Non-restrictive relative clauses, ellipsis and anaphora

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Abstract

Non-restrictive relative clauses (NRRCs) can modify constituents which undergo 'pragmatic enrichment' when they appear in answers to questions. For example, in an interchange like: 'A: What did Jo think? B: That you should say nothing, which is surprising.' What B says is surprising is that 'Jo thinks ...' On the face of it, this might seem problematic for approaches to NRRCs which assume 'syntactic integration' and to support an 'orphan' analysis, where NRRCs are combined with purely conceptual representations. In this paper we examine a range of elliptical and anaphoric phenomena, and show that this conclusion is misplaced. In fact, the phenomena argue strongly in favour of a syntactically integrated analysis.

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1   Introduction

Blakemore (2006) points out that B's answer in (1) is understood as 'Just as we predicted, *Jo thinks* you should say nothing' (though the syntactic host of the *as*-parenthetical is apparently just *you should say nothing*):

(1)   A: What did Jo think?
      B: Just as we predicted, you should say nothing.

In other words, the host of the *as*-parenthetical is 'pragmatically enriched' with content from the preceding question (specifically, *Jo thinks...*). Blakemore suggests that this supports an 'orphan' analysis, in which "the parenthetical is inserted not into a syntactic representation at the level of grammatical representation, but into a conceptual representation at the level of pragmatic or utterance interpretation".[1]

We have similar data with non-restrictive relative clauses (NRRCs). In (2) B expresses surprise that *Jo thinks* you should say nothing (not just that you should say nothing):

(2)   A: What did Jo think?
      B: You should say nothing, which is surprising.

This might lead one to expect that such examples would provide evidence for an orphan analysis of NRRCs, as can be found in, for example, Safir (1986); Fabb (1990); Espinal (1991); Burton-Roberts (1999); and Peterson (2004).

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[1]Cf. Potts (2002b) and Potts (2002a) for a 'syntactically integrated' account of *as*-parentheticals.

However, on closer inspection such examples turn out to provide evidence *against* such an analysis and in favour of the kind of syntactically integrated analysis provided in, for example, Jackendoff (1977); Perzanowski (1980); Kempson (2003); Potts (2003, 2005); Del Gobbo (2003, 2007); Egg (2007) and, from an HPSG perspective, Arnold (2004, 2007). In fact, as we will demonstrate, the analysis of such examples follows straightforwardly from Arnold's approach and the sort of approach to ellipsis and anaphora that is developed in Ginzburg and Sag (2000) (G&S).

These observations seem to be novel. We are not aware of any previous exploration of this interaction between NRRCs, ellipsis and anaphora in any framework.

The paper is organized as follows. In Section 2 we will present some data involving ellipsis and anaphora that show that Blakemore's suggestion cannot be extended to NRRCs, and that appear problematic for any kind of 'conceptual attachment' analysis of NRRCs. In Section 3 we will show that these data follow straightforwardly from the G&S approach to ellipsis and anaphora and the analysis of NRRCs presented in Arnold (2004, 2007). In Section 4 we will show that the same pattern of behaviour occurs with other forms of ellipsis. Section 5 will examine some apparent counter-examples. Section 6 summarizes the paper, and returns briefly to *as*-parentheticals.

2   Phenomena

Consider first a pair of examples where there is no ellipsis or anaphora (other than that involved in any relative clause):

(3) Kim owns a dog, which is regrettable.
(4) Kim owns a dog, which is a dachshund.
(5) Kim owns a dog, which is lucky.

Here we have an NRRC following a clause with a final NP, and the antecedent can be either the clause *Kim owns a dog* as in (3) or the NP *a dog* as in (4). As one might expect, this can lead to ambiguity, as in (4), which may be interpreted as saying either than Kim's owning a dog is lucky, or that Kim's dog itself is lucky.

Consider now examples involving ellipsis (so-called 'bare argument ellipsis'). We have examples with question-answer pairs as in (6) and examples with conjoined clauses as in (7).

(6) A: Who owns a dog?
    B: Kim, which is regrettable.

(7) Lee owns a dog — and Kim (too), which is regrettable.

In both cases the relative pronoun can be interpreted as 'Kim owns a dog', (i.e. it has a 'propositional' antecedent).[2] In question-answer examples with the right fragment and the right NRRC, ambiguities arise. Thus, the first response in (8) is ambiguous. It may mean either that B's receiving a pullover for Christmas was nice, or that the pullover itself was nice. The other responses are unambiguous because of the way subject-verb agreement works inside the NRRC.

(8) A: What did you get for Christmas?
    B: A pullover, which was nice.
    B': Socks, which was nice.
    B'': Socks, which were nice.

What is not possible in examples like these is for an NP inside the 'missing material' to be antecedent for the NRRC:

(9) A: Who owns a dog?
    B: *Kim, which is a dachshund.

This is unlike the situation with an ordinary anaphoric pronoun:

(10) A: Who owns a dog?
     B: Kim, and it's a dachshund.

We have a similar situation with anaphora, such as the anaphoric relation between 'propositional lexemes' like *yes*, *no*, *probably*, *unfortunately* and their antecedents. Consider the following:

(11) A: Does Kim own a dog?
     B: Yes, which is regrettable.

Here the relative pronoun has the 'propositional' antecedent *yes* (interpreted as 'Kim owns a dog'). It is not possible for it to have an antecedent inside the interpretation of *yes*:

(12) A: Does Kim own a dog?
     B: *Yes, which is a dachshund.

Again, there is no problem with ordinary anaphora:

(13) A: Does Kim own a dog?
     B: Yes, and it's a dachshund.

