Squiggly Issues: Alternative Sets, Complex DPs, and Intensionality

Arndt Riester[1] and Hans Kamp[1,2]

[1] Institute for Natural Language Processing & SFB 732, University of Stuttgart
[2] Department of Philosophy, University of Texas, Austin
{arndt.riester,hans.kamp}@ims.uni-stuttgart.de

Abstract. In this paper, we investigate a number of long-standing issues in connection with (i) focus interpretation and its interrelation with complex definite descriptions, and (ii) the intensional properties of sentences with focus constituents. We revitalize the use of Rooth's (1992) $\sim$ operator, clarify its definition as an anaphoric operator, discuss the principles that govern its placement in logical forms and show how it can be succesfully employed to replace the notion of Krifka's (2006) focus phrases. Finally, we argue that a proper view of the intensional dimension of retrieving the antecedent sets required by the operator can account for problems relating to the intensionality of sentences with focus sensitive operators that are discussed by Beaver & Clark (2008).

Key words: Alternative Semantics, anaphora, DP meaning, DRT, focus interpretation, focus phrase, intensionality, presupposition

1 Introduction: Focus Semantic Values and Context Sets

According to Rooth (1985, 1992, 1996), focusing – the semantic reflex of an F feature assigned to some constituent X in logical form – leads to the creation of a focus semantic value $[\![X]\!]^f$. The FSV is simply the domain of objects of the same semantic type as the ordinary semantic value $[\![X]\!]^o$ relative to some model. For instance, the FSV of the word $[\text{THEodore}]_F$ is the domain of individuals D_e.

Note that, other than in the case of mathematical models, natural discourse does not enable us to exhaustively list all entities that belong to D_e since we are not omniscient. All we know is that if d is an individual then it is a member of D_e. We shall therefore consider focus semantic values to be (anonymous) characterizations rather than extensionally determined sets.

It is well-known since Rooth (1992) that FSVs are not as such suited to function with conventionally focus-sensitive particles[3]; first, they need to undergo contextual restriction. Consider the sequence in (1).

(1) a. We have invited all siblings of your mom but, I noticed, we have really neglected your father's relatives.
b. So far, we have only invited $[\text{uncle THEodore}]_F$.

[3] Beaver & Clark (2008: Chap. 3) distinguish conventional, free, and quasi-sensitivity.

(2) $\forall x[x \in C \wedge \mathit{invite}(\mathbf{we}, x) \rightarrow x = \mathbf{t}]$

Using a standard semantics for *only* yields (2) as the reading for (1b). We obtain the wrong result if the quantificational domain C for *only* is set to D_e since this set also comprises Mom's invited siblings, which are then ruled out by (2). This goes against what is said in (1a). Therefore, in order to get the proper meaning for (1b), C must be restricted to a contextually available set, in this case "your father's relatives".

For this and a number of other focus-related purposes, Rooth (1992, 1996) defines, in addition to the focus feature F, a *focus interpretation operator* $\sim$ (informally known as "squiggle operator"), which can in principle attach to arbitrary constituents. If X is some constituent, $[\![X]\!]^o$ is the ordinary meaning of X and $[\![X]\!]^f$ is the FSV, then $\sim$X triggers a presupposition such that a *context set* C containing a contrastive item y must be identified, with the properties given in (3).[4]

(3) (i) $C \subseteq [\![X]\!]^f$ (ii) $y \in C$ (iii) $y \neq [\![X]\!]^o$

In the following we would like to scrutinize the anaphoric nature of $\sim$. For this purpose we provide a translation of the constraints in (3) into DRT, which is geared to the treatment of presupposition and anaphora in the framework of van der Sandt (1992), Geurts (1999) and Kamp (2001). Definite descriptions like that in the second sentence of (4) are represented as in Fig. 1a[5], where the "anaphoric" variable $\underline{z}$ is waiting to get bound to the previously mentioned customer x. In this vein, we formulate the $\sim$ conditions from (3) as in Fig. 1b.

(4) A customer entered. Mary greeted the man.

