Focus Particles, Sentence Meaning, and Discourse Structure

Submitted to: W. Abraham & A. ter Meulen (eds.). *Making Sense - From Lexeme to Discourse.* Oxford: Oxford University Press.

Klaus von Heusinger, Universität Konstanz

Semantic theories of information structure (von Stechow 1982, Jacobs 1983, Rooth 1985, Krifka 1991) assume a partition of the sentence into (at least) two disjunctive informational units. They play a crucial role in the interpretation of a sentence with respect to its felicity conditions and to its presuppositional meaning. Furthermore, they serve as arguments for focus particles. The sentence meaning is compositionally derived from the meanings of the informational units and focus operators.

I show that this view of information structure as a partition of a sentence leads to severe problems with the compositional process in more complex cases. I then argue that information structure must be represented by two overlapping units, rather than by two disjunctive ones. The *foreground*-unit corresponds to the whole sentence, and the *background*-unit corresponds to the whole sentence minus the focused expressions. These two units differ with respect to their contributions and with respect to their interaction with the established discourse representation. Evidence for the Foreground-Background Semantics is gained from an in-depth analysis of the interpretation of focus particles and adverbs of quantification.

1. Introduction[*]

In semantic descriptions of information structure, it is assumed that the sentence is divided into two components, the focus F, and the background B. The focus is often intonationally marked by a pitch accent and it is said to express the "new information". Following the usual convention, I set the expression with the pitch accent in small caps; the indexed feature F marks the syntactic constituent with the focus feature. Below, I discuss three constructions (constituent questions, contrastive focus, and focus particles) that involve the focus-background partition. I then present two problems for this view.

The traditional test for the focus-background structure of a sentence consists in a constituent question and its felicitous answer, (1a-b).

(1a)	Who did Sam talk to?
	presupposition: Sam talked to someone.
(1b)	Sam talked to FRED$_F$.

Background:	Sam talked to x.	
Focus:	Fred	
ordinary meaning:	Sam talked to Fred.	$= \mathbf{B}(\mathbf{F})$
presupposition:	Sam talked to someone.	$= $ x $\mathbf{B}$(x)
felicity conditions:	The sentence is uttered felicitously if its presupposition matches with the presupposition of the question.	

Sentence (1b) can be understood as a felicitous answer to question (1a) because its background *Sam talked to x* matches the presupposition of the question, while its focus *Fred* corresponds to the constituent that was asked for. The background meaning is formed by subtracting the focus from the full sentence meaning and by replacing the focus expression with a variable. The ordinary meaning of sentence (1b) is the combination of background and focus, while the presupposition is formed by existentially quantifying the variable of the background. The presupposition triggered by the focus in (1b) corresponds to the presupposition triggered by the constituent question in (1a). This observation motivates the view that the background expresses given or presuppositional information, while the focus provides the new information. The focus-background partition-aspect of information structure was taken up by the theory of Structured Meanings (see section 3.1).

The contrastive focus *FRED* in (2) is uttered without a corresponding constituent question. The focused expression is understood to express some contrast to other possible referents.[1] This is an instance of contrastive focus which motivates a semantics of focus (and of information structure in general) in terms of alternatives (see section 3.2 for Alternative Semantics). Here the function of the focus is invoking alternatives to the focused phrase. A sentence with a contrastive focus is uttered felicitously if there are alternatives to the focused expressions that could have replaced the focused expression in the given context, but actually did not.

(2)   Sam talked to FRED$_F$. (but not to Mary, John, Tim, ...)
        Background: Sam talked to x.
        Focus: Fred
        felicity conditions: The sentence is uttered felicitously if there are alternatives to Fred such that Sam might have talked to them.

Focus particles like *only, even,* and *also* are interpreted as operators that take two arguments: focus ***F*** and background ***B***. In (3) below, the focus particle *only* associates with the focus *Fred.* It is interpreted as an operation that is true if there is no alternative *x* with respect to Fred such that Sam had talked to *x*. The presupposition is that Sam talked to Fred. We can either paraphrase the presupposition and the assertion as in (3a), or represent them by the quasi-formalization in (3b), where "≈" means "similar, but not identical".

(3)   Sam only talked to FRED$_F$.
        B: Sam talked to x.
        F: Fred
(3a)   presupposition: Sam talked to Fred.
        assertion: *Nobody but* Fred *is such that* Sam talked to him.
(3b)   presupposition: **B(F)**
        assertion: For all x ≈ **F**: ¬**B**(x)

---

[1] A reviewer pointed out that the focus in (2) can also simply state some new information.

Focus particles also show truth-conditional effects with different focus-background structure (see (4) and (5) below). They play an important role in the assumption that information structure is best understood in terms of a dichotomy of the sentence. Focus particles are translated into operators that take two arguments that fit exactly with the informational units **F** and **B**. I challenge this view on the basis of two observations: First, I show that adverbs of quantification take as their arguments not **F** and **B**, but rather the whole sentence (the *foreground*) and the *background*. Second, I present evidence that the assumption of a division of a sentence into two disjunctive parts raises problems for the composition of the sentence meaning.

Adverbs of quantification are focus sensitive expressions, as can be seen from the difference between (4) and (5), where the adverb of quantification associates with different arguments.

(4)   Sam usually invites Fred to the MOVIES$_F$.
       B: Sam invites Fred to x.
       F: movies
(5)   Sam usually invites FRED$_F$ to the movies.
       B: Sam invites x to the movies.
       F: Fred

Both sentences compare two sets of time points or intervals for which a certain restriction holds. In (4) the restriction concerns the places Sam invites Fred to, while in (5) it concerns the persons Sam invited to the movies. Sentence (5) can be paraphrased by (5a), where it becomes clearer that the main assertion is that the times Sam takes Fred to the movies constitutes more than half of all times at which Sam took someone to the movies. Again, we can construct the focus and the background out of the whole sentence. However, the operator *MOST* for the expression *usually* compares two sets of times *t*. The first set is characterized by the background information, while the second is characterized by the whole sentence or the conjunction of focus and background.

(5a)   For most times in which Sam invites someone to the movies, he invites Fred to the movies.
(5b)   MOST(**t: ∃x t holds in B(x)**) (**t: t holds in B(F)**)

The second observation concerns the assumption that focus particles always take the focus and the background as their arguments. This assumption runs into problems if the focused phrase is not a simple proper name (as in most illustrations of focus theories), but rather a modifier, as in (6). If we apply the semantics of *only* described in (3a) and (3b) to (6), we get (6a), (6b) and (6c). The definite article is represented by the iota-operator " " expressing the uniqueness condition.

(6)   Sam only talked to the SWISS$_F$ artist.
           B: Sam talked to the X artist.
           F: Swiss

(6a)   pres.: Sam talked to the Swiss artist.
           ass.: *Nothing but* Swiss *is such that* Sam talked to the (unique) X artist.

(6b)   only(**F, B**) is translated into: Sam talked to the Swiss artist and for all X   Swiss:
           it is not the case that Sam talked to z[X(z) & artist(z)]

(6c)   Sam talked to the SWISS artist, but not to the GERMAN artist and not to the
           AMERICAN artist and not to the Italian artist.

However, the interpretation excludes too many alternatives, namely all those artists that are not unique with respect to their nationality. Given the situation that Sam talked to the Swiss artist and to one of the two German artists, the theory predicts the sentence to be true, since the one German artist is not in the alternative set to *the* Swiss artist (due to the violation of the uniqueness condition for definite NPs). Contrary to this prediction, we intuitively quantify over artists and assert that there is no artist but the Swiss artist such that Sam talked to him, as paraphrased in (7a) and represented in a quasi-formula in (7b).