There are two main approaches to ellipsis and anaphora: either (i) the gap or the anaphor has a syntactic structure similar to the antecedent and is a superficial matter; or (ii) there is no invisible syntactic structure but some interpretive mechanism assigns an interpretation like that of the antecedent. Whichever approach is taken, the bare argument *Kim* in (6), (7), (9), and (10), and the propositional lexeme *yes*

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[2]Of course, in (7) the NRRC can also be interpreted as having the whole co-ordinate structure (*Lee owns a dog — and Kim (too)*) as its antecedent.

in (11) and (12) and (13) will have essentially the same conceptual representation as *Kim owns a dog* in (3) and (4), since they have the same meaning. If NRRCs are only integrated into a larger structure at the level of conceptual representation, the NRRCs in these examples should be able to combine either with the conceptual representation of *Kim owns a dog* or the conceptual representation of *a dog*. Hence one would expect (9) and (12) to be acceptable. The fact that they are not seems to pose a serious problem for such approaches.

In the following section we will show how these and other facts involving the interaction of NRRCs, ellipsis and anaphora follow automatically when a 'syntactically integrated' approach to NRRCs, such as that put forward in Arnold (2004, 2007),[3] is combined with an approach to ellipsis and propositional lexemes such as that proposed in G&S.

3   Analysis

Arnold's analysis of NRRCs is a straightforward extension of the analysis of restrictive relatives in Sag (1997), the main features can be seen in the representations of (14a) and (14b) given in (15) and (16).[4]

(14)   a. Kim owns a dog, which is regrettable.
       b. Kim owns a dog, which is a dachshund.

The main point to note here is that NRRCs normally form a syntactic constituent with their heads, which can be of essentially any category (unlike restrictives, which only modify nominals — in fact, careful inspection will show that the *only* difference between the representations in (15) and (16) is the category of the antecedent — S vs NP). The result is a *head-adjunct* construction, where the relative clause is the adjunct, which selects its head via the MOD feature in the normal way, and the antecedent of the relative pronoun is the 'index' of the head. The relation
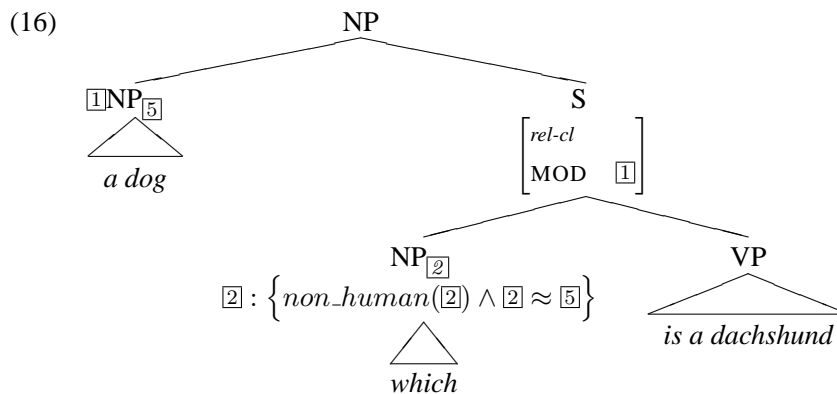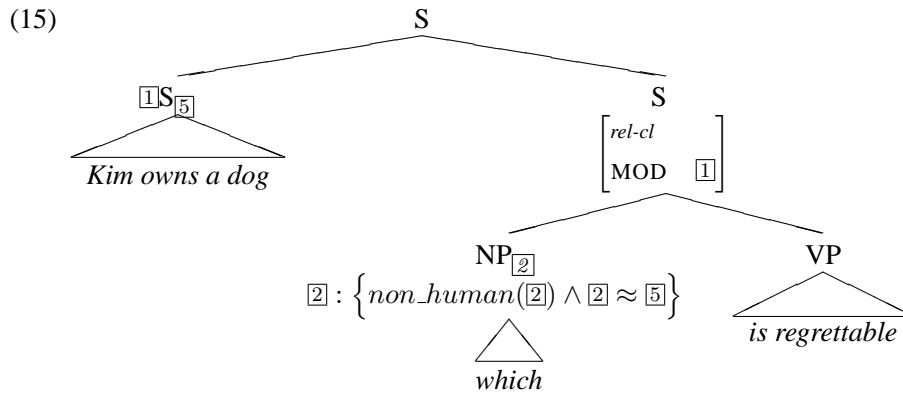
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[3]Other 'syntactically integrated' approaches to NRRCs would presumably work equally well, see references above.

[4]Here and below we use a number of abbreviations and simplifications. In particular, we will use NP$_{\boxed{1}}$ for an NP whose CONTENT | INDEX is $\boxed{1}$, and S$_{\boxed{1}}$ for an S whose CONTENT | SITUATION value is $\boxed{1}$. We use the term 'index' loosely for $\boxed{1}$ in either case. We will generally write whole CONTENT values as pairs consisting of an 'index' and a set of restrictions, in a form like the following:

(i) $y : \big\{ dog(y) \big\}$ (for *a dog*)

(ii) $s : \left\{ \begin{array}{c} \exists y, x | own\_rel(s) \wedge owner(x) \wedge owned(y) \wedge dog(y) \\ \wedge\, named(x, Kim) \end{array} \right\}$ (for *Kim owns a dog*)

The second of these describes a situation s which is an 'owning situation' involving two entities x and y, x fills the role of 'owner' in s, and is named 'Kim' (in s), and y is a dog, and is the object that is owned (in s). Translating these representations into Discourse Representation Theory (DRT) notation or the Situation Theoretic notation used in G&S is straightforward. In the DRT case it involves little more than making explicit reference to the 'situation' variable into the conditions, so that for example $owner(x)$ becomes $owner(s, x)$, and putting existentially bound variable with the 'index' to provide the universe for the discourse structure.

between a relative pronoun in an NRRC and its antecedent is treated as one of 'anaphoric dependence' (much like an ordinary pronoun — this is expressed in the restriction $\boxed{2} \approx \boxed{5}$ in the CONTENT of *which*, where $\boxed{2}$ is the index of *which*, and $\boxed{5}$ is the index or situation variable of whatever the relative clause modifies).[5]

