In: Emar Maier, Corien Bary & Janneke Huitink, eds. (2005) "Proceedings of SuB9"
www.ru.nl/ncs/sub9

CONTEXT AND FOCUS PROJECTION. A COMPOSITIONAL, INTONATION-BASED ACCOUNT OF FOCUS INTERPRETATION*

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Abstract

Theories of focus semantics can be divided into compositional, interpretation-oriented approaches (Rooth 1985, Rooth 1992, Krifka 1992) and production-oriented approaches (Schwarzschild 1999). The current paper attempts to bring these different perspectives together and profit from their respective strengths. A compositional algorithm will be developed which starts out from intonation instead of abstract focus; in other words, the algorithm integrates a compositional, givenness-based version of focus projection. Some explications to the notion GIVEN will be presented. Givenness and contrast are shown as two independent modules determining discourse congruence. Finally, the algorithm will be spelled out in Bottom-Up DRT (Kamp, van Genabith and Reyle 2004).

1 Introduction

There are two ways of tackling problems related to the meaning of stress. The first is to formulate the task as "On which word must one place an accent in order for an utterance to sound natural?" Different resources have been employed to resolve this question: phonological (Ladd 1980), syntactic (Chomsky 1971, Cinque 1993) and semantic ones (Schwarzschild 1999).

The task can also be conceived from a second perspective "How does a given accent contribute to the meaning of an utterance?" Taking the latter question seriously requires the integration of focus semantics into an existing theory of meaning as Rooth (1985) or Krifka (1992), based on work by von Stechow (1991).

Both questions have led to aspects that have had a substantial impact on the current theory of information structure. Nevertheless, there are some possible connections between them which have not been addressed so far.

It has become clear that a theory of information structure is incomplete without *some* reference to discourse. This criticism applies to all theories that predict accent placement purely in terms of syntactic configurations or rhythmic categories (meter). But even a theory like Schwarzschild (1999), which takes discourse context into account by virtue of its *givenness* criterion, must be further tested regarding its explanatory adequacy and its fulfillment of the compositionality principle. Without these it will not be possible

*I am grateful to Ágnes Bende-Farkas, Hans Kamp, Roger Schwarzschild and participants of the Bad Teinach workshop 2004 for valuable comments and criticism.

to bridge the gap between this theory and interpretational approaches like Rooth's and Krifka's. In other words, "What is going to happen if we turn Schwarzschild (1999) on its head and take an interpretation (perception) instead of a production perspective?"

The approaches by Rooth and Krifka show a different type of weakness. Although compositional with respect to a once identified focus, neither Alternative Semantics nor Structured Meaning Theory tell us much about how focus – i.e. its width – is actually *determined*. Without mentioning it explicitly, we have, thus, sketched the problem of integrating focus projection into a compositional process of interpreting a focus accent.

In this paper, I want to sketch a theory that combines compositional focus semantics and Schwarzschild's context-oriented theory of accent placement. I will come up with an algorithm of compositional focus projection, which involves a discussion and redefinition of the property GIVEN. Later on, I will compare the notion of *givenness* with the notion of *contrast* and sketch how either of them can be responsible for the infelicity of sentences in different situations. In an appendix, I will give a formulation of the algorithm in a recent version of bottom-up DRT.

2 Complications for theories of focus semantics

Before we come to the main discussion, I would like to first point out some caveats which will not be covered later on but which remind us of the actual complexity of focus semantics and its interactions with lexical semantics.

2.1 Adverbial quantifiers and other operators

Several operators in language alter their meaning at the same time as changes in prosody occur. This, however, does not mean that all processes of so-called *association* between these operators and focus are of the same kind. It was suggested in Rooth (1985) by use of examples like (1) that always and only are both directly focus sensitive, meaning that the domain of the quantifier is constituted by the background of the sentence while the focus forms the operator's nuclear scope.

(1) a. In Saint Petersburg, officers always escorted BALLERINAS.
b. In Saint Petersburg, officers only escorted BALLERINAS.
c. In Saint Petersburg, whenever an officer escorted somebody she was a ballerina.

There are, however, counterexamples which suggest that the alleged focus sensitivity of always is an illusion related to a not yet fully understood process which has to do with the fact that the source for the quantifier's domain might not be the background but perhaps the sentence's presupposition, which sometimes parallels its non-focus information, (2) or even something completely different (3).

