the following sentence:

(22) You have to have talent to stand on a stage in front of 5,000 people and God knows how many cameras. (COCA)

Given the assumption that only constituents of the same type can be coordinated (Radford (2009: 59)), the well-formedness of (22) can be best explained by the assumption that the NP 5,000 people is conjoined with the NP God knows how many cameras whose head is cameras.

The facts so far indicate that the CK is at least syntactically a head but there is also evidence that the CK is a head semantically. Grosu (2008: 25) claims that ICs have existential quantificational force, by observing that the ICs in (23a, b) are most naturally paraphrasable by means of indefinite

6 Kluck (2014: 33–34) tries to capture the matching effect by means of Merchant’s (2001) e-GIVENness. For reasons of space, we will not spell out her explanation here.
expressions, as in (24a,b).

(23) a. He gave me [you will never guess what].
    b. He invited [you will never guess how many people].

(24) a. He gave me something such that you will never guess what it was.
    b. He invited a number of people such that you will never guess how large that number was.

These paraphrases indicate that the boldfaced CKs in (23), like indefinite expressions in (24), determine the properties of the whole IC, supporting the treatment of the CK as a head in terms of meaning.

One might think, however, that the treatment of clausal chunks as modifiers sharply contradicts the widely accepted view that clauses can only be post-modifying in English (Quirk et al. (1985: 1337)). This problem will be solved if we assume that the clausal chunks are parts of a parenthetical clause (Wilder (1999: 696)). The only opportunity for clauses to be pre-modifying in English is when they are used parenthetically. (25a,b) show that the italicized parenthetical clause premodifies the highlighted constituent.

(25) a. John combined zinc and, I think sculpture.  
    (Okada (1985: 234))
    b. This is a, she thinks, stupid decision.  
    (Wilder (1999: 696))

Parenthetical clauses such as I think standardly modify propositions of clauses, but those in (26a,b) modify parts of propositions. As Okada (1985: 233–234) observes, this kind of local modification cannot occur freely: when a constituent carries the nuclear stress of a sentence, it is locally modified by a parenthetical. In (26) the focused constituent car is locally modified by I believe (the focus is represented with boldfaced capitals). Similarly, the constituent to be pre-modified by the clausal chunk in question carries the main focus of the entire sentence, as illustrated in (27).

(26) John went to Chicago, I believe by CAR.

(27) a. He asked I don’t know HOW many people.  
    (Quirk et al. (1985: 1137))
    b. Bob married you’ll never guess WHO last year.  
    (Kluck (2014: 8))

The parallel between (26) and (27) renders it plausible to assume that the clausal chunks are parentheticals that modify the wh-words that follow them.

Further evidence for such an idea comes from the interpretation of proforms. As McCawley (1982: 96) observes, parentheticals are excluded from the interpretation of proforms. For example, that in (28) refers, not to talk to us, it seems, about literature, but to talk to us about literature.
(28) John talked to us, \textit{it seems}, about literature, but Mary would never do that.

Similarly, clausal chunks are not included in the construal of proforms. In (29) \textit{them} refers not to \textit{God knows how many jobs} but only to \textit{jobs}, thus excluding \textit{God knows how (many)}.

(29) I’ve had \textit{God knows} how many jobs and I’ve quit every one of \textit{them}. 

(COCA)

As two anonymous reviewers pointed out, however, the analysis of clausal chunks as parentheticals faces one serious problem. Since parentheticals can be omitted without change in basic meaning, the parenthetical in (25) can be omitted (30). In contrast, clausal chunks, which we have analyzed as parentheticals, cannot (31).

(30) John combined zinc and (\textit{I think}) sculpture.

(31) John made *(\textit{I don’t know}) how many mistakes.

The question is why clausal chunks cannot be omitted despite being parentheticals. We will return to this problem after we clarify the structure of \textit{wh}-SA.

4.2. The Syntactic Structure of \textit{Wh}-SAs

We have shown that the CK is the head of the IC and that the clausal chunk is a parenthetical that locally modifies the following \textit{wh}-word. It is appropriate at this point to consider the internal structure of \textit{I don’t know how many}. To consider this, we need to clarify the category of \textit{how many} and that of parenthetical clauses like \textit{I don’t know}. As for \textit{how many}, let us assume with Jackendoff (1977) that it is composed of QP headed by \textit{many} and DegP headed by \textit{how}. As for parenthetical clauses, we adopt de Vries’s (2007) idea of Par-Merge and assume that they are Par-merged as a complement to the parenthetical head \textit{Par}, resulting in a ParP. Given these assumptions, we can assign the relevant parts of (1a) a structure like that in (32a). This can be extended to cases like (1b), where the \textit{wh}-phrase is a bare \textit{wh}-word (32b).

