Stress Test for Relative Clauses

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Abstract

A brief overview on the semantic differences between restrictive and non-restrictive relative clauses is given. Subsequently differences with regard to information status and focus alternatives are presented. I investigate, in a systematic way, which focus (accent) patterns on relative-clause constructions are (im)possible in which contexts and why this is so. In order to account for the infelicity of certain restrictive relative clause constructions a new proposal is made how to derive the contrastive properties of complex definite descriptions (focus phrases) involving relative clauses. The account presented in this paper gives rise to predictions on intonational phonology and sentence processing.

1   On the semantics of relative clauses

Relative clauses are traditionally grouped in two main classes: *restrictive* and *non-restrictive/appositive*.[1] There is broad consensus that the distinction between the two types can informally be described by saying that *restrictive relative clauses* form an integral part of the greater (in)definite description and are necessary to determine the referent of that description whereas *appositive relative clauses* provide extra information about their external head noun, whose referent is determined on independent grounds, compare examples (1a) and (1b).

(1)   a.   The young man whom you briefly met at the theatre yesterday is my nephew.
       b.   The moon, which makes a complete orbit around the earth every 27.3 days, has a diameter of 3,474 km.

Despite this intuitive and clear-cut picture, a description in formal semantic terms has for a long time presented a challenge which has to do with the presentiment that an explanation must be given in terms of discourse interaction rather than in a purely static way. I will briefly go through a series of proposals that have been made in the literature and discuss why they fall short or are not entirely convincing. Later on, I will present a context-dependent analysis in terms of information status theory and Alternative Semantics.

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[1] The two notions will be used interchangeably.

1.1   Properties and propositions

A not very helpful claim – especially in the "dynamic age" – says that there is a *type* difference between restrictive and appositive relative clauses. According to Rodman (1976); Heim and Kratzer (1998); Holler (2005); Del Gobbo (2007) and others, restrictive relative clauses are property-denoting while appositive relative clauses denote propositions. In Holler (2005), the following arguments in favor of such a distinction are given. We can, for instance, have a parenthesis referring back to the relative clause information in the appositive (2a) but not in the restrictive case (2b).

(2)   a.   Luise, die   eine Emanze   ist – was   ich sehr bemerkenswert finde
            Luise who a   women's libber is   which I   very remarkable   find
            . . .

            'Luise, who is a women's libber – which I think is quite remarkable . . . '
       b.   *Diejenigen Damen, die   Emanzen   sind – was   ich sehr
            Those   ladies who women's libbers are   which I   very
            bemerkenswert finde . . .
            remarkable   find
            *'*Those ladies who are women's libbers – which I think is quite remarkable
            . . . '*

Another argument (Lehmann, 1984; Holler, 2005) in favour of a type difference is that appositive relative clauses should come with their own illocution, which is impossible for restrictive relative clauses. The insertion of the performative adverb "hiermit" necessarily turns the otherwise ambiguous sentence (3) into an appositive.

(3)   Die Chinesen, denen   ich (hiermit) für ihren vorbildlichen Fleiß   danke,
       the Chinese   to_whom I   hereby   for their exemplary   diligence thank
       sind reich.
       are   rich
       'The Chinese, whom I hereby would like to thank for their exemplary diligence,
       are rich.'

Although I share the intuitions illustrated in the above examples I would like to remain less outspoken regarding the question whether this justifies a proposition vs. property distinction. This has to do with the fact that the use of a dynamic framework will blur, to a certain degree, the question whether some phrase is going to be translated as a property or proposition because both restrictive and non-restrictive relative clauses are at some point represented as open formulae (*discourse conditions* in DRT terms) containing a variable with the value of the referent shared by the head noun and some property attributed to it. Therefore, the question is rather how these entities are put to use in the respective cases rather than what their type-theoretic status is.

1.2 Treatment of relative clauses in DRT

Discourse representation theory (Kamp and Reyle, 1993) provides a formal distinction – shown in figure 1 – between the two readings of the clause in (4).

(4)   The son(,) who attended a boarding school(,) was insufferable.