(15)

$$
\begin{array}{c}
\text{S} \\
\diagup \qquad \diagdown \\
\boxed{1}\text{S}_{\boxed{5}} \qquad\qquad \text{S} \\
\text{Kim owns a dog} \qquad \begin{bmatrix} \textit{rel-cl} \\ \text{MOD} \quad \boxed{1} \end{bmatrix} \\
\diagup \qquad\qquad \diagdown \\
\text{NP}_{\boxed{2}} \qquad\qquad \text{VP} \\
\boxed{2} : \left\{ \textit{non\_human}(\boxed{2}) \wedge \boxed{2} \approx \boxed{5} \right\} \qquad \textit{is regrettable} \\
\textit{which}
\end{array}
$$

(16)

$$
\begin{array}{c}
\text{NP} \\
\diagup \qquad \diagdown \\
\boxed{1}\text{NP}_{\boxed{5}} \qquad\qquad \text{S} \\
\textit{a dog} \qquad \begin{bmatrix} \textit{rel-cl} \\ \text{MOD} \quad \boxed{1} \end{bmatrix} \\
\diagup \qquad\qquad \diagdown \\
\text{NP}_{\boxed{2}} \qquad\qquad \text{VP} \\
\boxed{2} : \left\{ \textit{non\_human}(\boxed{2}) \wedge \boxed{2} \approx \boxed{5} \right\} \qquad \textit{is a dachshund} \\
\textit{which}
\end{array}
$$

These examples involve NRRCs attached to NP and S, but NRRCs can attach to a wide range of antecedents:

(17)   a. They have done the washing, which they said they would. (VP)

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[5]A further feature of the analysis is that the content of a relative clause gets 'wide scope' — in DRT terms, it goes directly into the top box. For example, in *Kim thinks that Ron Paul, who isn't even running, will win the election*, the content of the NRRC is not part of Kim's beliefs (in fact, it is inconsistent with them, since one cannot win an election without running for election), rather it is an assertion of the speaker's. This feature of the analysis is not important here, but it means that the compositional semantics of a construction made up of an XP plus NRRC does not contain the semantics of the NRRC (it is generally just the same as that of the XP). Since this is a potential source of confusion, we will usually omit any mention of content on the root nodes of structures involving NRRCs.
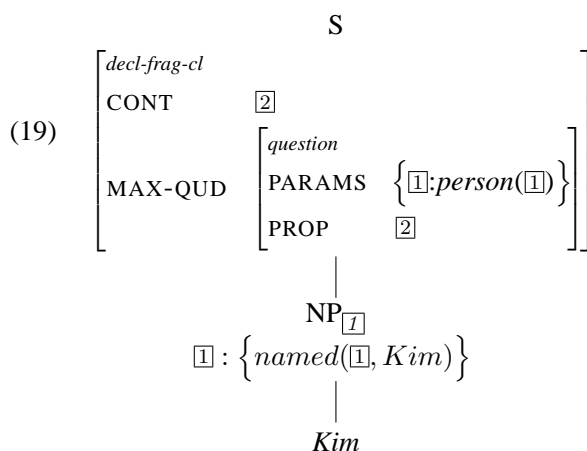
This treatment of the CONTENT is the main difference between this analysis of NRRCs and Sag's analysis of restrictives in Sag (1997). The other differences are that NRRCs are not limited to modifying NPs, and that in the case of restrictives the relation between the index of the relative pronoun and the antecedent should be tighter — probably identity rather than anaphoric dependence as is the case with NRRCs.

b. They hid the books under the bed, which is a good place. (PP)
c. They painted the house red, which is a nice colour. (AP)
d. They dressed carefully, which is also how they talk. (ADVP)

Now consider the analysis of a case of 'bare NP ellipsis' such as B's utterance of *Kim* in (18):

(18) A: Who owns a dog?
      B: Kim.

The basic outline of G&S's analysis can be seen in (19). *Kim* is treated as an NP which is the sole daughter of a *declarative-fragment-clause*, whose CONTENT (a *proposition*) is the value of the PROP feature in the current MAX-QUD (the current 'question under discussion').[6]

$$
(19) \quad
\begin{matrix}
& S \\
\begin{bmatrix}
\textit{decl-frag-cl} \\
\text{CONT} \quad \boxed{2} \\
\\
\text{MAX-QUD} \quad
\begin{bmatrix}
\textit{question} \\
\text{PARAMS} \quad \left\{\boxed{1}{:}person(\boxed{1})\right\} \\
\text{PROP} \quad \boxed{2}
\end{bmatrix}
\end{bmatrix} \\
| \\
\text{NP}_{\boxed{1}} \\
\boxed{1} : \left\{named(\boxed{1}, Kim)\right\} \\
| \\
\textit{Kim}
\end{matrix}
$$

In the case of A's utterance in (18), this proposition is roughly (20) (the question being roughly: for which x, where x is human, is this proposition true). G&S's account involves a variety of constraints interacting to ensure that the normal content of *Kim* is combined with this proposition, giving (21) as the content of *Kim* in this context.[7]

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[6]We have written MAX-QUD instead of the more precise CONTEXT | MAX-QUD, and we ignore the internal structure of the PROP value, which should contain a SITuation value and a SOA value, the latter containing a list of *quantifier*s and a set of conditions (the value of NUCLEUS).

[7]From an intuitive point of view, one can just think of this as unifying the content of the *declarative-fragment-clause* into the content of the question in place of the wh-phrase content. A more precise account of what happens in (19) is as follows (cf. G&S:304ff). G&S treat *declarative-fragment-clause* as a subsort of *head-fragment-phrase*. Thus, *Kim* is automatically a *head-fragment-phrase*, and because of this, its CAT and CONT | INDEX values are identified with those of the element of CONTEXT | SAL-UTT (which, in this context, is *who*). Identifying the CAT values ensures that, for example, that only and NP will be an acceptable fragmentary answer to a '*who*' question. Identifying the CONT | INDEX values has the effect of 'coindexing' *who* and the fragment answer *Kim*, so that the index associated with *Kim* enters the proposition associated with *Who owns a dog?* in the right place. Because *Kim* is a *declarative-fragment-clause*, its MAX-QUD contains the *question* corresponding to *Who owns a dog?*, and the QUANTS and NUCL of this question are combined with those that come from *Kim*. In (19), we have (mis-)represented this as though the proposition involved in the question

$$(20) \quad s : \left\{ \exists x, y | own\_rel(s) \wedge owner(x) \wedge owned(y) \wedge dog(y) \right\}$$

$$(21) \quad s : \left\{ \begin{array}{c} \exists y, x | own\_rel(s) \wedge owner(x) \wedge owned(y) \wedge dog(y) \\ \wedge\, named(x, Kim) \end{array} \right\}$$