(7a)   No artist but the Swiss artist is such that Sam talked to him.

(7b)   for all x   **artist'** & x   z[**Swiss'**(z) & **artist'**(z)]: it is not the case that Sam
           talked to x

The discussion shows that the semantics of focus sensitive expressions like focus particles or adverbs of quantification plays an important role in the discussion of the nature of informational units. In particular, the discussion of the last two examples strongly suggests that the informational units are the representations of the background and the representation of the whole sentence, rather than a partition into focus and background.

   To summarize this informal discussion, the commonly accepted view of information structure makes the assumptions listed in (8), while I claim the opposite assumptions listed in (9).

(8)   *Common assumptions of information structure*

(i)   Information structure is to be defined with respect to the *sentence*.

(ii)   Information structure is the partition of the sentence into *focus* and *background*.

(iii)   Focus expresses new information, while the background refers to old or given
           information.

(iv)   The sentence meaning can be constructed as a composite of the meaning of the
           focus and that of the background ($\|S\| = \|B\|(\|F\|)$).

(v)   A focus sensitive particle is translated into an operator *O* that takes the focus and
           the background as its arguments (O(F,B)).

(vi)   An adverb of quantification is translated into an operator *Adv* that takes the
           background and the whole sentence meaning as its arguments (Adv(B,B+F)).

(9)   *Assumptions of Foreground-Background Semantics*

(i)   Information structure is to be defined with respect to *discourse.*

(ii)   Information structure is realized as two representations: the *foreground* representation corresponding to the whole sentence, and the *background* representation.

(iii)   It is the whole sentence that expresses new information (rather than one word or one constituent); so the *foreground* representation expresses the new information; the *background* representation is discourse-anchored and therefore contains old or given information.

(iv)   Sentence meaning is compositionally formed from the meaning of its parts according to the syntactic structure and the compositional rules of semantics, rather than in terms of information structure.

(v)   A focus sensitive particle is translated into an operator O that takes the foreground and the background as its arguments (O($background$, $foreground$)).

(vi)   An adverb of quantification is translated into an operator Adv that takes the foreground and the background as its arguments (Adv($background$, $foreground$)).

I will present three arguments in favor of my view: First I show that the traditional dichotomy of the sentence into focus and background is not feasible for conceptual, methodological, and epistemological reasons. Second, I argue that the traditional view leads to problems in the analysis of associations with focus. And third, I argue that the accepted analysis of adverbs of quantification already supports the new view.

The remainder of the article is organized as follows: In section 2, I present some traditional concepts of information structure and argue that they all are defective since they essentially refer to the informal concept of subject-predicate structure. It was the only available concept of sentence structure at the time when information structure was first discussed. However, the subject-predicate structure is itself not well defined. In section 3, I present the two most prominent semantic theories of focus. The Structured Meanings approach assumes a division of the sentence meaning in terms of Frege's functor-argument structure, while Alternative Semantics introduces a new denotation, the so called "alternative meaning". In section 4, I show that both approaches have problems with the compositionality of more complex instances of association with focus, e.g. with modifiers in definite NPs. In section 5, I give a very short introduction to some of the ideas of discourse semantics. Discourse semantics provides us with a new conceptual framework that allows us to describe information structure in a more adequate way. In section 6, I sketch my new approach of *Foreground-Background Semantics*, which is based on the discourse semantics developed so far. In section 7, I provide a summary of the paper.

2. The conceptual background of the information dichotomy

In the 18th century, linguists began to account for the traditional and purely descriptive subject-predicate structure of sentences in terms of syntax. The more this structure was syntactically reconstructed, the more aware linguists became of the fact that there is a residual that is not captured by syntactic description. In particular, the presentation of the content of a sentence did not always correspond to the syntactic categories. Therefore, an additional structure of the sentence was introduced, which subsequently received different terms, but has always been understood as being an additional subject-predicate structure. The theoretical basis for this additional structure varies according to the background theory of the researcher. For example, von der Gabelentz (1869) introduced the pair *psychological subject - psychological predicate*, which are based on his view that psychology is the ultimate base for language structure. This was then taken up by Paul (1880) and others. Ammann (1925) and subsequently, the Prague School (later documented by Daneš 1970, Firbas 1964) used the terms *theme - rheme* and later the Modern Prague School (Sgall & Hajičová & Benešová 1973) *topic - comment*, which are both borrowed from traditional rhetoric and philology. This was the move from a psychological base to a base in information or communication theory. Halliday (1967) learned about information structure from the Prague School, and then brought this concept into the American Structuralism; Chomsky (1971) and Jackendoff (1972) rephrased the distinction in terms of *presupposition - focus*, stressing the semantic-pragmatic nature of the distinction. See (10) for a succinct survey.

(10)   Terminology for the informational dichotomy

(i)	von der Gabelentz (1869), Paul (1880)	*psychological subject - psychological predicate*
(ii)	Amman (1925), Prague School: Firbas (1964), Daneš (1970)	*theme - rheme*
(iii)	American Structuralistic Tradition: Halliday (1967)	*theme - rheme*
(iv)	Modern Prague School: Sgall & Hajičová & Benešová (1973)	*topic - focus*
(v)	Chomsky (1971), Jackendoff (1972)	*presupposition - focus*

All these approaches share the following main assumptions: first, the partition of the sentence into two disjunctive parts with respect to their informational content; second, the distinction between the parts in terms of their contribution to the sentence meaning; third, the assumption that the two units can be united to give the meaning of the whole sentence in a subject-predicate manner. I argue that none of these three claims is well founded.

First, it is not clear what it means that one expression presents new content (concept, information, proposition) in a sentence. Only the whole sentence can provide new information, but not a particular constituent. Even in the answer (1b) to the constituent question (1a) above, the whole sentence provides the new information. It does not make sense

to say that the expression *Fred* provides the new information since *Fred* only refers to some individual, but is unable to express any other information (without additional information from the context). Second, it seems questionable to restrict the information structure to the sentence and not to its setting within a larger discourse. Third, it is highly questionable that the informational units can be merged in a subject-predicate manner. As already argued, it was the feeling that the traditional subject-predicate structure was insufficient that caused the new dichotomy in terms of informational units. Therefore, it is circular to explain the informational units in terms of subject-predicate structure, which itself has not received a semantic explanation, except for Frege's functor-argument structure (see von Heusinger 2002 for a detailed argument).

3. Semantic theories of association with focus

Information structure can cause truth-conditional effects in collaboration with focus-sensitive operators such as *only, even,* and *also*. This is illustrated by (11) and (12) which differ only in the placement of the pitch-accent. This is marked by the focus feature *F*. In a situation where Mary introduced Sue to John and Ann to John and where no other introductions are made, (11) is false, but (12) is true.

(11)   Mary only introduced SUE$_F$ to John.
(12)   Mary only introduced Sue to JOHN$_F$.

This and other observations triggered a new interest of semantic theories in information structure. The semantics of focus-sensitive operators is generally assumed to require two kinds of additional information: the value of the focused expression, and the value of the linguistic environment of the focus, which is called the *background*. In (11), *Sue* is the focus unit, whereas *introduced to John* is the background unit. The focus-sensitive particle is translated into an operator that takes two arguments. Semantic theories differ in the way they compositionally construct the two arguments. The Structured Meanings approach assumes a partition of the meaning of the sentence, while Alternative Semantics composes alternative denotations parallel to the ordinary denotations. This are each discussed below.