(2) Kim always beats Sandy at PING-PONG$_F$. (Beaver and Clark 2003)
a. Whenever Kim and Sandy play ping-pong, Kim beats Sandy.
b. *Whenever Kim beats Sandy at something it's pong-pong.

(3) a. {Ann likes to go to Paolo's once a month.}
b. {Ann is never tired after lunch.}
… She always *(once a month/every day after lunch)* has a cup of ESPRESSO. (Kuhn 1997)

Because of problems like these, the implications of the following algorithm on focus sensitivity should also be investigated separately in the light of every single operator.

2.2 Second occurrence focus:

Another problem which has received considerable attention is second occurrence focus, as exemplified in the following examples.

(4) a. People only eat RICE$_F$.
b. People who GROW$_F$ rice generally only EAT$_{contrast.F}$ [rice]$_{2OF}$. (Rooth 1992)

(5) Mary only STEAMS$_F$ vegetables and even JOHN$_{contrast.F}$ only [steams]$_{2OF}$ vegetables. (Krifka 1997)

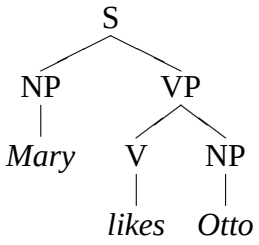
(6) Who does only like ICE CREAM$_F$?
FRED$_{answerF}$ only likes [ice cream]$_{2OF}$?

The constituents marked as $2OF$ in these examples adhere to all semantic intuitions about focus and are very much akin to their corresponding predecessors. Yet, crucially, they lack (much of) their intonational marking and, thus, provide quite an obstacle to any theory that attempts to generate meaning from the prosodic parts of a linguistic input signal. Although there have been attempts to show that there is actually *some* kind of phonetic marking on the alleged focus constituents (Rooth 1996, Beaver, Clark, Flemming and Wolters 2002), I still have the strong intuitions that the "de-accenting" is so evident that we should not attempt to build our theory on these weak prosodic remains. What we need instead is a heuristics to which the reoccurrence of the "de-accented" item is central. Such a heuristics, however, will not be part of the current paper.

3 Givenness in a bottom-up framework

I will now come to the main part of this article and begin with a description of a focus interpretation algorithm. Let's first take a look at the following simple sentence (7).

(7)



We assume any ordinary compositional semantic system like the one from Krifka (1992) or Bottom-Up DRT (Kamp et al. 2004, Kamp 2004) and add to it a number of semantic-syntactic constraints. The most important ones are taken from Schwarzschild (1999) where they function as restrictions on output candidates for the most appropriate accent distribution. I have adapted them slightly to make them fit into our changed perspective of meaning generation. Moreover, all of the following constraints are supposed to be of an absolute nature and may not be violated.

Rule 1 (GIVENness)

A constituent must be GIVEN *or* F*-marked or both.*

Rule 2 (AVOIDF) *Only spread an* F*-mark if some other rule demands it.*

We think of any constituent as having two features F and GIVEN. The precise purpose of these will become clear very soon. The goal of our system is to assign to an accented sentence a distribution of F-labels which the hearer is able to interpret. While doing this, as can be directly inferred from GIVENness, the system has to avoid a constellation of the following kind:

Definition 1 (GIVENness violation) $*\begin{bmatrix} \text{F} & - \\ \text{GIVEN} & - \end{bmatrix}$

As in a game of chess, sometimes there are ways to escape this undesired constellation; in other situations, however, no further move is possible. For the hearer an unavoidable GIVENness violation means that a perceived sentence will sound infelicitous in the present context.

Among the "moves" that our system allows or prescribes are the well-known rules of prosodic-syntactic *focus projection* (Selkirk 1984, Selkirk 1996, Rochemont 1986). I am using the term "focus projection" in its most general sense: any predictable mechanism that accounts for the relation between accents and semantic representations of focus, like Structured Meanings. Syntax need not play a role here *a priori*. For computational reasons, however, it seems clearly desirable and necessary to have certain syntactic restrictions which might be language specific and are ultimately a matter of empirical research.[1] A theory without such constraints would be a very weak one, that also allows for sentences that, intuitively, should get ruled out.