The key points of the analysis can be seen in the representation in (22), which involves an S with propositional content, whose sole daughter is an NP with content appropriate for an NP.

$$(22)$$

$$\text{S}_{\boxed{s}}$$
$$s : \left\{ \begin{array}{c} \exists y, x | own\_rel(s) \wedge owner(x) \wedge owned(y) \wedge dog(y) \\ \wedge named(x, Kim) \end{array} \right\}$$
$$|$$
$$\text{NP}_{\boxed{x}}$$
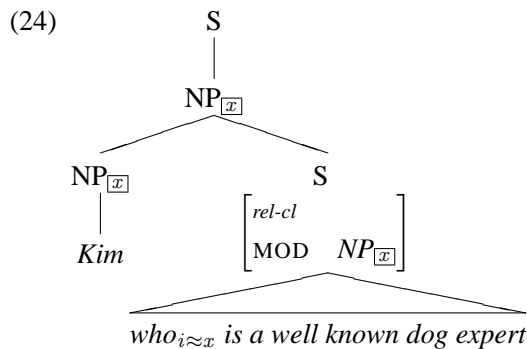$$x : \left\{ named(x, Kim) \right\}$$
$$|$$
$$Kim$$
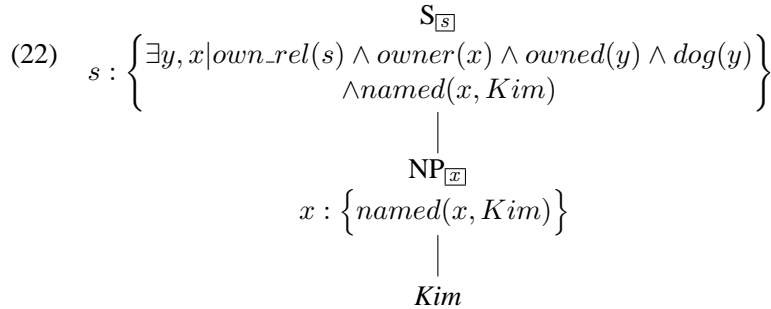
Clearly, this makes available just two attachment points for NRRCs, and just two antecedents for relative pronouns: an NRRC can be adjoined to the mother S node, as in (23), or the daughter NP node, as in (24), corresponding to the two grammatical possibilities in (25). Notice there is no attachment point available corresponding to *a dog*, hence no way of licensing the ungrammatical utterance B".[8]

(23)

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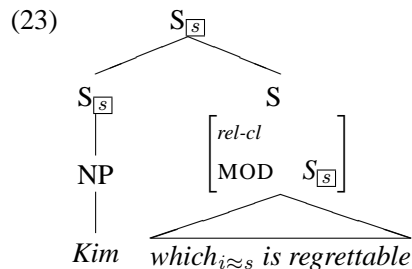
was simply unified with the proposition expressed by the answer, which is close enough for present purposes.

A final detail is that we have made the condition $\{named(\boxed{1}, Kim)\}$ part of the CONTENT here, whereas G&S treat it as part of the BACKGROUND. Nothing hangs on this.

[8]A careful reader may notice that the same index appears on the S dominating *Kim*, and root node in (23). This is not a mistake, though it may be confusing given that the former is interpreted as describing a situation where Kim owns a dog and the latter is seems to be about a different situation (in which the first situation is said to be regrettable). But, as noted in footnote 5, under the analysis we assume, the content of an NRRC is not part of the compositional semantics of its mother node — so, *compositionally* the two nodes in question in (23) are identical, and have the same index. One might think of the root node of (23) as having two kinds of content — a local content corresponding to *Kim owns a dog*, and a 'global', non-compositional content corresponding to 'That Kim owns a dog is regrettable'.

(24)

```
                      S
                      |
                    NP[x̄]
                   /      \
              NP[x̄]         S
                |        ⎡ rel-cl        ⎤
               Kim       ⎢ MOD   NP[x̄]  ⎥
                         ⎣               ⎦
                          ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
              who_{i≈x} is a well known dog expert
```

(25) A: Who owns a dog?
     B: Kim, which is regrettable.
     B': Kim, who is a well-known dog expert.
     B'': *Kim, which is a dachshund.

    The impossibility of having an NP inside the 'missing material' as antecedent for the NRRC, which produces the contrast in grammaticality between (6) and (9) above, thus falls out automatically. This analysis extends straightforwardly to other kinds of bare argument ellipsis, such as the following.[9]

(26) A: What colours suit Kim's dog?
     B: Orange and yellow, which is surprising. (AP)
     B': Orange and yellow, which are nice colours.
     B'': *Orange and yellow, which is a dachshund.
     (cf. Orange and yellow suit Kim's dog, which is a dachshund.)

(27) A: Where would be a good place for Kim's dog?
     B: Under the bed, which is surprising. (PP)
     B': Under the bed, which is where I keep all my pets.
     B'': *Under the bed, which is a dachshund.
     (cf. Under the bed would be a good place for Kim's dog, which is a dachshund.)

(28) A: What upset Kim's dog?
     B: That she bought a pair of cats, which is not surprising, because dogs hate cats. (S)
     B': That she bought a pair of cats, which is surprising because she *hates* cats.
     B'': *That she bought a pair of cats, which is dachshund.
     (cf. That she bought a pair of cats upset Kim's dog, which is dachshund).