3.1 Structured Meanings

Theories of Structured Meanings assume that the focus is moved to a position adjoined to the focus operator at the level of Logical Form (= LF). The focus leaves a trace in its original position which is interpreted as a variable. The LF representation can be translated into the categorial language of the *Structured Meanings* (Jacobs 1983, von Stechow 1982, Krifka 1991). In (11a), I represent the VP-constituent of (11) that is headed by the focus sensitive operator *only*. The focus *Sue* is moved out of its base position toward the operator and leaves a trace in the original position. The background, λt_1 [$_{VP}$ *introduced t_1 to John],* consists of the remainder of the VP with a lambda abstraction over the variable left by the focus. The lambda abstraction forms a relation between two individuals *x* and *y* (in subject and direct object positions, respectively) such that *x* introduces *y* to John. Thus, the information structure of

the sentence is reconstructed by a different way of dividing the sentence into an "informational predicate" and an "informational argument". *Only* is translated into an operator that takes these informational units as its arguments, as in (11c):

(11a)   only [$_{VP}$introduced SUE_F to John]
         F: Sue
         B: t_1 [$_{VP}$introduced t_1 to John]

(11b)   only (Sue$_1$, t_1 [$_{VP}$introduced t_1 to John])

(11c)   ‖only‖ (‖Sue‖, ‖ t_1 [$_{VP}$introduced t_1 to John]‖)

The meaning of *only* combines with such a structured meaning consisting of the meaning of the focus and of the background. The semantic rule (13) of this operation asserts, first, the application of the meaning of the background to the meaning of the focus, and, second, that the background, applied to any other object than the meaning of the focus yields a false statement.[2]

(13)   ‖only‖(**F**, **B**) =   x [**B**(**F**)(x) &   y   ALT(**F**) [**B**(y)(x)   y = **F**]]

The domain of quantification of the operator is formed by a function *ALT* applied to the meaning of the focus, **F**. The function *ALT* takes an object, **d**, and yields the set of elements that have the same type as **d**, as in (13a). We may also say that **d** generates the set of alternatives *ALT(d)*. The function *type* assigns a type to an object, e.g. (13b), where the denotation of a proper name like *Sue* is of type *e*. Hence, the alternatives generated from the denotation of *Sue* are all elements of type *e*, i.e. the domain of individuals.

(13a)   ALT(**d**) = D$_{type(\mathbf{d})}$
(13b)   ALT(‖Sue‖) = D$_{type(‖Sue‖)}$ = D$_{type(\mathbf{s})}$ = D$_e$ = { **b, j, m, s,** ...}

These rules can now be applied to example (11), repeated as (14). In the LF representation, (14a), the focused expression *Sue* is moved to a position adjoined to *only*, and leaves the trace t_1. This translation is compositionally interpreted: proper names and predicates denote constants, as given in (14b). The application of a predicate to its argument is defined as a functional application, as in (14c). In (14d), the semantics (13) of *only* combines with the meaning of the focus and the background. This yields the property of introducing nobody but Sue to John. Finally in (14e), this property combines with the subject, resulting in the interpretation of the whole sentence. It correctly expresses that Mary introduces Sue to John and that she does not introduce anyone else to John.[3]

---

[2] This is a simplification since the first conjunct *B(F)(x)* is the presupposition and the second is the assertion. In the remainder, both aspects of the meaning are merged for convenience.

[3] The formalism observes the following conventions: The lexical meaning of nouns, adjectives and verbs are represented in bold face with apostrophes. Proper names may be abbreviated by their first letter. A predicate takes first its subject argument, then its indirect object and then the direct object. For example, the sentence *Mary introduces Sue to John* receives **introd'**(**s**)(**j**)(**m**) as its semantic translation.

(14)   Mary [$_{VP}$ only [$_{VP}$ introduced SUE$_F$ to John]]

(14a) Mary [$_{VP}$ only [Sue$_1$]$_{Focus}$ [t$_1$ [$_{VP}$ introduced t$_1$ to John]]$_{Background}$]

(14b) $\|$Mary$\| = $ **m** $\|$Sue$\| = $ **s** $\|$John$\| = $ **j** $\|$introduced$\| = $ **introd'**

(14c) $\| $ t$_1$ [introduced t$_1$ to John]$\| = $ z [**introd'**(z)(**j**)]

(14d) $\|$only$\|$ ($\|$[Sue$\|$, $\| $ t$_1$ [introduced t$_1$ to John]$\|$)
       $= $ x [**introd'**(**s**)(**j**)(x) &   y ALT(**s**) [**introd'**(y)(**j**)(x)   y = **s**]]

(14e) $\|$Mary only [Sue   t$_1$ [introduced t$_1$ to John]]$\|$
       $= $ **introd'**(**s**)(**j**)(**m**) &   y ALT(**s**) [**introd'**(y)(**j**)(**m**)   y = **s**]

One of the problems of this semantic approach to information structure is that even though the focus movement is understood as an instantiation of a more general principle of movement, it does not obey island restrictions that hold for quantifiers or wh-movement (Jackendoff 1972, Rooth 1985, Kratzer 1991, von Stechow 1991). Another and more severe problem is that in certain cases, focus movement makes the wrong predictions (compare the discussion in section 4).

3.2 Alternative Semantics

Alternative Semantics (Rooth 1985; 1992) does not separate the meaning of the focus from the meaning of the background by extracting the focus out of the background. Rather it leaves the focus *in situ* and compositionally computes the alternatives generated by the focused expression onto a new semantic level. Alternative Semantics distinguishes between two dimensions of meaning, the *ordinary meaning,* $\| \|_O$, and the *alternative meaning,* $\| \|_A$. The alternatives are formed by the function *ALT* applied to the ordinary meaning of the focused expression. The alternative value of an expression is a set containing elements of the same type as its ordinary meaning. In this sense, the alternative meaning of a basic expression is derived from the corresponding ordinary value. The alternatives are projected parallel to the composition of the ordinary meaning.

Since there are two semantic dimensions, we have to define the interpretation rules for either dimension in (15a-c).

(15a) $\| \|_O = \| _F\|_O$

(15b) $\| _F\|_A = $ ALT($\| \|_O$) $= D_{type(\| \|_O)}$

(15c) $\| \|_A = \{\| \|_O\}$

The ordinary interpretation (15a) does not see the focus feature *F* and, therefore, interprets a focused expression like the unfocused one. The alternative interpretation of a focused expression (15b) creates the set of alternatives. The alternative semantics of an unfocused expression (15c) is the singleton containing the ordinary semantic value. The interpretation of functional application must also be formulated in both ordinary and alternative semantics. The ordinary semantic function of functional application is simple set inclusion, as in (16). The alternative function of functional application (17) is more complex since it must warrant that

the alternatives that are generated by a focused expression can be projected. It is a set formed by all possible expressions *X(Y)* that are derived from the application of an element *X* of the first alternative set to an element *Y* of the second alternative set.

(16) $\|\ \|_O = \|\ \|_O(\|\ \|_O)$

(17) $\|\ \|_A = \{X(Y) \mid X \in \|\ \|_A, Y \in \|\ \|_A\}$

For example, the application of a predicate to its focused argument is the functional application of its meaning to the meaning of the argument. The alternative set, (18), generated by the VP *talk to FRED_F* includes the interpretations of all VPs of the form *talk to y,* where *y* is an alternative value to Sam. This is the set of individuals *d* that have the property of talking to someone.