Rule 3 (GENF) *If a word is accented it gets* F*-marked.*

Rule 4 (ARGHEAD) *An* F*-mark on an internal argument of a head licenses the* F*-marking of the head.*

Rule 5 (HEADPHRASE) *An* F*-mark on a head of a phrase licenses the* F*-marking of the phrase.*

[1] As for English, it might turn out that the rules given in Selkirk (1996) fall out as a special case of more general syntactic processes, cf. (Johnson 2002).

Finally, I want to add another, purely technically motivated rule to our system.

Rule 6 (FILLPHRASE) F-*mark a constituent if all of its sub-constituents are* F-*marked.*

After having listed these constraints, let me now demonstrate how the new focus interpretation algorithm works.

3.1 Accent on object NP

Assume an accent pattern like in (8).

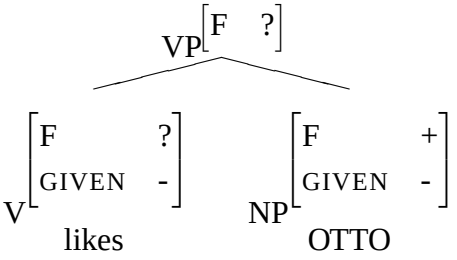
(8) Mary likes OTTO.

We take this simple example and start processing bottom-up. The first thing to do is to apply GENF, which in (8) assigns +F to the accented object OTTO. At the same time we assign *all terminal elements in the tree* an entry +/-GIVEN where GIVEN means availability of the referent of the lexical item in the context provided by recent discourse.[2] We will come to a detailed discussion of how exactly GIVEN should be defined, in section 3.2 below. Assume, for now, that we are in a situation in which the context consists of just the question

(9) {So, what about Mary?}

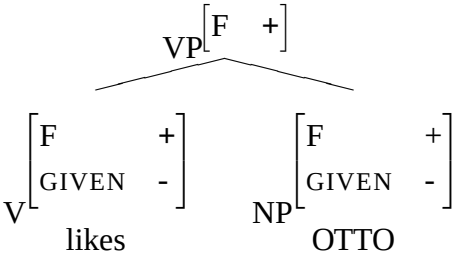
and the lexical entry for likes is, thus, *not* GIVEN. The same is the case for OTTO.

(10)



On combining the verb with the object, ARGHEAD permits – but doesn't require – us to project an F-feature onto the verb likes – a typical case of a projection ambiguity. But now, thanks to our extended set of rules, we can determine exactly what to do. Not projecting will lead to a GIVENness violation on likes. The only remaining option is to assign likes a +F. Finally, FILLPHRASE requires another +F for the VP node. The result is

(11)



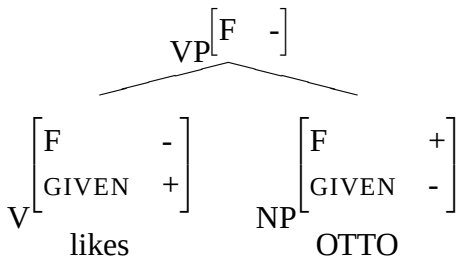
[2] As other people have observed, words (gorilla) also license their hyperonyms (monkey) as GIVEN. We also take it for granted that high frequency words (conjunctions, prepositions, articles,...) are GIVEN due to their special importance in language.

The reasoning is different if the context consists of the question

(12) {Whom does Mary like?}

Now, the GIVEN value for likes in (8) is positive, i.e. there is no danger of a GIVENness violation at V. In that case AVOIDF instructs us not to assign likes a +F; subsequently VP can't get +F-marked either.

(13)



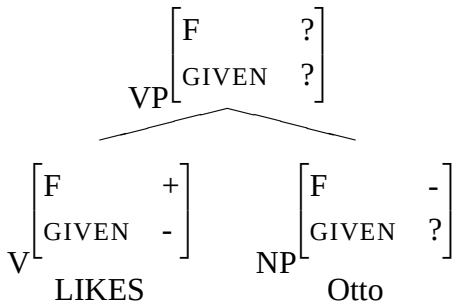
3.2 Accent on V

Now, compare the previous problems with the case of an accented verb.

(14) Mary LIKES Otto.

There are several things that we can note immediately.

(15)



[GenF]

First, it is crucial that the object NP is GIVEN. It has been observed quite some time ago (Jacobs 1988) that so-called "de-accenting" phenomena like (16) are possible only in contexts in which the respective NP (Gerd) has been mentioned previously.