\footnote{Following Radford’s (2009: 184) suggestion that \textit{wh}-expressions are pronominal quantifiers, we assign \textit{what} in (32b) the category Q.}
(32) a. VP  b. VP
   V      V
   NP     NP
   made   ate
   QP     ParP
   ParP   ParP
   DegP   DegP
   Q'     Q'
   N'     N
   mistakes
   Par'   Par'
   Par'   TP
   TP how
   many
   I don’t know
   I don’t know

The proposed analysis immediately raises a number of questions. The first question concerns the constituency of I don’t know {how many/what}. Since parentheticals generally do not form a syntactic unit with the host (McCawley (1982)), it seems implausible that I don’t know {how many/what} forms a constituent. The constituency of the string, however, is confirmed by the following example:

(33) Such a thing had not occurred for thirty, forty, or I don’t know how many voyages.

(William Whittaker Barry, A Walking Tour in Normandy)

Given the assumption that only constituents of the same type can be coordinated, the grammaticality of (33) is captured by assuming that QPs such as thirty and forty are conjoined with the QP I don’t know how many.

Further evidence for the treatment of I don’t know how many as QP is obtained considering Jackendoff’s (1977: 104) observation that certain quantifiers (many/few), but not others (some/each/all), may be preceded by definite articles or demonstratives (e.g. {the/those} {many/few/*some*/each*/all} dwarfs). Given this, it is predicted that the QP I don’t know how many should follow the or those. This is the case, as is shown by the following example:

(34) His dad was one of the folks who was blackballed at Republic Steel in 1937 and one of the I don’t know how many who got their jobs back through the Supreme Court.

(Staughton Lyn and Alice Lynd, The New Rank and File)

It is worth noting that neither (33) nor (34) can easily be accommodated under Kluck’s analysis, which, as is evident from structure (13), does not
take the string *I don't know how many* to be a constituent.

There is a hitch in our claim that *I don’t know how many* is a QP. It is unclear how the DegP (*I don’t know how*) within the QP functions. HP (2002: 984) note that *he made I don’t know how many mistakes* implies that “he made a large number of mistakes.” In this example *I don’t know how* serves to amplify or boost the number of mistakes that he made. In this respect, the expression might be taken as intensifiers (such as *far, too* and *so*) that scale the meaning of the modified element upwards from an assumed norm (Quirk et al. (1985: 445)). Evidence for that comes from the following observation. As is well-known, intensifiers cannot modify adjectives that themselves have attributive functions (*a {so/too} noisy party*); they must be preposed with the adjectives that they modify (**{so/too} noisy a party**). If it is right to analyze *I don’t know how* as an intensifier, then it should be preposed with an adjective that it premodifies. This prediction is fulfilled:

(35) … we can get to Greece in something like five hours and then it would have taken *I don’t know how long* a time.

(James Baldwin, *The Cross of Redemption: Uncollected Writings*)

Example (35) constitutes evidence for the characterization of *I don’t know how* as a DegP which intensifies the meaning of the following expression.

Our analysis of *wh*-phrases in the ICs as QPs is compatible with Grosu’s (2008) observation in (24) that the *wh*-expressions within the ICs are construed as indefinite pronouns with existential quantificational force (cf. Tsubomoto and Whitman (2000: 182)). This raises another question: how is the existential quantificational force of the *wh*-expressions determined? It has been widely assumed that indefinite pronouns lack a quantificational force of their own but get it from some external elements with inherent quantificational force. Nishigauchi (1990: 181) shows that this property is displayed by *wh*-phrases in concessive clauses:

(36) *No matter what* happens, do not lose hope.