a. Restrictive   b. Appositive
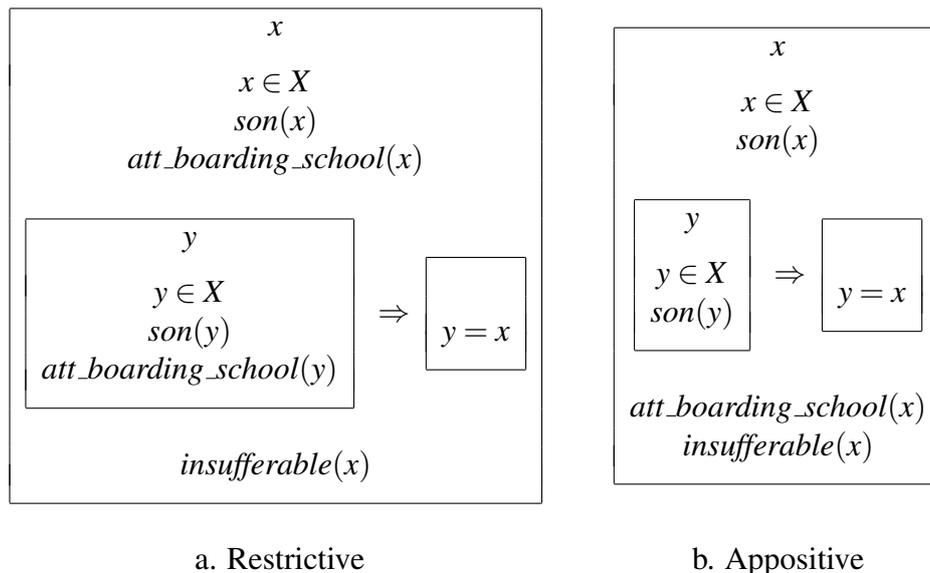
Figure 1: DRT representations of (4)

Kamp & Reyle's proposal amounts to capturing the distinction in terms of different restrictions on the definite determiner's implicitly or explicitly available context set X. Not surprisingly, the content of the relative clause occurs within the restrictor box in the restrictive case (a) while merely functioning as a main level condition in the non-restrictive case (b). Informally, there is precisely one son attending a boarding school in (a), while (b) just says that there is precisely one son.

This captures our intuitions. Questions remain, however, as regards the determination of the context set and, in particular, the role that the relative clauses play in determining the other (excluded) elements of the set. What we would like to possess is a non-circular procedure that tells us how to construe or resolve this set X.

Furthermore, the presuppositions triggered by the definite descriptions do not receive any special treatment (as they do in more contemporary versions of DRT (Kamp, 2001; Kamp et al., to appear)); the interesting procedural character of the restrictive/appositive distinction is not addressed.

1.3 Presupposition and assertion

A related hypothesis, formulated in Holler (2005, p. 58), following Chierchia and McConnell-Ginet (1990), is that restrictive relative clauses are presuppositional in nature while appositives are not. The situation seems a bit unclear, however, since appositives, too, pass classical presupposition tests, as shown in (6).

(5)   a.   The passengers that were saved were happy.
      b.   The passengers that were saved weren't happy.

(6)   a.   The passengers, who – by the way – were saved, were happy.
      b.   The passengers, who – by the way – were saved, weren't happy.

Both (5) and (6), whether negated or not, give rise to the implication that (the) passengers were saved. Chierchia and McConnell-Ginet (1990, p. 282) argue for an intermediate status of the proposition expressed by the appositive: it is not a presupposition but a "backgrounded" part of the assertion. I do not want to comment on this proposal at this point and, instead, see whether a different concept can help us further in differentiating between the two types of relative clauses: the notion of *information status*, whose relation to presupposition and givenness is investigated in detail in Riester (2008b).

2   The information status of relative clause constructions

2.1   Two levels of information status

In Riester (2009), I discuss hybrid cases of presuppositions which cannot be grouped as clear instances of either presupposition resolution (binding) or accommodation.

(7)   I just met Fred's lawyer. $\boxed{\text{She}}$ seems to be really smart.

In (7), for instance, we would like to say that the discourse referent associated with the personal pronoun is anaphorically resolved (bound) to the discourse referent for Fred's lawyer (it is D(ISCOURSE)-GIVEN (in small capitals) according to Riester (2008b, 2009)), while the information that the person in question is female, is NEW[2] (in big capitals, see explanation below) from the perspective of the discourse context.

referent	content	information status
	female	NEW
she		D-GIVEN

Table 1: Information status of the pronoun in (7)

In order to sufficiently describe the information status of relative clauses it is to be expected that we need to employ a similar conceptual separation between a referential and a content level as exemplified above. This is reminicent of the twofold *givenness* definition used in Schwarzschild (1999, p. 151). If an expression is of type *e* it is *given* if and only if it is coreferential. If an expression is of a functional type $\langle \alpha, \beta \rangle$, it is *given* iff the context contains an identical or more specific expression (which may or may not be referentially related).

Nevertheless, the approach described here differs substantially from Schwarzschild's account. Instead of employing a simple *givenness* vs. *novelty* distinction, I will use a more fine-grained set of category labels adapted from the literature on *information*

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[2]Note that the information probably counts as "accommodated" but that name will be reserved for a special purpose under this account.

status (see Riester (2008a) for a survey). Moreover, rather than assuming two different ways of determining a single notion of *givenness*, I will strictly differentiate between a referential and a content level (like in table 1) for which different category labels will be used.[3]

2.1.1 Referential level

I take it that the determination of a discourse referent normally takes place at the level of the NP/DP. This means that assigning a referential information status label only makes sense for maximal projections. In this paper, I distinguish whether such a phrase is coreferential with some aforementioned entity (D-GIVEN), whether it has no discourse antecedent but is hearer-known (ACTIVATE), whether it is construed via BRIDGING or whether neither of the former holds and the addressee has to simply ACCOMMODATE it.