(16) a. Was tat Petra, nachdem sie den Raum betreten hatte, in dem Gerd auf sie wartete?
'*What did Petra do after she had entered the room in which Gerd was waiting for her?*'
b. Sie BEGRÜSSTE Gerd.
'*She GREETED Gerd.*'

In (14) the impossibility of "de-accenting" in certain contexts is explained by the fact that Otto cannot receive an F-mark from anywhere other than accenting – which it lacks. (There is no projection from a head to its argument.) So in case Otto is not GIVEN, the sentence will get ruled out by a GIVENness violation.

The next question concerns the possibility to project the F from V to VP, which is licensed by HEADPHRASE. For the moment, we do not know whether such a move is required by GIVENness because we have no idea, yet, what it means for a complex constituent to be GIVEN. The definition in Schwarzschild (1999) is only for a part helpful.[3]

Definition 2 (s-GIVEN) *An utterance U counts as s-*GIVEN *iff it has a salient antecedent*[4] *A and*

a. if U is type e, then A and U co-refer;

b. otherwise: modulo $\exists$-type shifting. A entails the Existential F*-Closure of U.*

The (b)-part can be rephrased informally as: For an expression U of an arbitrary complex type $\langle \alpha, \beta \rangle$ it holds that U is s-GIVEN if and only if there is an entity A in the context which is exactly like (or stronger than) U, at least concerning U's non-F-marked subconstituents.

This definition, however, will lead us into a contradiction in all cases in which new information is stressed, i.e. in *all* standard cases of information focus (presentational focus). Just assume an accented word U which has not been uttered before, like OTTO in (17).

(17) a. {Fred opened the door.}
b. He saw OTTO$_F$.

Intuitively, OTTO is not GIVEN. Definition 2, however, tells us that it *should* be because all it needs is a constituent in context which is like itself, except for its F-marked subparts ($\equiv$ itself in its entirety!) Any word of the same type as U (e.g. Fred) will trivially fulfill this requirement.

To avoid strange problems like that, I suggest to choose a different definition:

[3] I call it "s-GIVEN" for "Schwarzschild-GIVEN" in order to distinguish it from revised versions presented below.

[4] The term "antecedent" is logically not quite in the right place here; only *after* one of the conditions (a) or (b) is fulfilled it is appropriate to speak of an antecedent.

Definition 3 (i-GIVEN[5]) *An utterance U counts as i-*GIVEN *iff there is a salient constituent A in the context and*

i. if U is a terminal element in a tree then A and U are co-referent[6] or it holds that U subsumes A;

ii. if U is non-terminal ***and not*** **F-*marked itself*** *then A is exactly like U, at least concerning U's non-*F*-marked sub-constituents.*

The object of (17), now, will not come out as GIVEN anymore because its denotation is not in the context. This is in line with our intuitions.

As for (3ii), this part of the definition tells us how to deal with constituents which are higher up in the tree. Whether we think of i-GIVEN in terms of semantic entailment like in Schwarzschild (1999), as simple pattern matching on syntactic constituents, or spelled out as a presuppositional mechanism on discourse representations (see appendix) is not crucial.

A question that ought to be addressed, however, and to which I shall have no decisive answer is whether an i-GIVEN lookup really needs to involve antecedents with a fixed structure or whether the parts of what we are looking for might as well occur in a different configuration. The problem is revealed by the following examples.

(18) a. {Fred screamed in his sleep.}
b. Alice SHOOK Fred.

In (18) the expression $\exists R \exists x.R(x, fred)$, corresponding to the VP of (18b), has no salient constituent in context that entails it. It is, therefore, not i-GIVEN.[7] As a consequence, one would predict projection of F from V to VP. Depending on one's syntactic framework one might then go on and project the F further to the sentence level, again because there is no antecedent for $\exists R.R(alice, fred)$, the F-closure of the sentence. I have no conclusive argument why we shouldn't do this; yet, it feels strange to assign F to S and, thus, focus to the entire sentence (18b). A presumably even more severe problem is presented by (19).

(19) a. {Who did John's mother vote for?}
b. She voted for HER mother. (Rooth, cited in Kuhn (1997))

As in (18), the second sentence is clearly a felicitous continuation to the first one. And, although the constituents [mother] and [HER mother] have antecedents, there is no match for the VP [voted for X's mother]. Arbitrary assignment of an F to that VP would not only ignore problems of compositional meaning construction, it would, moreover, ask for syntactic focus projection from possessives, something we normally wouldn't want, cf. (20).