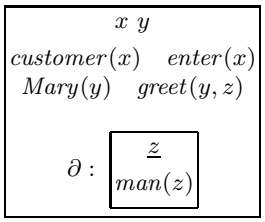

Fig. 1a.
Preliminary DRS for (4)

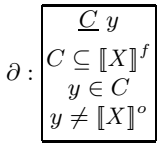

Fig. 1b.
Presupposition triggered by $\sim X$

[4] We ignore a fourth condition according to which $[\![X]\!]^o \in C$, since we think it is generally superfluous and sometimes even out of place. While it is unproblematic that the retrieved set C sometimes contains $[\![X]\!]^o$ there are cases in which imposing this as a *constraint* is implausible; for instance, overtly contrastive focus.

[5] We ignore tense.

2 Squiggle Placement

A representation like the one in Fig. 1b – in particular the treatment of C as an anaphoric variable – clearly shows that the semantic type which the variables adopt is dependent on the attachment site of the squiggle operator. If $\sim$ attaches to a DP then C must be a set of individuals. If it attaches to a VP then C is a set of properties or, preferably, a set of events or states. Seen in this light, it is surprising that Rooth (1992: 89) chooses to attach the $\sim$ in (5) at VP level.

(5) Mary only $\sim[_{VP}$ introduced BILL_F to Sue].

Rooth assumes that *only* is syntactically adjoined to VP and that it quantifies over the set provided by a variable C which gets instantiated by means of $\sim$. The squiggle operator, in its designated location, triggers the presupposition in Fig. 2a,b.

$$\partial : \boxed{\begin{array}{c} \underline{C}\ P \\ C \subseteq \{\lambda x.\mathit{introd}(x, z, \mathbf{s}) \mid z \in D_e\} \\ P \in C \quad P \neq \lambda x.\mathit{introd}(x, \mathbf{b}, \mathbf{s}) \end{array}}$$

Fig. 2a
Presupposition triggered by $\sim[_{VP}\ldots]$

$$\partial : \boxed{\begin{array}{c} \underline{C}\ e' \\ C \subseteq \{e \mid \mathit{introd}(e) \wedge \textsc{go}(e, \mathbf{s})\} \\ e' \in C \quad \textsc{th}(e') \neq \mathbf{b} \end{array}}$$

Fig. 2b
Same issue, using event semantics

We provide two variants of this presupposition. Figure 2a is immediately derived from Rooth's original account, Fig. 2b is a reformulation in Neo-Davidsonian semantics, which uses discourse referents for events rather than properties (as it is common practice in DRT).[6] The meaning of (5) is correctly represented as (6a)[7] or (6b).

(6) a. $\forall P[P \in C \wedge P(\mathbf{m}) \rightarrow P = \lambda x.\mathit{introd}(x, \mathbf{b}, \mathbf{s})]$
b. $\forall e[e \in C \wedge \textsc{ag}(e, \mathbf{m}) \rightarrow \textsc{th}(e, \mathbf{b})]$

The question is whether it is plausible to assume that the instantiation of C is due to anaphoric retrieval as suggested by the definitions in Fig. 2a,b. Consider the discourse in (7).

(7) a. At the party, there were Alex, Bill, and Carl, none of whom Sue had met before.
b. Mary only introduced BILL_F to Sue.

There are no introduction *events* in the discourse context given by (7a). It seems therefore wrong to assume that (7b) involves anaphoric retrieval of a set of VP-

[6] Cf. Bonomi and Casalegno (1993), Beaver and Clark (2008) for an elegant treatment of focus in event semantics.
[7] Here, we ignore intensionality.

meanings of the form [introduced z to Sue]. On the other hand, it is highly likely that retrieval is of a set of alternatives to *Bill*. But in that case it is more intuitive for $\sim$ to attach to [BILL$_F$] as shown in (8).

(8) Mary only introduced $\sim$[$_{DP}$ BILL$_F$] to Sue.

The problem is how to bring this insight in line with the semantics in (6a), which was found to be essentially correct. First of all, since C is now the set of individuals $\{\mathbf{a}, \mathbf{b}, \mathbf{c}\}$ rather than a set of predicates, it can no longer be used in formula (6a) as before. What we want instead is (9).