2.1.2 Content level

At the content level, on the other hand, (which will be annotated on *words* in contrast to the phrasal annotations in section 2.1.1), it doesn't make sense to talk about discourse referents[4] (and, relatedly, about an issue such as co-reference). Here, the concepts we have to deal with are word relations like (phonetic) identity, synonymy and hyperonymy. In consequence, the following labels will be used: depending on whether there is a suitable term in the previous discourse, a content word will be labeled SAME for phonetic identity, SYN for synonymy, SUB if the annotated word forms a hyponym or a subordinate (e.g. part) concept, and SUPER in the opposite case if we are dealing with a hypernym or superordinate concept in relation to the respective predecessor. A word which does not possess any appropriate antecedent will receive the label NEW.

2.2 The information status of restrictives

Having defined our vocabulary, we are now able to precisely analyse the information status of the restrictive relative clause construction in a sentence like (8) provided a number of relevant contexts.

(8)   The passengers that/who were saved were happy.

Note that it is part of the story that not all of those contexts will actually license an utterance of (8), yet others will impose on it a very distinct intonational pattern. As we still lack some necessary tools, we cannot satisfactorily explain these matters in this section; especially issues having to do with prosody. I would like to ask for the reader's patience until section 3, where the relevant background will be introduced.

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[3]This section owes much to discussions with Stefan Baumann; in particular the idea of distinguishing two levels of information status. I carry the responsibility for potential flaws and bad representations.

[4]At least, if we want that a fundamental distinction between discourse referents and discourse conditions is maintained and an uncontrolled growth of discourse referent types is avoided.

In this section, we shall purely concentrate on analysing the two levels of information status in the written text as sketched above, even for the infelicitous cases. Let us assume that sentence (8) is uttered in any of the following contexts.

(9) a. A plane had a crash landing.
     b. A plane with 155 passengers on board had a crash landing.
     c. A plane with 155 passengers on board had a crash landing. Everyone was rescued.
     d. A plane with 155 passengers on board had a crash landing. Only a few were rescued.

The information status of sentence (8) in the respective environments (information profile) is given in table 2.

ref	content	(9a)	(9b)	(9c)	(9d)
		information status			
	passengers	SUB *(plane)*	SAME	SAME	SAME
	saved	NEW	NEW	SYN *(rescued)*	SYN *(rescued)*
	the passengers that were saved	BRIDGING/ ACCOMM.	D-GIVEN	D-GIVEN	D-GIVEN

Table 2: Information profile of the restrictive case

The annotations at the content level are straightforward. The word "passengers" in (8) is a repetition when uttered in the contexts (9b), (9c) or (9d); this is why it receives the label SAME. On the other hand, it is not mentioned in context (9a). Here, it can be construed as being related to the more general concept plane and will be labeled SUB (for "subordinate concept"). As regards the word "saved" it will be interpreted as NEW in the first two contexts and as a synonym of the previously mentioned term "rescued" in (9c) and (9d).

If we now consider the referential level, i.e. the information status of the entire relative clause construction, we may state that each of the contexts (9b), (9c) and (9d) offers a discourse (group) referent that can, in principle, be picked up by the subject phrase of (8) (label D-GIVEN). The antecedents are the groups formed or described, respectively, by the phrases "155 passengers" in (9b), "everybody" in (9c) and "a few" in (9d). In the context of (9a) we have the choice between saying that the passengers stand in a bridging relation to the contextually available plane or that the existence of "passengers that were saved" must be accommodated. (The difference is quite subtle and does not need to be decided at this point.) In any case, the passengers themselves have not been mentioned in (9a).

Taking a first glance at the felicity conditions, the following rough picture arises. Sentence (8) sounds fully acceptable in the contexts (9a), (9b), and probably also (9d).

There is something odd about it when uttered in context (9c). It is difficult to have intuitions about these issues, though, because different ways of accenting strongly influence our felicity judgments.

2.3   The information status of non-restrictives

I will now discuss the corresponding non-restrictive case, as given in (10), in the same set of contexts (9a)-(9d). Table 3 shows the respective information profile of the relative clause construction.

(10)   The passengers, who were saved, were happy.

		(9a)	(9b)	(9c)	(9d)
ref	**content**	**information status**			
	passengers	SUB *(plane)*	SAME	SAME	SAME
the passengers		BRIDGING	D-GIVEN	D-GIVEN	D-GIVEN
ref	**content**	**information status**			
	saved	NEW	NEW	SYN *(rescued)*	SYN *(rescued)*
who were saved		D-GIVEN	D-GIVEN	D-GIVEN	D-GIVEN

Table 3: Information profile of the non-restrictive case

Not surprisingly, the content level information profile is unchanged for both the words "passengers" and "saved" as compared to the restrictive case. However, what strikes us when examining table 3 is that is separated in two parts below one another, each of which possesses its own (referential) information status. This reflects the insight that the information status of the head noun is determined independently of the apposition.