In each case, response B shows that it is possible to have an NRRC that modifies the pragmatically enriched content of the declarative fragment; the B' response shows that it is possible to modify the 'normal' content of the declarative fragment; the

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[9]G&S only deal explicitly with nominal *declarative-fragment-clauses*, because they want to avoid discussing the semantics of adjuncts (p303), but the extension to cases like those in (26)–(28) seems straightforward.

ungrammaticality of response B'' shows that it is *not* possible to modify material that has been ellided; the B'' example is followed by an example that shows that an NRRC is possible when there is no ellipsis.
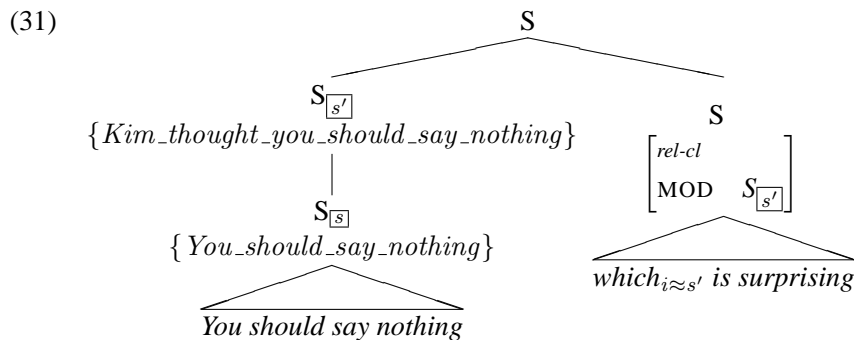
Notice that (28), where the argument is clausal, parallels (2), the example we began with above, which is repeated here:

(29) A: What did Jo think?
　　 B: You should say nothing, which is surprising.

In this context, where the proposition in MAX-QUD is roughly 'Jo thought X' (corresponding to *What did Jo think?*), if *You should say nothing* is interpreted as a *declarative-fragment-clause*, its content will be combined with this proposition to give content similar to *Jo thought you should say nothing*. Thus, without the NRRC, one would get a representation like the following for *you should say nothing*:

(30)

$$
\begin{array}{c}
S_{\boxed{s'}} \\
\{Kim\_thought\_you\_should\_say\_nothing\} \\
| \\
S_{\boxed{s}} \\
\{You\_should\_say\_nothing\} \\
\overbrace{\hspace{3cm}} \\
\textit{You should say nothing}
\end{array}
$$
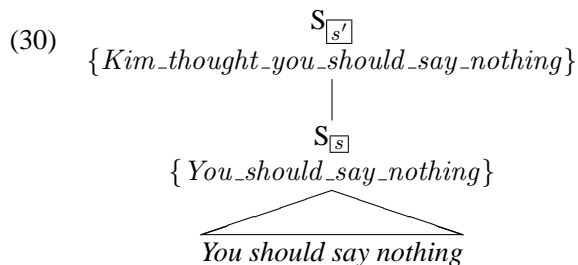
Here there are two possible Ss that an NRRC can attach to. In the case of (2)/(29), it is the higher 'pragmatically enriched' S that is the natural point for attachment, as in (31), and the NRRC is interpreted as expressing surprise in relation to this enriched content.
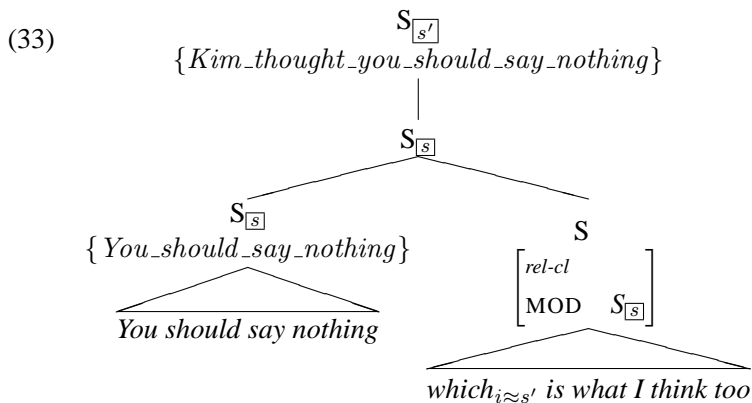
(31)

$$
\begin{array}{c}
S \\
\diagdown \\
\begin{array}{cc}
S_{\boxed{s'}} & S \\
\{Kim\_thought\_you\_should\_say\_nothing\} & \begin{bmatrix} rel\text{-}cl \\ \text{MOD} \quad S_{\boxed{s'}} \end{bmatrix} \\
| & \\
S_{\boxed{s}} & \\
\{You\_should\_say\_nothing\} & \\
\textit{You should say nothing} & \textit{which}_{i \approx s'} \textit{ is surprising}
\end{array}
\end{array}
$$

The 'pragmatic enrichment' observed in (2)/(29) is thus a straightforward consequence of this analysis of NRRCs and the G&S approach to questions and elliptical answers.

Of course, the analysis also (correctly) predicts that attachment to the lower S node should be possible. This is exemplified in (32) and (33), where B is naturally

interpreted as saying that she also thinks you should say nothing.[10]

(32) A: What did Jo think?
   B: That you should say nothing, which is what I think too.

(33)

$$S_{\boxed{s'}}$$
$$\{Kim\_thought\_you\_should\_say\_nothing\}$$

$$S_{\boxed{s}}$$

$$S_{\boxed{s}}$$
$$\{You\_should\_say\_nothing\}$$

You should say nothing

$$S$$
$$\begin{bmatrix} rel\text{-}cl \\ MOD \quad S_{\boxed{s}} \end{bmatrix}$$
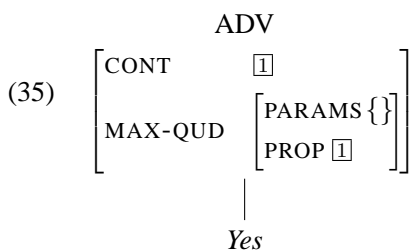
which$_{i\approx s'}$ is what I think too

More generally, though the formal mechanics will be different, this will extend to all cases of bare argument ellipsis, such as (7), repeated here as (34a) so long as they are treated as having the same content as their antecedents.[11]

(34) a. Lee owns a dog — and Kim, which is regrettable.
   b. *Lee owns a dog — and Kim, which is a dachshund.