(9) $\forall P[P \in [\![\textit{introd. } \sim[\textit{BILL}_F] \textit{ to Sue}]\!]^{\sim} \wedge P(\mathbf{m}) \rightarrow P = \lambda x.\textit{introd}(x, \mathbf{b}, \mathbf{s})]$;
where $[\![\textit{introd. } \sim[\textit{BILL}_F] \textit{ to Sue}]\!]^{\sim} = \{\lambda x.\textit{introd}(x, z, \mathbf{s}) \mid z \in C\}$

$[\![\cdot]\!]^{\sim}$ is, like Rooth's $[\![\cdot]\!]^{o}$ and $[\![\cdot]\!]^{f}$, a mapping from well-formed expressions to semantic values (associated with some model). $[\![\cdot]\!]^{\sim}$ differs from $[\![\cdot]\!]^{f}$ in that it is defined only for constituents which contain an occurrence of the "context resolution" marked $\sim$. There is a switch from $[\![\cdot]\!]^{f}$ to $[\![\cdot]\!]^{\sim}$ when $\sim$ is encountered, indicating that the operation it triggers subjects $[\![\cdot]\!]^{f}$ to the relevant contextual restriction. Thus the constituent [BILL$_F$] of (8) has the focus semantic value $[\![\textit{BILL}_F]\!]^{f} = D_e$, but the $\sim$-marked constituent $\sim$[BILL$_F$] has instead a value $[\![\sim [\textit{BILL}_F]]\!]^{\sim}$ (a contextually determined subset of $[\![\textit{BILL}_F]\!]^{f}$). We call $[\![\sim [\textit{BILL}_F]]\!]^{\sim}$no longer FSV but *context set*. A comparison between Rooth's and our account is shown in Table 1.

Rooth (1992)		Our Account
$[\![\textit{BILL}_F]\!]^{f} = D_e$		$[\![\textit{BILL}_F]\!]^{f} = D_e$
	Foc.int.$\rightarrow$	$[\![\sim[\textit{BILL}_F]]\!]^{\sim} = \{\mathbf{a}, \mathbf{b}, \mathbf{c}\}$
$[\![\textit{introd. BILL}_F]\!]^{f}$ $= \{\lambda y \lambda x.\textit{introd}(x, z, y) \mid z \in D_e\}$		$[\![\textit{introd. } \sim[\textit{BILL}_F]]\!]^{\sim}$ $= \{\lambda y \lambda x.\textit{introd}(x, z, y) \mid z \in \{\mathbf{a}, \mathbf{b}, \mathbf{c}\}\}$
$[\![\textit{introd. BILL}_F \textit{ to Sue}]\!]^{f}$ $= \{\lambda x.\textit{introd}(x, z, \mathbf{s}) \mid z \in D_e\}$		$[\![\textit{introd. } \sim[\textit{BILL}_F] \textit{ to Sue}]\!]^{\sim}$ $= \{\lambda x.\textit{introd}(x, z, \mathbf{s}) \mid z \in \{\mathbf{a}, \mathbf{b}, \mathbf{c}\}\}$
$[\![\sim[\textit{introd. BILL}_F \textit{ to Sue}]]\!]^{\sim}$ $= \{\lambda x.\textit{introd}(x, z, \mathbf{s}) \mid z \in \{\mathbf{a}, \mathbf{b}, \mathbf{c}\}\}$	$\leftarrow$ **(flawed)** **Foc.int.**	

Table 1. Reversed order of compositional Alternative Semantics and context resolution

3 Benefits of our Account

In (8) $\sim$ is adjoined to the focus constituent itself. But we do not propose that this is always so. Our interpretation of the $\sim$ operator allows us, for instance, to handle the issue of *focus phrases* (Drubig, 1994, Krifka, 2006). Sentence (10) demonstrates what Krifka calls "the problem of the only child".

(10) Sam only talked to [BILL's$_F$ mother]$_{FP}$.