As we can see, the referential information profile of the host DP "the passengers" is (almost) identical to the one of the entire (restrictive) construction that we saw in the previous section. Concerning context (9a), however, we can now wholeheartedly speak of an instance of BRIDGING.

The additional block in table 3 pertains to a separate referential information status assigned to the appositive, which in all contexts is indicated as D-GIVEN; in other words, as co-referential with the head nominal. This deserves some extra comment as it comes with a non-trivial (and potentially questionable) assumption, viz that a non-restrictive relative clause is a referring expression in the first place and, more specifically, that it possesses an individual type referent. This seems at least partly justified if the relative clause can be interpreted as a projection of its relative pronoun, which, in turn, is co-referential with the head noun phrase.

If, on the other hand, we are not justified in saying that the apposition is a referring expression or that it refers to a proposition or eventuality, instead, then it is also not

in need of being represented in presuppositional/anaphoric terms and will fall beyond the issues discussed in this paper.

Concerning the felicity conditions of the non-restrictive construction we note that it sounds good in the first two contexts while being inappropriate in the last two. There is not much tolerance for prosodic variation; in particular, the apposition itself needs to be stressed.

3   Intonation and focus interpretation

3.1   Remarks on intonational issues

Concerning the prosodic properties of relative clauses, it has been noted in e.g. Lehmann (1984, p. 263), that there is an "intonation break" (prosodic boundary) between the head nominal and the non-restrictive relative clause, while there is one "continuous" intonational contour (presumably, a single intonation phrase) spanning the entire restrictive relative clause construction. A possible interpretation of this is that in the first case the relative clause is excluded from the scope of the determiner while in the second case it is included under it.

Clifton et al. (2002) investigate the attachment preferences for various syntactic constructions (including relative clauses like in (11)) depending on the relative size of the prosodic boundaries at the different possible attachment sites. The options consist in prosodically realizing the positions marked by an ↑ without any boundary (0), with an intermediate phrase boundary (ip) or with an intonation-phrase boundary (IP).

(11)   I met the daughter ↑ of the colonel ↑ who was on the balcony.

In an experiment where the early boundary was subject to variation while the late one was always realized as *ip*, interpretation preferences underwent a statistical shift. For the sequence [0 ip], exemplified in (12a), the sentence was for about half of the time interpreted as showing high ("the daughter was on the balcony") and for the other half as low attachment ("the colonel was on the balcony"). For the boundary sequence [IP ip], i.e. with a strong boundary on the initial position as in (12b), there was a significantly higher share of low attachment interpretations.

(12)   a.   ((I   met the daughter of the COlonel)$_{ip}$ (who was on the
                 L*   H*   L-

              BALcony)$_{ip}$)$_{IP}$
              H*   L- L%

        b.   ((I   met the DAUGHter)$_{ip}$)$_{IP}$ ((of the COlonel)$_{ip}$ (who was on the
                 L*   H*   L- H%   H*   L-

              BALcony)$_{ip}$)$_{IP}$
              H*   L- L%

While these findings aren't directly related to our general issue, there are nevertheless some useful implications that we can draw from them. Firstly, we may suspect that a strong initial boundary, i.e. the presence of a short initial intonation phrase, goes hand in

hand with an increased (though not absolute) need to place stress on the word "daughter". Secondly, although no reference is made to the restrictive vs. non-restrictive distinction in Clifton et al. (2002), it is clear that the sentence can give rise to the four different interpretations shown in table 4.

high attachment, restrictive (HR)	low attachment, restrictive (LR)
the d. that was on the b.	*the c. that was on the b.*
high attachment, appositive (HA)	low attachment, appositive (LA)
the d., who was on the b.	*the c., who was on the b.*

Table 4: Different interpretation possibilities of (11)

Taking the somewhat impressionistic account by Lehmann (1984) into consideration, table 4 allows for the following preliminary speculations. If it is true that a restrictive relative clause construction indeed forms a single intonation phrase then a prosodic solution like in (12b) is not compatible with the interpretation HR because the head, consisting of the complex possessive, arguably should not be split in two parts.

If, on the other hand, a non-restrictive relative clause construction requires an intonation break between the head noun and the relative clause then an intonation contour like in (13) – not discussed in Clifton et al. (2002) – would rule out all interpretations except LR: high attachment is ruled out by the intonation break after "daughter" and a non-restrictive interpretation is made impossible by the uninterrupted intonation contour spanning over the lower noun and the relative clause.

(13)   ((I   met the DAUGHter)$_{ip}$)$_{IP}$ ((of the COlonel who was on the
            L*   H*   L- H%   L*
        BALcony)$_{ip}$)$_{IPh}$
        H*   L- L%

The considerations contained in this section certainly have their deficits. Neither is there room for an exhaustive discussion of all possible cases nor is this paper meant to replace empirical psycholinguistic research. However, the issues addressed provide a first insight into the complex prosodic situation we are facing, which is immediately related to the field of focusing discussed in the next section, although the latter has so far typically been kept restricted to the meaning of pitch accents rather than intonation boundaries.