(18) $\|\text{talk to FRED}_F\|_A = \{X(y) \mid X \in \|\text{talk}\|_A, y \in \|\text{FRED}_F\|_A\}$
            $= \{\mathbf{talk'}(y) \mid y \in \text{ALT}(\mathbf{Fred'})\}$
            $= \{d \mid \exists y\ \mathbf{talk'}(y)(d)\}$

The definition of the meaning (19) for the focus-sensitive operator *only* operates on both aspects of the meaning of an expression α.

(19) $\|\text{only VP}\|_O = \lambda x [\|\text{VP}\|_O(x) \ \&\ \forall P \in \|\text{VP}\| \ P(x) \rightarrow P = \|\text{VP}\|_O]$

When applied to a VP, the ordinary meaning *//VP//_O* expresses the presupposition, whereas the alternative meaning *//VP//_A* determines the domain of quantification for the operator. There is no property in the set of alternatives that holds of *x* other than the property that is identical with the ordinary meaning. Here, the operator does not need two disjoint parts of the meaning of the expression as in the LF-movement account. Rather, it works with both dimensions of the meaning. Information structure is reconstructed by the denotation of the ordinary meaning and by the set of alternative denotations. The focus-sensitive particle is translated into an operator that is defined with respect to the relation between the two kinds of denotations.

   We can now analyze sentence (11), repeated as (20). In (20a), the focused expression *SUE_F* generates a set of alternatives, whereas the alternative interpretations of *Mary*, *John* and *introduce* form singletons containing the ordinary meaning. The ordinary semantics of the application of the predicate *introduce* to its arguments *Sue* and *John* yields the property **introd'**(**s**)(**j**), as in (20c).

(20)   Mary $_{VP}$[only $_{VP}$[introduced Sue$_F$ to John]]

(20a) $\|\text{Sue}_F\|_O = \mathbf{s}$ $\|\text{Sue}_F\|_A = \text{ALT}(\mathbf{s}) = D_e$

(20b) $\|\text{Mary}\|_O = \mathbf{m}$ $\|\text{Mary}\|_A = \{\mathbf{m}\}$
            $\|\text{John}\|_O = \mathbf{j}$ $\|\text{John}\|_A = \{\mathbf{j}\}$
            $\|\text{introduce}\|_O = \mathbf{introd'}$ $\|\text{introduce}\|_A = \{\mathbf{introd'}\}$

(20c) $\|\text{introduced Sue}_F \text{ to John}\|_O = \mathbf{introd'}(\mathbf{s})(\mathbf{j})$
            $\|\text{introduced Sue}_F \text{ to John}\|_A = \{\mathbf{introd'}(x)(\mathbf{j}) \mid x \in \text{ALT}(\mathbf{s})\}$
                    for example: $\{\mathbf{introd'}(\mathbf{s})(\mathbf{j}), \mathbf{introd'}(\mathbf{a})(\mathbf{j}), \mathbf{introd'}(\mathbf{b})(\mathbf{j}), ...\}$

The alternative value of this application is the set of properties consisting of introducing someone (i.e. an alternative value to Sue) to John. The semantics of *only* asserts in (20d) that there is only the one property, which consists of introducing Sue to John (and there is no other property of introducing someone else to John). This combines in (20e) with the subject and yields the correct semantic representation for the sentence, namely that Mary introduces Sue to John. Furthermore, all predicates that are formed by the description *introduce someone to John* and that hold of Mary are identical with the property of introducing Sue to John.
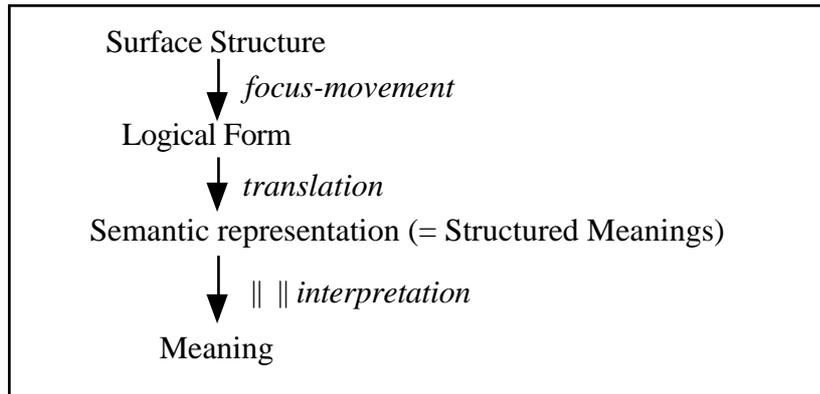
(20d) $\|$only introduced Sue$_F$ to John$\|_O = \lambda x\ [$**introd'(s)(j)**$(x)\ \&\ \forall P\ \{$**introd'**$(y)($**j**$)|\ y \in$ ALT(**s**)$\}\ P(x) \rightarrow P = $**introd'(s)(j)**$]$

(20e) $\|$Mary only introduced Sue$_F$ to John$\|_O = $**introd'(s)(j)(m)** $\&$
$\forall P\ \{$**introd'**$(y)($**j**$)\ |\ y \in$ ALT(**s**)$\}\ P($**m**$) \rightarrow P = $**introd'(s)(j)**$]$

For simple examples like (20), both theories give very similar analyses and predict the same truth conditions, as we can see by comparing (14e) with (20e). However, there are more subtle differences between Structured Meanings and Alternative Semantics, which are discussed in the next section.

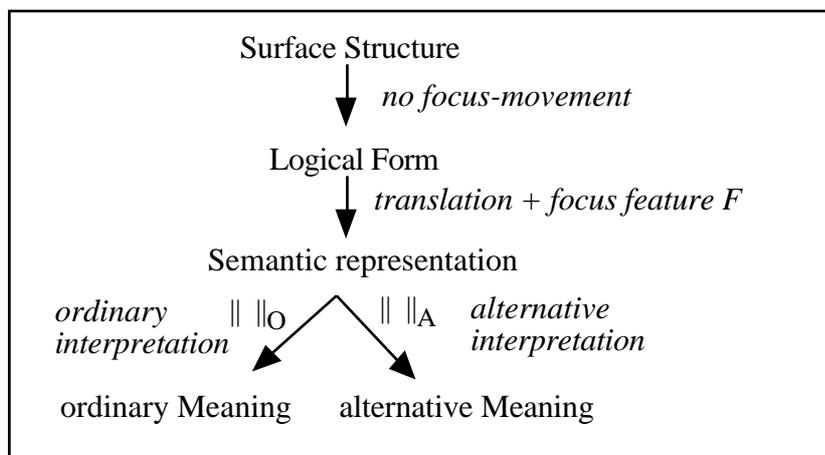## 3.3 Comparing semantic theories of information structure

There is an ongoing debate as to whether Structured Meanings or Alternative Semantics is more suitable to describe association with focus and focus-phenomena in general. I do not want to go into this discussion here (but see Rooth 1985, von Stechow 1991, Kratzer 1991, Krifka 1991, among others). However, I provide a short summary of the two semantic theories with respect to their reconstruction of information structure. Theories of Structured Meanings assume that the focus feature on a constituent forces the constituent to move from its base position to a focus sensitive operator. The logical form is then translated into Structured Meanings, i.e. into a representation of the meaning of the expression that describes the focus as the argument and the background as complex predicate (via lambda abstraction). The interpretation process can then proceed in the usual way. The focus sensitive particle is translated into an operator that takes the two parts of the structured proposition as its argument. Thus, this approach reflects the conception of information structure presented in section 2 in a semantically elaborated way – the problematic subject-predicate structure is reconstructed as the functor-argument relation in the Fregean sense, but independent of (and sometimes orthogonal to) the functor-argument structure of the sentence that is induced by syntax and LF representation.