Drubig and Krifka noticed the problem that (10) presents for a Structured Meanings account which would analyse the sentence as involving *only*-quantification over *Bill* and the other members of his alternative set. If the set contains a sibling of *Bill* then *Sam* must both have talked to their mother and, at the same time, not have talked to her, and the sentence would come out as a contradiction, although intuitively it isn't. Krifka (2006) solved the problem by postulating that *only* instead associates with *focus phrases (FP)*, cf. (10), which means that quantification is about referentially distinct alternatives to *Bill's mother* rather than alternatives to *Bill*.

By applying our strictly anaphoric definition of the squiggle operator we automatically get the correct semantics for (10). $\sim$ is attached to [$_{DP}$ BILL's$_F$ mother], giving rise to the presupposition in Fig. 3.

$$\partial : \boxed{\begin{array}{c} \underline{C}\ y \\ C \subseteq [\![BILL's_F\ mother]\!]^f \\ y \in C \quad y \neq [\![BILL's_F\ mother]\!]^o \end{array}}$$

Fig. 3. $\sim$[BILL's$_F$ mother]

(11) a. $[\![BILL's_F\ mother]\!]^o = \iota x.mother\_of(x, \mathbf{b})$
b. $[\![BILL's_F\ mother]\!]^f = \{d \mid \exists x.mother\_of(d, x)\}$

The ordinary value occuring in Fig. 3 is simply Bill's mother – representable as the ι-expression in (11a). (Here we ignore the presupposition that is arguably generated by the definite description.) The focus semantic value is the anonymous set given in (11b), the set of all mothers of individuals in D_e, regardless of who or how numerous they are. During the process of anaphoric retrieval this set undergoes restriction, and C is resolved to whatever mothers play a role in the given context. Compare, for instance, sentence (12).

(12) At the party there were Alex, Bill, Carl and Daniel, and also Bill's mother and Carl's mother. I only knew $\sim$[BILL's$_F$ mother].

The second sentence of (12) is naturally interpreted as saying that the speaker knew Bill's mother but not Carl's mother, leaving it open whether he also knew the unmentioned mothers of Alex and Daniel. This interpretation can be obtained when $\sim$ is attached to [BILL's$_F$ mother], but not when it is attached to [BILL's$_F$]. Note also that the semantics correctly predicts that the other persons mentioned, who are not mothers, do not become elements of C.

A further benefit of the way we propose to use $\sim$ arises in connection with an example discussed in von Heusinger (2007). He notices a problem with complex definite descriptions like the one occurring in (13a), which involves adjectival modification.

(13) a. John only talked to [the GERman$_F$ professor].
b. {⟦*the German professor*⟧, ⟦*the French professor*⟧, ⟦*the English professor*⟧, ...}

Something is wrong if (13a) is analyzed under the assumption that determining the truth conditions of the sentence involves computing denotations of expressions of the form [the A professor][8], in other words a set like (13b). For it might well be that on the occasion that (13a) speaks of there were besides the one German professor several French professors and therefore the expression ⟦*the French professor*⟧ would fail to properly refer. Still, if the only professor that John talked to was the only German professor there, then (13a) is a perfectly good way of saying that John only talked with this one professor. The problem recurs every time we want to determine the alternative set of a DP. Consider (14a) as a more complex example. Again, (14b) does not seem to be an appropriate alternative set, because it involves uncontrollable presupposition-triggering expressions itself.

(14) a. John only caught [the monkey which threw a toMAto$_F$ at Lisa].
b. {⟦*the monkey which threw a tomato at Lisa*⟧, ⟦*the monkey which threw a cucumber at Lisa*⟧, ⟦*the monkey which threw a carrot at Lisa*⟧, ..., ??}

The general solution we offer for cases like these will be demonstrated for (13a). The FSV of the phrase [the GERman$_F$ professor] is determined by a purely mechanical process as the set characterized by (15a), which does not run into the problems that (13b) caused. The set can even be further simplified to (15b).

(15) a. $\{d \mid \exists P[P(d) \wedge \mathit{professor}(d)]\}$ b. $\{d \mid \mathit{professor}(d)\}$

The $\sim$ is then adjoined to [$_{DP}$ the GERman$_F$ professor], which simply defines the task of retrieving from the context a set of professors, e.g. {**a, b, c, d**}, who are of course distinct from each other and whose nationality doesn't play any role.[9]

[8] A is some other nation-denoting adjective.