3.2   Felicity

In section 2.2, I discussed a number of contexts in which sentence (15) – with varying intonation – might have been uttered. These are repeated in (14).

(14)   a.   A plane had a crash landing.
        b.   A plane with 155 passengers on board had a crash landing.
        c.   A plane with 155 passengers on board had a crash landing. Everyone was rescued.
        d.   A plane with 155 passengers on board had a crash landing. Only a few were rescued.

(15)   a.   The passengers who were SAved$_F$ were happy.
        b.   The PASsengers$_F$ who were saved were happy.
        c.   The PASsengers$_F$ who where SAved$_F$ were happy.

The table below is an exhaustive listing of utterances of the variants in (15) in all contexts, along with indications whether the utterance is felicitous ($\sqrt{}$) or not (#) and how it can be interpreted.

con-text	(15a) the passengers who were SAved$_F$	(15b) the PASsengers$_F$ who were saved	(15c) the PASsengers$_F$ who were SAved$_F$
(14a)	rest: $\sqrt{}$, **app: #**	**rest: #, app: #**	rest: ?, app: $\sqrt{}$
(14b)	rest: $\sqrt{}$, app: $\sqrt{}$	**rest: #, app: #**	rest: $\sqrt{}$, app: $\sqrt{}$
(14c)	**rest: #, app: #**	rest: ?, **app: #**	rest: $\sqrt{}$, **app: #**
(14d)	rest: $\sqrt{}$, **app: #**	rest: ?, **app: #**	rest: $\sqrt{}$, **app: #**

Table 5: Felicity conditions and interpretations

There is a lot that could be said about table 5. I shall only give explanations for readings which are **not (#)** available. Firstly, I am going to discuss what criteria are responsible for not getting an appositive reading, then the restrictive case will be discussed, in which the issue of *contrastive interpretation* is going to play an important role.

3.2.1   Criteria for not having an appositive reading

The reason why no appositive reading is available in the rows for the contexts (14c) and (14d) is that the relative clause is not informative here and, thus, simply superfluous. No choice of accenting can remedy this.

In cases where the information conveyed is not superfluous there are, on principle, two lines of explanation why an appositive reading can be blocked: a semantic and a prosodic one. It is speculative to say which one is more fundamental. As has been noted long ago, an appositive reading is not available if the relative clause lacks an accent (column under (15b)). We explain this by saying that clauses which are informative have to be marked as such, i.e. with a pitch accent on "saved", following the givenness principle by Selkirk (1996) and Schwarzschild (1999): if an expression is not given (in our terminology: neither SAME, SYN nor SUPER), it must be F-marked (in our case, accented).[5] From a prosodic perspective, the apposition seems to form its own intonation phrase and this is minimally possible if it contains at least one pitch accent.

Finally, a possible explanation why an appositive reading isn't available if (15a) is uttered in context (14a) might run as follows. "The passengers" haven't been mentioned and are, therefore, not D-GIVEN. According to the reversal of the principle stated in the previous paragraph, if an expression is not F-marked, it must be given. Because "the passengers" aren't accented themselves we may conclude that if (15a) cannot be understood appositively then something seems to also block the projection of the F-feature from the relative clause to "passengers". If we were to argue syntactically, we would say that this is due to the fact that the appositive relative clause is not an *argument*

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[5]The same explanation accounts for the observation that there are no foci-less sentences.

of the head nominal in this case and is, therefore, not subject to *horizontal* F-projection, cf. Büring (2006). The other option is to invoke a prosodic explanation according to which it is the mandatory prosodic boundary after the head noun – the hermetic nature of the intonation phrase on the relative clause so to speak – that "locks up" the F-feature and in doing so prevents it from projecting.

3.2.2 Criteria for not having a restrictive reading

Among the combinations of contexts and intonation contours contained in table 5 above, restrictive readings are more frequent than appositive readings. Nevertheless, these, too, have to obey some constraints. Most strikingly, in the contexts (14a) and (14b), the relative clause construction cannot be uttered without an accent on "saved" (column (15b)). As in the appositive case, this can purely be explained in terms of the information status of the word "saved". This word is neither given (SAME/SYN/SUPER) nor F-marked and, thus, infelicitous.

As for contour (15a) in context (14c), however, we need to come up with a different explanation. Unlike in the appositive case, we do not want to say that the relative clause is superfluous, here. On the contrary, it is employed successfully in the task of singling out a particular group of people: "saved passengers". The problem is that the use of the phrase "the passengers that were $SAved_F$" is only felicitous if there are at the same time passengers that *weren't* saved and this is what context (14c) explicitly rules out.

It is, furthermore, likely that the prosodic realization (15b) ("the PASsengers that were saved") goes together with contexts (14c) ("everyone was rescued") and (14d) ("a few were rescued"). Such a solution requires the availability of "*non-passengers* that were saved"; an interpretation which is, at least, not in conflict with what has been said or is known so far, so these variants seem possible.[6]

3.3 The determiner and the alternative set

Krifka (2006) raises the issue what happens if a focus-sensitive operator associates with a complex definite description that contains a focus.