[6] We take co-reference of a word to mean equality of denotation. Names and pronouns are co-referent if they denote the same individual. Co-reference between two predicates or two quantifiers means that they denote the same sets.

[7] Neither is it s-GIVEN, of course.

(20) {Who came?}
a. *HER mother.
b. *MARY'S mother.

If we analyze (18) and (19) more closely, it becomes obvious that the core difficulty has to do with the search for *complex antecedents*, something which – apart from the empirical findings – represents a very tricky technical problem.

On the other hand, it looks like an affordable sacrifice not to examine the givenness of complex phrases but rely instead on a search for parts of those phrases. For example, one would not check in (18) whether there is an constituent of the form [X-ed Fred] in the context but simply whether the non-F-marked subpart Fred is present.

Bigger phrases would call GIVEN recursively. [$_{S}$ Alice [$_{VP}$ SHOOK$_{F}$ Fred]] would count as GIVEN if its parts, Alice and [$_{VP}$ SHOOK$_{F}$ Fred] are GIVEN. The latter, again, is GIVEN if Fred is GIVEN, while SHOOK is F-marked and doesn't count.

This brings us to our last revision of the GIVEN-definition; "pi-GIVEN" now stands for "partially, intuitively GIVEN".

Definition 4 (pi-GIVEN) *An utterance U counts as pi-*GIVEN *iff there is a salient constituent A in the context and*

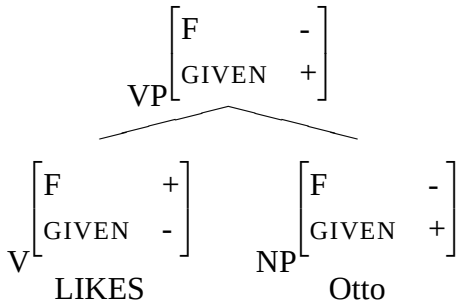
i. if U is a terminal element then A and U are co-referent or it holds that U subsumes A;

ii. if U is non-terminal and not F*-marked itself* ***then at least its non-F-marked subparts are pi-GIVEN.***

With this final revision, we can account for (18) and (19). As remarked just above, [SHOOK Fred] is now pi-GIVEN, which makes F-projection unnecessary. The same holds for [voted for HER mother] in (19).

Finally, we are now able to return to example (15), which was the starting point of our long discussion. If we interpret GIVEN now as pi-GIVEN, what we get is +GIVEN for the VP constituent, and, by virtue of AVOIDF, no F-projection.

(21)



At this point, let me briefly mention an issue that has to do with wh-elements and foci. (22) below seems to be an easier case than (19).

(22) a. John drove Mary's red convertible.
What did he drive before that?
b. He drove her BLUE convertible. (Schwarzschild 1999)

No further F-mark than the one on BLUE is necessary, as all higher constituents find an appropriate antecedent. This holds independently from whether we apply i-GIVEN or pi-GIVEN. The focus would, thus, be just on the adjective. Yet, it has often been argued that one definition for focus – that we haven't used in this paper – is "the constituent matching the wh-element of a preceding question". For (22) this would mean focus on [BLUE convertible]. As we see, that view clashes both with Schwarzschild's F-assignment and with projection-oriented approaches like mine, which – similar to the possessive case (19) – would not allow for projection from adjectives in modifier position. As far as I can see, this question has not so far been settled.

If we compare (22), (19) and (18) with findings from section 2 on second occurrence focus we actually can't fail to notice the parallels. In both cases conceptual uncertainty is caused by alleged focus assignment to unaccented words that reoccur. If we transfer the usual assumptions about second occurrence focus to (22b), we would presumably get (23).

(23) ...He drove her BLUE$_{contrast.F}$ [convertible]$_{2OF}$.

The two adjacent foci can then be seen as behaving as one large entity; an option which may have the potential to reconcile ideas about wh-related focus and constraints from focus projection. I am pointing this out carefully, as more work still needs to be done on second occurrence focus.

If we do not want to go as far as that, there is still a decision to be made between using i-GIVEN (Schwarzschild's view of antecedents) or pi-GIVEN (non-F-marked subparts of a constituent must be contextually available). Because of the arguments concerning the examples (18) and (19) I favor the latter.