Turning now to the data involving propositional lexemes, the main outlines of G&S's analysis of items such as *yes*, *no*, *probably*, *regrettably*, *unfortunately*, etc. can be seen in (35).

(35)

ADV
$$\begin{bmatrix} CONT & \boxed{1} \\ MAX\text{-}QUD & \begin{bmatrix} PARAMS\{\} \\ PROP\ \boxed{1} \end{bmatrix} \end{bmatrix}$$

Yes

---

[10]Of course, it is also possible to attach an NRRC to *nothing*, as in: *What did Jo think? That you should say nothing, which is what you always say.*

[11]The formal mechanics will be different because MAX-QUD presumably does not play a crucial role in the examples in (34).

It is perhaps worth noting that some sentence fragments require a more complex treatment than G&S's. Cullicover and Jackendoff (2005, 242) highlight examples like the following:
   a. A: Why don't you fix me a drink?
      B: In a minute, ok?
   b. A: Let's get a pizza.
      B: OK - pepperoni?
In (a), a full sentential equivalent of the answer would be something like 'I will fix you drink in a minute, ok?' and in (b) it would be something like 'Should we get a pepperoni pizza?'. Something more than MAX-QUD is required here.

Yes is analyzed as an adverb with propositional content; specifically, the propositional content associated with the question under discussion (MAX-QUD). In the case of (11) and (12), repeated here as (36), the proposition is (37), (the same as the proposition associated with *Kim* in the examples above). The representation of B's reply can be seen in (38).
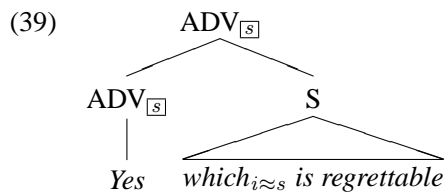
(36) A: Does Kim own a dog?
　　 B: Yes.

(37) $s : \left\{ \begin{array}{c} \exists y, x | own\_rel(s) \wedge owner(x) \wedge owned(y) \wedge dog(y) \\ \wedge\, named(x, Kim) \end{array} \right\}$

$$\text{ADV}_{\boxed{s}}$$
$$(38) \quad s : \left\{ \begin{array}{c} \exists y, x | own\_rel(s) \wedge owner(x) \wedge owned(y) \wedge dog(y) \\ \wedge named(x, Kim) \end{array} \right\}$$
$$\vert$$
$$\textit{Yes}$$

This gives us just one attachment point for an NRRC, as in (39), licensing an utterance such as B, but not B' in (40), and capturing the contrast noted in (11) and (12) above.

(39)

(40) A: Does Kim own a dog?
　　 B: Yes, which is regrettable.
　　 B': *Yes, which is a dachshund.

The point about inaccessibility of non-overt conceptual material to NRRCs is perhaps even clearer with other propositional lexemes, where there is a difference between the content of the antecedent proposition and the lexeme. For example, *no* expresses the negation of the antecedent.

(41)

$$\text{ADV}_{\boxed{s}}$$
$$s : \left\{ \neg p \right\}$$
$$\vert$$
$$\textit{No}$$

As one would expect on this approach, there is only one attachment point, and only one interpretation for examples like (42): the NRRC can only be taken as modifying the content of the propositional lexeme ($\neg p$) not the content of its antecedent (p), though the latter is conceptually present. For example, in (42), *which is a pity* can only be interpreted as 'it is a pity that Kim does not own a dog'. Notice that

with ordinary anaphora it is possible to access the non-negated content, if one uses a conditional (such as *and it would be a pity*). But this is not possible with an NRRC:

(42) A: Does Kim own a dog?
    B: No, which is a pity.
    B': *No, which would be a pity.
    B'': No, and it would be a pity.

Similar points emerge with examples in which *not* combines with a sentence fragment. Consider the following:

(43) A: Who went to Paris?
    B: Not Lee, which is unfortunate.

(44) A: Who went to Paris?
    B: Not Lee, which would have been unfortunate.

In (43) the answer means that it is unfortunate that Lee didn't go to Paris. In (44) it means that it would have been unfortunate if Kim had gone to Paris. This is not surprising if *not* in examples like this combines with a declarative fragment clause to form a larger declarative fragment clause. This would give the following structure for *not Kim*:

(45)
```
          S
        /   \
     ADV     S
      |       |
     not     NP
              |
             Kim
```
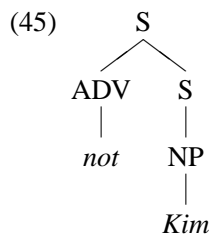
Here, unlike with *no*, there two constituents to which a clausal NRRC can be attached: the higher S and the lower S, predicting the two interpretations noted above.[12] Notice that, as we would expect, it is not possible for an NRRC to have an antecedent inside the ellided material, though this is possible with an ordinary pronoun:

(46) A: Who went to Paris?
    B: *Not Lee, which he wouldn't have liked.
    B: Not Lee, and he wouldn't have liked it.

Thus the facts are quite straightforward for the approach that we are assuming.

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[12]Of course, it is also possible to attach an NRRC to the NP, as in e.g. *Not Kim, who never goes anywhere*.

4   Other Forms of Ellipsis and Anaphora

The pattern that we have discussed above is also found with other kinds of ellipsis. In what follows, we will exemplify with respect to a variety of elliptical processes.

4.1   VP Ellipsis

VP Ellipsis (VPE) is exemplified in (47). (48a) is an example with an NRRC without ellipsis, showing an NRRC attached to *a camel*. (48b) shows that if *ridden a camel* is ellided *a camel* is no longer available as the antecedent of an NRRC; (48c) shows that it remains accessible to ordinary anaphora; (48d) simply shows that an NRRC can attach to, and modify, the clause containing the ellipsis, as one would expect (so the ungrammaticality of the case involving ellipsis does not reflect some incompatibility between VPE and NRRCs).[13]

(47)   I have never ridden a camel, but Kim has. (=ridden a camel)

(48)   a. I have never ridden a camel, but Kim has ridden a camel, which stank horribly.
       b. *I have never ridden a camel, but Kim has ＿＿, which stank horribly.
       c. I have never ridden a camel, but Kim has ＿＿, it stank horribly.
       d. I have never ridden a camel, but Kim has ＿＿, which surprises me, because she is scared of animals.