(16)   John only met the woman who talked to $BILL_F$.

Sentence (16) can be felicitously uttered in a situation in which John met one woman – Mary – and Mary talked to Bill and Fred; although a classic Structured Meanings approach (Krifka, 1992, 1993) would predict that this sentence is false here. The theory translates (16) into a formula saying that "Bill" is the only name that fits the position marked by the focus in order for the sentence to express a true statement. However as, in fact, "Fred" fits there equally well, the formula is evaluated as false. This, in turn, means that Structured Meanings Theory has to be enhanced by the notion of *focus phrase* (Drubig, 1994; Krifka, 2006), e.g. the definite noun phrase embedding the focus. The quantification domain of "only" will contain referentially distinct alternatives to this

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[6]But it is particularly important here not to separate the unstressed relative clause from the head noun by a strong break.

focus phrase while the focus-background structure simply provides the general template for these alternatives.

I argue that the problem described by Krifka is not limited to contexts involving focus-sensitive particles like "only". In fact, it also shows up above in our discussion about the contextual constraints for the felicity of relative-clause constructions. The question is, even in the absence of a focus-sensitive particle: what are the alternatives of a somehow focused definite description?

3.4   A previous proposal

Von Heusinger (2007) makes a proposal how to derive the Alternative Semantics of definite noun phrases. He notes that in a situation in which there is one Dutch but several English professors the expression in (17a) can give rise to a questionable alternative set as in (17b), whose second element violates uniqueness.

(17)   a. $[\![\textit{the DUTCH}_F \textit{ professor}]\!]^f$
       b. $= \{[\![\textit{the Dutch professor}]\!]^o, [\![\textit{the English professor}]\!]^o, \dots\}$

The same problem arises in a scenario in which there are three women and two men such that Sue talked to Bill, Mary talked to Fred, and Julia also talked to Fred. The alternative set of the modified noun alone is given in (18). Combining this expression with the determiner, as in (19a), yields the focus-semantic value in (19b), which – if instantiated – is represented as (19c).

(18) $[\![\textit{woman who talked to BILL}_F]\!]^f$
       $= \{\lambda x[\textit{woman}(x) \wedge \textit{talk\_to}(x, y)] \mid y \in D_e\}$

(19)   a. $[\![\textit{the woman who talked to BILL}_F]\!]^f$
       b. $= \{\iota x[\textit{woman}(x) \wedge \textit{talk\_to}(x, y)] \mid y \in D_e\}$
       c. $= \{\iota x[\textit{woman}(x) \wedge \textit{talk\_to}(x, \textit{bill})], \iota x[\textit{woman}(x) \wedge \textit{talk\_to}(x, \textit{fred})]\}$

Again, there is reason to feel uneasy about the second element in the set, which seems to breach the uniqueness conditions in the given situation – speaking of "*the* woman who talked to Fred" makes no sense. Von Heusinger's attempt to solve the problem is to assign the definite article a special alternative semantic value, generalized union ($\cup$), which when combined with the focus semantic value in (18) yields the following derivation in (20).

(20)   a. $[\![\textit{the woman who talked to BILL}_F]\!]^f$
       b. $= \cup\{\lambda x[\textit{woman}(x) \wedge \textit{talk\_to}(x, y)] \mid y \in D_e\}$
       c. $= \{d \mid d \in P \textit{ for some } P \in [\![\textit{woman who talked to BILL}_F]\!]^f\}$
       d. $= \{d \mid \textit{woman}(d) \wedge \textit{talk\_to}(d, y); \ y \in D_e\}$
       e. $= \{d \mid \textit{woman}(d) \wedge \exists y.\textit{talk\_to}(d, y)\}$

Now, the alternative set consists of all women that were present, which is intuitively the right result. However, assigning such an idiosyncratic alternative value to the definite article is a strong deviation from standard Alternative Semantics, which is not entirely

unproblematic (compare von Heusinger (2007, sect. 4) for a discussion and other potential solutions).

According to Rooth (1992), the story about focus is not limited to the creation of a focus semantic value; rather, these sets additionally need to undergo some contextual interaction called *focus interpretation*. An operator ($\sim$) is attached to a focus-containing expression. The job of this operator is to check whether the context provides at least one contrastive element to the expression in its scope which instantiates the "template" designated by the focus alternative value. It is necessary at this point to warn the reader that "context" has to be understood here in a broader sense than just the discourse. While it may be the case on some occasions that the desired contrastive element can indeed be found in the previous discourse there are also plenty of cases in which such an overt item is lacking from the discourse and, yet, listeners are often able to identify it thanks to their lexical or world knowledge. The set made up from the ordinary meaning of the expression plus its contextually identified alternatives is a subset of the original focus semantic value.