(21)   Reconstruction of information structure in Structured Meanings

Surface Structure
↓ *focus-movement*
Logical Form
↓ *translation*
Semantic representation (= Structured Meanings)
↓ ‖ ‖ *interpretation*
Meaning

Alternative Semantics does not assume focus movement. It leaves focused constituents *in situ*. The surface form is translated into a semantic representation (intensional logic) to which the focus feature *F* is added. There are two interpretation processes, one yielding the ordinary meaning, the other yielding the alternative meaning. The alternative meaning consists of alternatives generated by the focused expression and projected by compositional rules. Information structure is understood as a relation between the ordinary and the alternative meaning of a sentence, and focus operators compare the ordinary and the alternative meaning.

(22)   Reconstruction of information structure in Alternative Semantics

Surface Structure
↓ *no focus-movement*
Logical Form
↓ *translation + focus feature F*
Semantic representation
ordinary ‖ ‖$_O$ ╱ ╲ ‖ ‖$_A$ *alternative*
interpretation   *interpretation*
ordinary Meaning   alternative Meaning

While Structured Meanings approaches stick to a dichotomy of the sentence, Alternative Semantics assumes one representation, but two interpretations that are computed in parallel. Thus information structure is not understood as a dichotomy of the sentence, but rather as the instruction to generate two meanings (denotations). In section 5, I modify this view: I will argue that information structure is an instruction to generate two discourse representations, rather than two denotations as in Alternative Semantics. The argument is built on problems with the compositionality in cases of association with focus in definite NPs. This argument will be pursued in the following section.

4. Association with focus in definite NPs

In the previous section, it was argued that association with focus reveals the complex interaction between different levels of semantic representation and interpretation. However, both discussed approaches have problems with cases of association with focus in definite NPs. Imagine the following situation: At an international art exhibition, some critics, several German, Italian and American artists, but only one Swiss artist appeared. Sam talked to the Swiss artist and to one of the two German artists and to nobody else. In this context, sentence (6), repeated as (23), is intuitively false. Yet in Structured Meanings as well as in Alternative Semantics the sentence is predicted to be true.

(23)   Sam only talked to the SWISS_F artist.

In the Structured Meanings account the focused adjective is moved to the operator as in (23a) with the paraphrase (23b). *Only* is translated into an operation on the focus and background as defined in (13). The definite article is represented with its classical semantics as iota-operator expressing the uniqueness condition (here: there is only one Swiss artist). A paraphrase for (23c) is: for all properties alternative to Swiss, if there exists a unique element x such that x has X and x is a artist and Sam talks to x, then X is Swiss.

(23a)   Sam only (Swiss$_1$,   X$_1$ [talked to the X$_1$ artist])
(23b)   No nationality but Swiss is such that Sam talked to the artist of this nationality.
(23c)   X   ALT(**Swiss'**) [**talk'**(**s**, z [X(z) & **art'**(z)])   X = **Swiss'**]

The uniqueness condition of the definite article reduces the domain of quantification to exactly one element: the Swiss artist. All other expressions of the kind *the X artist* are not well-formed since they do not satisfy the uniqueness condition of the definite article. Thus, in a situation in which Sam talked to the Swiss artist and to one of the German artists, the sentence is counter-intuitively predicted to be true since no alternatives have survived the compositional process of the background part of the Structured Meanings.

Similar considerations hold for the analysis in Alternative Semantics, as will be illustrated in detail with example (23), repeated as (24). The adjective *Swiss* induces alternatives such as *German, American*, and *Italian*. But again, when these alternatives compositionally combine with the definite article, as in *the X artist* for X   {Swiss, German, American, Italian}, only *the Swiss artist* survives the uniqueness condition of the definite article. In order to compose the alternative meaning of the definite NP, we have to account for the alternative meaning of the definite article. In a first approach we assume, according to the general rule in (15c) above, that the alternative meaning of the article is the singleton of its ordinary meaning. If we take the iota operator as the ordinary meaning of the definite article, we then have the singleton containing the iota operator as the alternative meaning. Thus we get the ordinary meaning (24a) and the alternative meaning (24b) for the definite NP *the SWISS$_F$ artist*. Here, the alternative set consists of unique artists with respect to nationality. Since there is more than one artist for all countries but Switzerland, all iota expressions are undefined except the one

for the Swiss artist. Hence, the alternatives would include one single individual, namely the unique Swiss artist (see von Heusinger 1997 for a more elaborate argument):

(24)   [the SWISS$_F$ artist]$_{NP}$

(24a) $\|$the SWISS$_F$ artist$\|_O =$ x [**Swiss'**(x) & **art'**(x)]

(24b) $\|$the SWISS$_F$ artist$\|_A = \{X(Y) \mid X \quad \{ \}, Y \quad \|$SWISS$_F$ artist$\|_A\}$

$\quad = \{d \mid d =$ x [R(x) & **art'**(x)] for some R $\|$SWISS$_F\|_A\}$

$\quad = \{$ x [**Swiss'**(x) & **art'**(x)]$\}$

Intuitively, the correct domain of quantification for the operator *only* consists of just all the artists at that meeting. In other words, the focused expression does not contribute to the construction of the domain of quantification. On the contrary, it is "invisible" for that process. It seems, therefore, that approaches which rely on the distinction of focus and background are unable to analyze complex NPs. Such theories are usually illustrated with proper names, which are a special type of NP. An adequate approach to information structure must base the definition for the informational units on their discourse functions, rather than on a simple partition of a sentence. In the next section, I introduce a simple discourse structure, which then is extended to the foreground-background theory of information structure. This will meet the conditions which we failed to detect in either of the previous approaches.

5. Discourse structure

The initial problem that motivated discourse representation theories was the interpretation of nominal and temporal anaphora in discourse. The phenomenon of cross-sentential anaphora forces a semantics to extend its limits from the sentence to the discourse. The key idea in the approach to the semantics of discourse, exemplified in Heim (1982) and Kamp (1981), is that every new sentence or phrase is interpreted as an addition or 'update' of the context in which it is used. This update often involves connections between elements from the sentence or phrase with elements from the context. Informally described, a sequence of sentences S_1, S_2, S_3, S_4 is interpreted by incrementally constructing a discourse representation structure (DRS) in Discourse Representation Theory (DRT) of Kamp (1981) and Kamp & Reyle (1993), as in (25).
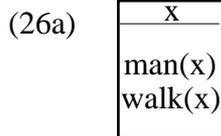
(25)   Construction of a discourse representation structure (DRS) in classical DRT
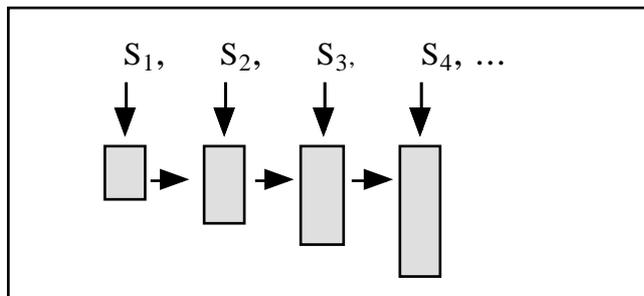
Anaphoric relations and definite expressions are captured by links between objects in this representation. In order to derive the truth condition of the sentence, the representation is embedded into a model.