4.2   N' Ellipsis

N' Ellipsis is exemplified in (49). (50a) is an example without ellipsis showing an NRRC attached to *Sandy*. (50b) shows that if *pictures of Sandy* is ellided *Sandy* is no longer available as the antecedent of an NRRC; (50c) shows that *Sandy* remains accessible to ordinary anaphora. (50d) shows that what remains after ellipsis can be modified by an NRRC.[14]

(49)   Lee took two pictures of Sandy, so Kim took three ＿＿. (=pictures of Sandy)

(50)   a. Lee took two of pictures of Sandy, so Kim took three pictures of Sandy, who must be one of the most photographed people around.

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[13] We often mark the ellipsis site with ＿＿. This is purely expository — it is not supposed to suggest the presence of empty syntactic structure.

[14] In the case of (50c), one might wonder whether the pronoun is anaphoric to the ellided instance of *Sandy* or the overt instance in the preceding clause. Nothing crucial to our analysis hangs on this, but it is interesting to note that the antecedent of a ordinary pronoun can be in the ellided material. Consider: *Personnel hired two secretaries, so Accounts had to sack three. They were really upset.* Here it is natural to take the antecedent of *they* to be the three secretaries sacked from Accounts. Similarly with VPE in (48c) what stank horribly is the camel that Kim rode, which is only present in the interpretation of the ellided VP, and not mentioned explicitly.

b. *Lee took two of pictures of Sandy, so Kim took three __, who must be one of the most photographed people around.

c. Lee took two of pictures of Sandy, so Kim took three __, she must be one of the most photographed people around.

d. Lee took two of pictures of Sandy, so Kim took three __, which turned out well.

4.3 Sluicing

Sluicing is exemplified in (51). (52a) is an example where no sluicing has occurred; (52b) shows that material that has been removed by sluicing is not available to be the antecedent of an NRRC, (52c) shows that it can be the antecedent of an ordinary pronoun; (52d) shows that the material that remains after sluicing can be the antecedent of an NRRC.

(51) I know Frazier beat Ali, but I don't remember how/why/when. (=Frazier beat Ali)

(52) a. I know Frazier beat Ali, but I don't remember how/why/when Frazier beat Ali, who many think was the greatest champion ever.

b. *I know Frazier beat Ali, but I don't remember how/why/when, who many think was the greatest champion ever.

c. I know Frazier beat Ali, but I don't remember how/why/when — many think he was the greatest champion ever.

d. I know Frazier beat Ali, but I don't remember how/why/when, which is what you really want to know.

4.4 Comparative Ellipsis

Comparative ellipsis is exemplified in (53). (54a) is an example involving an NRRC, but without ellipsis; (54b) shows that ellided material is not available as the antecedent of an NRRC; (54c) shows that it *is* accessible for ordinary anaphora; (54d) shows that the constituent that remains after deletion can be modified by an NRRC.

(53) a. Sam is happier in London than Kim was in London.

b. Sam is happier in London than Kim was __.

c. Sam is happier in London than Kim __.

(54) a. Sam is happier in London than Kim was in London, which was too busy for her.

b. *Sam is happier in London than Kim (was) __, which was too busy for her.

c. Sam is happier in London than Kim (was) __, it was too busy for her.

d. Sam is happier in London than Kim (was) ___, which is not surprising.

4.5   *Or not* Anaphora

What we might call '*or not* anaphora' involves a rather different propositional lexeme. It is exemplified by (55).

(55) Whether Kim knows the answer or not, we will talk to him.

(56a) is an example with an NRRC and no anaphora; (56a) shows that an NRRC cannot have an antecedent inside the interpretation of anaphoric *not*; (56c) shows that this is possible with ordinary anaphora; (56d) shows that an NRRC can have the whole interpretation of anaphoric *not* as its antecedent.

(56)   a. Whether Kim knows the answer or doesn't know the answer, which is 42, we will talk to him.
　　　 b. *Whether Kim knows the answer or not, which is 42, we will talk to him.
　　　 c. Whether Kim knows the answer or not, and it's 42, we will talk to him.
　　　 d. Whether Kim knows the answer or not, which would be surprising, we will talk to him.

5   Apparent Counter-examples

At first glance (57) looks as if it might be a counter-example to this analysis:

(57) A: Do you think United will win this weekend?
　　　 B: Yes, which will put them into the top three.

At first glance, it seems that on our account the content of *yes* should be 'I think. . . ', and it should be this content that is modified by the NRRC. But this is not the interpretation we get for (57) — the natural interpretation involves B saying that a win will put United into the top three, she is not claiming that what she *thinks* can do this. In other words, the NRRC is understood as modifying the embedded clause. But this should not be possible on our analysis (any more than it is possible for an NRRC to modify part of 'Kim owns a dog' when this proposition is expressed as *yes*). According to our account, it seems (57) should be bad, but it is fine.

However, this ignores the crucial role played by MAX-QUD in our account. What the propositional anaphor *yes* affirms is the proposition associated with the MAX-QUD, and it is this content that is accessible to the NRRC. This is not necessarily the same as the proposition associated with the question as posed. In the case in hand, the question seems to be about B's cognitive state, but with an example like this it is quite possible for B to take it as a question about reality, so that the proposition expressed by *yes* becomes something like (58), and it is this that the

NRRC modifies.

(58) s:{*United_will_win_this_weekend*}

Notice that if this is taken to be the proposition associated with MAX-QUD it should also be possible to respond to A's question in (57) with a short-answer such as *yes, they will*. This is indeed the case:

(59) A: Do you think United will win this weekend?
    B: Yes, they will.
    B: Yes, they will, which will put them into the top three.

Interchanges such as (60) and (61) might also appear to be counter-examples (they are based an example from Jackendoff (1972, 272) involving ordinary anaphora):

(60) A: Did Kim turn the hot dog down flat?
    B: Yes, which would not have happened with the filet mignon.
    B': Yes, which would not have happened with Jo.