In order to make it clear what I am talking about I propose to call the orginal focus semantic value *the logical alternative set* and the subset identified via focus interpretation *the context-dependent alternative set*. Such a distinction, originally present in Rooth (1992), is not explicitly addressed in von Heusinger (2007).

3.5 Revision

In the remaining space of this paper, I would like to propose a different solution concerning the determination of the context-dependent alternative set of definite NPs which may be put to use in various discourse processes, e.g. identifying the quantification domain for a particle like "only" or testing the felicity conditions of relative clauses.

What if the definite determiner, as a functional category, does not participate in the formation of a focus semantic values at all but is simply an indicator of the position at which the focus interpretation operator attaches? The (logical) alternative value of the definite NP "the woman who talked to BILL_F" (= X) would thus simply amount to the set given in (21).[7]

(21) $[\![X]\!]^f = \{\lambda x[woman(x) \wedge talk\_to(x,y)] \mid y \in D_e\}$

A DRT representation of Rooth's *focus interpretation operator* $\sim$, is given in figure 2. The box represents an unresolved presupposition (indicated by ∂[8]) with the instruction to identify a contextual alternative x and a set C, containing x as well as the ordinary meaning $[\![X]\!]^o$.

The use of this operator is not yet an answer to the problems raised by Krifka and von Heusinger. In particular, the logical alternative set in (21) has a different type

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[7]Eventually, it will be necessary to recast this account in an intensional format. Such a move is propagated e.g. in Beaver and Clark (2008, ch. 4). As we are dealing with issues like anaphora, however, this is a non-trivial enterprise which cannot be dealt with in the scope of this paper. Questions arise whether context sets are intensional like focus semantic values are. Possible worlds, on the other hand, can differ with regard to what counts as an alternative in them.

[8]Beaver (1992) and subsequent work

$$\partial : \begin{array}{|cc|} \hline \multicolumn{2}{c}{\underline{C}\ \underline{z}} \\ [\![X]\!]^o \in C & C \subseteq [\![X]\!]^f \\ C(z) & z \neq [\![X]\!]^o \\ \hline \end{array}$$

Figure 2: Presuppositional representation of $\sim$

than what we would like C to be: a set of individuals. Other than postulating a special alternative meaning for the definite article, I propose to integrate von Heusinger's union operator in the definition of $\sim$, defined in figure 3.

$$\partial : \begin{array}{|cc|} \hline \multicolumn{2}{c}{\underline{C}\ \underline{z}} \\ [\![X]\!]^o \in C & C \subseteq \cup [\![X]\!]^f \\ C(z) & z \neq [\![X]\!]^o \\ \hline \end{array}$$

Figure 3: Presuppositional representation of $\sim^\iota$

The advantage of this proposal is that the burden of identifying the right context domain is shifted to an operator which is presuppositional already; no unusual focus semantic values have to be assumed. The disadvantage is that we now possess a second focus interpretation operator ($\sim^\iota$), for referential expressions. But this might come as not so surprising since we learnt from section 2 that there is also reason for assuming two types of *information status* for individual and functional categories, respectively.

The $\sim^\iota$ presupposition will be evaluated against the context described at the beginning of section 3.4 (see figure 4) and will lead to the desired result in figure 5.

$$\begin{array}{|c|} \hline u\ v\ w\ x\ y \\ \\ Sue(u) \qquad Mary(v) \qquad Julia(w) \\ Bill(x) \qquad Fred(y) \\ talk\_to(u,x) \qquad talk\_to(v,y) \qquad talk\_to(w,y) \\ \\ \partial : \begin{array}{|cc|} \hline \multicolumn{2}{c}{\underline{C}\ \underline{z}} \\ [\![X]\!]^o \in C & C \subseteq \cup [\![X]\!]^f \\ C(z) & z \neq [\![X]\!]^o \\ \hline \end{array} \\ \hline \end{array}$$

Figure 4: Context of evaluation and referential focus presupposition trggered by $\sim^\iota$

3.6 Explaining infelicity

Recall what led us to consider the combination of definiteness and focusing in the first place: to account for the felicity conditions of the restrictive relative clause in (22). Why is this sequence infelicitous? The preliminary discourse representation of it (ignoring the assertional contribution of the last sentence) is given in figure 6.

$$\boxed{\begin{array}{c} u\,v\,w\,x\,y\,z\,C \\[4pt] Sue(u) \qquad Mary(v) \qquad Julia(w) \\ Bill(x) \qquad Fred(y) \\ talk\_to(u,x) \qquad talk\_to(v,y) \qquad talk\_to(w,y) \\[6pt] C = \{u,v,w\} \subseteq \{d \mid woman(d) \wedge \exists y.talk\_to(d,y)\} \\ z = v \end{array}}$$
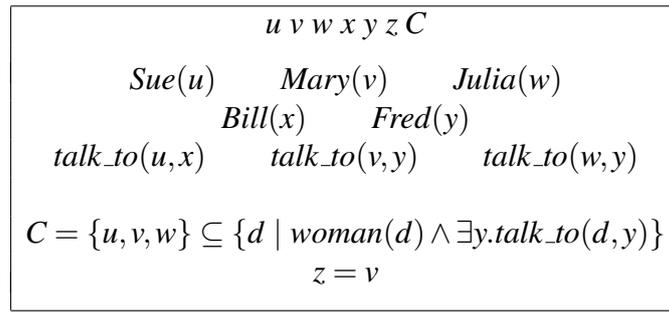
Figure 5: Contrast presupposition resolved