In (36) *what* gets its universal quantificational force from *no matter*, which acts as a c-commanding unselective binder of the *wh*-phrase. We extend this analysis to *wh*-SAs and assume that the *wh*-phrases in the ICs get their quantificational force from clausal chunks. Specifically, the chunks function as binders with inherent quantificational force that c-command the *wh*-pronouns. There are two arguments for this assumption. One argument concerns the meaning of clausal chunks. It seems that the clausal chunks that are frequently used in *wh*-SAs (*I don’t know, God knows, who knows, I forget*) all share the speaker’s lack of comprehension or knowledge (*“un-
known to the speaker”). It is not difficult therefore to understand why they denote indefiniteness because “indefinite pronouns are typically used when the referent is unknown to the speaker” (Haspelmath (1997: 132)). In fact, Haspelmath (1997: 130–133) observes that in a number of European languages expressions like *I don’t know* are reanalyzed as indefinite markers, such as *some* or *any* in English. The other argument lies in the fact that the *wh*-expression in the IC gets “universal” interpretation from a clausal chunk. As Haspelmath (1997: 141) observes, *it does not matter* what in (37) conveys universal quantification, namely the interpretation of a free choice *any*.

(37) You may take *it does not matter* what.

This indicates that *it does not matter*, like *no matter* in (37), determines the universal quantificational force of the *wh*-pronoun. It seems plausible therefore to assume that clausal chunks determine the quantificational force of the *wh*-phrase in the ICs.

An obvious question arises: how can the structures in (32a, b) ensure the c-command relation between the clausal chunk and the *wh*-expression? Notice that in (32a) *how* is not c-commanded by *I don’t know*. We assume that the *Par* that selects *I don’t know* as its complement has the feature [−definite] which designates the meaning of “unknown to the speaker” that all clausal chunks share. The assumption that the *Par* has [−definite] seems reasonable in the light of the principle suggested in Chomsky (1995) that all heads must “contribute something to the meaning of the sentence containing them.” (Radford (2009: 132)). At the stage that unselective binding applies, the feature percolates from the *Par* up to the *ParP* as in (38). This allows the entire *ParP* to be identified as an indefinite marker and c-command *how*. The *wh*-pronoun therefore gets an appropriate quantificational interpretation from a c-commanding *ParP*.

(38) 

One consequence of this analysis is that we can account for the inability
of clausal chunks to be omitted (31). This fact can be attributed to the same reason that no matter cannot be omitted from (36): *(No matter) what happens, do not lose hope. If no matter is deleted in (36), there will be no binder that determines the quantificational force of what. For a similar reason, the omission of I don’t know from (31) results in the absence of an appropriate binder for the wh-phrase; (31) is unacceptable as a declarative sentence.

4.3. A Comparison with Kluck’s Analysis

While our analysis is similar to Kluck’s in adopting Par-Merge, the two differ in two crucial respects. (i) Kluck assumes that the entire IC including the CK is Par-Merged to Par; we assume that the IC minus CK (I don’t know) is Par-Merged to Par. (ii) She argues that the IC is a clause with sluicing; we argue that the IC is a phrase headed by the CK. In this section, we compare Kluck’s approach with ours to establish which one, if any, is empirically more successful with respect to the explanation of properties of wh-SAs. The properties of wh-SAs to be accounted for are as follows: (i) the opacity of the IC to the matrix with respect to Condition C/B (2a, b) and (ii) the transparency of the CK with respect to Condition C/B (6a, b) and number agreement (4).

Let us first consider the opacity of the IC (2a, b), which Kluck attributes to the inability of the Par-Merged IC to be c-commanded by the matrix subject (14). Under our analysis, the structures of (2a, b) will be represented as follows (with irrelevant details suppressed):

(39) a. He it told Bea [NP [QP [ParP [TP the professor] didn’t even remember]] how many] stories].

b. The professor it told Bea [NP [QP [ParP [TP he] couldn’t remember]] how many] boring stories].

Since complements to Par are invisible to elements merged higher up in the structure with respect to c-command, in (39a) the IC subject the professor is not c-commanded by the matrix subject he, which satisfies Condition C. For a similar reason, in (39b) the IC subject he is not c-commanded by the matrix subject the professor, and the two are not in the same local domain; thus Condition B is satisfied.

Let us turn to the sensitivities of the CK to Condition C and B (6a, b), which Kluck captures as a reconstruction effect of the sluiced wh-phrase. Under our analysis, (6a, b) will be represented in simplified form as in (40a, b), respectively.
(40) a. *[TP \He_1 told Bea [NP _ParP you can imagine] how many stories about the professor_1]].

b. *[TP The professor_1 told Bea [NP _ParP you can imagine] which story about him_1]].

In (40a), the R-expression the professor inside the CK that corefers with the matrix subject he is within the c-command domain of he, yielding a Condition C violation. In (40b), the pronoun him in the CK is c-commanded by the matrix subject the professor within its local domain (TP), violating Condition B.