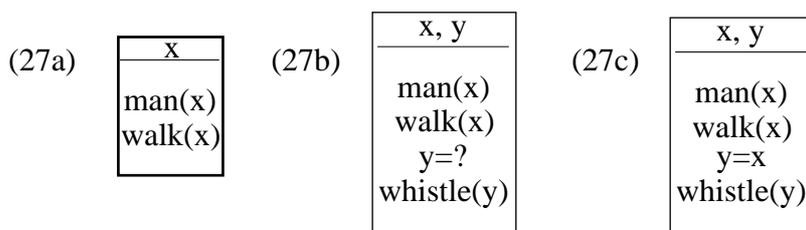The best way to get acquainted with DRSs is to look at the example (26).

(26)   A man walks.

(26a)

$$\boxed{\begin{array}{l} \underline{\quad x \quad} \\ man(x) \\ walk(x) \end{array}}$$

The box in (26a) graphically describes a discourse representation structure (DRS) with two parts. One part is called the *universe* of the DRS, the other its *condition set*. A DRS is an ordered pair consisting of its universe and condition set, written as $<U_K, Con_K>$. The DRS in (26a) has as its universe one discourse referent x and as its condition a set of properties that are ascribed to the discourse referents in the universe. In (26a) the property of being a man and of walking is ascribed to the discourse referent x. To yield the truth conditions for (26), we need to define a *proper embedding* for the DRS. Informally, a proper embedding for a DRS in an (extensional) model M = $<D, \| \ \|>$, consisting of a domain D and an interpretation function $\| \ \|$, is a function f that maps the discourse referents onto elements of the domain of M such that the elements are in the extension of the predicates that are ascribed to the discourse referents. For example, the DRS (26a) is true just in case that $f(x)$ is a man and $f(x)$ walks.
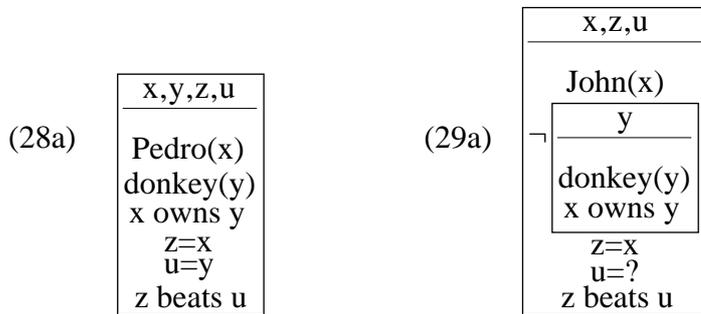
The sequence or conjunction of two sentences as in (27), receives a DRS incrementally. We start with the already established DRS for the first conjunct in (27a) then a new discourse referent for the pronoun *he* and a condition for the predicate *whistle* is added in (27b). The anaphoric link of the pronoun is graphically represented as *y=?*, indicating that the reference of the pronoun is still unresolved. The discourse referent which stands for an anaphoric expression must be identified with another *accessible* discourse referent in the universe. In the given context y is identified with x, as in (27c). This mini-discourse is true if there is an embedding function f onto a model such that $f(x)$ is a man and walks and $f(y) = f(x)$ and $f(y)$ whistles.

(27)   A man walks. He whistles

(27a)

$$\boxed{\begin{array}{l} \underline{\quad x \quad} \\ man(x) \\ walk(x) \end{array}}$$

(27b)

$$\boxed{\begin{array}{c} x, y \\ \hline man(x) \\ walk(x) \\ y=? \\ whistle(y) \end{array}}$$

(27c)

$$\boxed{\begin{array}{c} x, y \\ \hline man(x) \\ walk(x) \\ y=x \\ whistle(y) \end{array}}$$

The new discourse referent introduced by the pronoun must be linked or identified with an already established and accessible discourse referent. DRT defines accessibility in terms of structural relations, i.e. the discourse referent must be in the same (or in a higher) universe. With this concept of accessibility, the contrast between (28) and (29) can be described by the difference in the set of discourse referents that are accessible for the discourse referent u of the pronoun *it*. The construction rule for the negation in (29) creates an embedded discourse universe with the discourse referent y and the conditions *donkey(y)* and *x owns y*. The anaphoric pronoun *it* in the second sentence cannot find a suitable discourse referent since it has no access to the embedded discourse universe with the only fitting discourse referent y.

(28)   Pedro owns a donkey. He beats it.

(29)   John does not own a donkey. #He beats it.

(28a)
$$\begin{array}{|l|}\hline x,y,z,u \\ \hline \text{Pedro}(x) \\ \text{donkey}(y) \\ x \text{ owns } y \\ z=x \\ u=y \\ z \text{ beats } u \\ \hline \end{array}$$

(29a)
$$\neg \begin{array}{|l|}\hline x,z,u \\ \hline \text{John}(x) \\ \begin{array}{|l|}\hline y \\ \hline \text{donkey}(y) \\ x \text{ owns } y \\ \hline \end{array} \\ z=x \\ u=? \\ z \text{ beats } u \\ \hline \end{array}$$

This program of investigating sentences and describing their informational properties with respect to the larger linguistic context has just begun. In the remainder of this section, I present Asher's theory of *segmented* DRT (= SDRT) as one of the rare examples of a semantic account of discourse and discourse relations.

Asher (1993; 2002) develops his SDRT, which is not confined to the incremental composition of DRSs, but also captures discourse relations between the sentences in the discourse. He revises the classical DRT of Kamp (1981) and Kamp & Reyle (1993). The classical version describes the dynamic meaning of a discourse by processing sentence for sentence. Since the meaning of each sentence is construed as a function from truth conditions to truth conditions, the truth-conditional content of the whole discourse is reconstructed by the sequential application of these functions. Asher (1993, 256) notes that

> the notion of semantic updating in the original DRT fragment of Kamp (1981) (...) is extremely simple, except for the procedures for resolving pronouns and temporal elements, which the original theory did not spell out. To build a DRS for the discourse as a whole and thus to determine its truth conditions, one simply adds the DRS constructed for each constituent sentence to what one already had. (...) This procedure is hopelessly inadequate, if one wants to build a theory of discourse structure and discourse segmentation.

In SDRT, each sentence S_i is first represented as a particular segmented DRS for that sentence. The segmented DRS can then interact with the already established DRS reconstructing a discourse relations R, such as causation, explanation, coherence, elaboration, continuation, as informally sketched in (30). Only in a second step is the representation integrated into the already established representation.

(30)   Construction of a segmented DRS in SDRT

$$S_1, S_2, S_3, S_4, \quad .... \quad S_i$$

*discourse* · · · · · · · · · · · · · *R* · · · · · *segmented DRS*
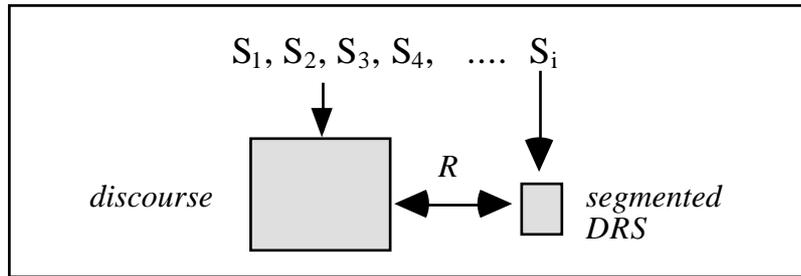
To summarize this very short presentation of DRT: The discourse structure of DRT provides not only a new structure but also introduces new semantic objects: discourse referents, conditions, and discourse domains ("boxes"). DRT explains semantic categories such as definiteness and anaphora in terms of interaction between these representations. Furthermore, the extension to SDRT allows us expressing discourse relations between whole propositions as well. These new tools, objects, and representations form the basis for a new semantic analysis of information structure. In the next section, this approach is sketched briefly.