(22)   A plane with 155 passengers on board had a crash landing. Everyone was rescued. #$\sim^1$[The passengers that were SAved] were happy.

$$\boxed{\begin{array}{c} x\,Y\,Z \\[4pt] plane(x) \qquad has(x,Y) \\ passengers(Y) \qquad |Y| = 155 \\[6pt] \boxed{\begin{array}{c} y \\ y \sqsubseteq Y \end{array}} \; \langle\!\!\begin{array}{c}\forall \\ y\end{array}\!\!\rangle \; \boxed{rescued(y)} \\[6pt] \partial : \boxed{\begin{array}{c} \underline{C}\;\underline{U} \\ [\![X]\!]^o \in C \qquad C \subseteq \cup[\![X]\!]^f \\ C(U) \qquad U \neq [\![X]\!]^o \end{array}} \end{array}}$$
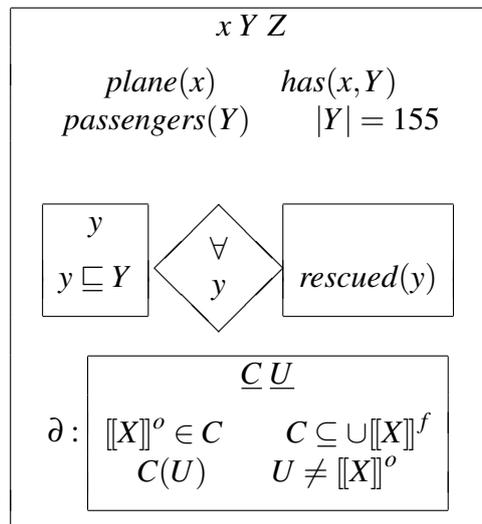
Figure 6: Incoherent discourse, unresolvable $\sim^1$ presupposition

On principle, the DRS in figure 6 is well-formed and expresses that every passenger of the the group was rescued and is happy. But now, the focus presupposition goes wrong. The logical alternative set $[\![X]\!]^f$ of the focus phrase is (23a). Applying generalized union yields (23b) and C must be a subset of this.

(23)   a. $[\![X]\!]^f = \{\lambda X[passengers(X) \wedge P(X)] \mid P \in D_{\langle e,t\rangle}\}$
        b. $\cup[\![X]\!]^f = \{A \mid passengers(A) \wedge \exists P.P(A)\}$

We fail to identify a group U, different from $[\![X]\!]^o$ and with the property that their members were not saved. This is why the presupposition cannot be resolved, the discourse stays incoherent and the restrictive relative clause construction cannot be successfully uttered in this context.

4   Conclusions

4.1   Summary and afterthoughts

In this paper, I have presented a comprehensive treatment of the information structural properties of relative clauses, both with regard to information status and focus alternatives. For a number of exemplary contexts and different intonational variants, I investigated and explained which combinations are possible or impossible and why this is the case. Furthermore, I sketched a solution to the problem of determining the focus alternatives of complex definite descriptions (focus phrases). Relative clauses are one type of these. In order to identify the focus alternatives and to explain the infelicity of certain examples, I combined von Heusinger's proposal using set union with Rooth's focus interpretation operator $\sim$.

Under my account, the definite article does not give rise to special alternative meanings but instead indicates the position at which a variant of the focus interpretation operator is attached. This might explain, among other things, why *non-restrictive* relative clauses (other than restrictive ones) do not participate in the determination of the contrastive properties of the whole construction: they are outside the scope of the determiner and the focus interpretation operator cannot see them.

In future work, the proposal has to be validated further and re-cast in an intensional framework.

4.2   Predictions on intonation

Apart from the semantic and information structural treatment of relative clause constructions this paper makes a number of testable predictions with regard to intonational phonology and sentence processing. Table 5 in section 3.2 not only gives an exhaustive list of context and accenting combinations but is also meant to inspire production or perception experiments. For instance, if the head noun, and along with it its information status, is varied (e.g. "the man" (unmentioned), "the man" (D-GIVEN), "the moon" (unmentioned but identifiable by the hearer (ACTIVATE)), this is very likely to influence the interpretation of a subsequent relative clause. Since "the moon" is already fully identified, further information can only be understood as an apposition, while "the man" in the unmentioned case is in need of further specification. From the story told in this paper, it should be much clearer what accenting differences are to be expected. Finally, the table gives an overview which context-intonation pairs are compatible with both types of relative clauses. In such cases we may expect intonation boundaries to play a decisive role in disambiguation.

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