[9] Since a number of people have questioned the compositionality of this proposal, here comes the derivation: $[\![\mathit{professor}]\!]^f = \{\lambda x.\mathit{professor}(x)\}$;
$[\![\mathit{GERman}_F]\!]^f = \{\lambda Q\lambda x.[P(x) \wedge Q(x)] \mid P \in D_{\langle e,t\rangle}\}$ (set of intersective modifiers);
$[\![\mathit{GERman}_F\ \mathit{professor}]\!]^f = \{\lambda x.[P(x) \wedge \mathit{professor}(x)] \mid P \in D_{\langle e,t\rangle}\}$
As the alternative meaning $[\![\mathit{the}]\!]^f$ we assume – similar to a proposal made in von Heusinger (2007: Sect. 3.3) – $[\lambda\mathcal{P}.\cup\mathcal{P}]_{\langle\langle\langle e,t\rangle,t\rangle,\langle e,t\rangle\rangle}$ (involving a typeshift from a set of properties to a set of individuals). The resultant set of professors (15) is then – other than on von Heusinger's account – restricted and contextually identified by means of $\sim$. If this seems a bit curious at first, recall that the *ordinary meaning* of the definite determiner $[\![\mathit{the}]\!]^o$ consists of precisely the same two aspects: a typeshifter $[\lambda P.x]_{\langle\langle e,t\rangle,t\rangle}$ and a presuppositional condition (sometimes written as ι-operator) to identify the free variable x as the unique individual with property P (here: *German professor*) in the relevant context.

4 Intensionality

Discussions of the intensional aspects of information structure are not very common, but an exception is Beaver & Clark (2008: 95ff.) (in the following: B & C), which contains a detailed discussion of the sentence in (16a) (the F-marking is theirs, a translation to our account is (16b)).

(16) a. Sandy only met [the PREsident]$_F$.
b. Sandy only met $\sim$[the PREsident$_F$].

B & C argue roughly as follows. An extensional evaluation of (16) involves a set A of alternatives for the denotation (= the *extensional value*) of *the president*. A is a set of ordinary individuals (of which the actual president is one) that enters into the determination of the extensional value of the sentence (its actual truth value), like the actual president himself does. If instead we want to obtain the *intensional* value of the sentence (i.e. the proposition it expresses), then we must start with the intensions of its smallest constituents and compute the intensions of the complex constituents from the intensions of their components, in the manner familiar from Montague Grammar, arriving eventually at the intension of the sentence as a whole. In this way we obtain as intension for *the president* an individual concept *pr* (a function from possible worlds to individuals; for each possible world w, $pr(w)$ is the president in w). B & C's next assumption is that if the semantic value of *the president* is an individual concept, then the members of the *alternative set* invoked by the F-marking of this phrase must consist of individual concepts as well. But if that is what we want to assume about the alternative set A, we have to be a very careful. For one thing we cannot assume A to be the set of *all* individual concepts. For if there is at least one world w_1 other than the actual world w_0, and there are at least two individuals, then there will be different individual concepts that both assign the actual president **a** to the actual world but differ in what they assign to w_1: $c1 = \{\langle w_0, \mathbf{a}\rangle, \langle w_1, \mathbf{a}\rangle\}$ and $c2 = \{\langle w_0, \mathbf{a}\rangle, \langle w_1, \mathbf{b}\rangle\}$. And then the usual semantics for *only* will yield a contradiction for a sentence like (16). Furthermore, even when we accept that in general the alternative set is contextually restricted, it isn't immediately clear how this kind of conflict can be avoided. B & C discuss a number of options. But as we see it, the problem that these options are trying to deal with need not arise in the first place. The solution we suggest starts from the observation that all compositional steps in the computation of the truth value of sentences like (17) (in any possible world w) are extensional. In this regard (16) is no different than e.g. (17).

(17) Sandy met the president.