6. Foreground-Background Semantics

The present approach is based on the assumption that a sentence makes (at least) two kinds of contributions to the context: the ordinary meaning and the background meaning. These two contributions are not provided by a division of the sentence surface in terms of focus-background, but rather by two construction mechanisms that translate the sentence into two representations at the level of discourse representation. I assume a SDRT-like model sketched in section 5 with an extra set of construction rules for the background representations. The foreground representation is constructed from the material of the sentence in the common way a DRS is constructed. The background representation, however, is a DRS in which the focused expressions are not represented. They are merely represented by variables. Background and foreground are both DRSs, or representational objects at the level of discourse representation. Thus, there are (at least) three objects when analyzing a sentence: the DRS for the discourse, the DRS for the background, and the DRS for the foreground:

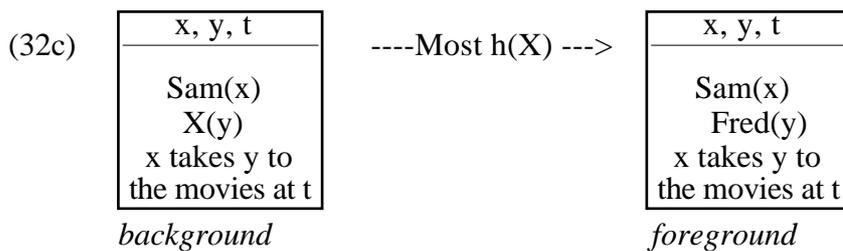(31)   DRSs for the discourse, foreground, and background

$$S_1, S_2, S_3, S_4, \quad .... \quad S_i$$

discourse · · · · · · · · · · *background* · · · *foreground*
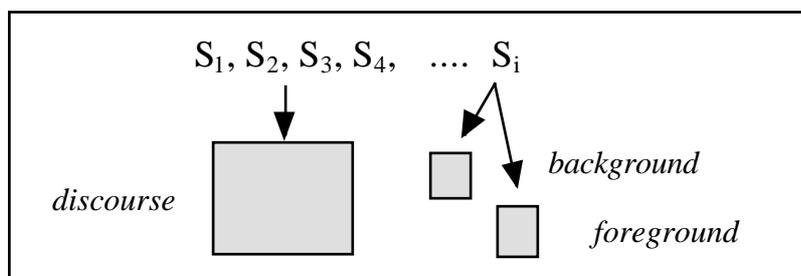
There are relations between each pair of DRSs: the relation between the discourse and the foreground establishes the discourse relation *R,* such as causation, explanation, coherence, elaboration, continuation, mentioned in (30). The relation between the background and discourse is generally described in terms of givenness or presupposition. Thus, the status of being part of the background or not basically depends on the given discourse, rather than on some (mysterious) sentence property. And finally the relation between the background and the foreground serves as the domain over which discourse operators and focus sensitive operators range. In the remainder, I will focus on the relation between the foreground and the background representation and illustrate this with the analysis of three examples (adverbs on quantification, contrastive focus, and association with focus in definite NPs).

The adverb of quantification *usually* associates with the focus *FRED* in (6), repeated as (32). It is translated into the operator *Most* that ranges over sets of times that are constructed from the foreground and the background representations as in (32b).
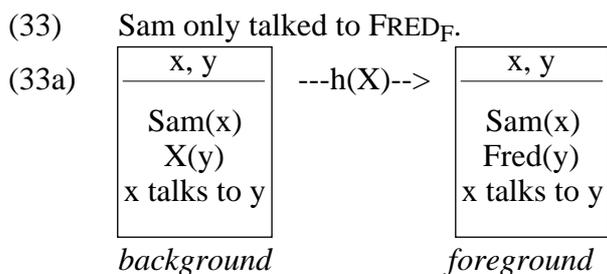
(32)   Sam usually takes $FRED_F$ to the movies.
(32a)   For most times in which Sam takes someone to the movies, he invites Fred to the movies.
(32b)   Most {t | Sam takes someone to the movies at t}
                    {t | Sam takes Fred to the movies at t}

The Foreground-Background Semantics shifts the perspective to the different representations and their relation to each other. First the foreground and background are represented as DRSs, as in (32c). The difference between the two representations is the variable *X* in the background representation standing for the focused *Fred.* We can now translate *usually* into an operator *Most* that ranges over possible embeddings *h* of the background representation into the foreground representation. Since there is only one difference (*X* vs. *Fred*), we can reduce the range of *Most* to the possible values of *h(X)*, as in (32c).
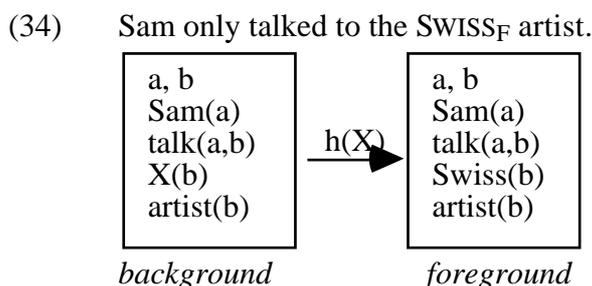
(32c)
$$
\begin{array}{|c|}
\hline
x, y, t \\
\hline
Sam(x) \\
X(y) \\
x \text{ takes } y \text{ to} \\
\text{the movies at } t \\
\hline
\end{array}
\quad \text{----Most } h(X) \text{ ---}\!\!> \quad
\begin{array}{|c|}
\hline
x, y, t \\
\hline
Sam(x) \\
Fred(y) \\
x \text{ takes } y \text{ to} \\
\text{the movies at } t \\
\hline
\end{array}
$$

background   *foreground*

(32c) expresses that most possible embeddings *h* from the background onto the foreground replace the *X* by *Fred*, or to paraphrase: for most instances (time points) at which Sam takes someone to the movies, he takes Fred to the movies. Thus, the adverb of quantification operates on the embedding function from the background onto the foreground. We can now also apply this mechanism to the other two examples.

The foreground representation in (33a) contains the two discourse referents, *x* and *y*. Moreover, it contains the conditions which link the discourse referents to Sam and to Fred, and finally it contains the condition that expresses the relation of talking between the two. The background representation in (33a) contains the same structure as the foreground except for the condition *Fred(y)*, which is replaced by *X(y)*. The felicity conditions can now be formulated in the following way: Sentence (33) is felicitous if there are alternative embeddings *h'* that assign to *X* individuals such that Sam might have talked to them.

(33)   Sam only talked to FRED$_F$.