(61) A: Who turned the hot dog down flat?
    B: Kim, which would not have happened with the filet mignon.
    B': Kim, which would not have happened with Jo.

The reason these may appear to be counter-examples is as follows. We have repeatedly shown that NRRCs cannot be understood as modifying 'part' of the content of their antecedents, but this is what seems to be going on here. The interpretation of *Kim* in (61), and *yes* is a proposition involving a turning-down-flat event with Kim as agent and the hot dog as theme. This cannot be the interpretation of *which* here, the interpretation of *which* must be only part of this event (in B, it would be the event minus the hot dog, in B" the event minus Kim).

These will be counter-examples to analyses that are superficially very similar to ours, but not to our actual analysis. Specifically, these are counter-examples to analyses that identify the content of the relative pronoun in an NRRC with that of its antecedent, or which co-index the relative pronoun and the antecedent. Crucially, our analysis involves 'anaphoric dependence' between relative pronoun and antecedent, not identity (cf. the representations (15) and (16) have ② $\approx$ ⑤, not ② = ⑤). The prediction is that there should be the same sort of flexibility with *which* and a propositional antecedent (as we have here) that one finds with other pronouns that take such antecedents, specifically *it* and *that*. This is correct:

(62) a. Kim turned the hot dog down flat. It would not have happened with the filet mignon.
    b. Kim turned the hot dog down flat. That would not have happened with the filet mignon.

What seems to be going on in cases like these is that the event or situation that the pronoun denotes is not the event or situation described by the antecedent, but a

'supertype', or 'abstraction' of it. This is also characteristic of *one*-anaphora. In an example like (63), the dog that Kim is scared of may be big or not, brown or not, and stupid or not (actually getting all the interpretive possibilities may require some imaginative placement of intonation focus on the adjectives in the antecedent):

(63) a. Kim is not scared of this big brown stupid dog, but she is scared of that one.

The interpretation of *one*, and other pronouns shows some flexibility, but the flexibility is strictly limited by the head of the antecedent. For example, in the case of *one* in (63) the antecedent may be various kinds of dog, but it must be a dog. Similarly, with (62) while the denotation of the pronouns there can be an event/situation involving Kim (or not), and a hot dog (or not), it must be a turning-down-event, as indicated by the head (in this case the verb).

This is just what we observe with NRRCs, as in (60)/(61). The descriptive insight underlying our analysis involves an anaphoric relation between the index of the relative pronoun in an NRRC and the index of its antecedent, the phrase to which it is attached in the syntax. Far from being counter-examples to our analysis, examples like (60)/(61) are entirely consistent with it.

6   Conclusion

In this paper we have investigated the interaction of ellipsis and anaphora with NRRCs. We have shown that it is not possible for an NRRC to modify any part of the ellided material (in cases of ellipsis), or any part of the interpretation of a propositional anaphora. This is unlike the situation with ordinary pronouns, which can have antecedents inside some missing material or inside the interpretation of an anaphor. These observations provide compelling evidence against the idea that NRRCs are orphans, only integrated into a larger structure at some conceptual level. In contrast, the facts are unproblematic for a syntactically integrated approach to NRRCs. In fact they follow in a straightforward way from the analysis of NRRCs developed in Arnold (2004, 2007) and the approach to ellipsis and anaphora outlined in G&S.

It is perhaps worth adding that we expect that there should be nothing specific to English in any of this. We would expect the facts to be parallel in any language which has broadly similar processes of ellipsis and propositional anaphors and where NRRCs can take propositional/clausal antecedents.

It is, finally, interesting to ask whether these rather clear conclusions also apply in the case of the *as*-parentheticals that were our point of departure. It would be natural to assume that their interaction with ellipsis and anaphora is like that of NRRCs which we have discussed in the preceding pages. It seems, however, that the data are more problematic here. To set the scene, consider the following:

(64) Jo will be upset that United lost, (just) as the bookmakers predicted.

This is potentially ambiguous: it has a natural interpretation where *(just) as the bookmakers predicted* is taken as a comment on the content of the embedded clause *United lost*, so that it entails *The bookmakers predicted that United would lose*. It also has another, factually implausible, interpretation according to which the bookmakers made predictions about Jo's state of mind. This interpretation involves the *as*-parenthetical being associated with the main clause.

Now consider a case of propositional anaphora:

(65) A: Will Jo be upset that United lost?
  B: *Yes, as the bookmakers predicted.

B seems to have only the factually implausible interpretation involving bookmakers predicting Jo's emotions. This is consistent with our analysis of NRRCs — for example, notice that the corresponding examples involving NRRCs are similarly bad (again B is grammatical if the NRRC is taken as modifying the content of *yes*, but the interpretation is factually implausible):

(66) A: Will Jo be upset that United lost?
  B: *Yes, which the bookmakers predicted.

Likewise, the following *as*-parenthetical is bad, in the same way as the NRRC in B':

(67) A: Will Jo be upset that United lost?
  B: *No, as the bookmakers predicted.
  B': *No, which the bookmakers predicted.

Again, this is what one would expect if the analysis of *as*-parentheticals were similar to that of NRRCs.

But not all cases are so straightforward. The following case of an *as*-parentheticals is not hugely different from (66), and seem to us to be fully acceptable, in contrast with the corresponding NRRC (which our account correctly predicts to be impossible):

(68) A: Is Jo convinced that United will loose?
  B: Yes, (just) as the bookmakers predicted.
  B': *Yes, which the bookmakers predicted.

Notice this B has the same factually plausible interpretation we observed with (64), where the *as*-parenthetical is associated not with the content of *yes*, but with 'missing' content (specifically, 'that United will loose').

It is not clear to us why as-parentheticals should differ from NRRCs in this way. One possibility is that it has something to do with the fact, noted by Blakemore (2006) and others, that as-clauses have a predicative use, as in (69).

(69) It is just as the bookmakers predicted.

However, we will leave this issue to future research.

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