The intension of such a "purely extensional" sentence ϕ can be obtained by simple "abstraction with respect to possible worlds". (In an intensional model $M = \langle \mathrm{W}, \mathrm{M}\rangle$, where W is a set of possible worlds and M a function which assigns each $w \in \mathrm{W}$ an extensional model $\mathrm{M}(w)$, the intension $[\![\phi]\!]_M$ of ϕ in M can be obtained as $\lambda w.[\![\phi]\!]_{M,w}$, where $[\![\phi]\!]_{M,w}$ is the truth value of ϕ in $\mathrm{M}(w)$.)

Our second assumption is that retrieval of alternative sets is in actual fact always retrieval of a set description – or, if you prefer, of a predicate. Intuitively, interpreting the focus of (18b) triggers retrieval of the predicate *"(member of) the president's family"* (in the following: *MPF*).

(18) a. Sandy wanted to meet the president's family.
b. But she only met ∼[the PREsident$_F$].

To capture the intensional dimension in our representations there are various ways in which one could proceed. For present purposes the simplest solution is to adopt a DRT-based version of the Type2 logic of Gallin (1975), in which possible worlds are represented explicitly by variables or, for us, discourse referents, cf. Roberts (1989), Brasoveanu (2007), Bittner (to appear). This entails that ordinary predicates get an additional argument position that is to be filled by a possible world. (Some modifications are needed for the algorithm that constructs (preliminary) DRSs of this new form from sentences, but this is not a serious problem.) In this formalism the representation for (17) can be given the representation in Fig. 4.[10]

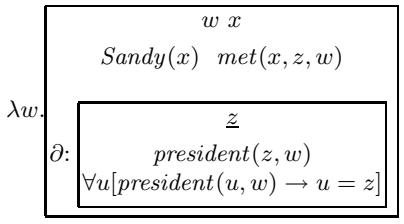

Fig. 4. DRS for (17)

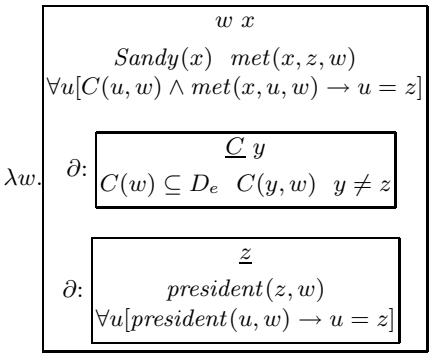

Fig. 5. DRS for (18b)

A representation of this kind should be evaluated with respect to contexts c which specify (among other things) a set W_c of worlds. For instance, W_c could be the set of worlds that are assumed to be compatible with the belief of some given person A. The embedded presupposition in Fig. 4 imposes on c the constraint that every world in W_c must satisfy it. If the presupposition is not satisfied, then the context c should, if possible, be accommodated so that the constraint is satisfied by all its worlds after all.

[10] In the following, we explicitly indicate the uniqueness condition of the definite, which is treated implicitly in van der Sandt (1992) and in Fig. 1a, where it is assumed that contextual *identification* via anaphora – if successful – is necessarily unique. However, when as is the case in (17) the presupposition has to be justified in the encyclopaedic context, its representation is arguably defective without the uniqueness condition.

Given that the context c satisfies the presupposition, the non-presuppositional part of Fig. 4 modifies c to an output context c' whose world set $W_{c'}$ consists of those worlds of W_c in which the non-presuppositional part of Fig. 4 is true.

A representation of (18b) which captures intensionality along the same lines must include a presuppositional requirement for a description of the alternative set for the focused constituent $[\![\sim [\mathit{the}\ \mathit{PREsident}_F]]\!]^\sim$. We represent this presupposition by means of a predicate discourse referent C, which has besides its ordinary argument slot also a slot for a possible world. One such representation is given in Fig. 5. In the context provided by (18a) C can be resolved to the predicate *"member of the president's family"*. This turns Fig. 5 into the representation in Fig. 6.