The visibility of the CK to the matrix with respect to number agreement (4), which Kluck reduces to the presence of the elliptical TP (see (17)), is also explained under our analysis. We give (4) the following structure shown in skeletal form:

(41) There are [NP _ParP God knows] how many mistakes in this paper.

In (41), there is no potential intervening head that agrees with the CK mistakes between the matrix verb are and mistakes. The CK is close enough to agree with the matrix verb.

Like Kluck’s approach, our analysis of wh-SAs has accounted for the opacity of ICs and the transparency of CKs. As shown in section 4.1, we have followed directly from the endocentricity of X-bar theory the categorial matching effect between the IC and the CK, one of the central properties of wh-SAs. Besides this, our approach has some advantages over Kluck’s. First, extraction out of the CK in (18a), which Kluck’s analysis cannot accommodate easily, is also expected under our analysis. The IC is argued to be a phrase headed by the CK (see (32a, b)), which is generally considered not to form an island for extraction. We can correctly predict (18a) to be grammatical. Second, the obligatoriness of “sluicing” (21a, b), which Kluck has difficulty capturing without any construction-specific mechanism of sluicing, poses no problem for the present analysis. As far as we consider the IC to be a phrase without sluicing, we don’t need to specify whether “sluicing” is obligatory or not. Third, the constituency of the string I don’t know how many ((33) and (34)) that has supported the proposed structure is difficult to be captured under Kluck’s structure (13), from which it is obvious that such a string does not form a syntactic unit.

As an anonymous reviewer notes, however, our analysis seems to have difficulty accounting for the inability of wh-phrases to pied-pipe a preposition (20a, b), which weakens Kluck’s assumption that the sluiced wh-remnant moves out of the elliptical TP to Spec, CP. Under our analysis, the
relevant parts of (20a, b) will be represented in simplified form as in (42a, b), respectively.

(42)  a. Mr. Smith was talking [PP to [QP [ParP I forgot] who]] after the meeting.

b. *Mr. Smith was speaking [PP [ParP I forgot] [P to [QP whom]]] after the meeting.

As we argued in section 4.2, the wh-pronoun in the IC must be c-commanded by the clausal chunk that serves as an unselective binder (see (38)). In (42a, b) the wh-pronouns are c-commanded by their associated clausal chunks (I forgot), thus wrongly predicting there to be no contrast between (20a) and (20b). This problem is resolved, however, with recourse to Chomsky’s (2000) Phase Impenetrability Condition (PIC), the definition of which is given in (43). The PIC blocks the domain (complement) of a phase head from being affected by further syntactic operations once the domain is transferred to the phonological component.

(43) In phase α with head H, the domain of H is not accessible to operations outside α; only H and its edge are accessible to such operations. (Chomsky (2000: 108))

On the grounds that phases are ‘propositional’ in nature, Chomsky suggests that CP and vP are phases. It has been controversial, however, which categories count as phases. Radford (2009: 428–430) suggests that PPs, along with CP and vP, are phases. Assuming with Radford that PPs are phases, let us consider the structure in (42b). If PPs are phrases, the domain (QP) of the preposition to will be transferred to the phonological component and therefore be prevented by the PIC from being accessible to further syntactic operations. This results in the failure of whom within the QP to be c-commanded by I forgot in Spec, PP. The absence of an appropriate binder for whom renders (20b) ungrammatical. On the other hand, in (42a) the wh-pronoun who is c-commanded by the chunk I forgot in Spec, QP, thereby correctly predicting the grammaticality of (20a). The contrast in (20a, b) thus raises no problem for our analysis.

Before closing this section, we consider one problem that an anonymous reviewer pointed out. It is unclear how our analysis can explain the selectional properties of verbs within clausal chunks: the verbs (guess, know and forget) all select interrogative complements.8

8 We would like to thank an anonymous reviewer for raising this issue.
(44) a. *John invited you’ll never \textit{think} how many people to the party.
    b. *John invited you’ll never \textit{guess} too many people to the party.

Kluck’s analysis attributes the ungrammaticality of (44) to the fact that the sluiced \textit{wh}-phrases are allowed only in the complement position of verbs that can select interrogative CP complements.

Based on Grimshaw’s (1979: 296) analysis of null complements, we assume that complements to verbs within clausal chunks are “null syntactically but filled semantically.”\textsuperscript{9} The phenomena of null complements are exemplified in (45).

(45) A: Who left?
    B: \{I don’t know/ Guess/ God knows /*I agree/ *I don’t think\}.