(33a)

x, y
Sam(x)
X(y)
x talks to y

---h(X)-->

x, y
Sam(x)
Fred(y)
x talks to y

background   *foreground*

Finally, let us have a closer look at example (6), repeated as (34). The focused adjective *Swiss* is replaced by a predicate variable *X* in the background. Note that the definite article does not appear in the representation. Focus semantics does not interact with the uniqueness condition of the definite article. One way to implement this is to assume with other discourse semantics (Heim 1982, Kamp 1981, Kamp & Reyle 1993), that the definiteness is a discourse pragmatic concept which is not expressed at the level of the lexical meaning. It is operative while constructing the DRSs, for example, as an additional condition that there is only one Swiss artist. Such a condition could be understood as a locally accommodated representation (cf. Kamp & Reyle 1993, 297-299), which will be suppressed here, as in (34). The operator *only* ranges over possible embeddings *h* from the background onto the foreground. Since the only difference is the (alternative) value for X (being Swiss in the foreground), we can compare embeddings for this value: *h(X)*. The semantics of *only* tells us that there is only one embedding for this variable, namely the embedding to *Swiss*.

(34)   Sam only talked to the SWISS$_F$ artist.

a, b
Sam(a)
talk(a,b)
X(b)
artist(b)

h(X) →

a, b
Sam(a)
talk(a,b)
Swiss(b)
artist(b)

background   *foreground*

In this very brief sketch, I showed that the informational units in a sentence are discourse units that are defined in a discourse representation theory. Semantic operations on these units, such as adverbs of quantification, contrast, or association with focus in definite NPs, can be defined in terms of embedding relations of the background onto the foreground. In this way, focus sensitive operations are generalized to operations on discourse representations.

7. Summary

The concept of Foreground-Background Semantics posits a challenge for semantic theories of information structure because it tries to integrate a wide range of phenomena. It provides a new view on information structure as being part of a larger discourse representation. Thus the following claims are defended in this paper (compare the lists in (8) and (9) above).

(35)   *Assumptions of Foreground-Background Semantics*

(i)   Information structure is to be defined with respect to *discourse.*

(ii)   Information structure is realized as two representations in the discourse structure: the *foreground* representation corresponding to the whole sentence, and the *background* representation.

(iii)   It is the whole sentence that expresses new information (rather than one word or one constituent); so the *foreground* representation expresses the new information; the *background* representation is discourse-anchored, and therefore contains old or given information.

(iv)   Sentence meaning is compositionally formed from the meaning of its parts according to the syntactic structure (LF) and the compositional rules of semantics, rather than in terms of information structure.

(v)   Focus sensitive particles are translated into operators that take the foreground and the background as their arguments (O($background, foreground$)).

(vi)   Adverbs of quantification are translated into operators that take the foreground and the background as their arguments (Adv($background, foreground$)).

These main assumptions of Foreground-Background Semantics have led to a different view of information structure, which is understood as a part of discourse semantics and therefore as a part of semantics in general. It is beyond doubt that information structure effects sentence processing, psychological models, and computational questions of language, but as described here, this occurs on a linguistic, discourse-semantic, level with linguistic objects.

The particular view defended here might have raised more questions than it has solved. Certainly more research is necessary to elaborate this question. Furthermore, the theory presented has to be tested against a wide range of data.

References

Ammann, H.: 1925, *Die menschliche Rede. Sprachphilosophische Untersuchungen. 1. Teil: Die Idee der Sprache und das Wesen der Wortbedeutung*, Schauenburg, Lahe i. B.

Asher, N.: 1993, *Reference to Abstract Objects in Discourse*, Kluwer Academic, Dordrecht.

Asher, N.: 2002, 'From Discourse Macro-structure to Micro-structure and Back again: Discourse Semantics and the Focus/Background Distinction', in H. Kamp and B. Partee (eds.), *Context Dependence in the Analysis of Linguistic Meaning*. Elsevier, Amsterdam.

Chomsky, N.: 1971, 'Deep Structure, Surface Structure, and Semantic Representation', in D. D. Steinberg and L. A. Jakobovitz (eds.), *Semantics*, pp. 193–217, CUP, Cambridge.

Daneš, F.: 1970, 'One Instance of Prague School Methodology: Functional Analysis of Utterance and Text', in P. Garvin (ed.), *Method and Theory in Linguistics*, pp. 132–146, Mouton, The Hague.

Firbas, J.: 1964, 'On Defining the Theme in Functional Sentence Analysis', *Travaux Linguistique de Prague* **1**, 267–280.

von der Gabelentz, G.: 1869, 'Ideen zu einer vergleichenden Syntax. Wort und Satzstellung', *Zeitschrift für Völkerpsychologie und Sprachwissenschaft* **6**, 376-384.

Halliday, M.: 1967, 'Notes on Transitivity and Theme in English. Part 1 and 2', *Journal of Linguistics* **3**, 37-81; 199-244.

Heim, I.: 1982, *The Semantics of Definite and Indefinite Noun Phrases*, Ph.D. Dissertation, University of Massachusetts, Amherst, University Microfilms, Ann Arbor.

von Heusinger, K.: 1997, 'Focus in Complex Noun Phrases', in P. Dekker and M. Stokhof and Y. Venema (eds.), *Proceedings of the Eleventh Amsterdam Colloquium*, pp. 49-54, ILLC / Department of Philosophy, University of Amsterdam.

von Heusinger, K.: 2002, 'Information Structure and the Partition of Sentence Meaning', in P. Sgall and E. Hajičová and J. Hana and T. Hosovec (eds.), *Travaux du Cercle Linguistique de Prague n. s. / Prague Linguistic Circle Papers 4*, pp.275-305, Benjamins, Amsterdam; Philadelphia.

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

Jacobs, J.: 1983, *Fokus und Skalen. Zur Syntax und Semantik von Gradpartikeln im Deutschen*, Niemeyer, Tübingen.

Kamp, H.: 1981, 'A Theory of Truth and Semantic Interpretation', in J. Groenendijk and T. Janssen and M. Stokhof (eds.), *Formal Methods in the Study of Language*, pp. 277-322, Amsterdam Center, Amsterdam.

Kamp, H. and U. Reyle: 1993, *From Discourse to Logic. Introduction to Modeltheoretic Semantics of Natural Language, Formal Logic and Discourse Representation Theory*, Kluwer, Dordrecht.

Kratzer, A.: 1991, 'The Representation of Focus', in A. von Stechow and D. Wunderlich (eds.), *Semantik. Ein internationales Handbuch der zeitgenössischen Forschung*, pp. 825-835, de Gruyter, Berlin.

Krifka, M.: 1991, 'A Compositional Semantics for Multiple Focus Constructions' *Proceeding of the First Conference on Semantic and Linguistic Theory (SALT 1)*, pp. 127-158.

Paul, H.: 1880, *Prinzipien der Sprachgeschichte*. Niemeyer, Halle.

Rooth, M.: 1985, *Association with Focus*, Ph.D. Dissertation, University of Massachusetts, Amherst, Graduate Linguistics Student Association (GLSA), University of Massachusetts, Amherst.

Rooth, M.: 1992, 'A Theory of Focus Interpretation', *Natural Language Semantics* **1**, 75-116.

Sgall, P. and E. Hajičová and E. Benešová: 1973, *Topic, Focus and Generative Semantics*, Scriptor, Kronberg/Taunus.

von Stechow, A.: 1982, *Structured Propositions*, Arbeitspapier 59 des Sonderforschungs-bereichs 99, Universität Konstanz.

von Stechow, A.: 1991, 'Current Issues in the Theory of Focus', in A. von Stechow and D. Wunderlich (eds.), *Semantik. Ein internationales Handbuch der zeitgenössischen Forschung*, pp. 804-825, de Gruyter, Berlin.