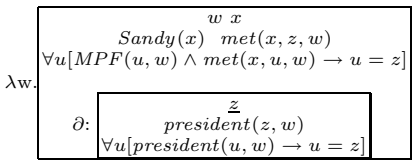

Fig. 6. Doubly *de dicto*

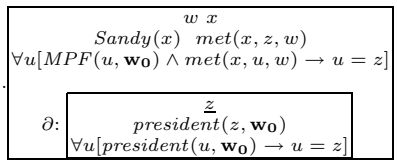

Fig. 7. Doubly *de re*

Figures 5 and 6 represent only one interpretation of (18b). We call this interpretation the "doubly *de dicto*" interpretation, since both the DP *the president* and the alternative set description *MPF* are evaluated at the different evaluation worlds w, at which the non-presuppositional content is then evaluated for truth or falsity. Figure 6 would be a natural interpretation in a situation where Sandy set out on her quest for satisfaction of the desire described in (18a) with a purely descriptive conception of the president and knows no more about his family than that he has one. But this is not the only interpretation of (18b). For one thing, as often observed, the DP *the president* can not only be interpreted *de dicto* but also *de re*. We can represent this interpretation by replacing the relevant occurrences of the discourse referent w by the discourse referent $\mathbf{w_0}$, an "indexical" discourse referent that always stands for the actual world. But not only *the president* can be given either a *de dicto* or a *de re* interpretation, the same holds for the description *MPF*. Figure 7 represents the "doubly *de re*" interpretation of (18b).

Certain "mixed" interpretations seem possible also. For instance, Sandy may have directly referential knowledge of the president (say, by having seen him on TV), but know little about his family. In that case an interpretation might seem reasonable in which the DP *the president* is interpreted *de re* but the alternative set description *MPF de dicto*. On the other hand, the combination of a *de dicto* interpretation of *the president* in combination with a *de re* interpretation of *MPF* makes little intuitive sense. As things stand, however, we do not know what general principles if any limit the number of interpretational options for such sentences. We leave this as a question for further investigation.

Bibliography

David Beaver and Brady Clark. *Sense and Sensitivity. How Focus Determines Meaning*. Wiley-Blackwell, Chichester, UK, 2008.

Maria Bittner. Tense, Mood and Centering. To appear in: R. Musan and M. Rathert, editors, *Tense across Languages*, Niemeyer, Tübingen.

Andrea Bonomi and Paolo Casalegno. Only: Association with Focus in Event Semantics. *Natural Language Semantics*, 2(1):1–45, 1993.

Adrian Brasoveanu. *Structured Nominal and Modal Reference*. PhD thesis, Rutgers University, New Brunswick, 2007.

Hans Bernhard Drubig. Island Constraints and the Syntactic Nature of Focus and Association with Focus. *Arbeitspapiere des SFB 340*, 51, 1994. Universität Tübingen.

Daniel Gallin. *Intensional and Higher-Order Modal Logic*. North-Holland, Amsterdam, 1975.

Bart Geurts. *Presuppositions and Pronouns*. Elsevier, Oxford, 1999.

Klaus von Heusinger. Alternative Semantics for Definite NPs. In: K. Schwabe and S. Winkler, editors, *Information Structure and the Architecture of Grammar. A Typological Perspective*, pages 485–508. Benjamins, Amsterdam, 2007.

Hans Kamp. The Importance of Presupposition. In: Christian Rohrer and Antje Roßdeutscher, editors, *Linguistic Form and its Computation*. CSLI, 2001.

Manfred Krifka. Association with Focus Phrases. In: Valéria Molnár and Susanne Winkler, editors, *The Architecture of Focus*, pages 105–136. Mouton de Gruyter, Berlin, 2006.

Craige Roberts. Modal Subordination and Pronominal Anaphora in Discourse. *Linguistics and Philosophy*, 12(6): 683–721, 1989.

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

Mats Rooth. A Theory of Focus Interpretation. *Natural Language Semantics*, 1 (1):75–116, 1992.

Mats Rooth. Focus. In: Shalom Lappin, editor, *The Handbook of Contemporary Semantic Theory*, pages 271–297. Blackwell, Oxford, 1996.

Rob van der Sandt. Presupposition Projection as Anaphora Resolution. *Journal of Semantics*, 9:333–377, 1992.