The responses in (45) are interpreted as if the complements to the verbs were present; \textit{I don’t know} is construed as \textit{I don’t know who left}. Grimshaw (1979: 296) assumes that null complements have “no syntactic realization at all.” Based on this, we can assign the relevant parts of (1a) a structure like that in (46), where no complement to \textit{know} is realized.

(46) [\text{NP [\text{QP [DegP Par P Par [TP I don’t [\text{VP [V know]]}]]] how]} many] mistakes]

One might argue that the complement to \textit{know} is syntactically realized as an empty CP for which the content of the CP is later copied. This is, however, incompatible with the view that English lacks CP-ellipsis (Merchant (2001: 117–120)). The idea that clausal chunks take null complements gains plausibility from Quirk et al.’s (1985: 113–114) view that parenthetical clauses are “defective syntactically: the verb or adjective lacks its normally obligatory complementation.”

An immediate question that arises here is why \textit{know} and \textit{guess} allow null complements but not \textit{agree} or \textit{think}? Grimshaw (1979: 293) adopts Williams’s (1977) Null Complement Rule (NCR), which copies the content of the antecedent into the empty argument slot of the semantic representation of a verb. Take \textit{I don’t know} in (45). The NCR copies the semantic representation of the missing complement (\textit{Who left?}) into the argument slot of \textit{know}:

\textsuperscript{9} We would like to thank an anonymous reviewer for directing us to the discussion of null complements.
(47) Who left?:  wh x (leave (x))

\[ \downarrow \text{NCR} \]

know:  \[ \text{[wh x (leave (x)) Q]} \]

The resulting representation in (47) is well-formed, since the semantic type (Q) of the antecedent is matched with that of the complement to know. In contrast, when the NCR copies the semantic representation of who left into the argument slot of agree, the resulting representation is ill-formed, since the semantic type of the antecedent is an instance of Q and agree selects for P (Proposition).

A parallel analysis would extend to wh-SAs. Take (1a) for example. Suppose that the missing complement of I don't know is interpreted as a question and assigned the semantic representation how many x he made x mistakes.\(^\text{10}\) This is copied into the empty argument slot of know:

(48) how many mistakes he made:  how many x (he made x mistakes)

\[ \downarrow \text{NCR} \]

know:  \[ \text{[how many x (he make x mistakes) Q]} \]

The output (48) is licit, since the semantic type of the missing complement and that of the complement to know are matched. Given this analysis, (44a, b) can be correctly ruled out. When the NCR copies the semantic representation of the missing complement how many people he invited to the party into the argument slot of think, the resulting representation for (44a) is illicit because the semantic type (Q) of the missing complement is not matched with that (P) of the complement to think. Similarly, the output for (44b) is ill-formed, because of the mismatch between the semantic type (P) of the antecedent and that (Q) of the complement to guess.

It is not entirely clear, however, at what level of the grammar (argument structure, LF, conceptual structure) the NCR should apply and how the NCR is constrained. Crucially, the idea that verbs within clausal chunks take null complements needs to be well-motivated. It is fair therefore to say that our analysis of (44a, b) based on the NCR is less successful than Kluck’s.

5. Conclusion

In this paper we have proposed a syntactic structure for wh-SAs, in which

\(^{10}\) We assume that the content of the missing complement is simply inferred from our contextual pragmatic knowledge rather than a syntactic or semantic structure.
the IC is merely a phrase headed by the CK and the clausal chunk serves as a parenthetical to locally modify the wh-word that follows it. One merit of this analysis is that the categorial matching effect between the IC and the CK is naturally derived from the endocentricity of X-bar theory. Additionally, we have analyzed the clausal chunk as an unselective binder that determines the quantificational force of the following wh-word. This explains the fact that the wh-expressions in the ICs convey universal as well as existential interpretation. Our analysis has been compared with Kluck’s sluicing approach to wh-SAs to determine which is empirically superior. Two important properties of wh-SAs, the opacity of the IC and the transparency of the CK, have been accounted for under our analysis as well as Kluck’s approach, with recourse to de Vries’s Par-Merge. However, our analysis has captured a number of facts that Kluck’s approach has failed to account for: extraction out of the CK (18a), the inability of a wh-phrase to pied-pipe a preposition (20b), the obligatoriness of “sluicing” (21b), and the constituency of I don’t know how many ((33) and (34)). The discussion so far leads us to conclude that our proposed structure of wh-SAs has several more empirical adequacies than Kluck’s model.

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