4 Givenness vs. Contrast: The different layers of infelicity

Compare the following two examples, (24) and (25):[8]

(24) What did Fred do?
a. Fred saw JOHN.
b. *Fred SAW John.

(25) John saw Fred, then ...
a. Fred saw JOHN.
b. *Fred SAW John.

Examples (24b) and (25b) look exactly the same. Moreover, both are infelicitous. However, the explanations why each of them is bad run into totally different directions. Based on the mechanism I have presented we would say that (24b) is infelicitous (or even "con-

[8]brought up by Roger Schwarzschild, p.c.

textually ungrammatical") because unaccented (and non-F-marked) John has neither a salient antecedent nor a possibility to receive an F-mark from anywhere.

(25b) on the other hand has no trouble from John, which is already in the context, like all other word constituents. For this reason, the VP also counts as pi-GIVEN and so does the sentence. So, why is it bad, then? I argue that this has to do with a filtering process different from GIVENness checking, namely focus *interpretation* in line with Rooth (1992), a process that I would like to call *contrast checking* respectively.

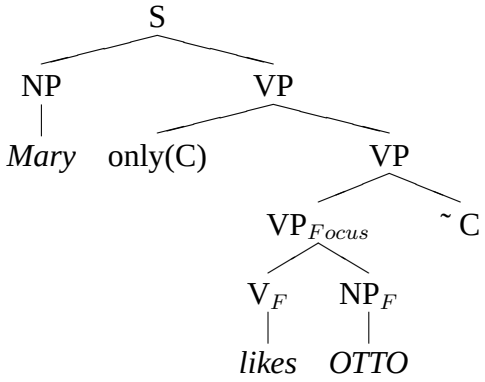
Now we are back at our original motivation, which was to spot the connections between approaches of accent placement and of compositional focus semantics. My criticism was that the former isn't compositional and the latter has no means to determine the focus range on-line, i.e. during sentence processing. By spelling out Schwarzschild's accent placement theory in a bottom-up framework I have made it a bit more commensurable to e.g. Rooth's Alternative Semantics. I argue, that the two "traditions" don't contradict each other, but rather are different modules building on each other. The *givenness module* examines *non*-F-*marked constituents* and either drives focus projection or rules out utterances that violate GIVENness, as described in section 3. The *contrast module*, represented by Rooth's ˜-operator ("squiggle"), on the contrary, operates on *focus constituents* and, in general, *after* the focus range has been determined by the givenness module. What contrast checking does is formulated in the Focus Interpretation Principle (Rooth 1992), which, roughly, says the following:

Rule 7 (FIP) *When interpreting a ˜-operator (which must have a focus in its scope), find a set in the discourse context which contains the ordinary semantic value of the focus and at least one contrasting alternative of the same type.*

Consider example (26), which shows the interaction of the focus-sensitive operator only with a focus in its scope, mediated by the ˜.

(26) a. {What about Mary?}

b.



According to Rooth (1992) the semantics of [only VP] is (27).

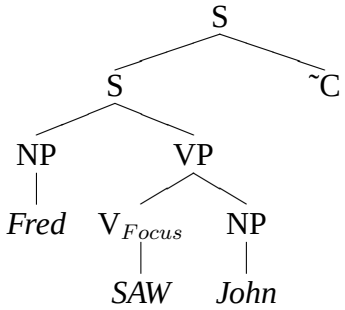
(27) $\lambda x.\forall P((P \in C \wedge P(x)) \rightarrow P = [\![VP]\!])$

The variable C is resolved or accommodated by the ˜-operator to a set of contextual alternatives to the ordinary semantic value like {goes skiing, hates cooking, likes Otto,

. . . }.[9] In order to do this, the ˜ makes use of the focus, which has been determined beforehand by my givenness algorithm. I argue that in the bad example (25b) we are faced with the constellation (28).

(28) a. {John saw Fred, then . . . }

b.



I suggest that the badness of this example must have something to do with a contrast failure. In the given context, the "squiggle" can't find any appropriate contrastive element to the transitive verb. Or, in other words, the assertion that a contrasting alternative to SAW is under discussion is judged to be false. This is different from (24b), where a GIVENness failure on John caused the infelicity of the sentence.

5 Summary

The semantics of focal accents can be made fully compositional – in particular for the purpose of determining the information structure of a sentence. For this purpose, I have translated the notion of GIVENness from Schwarzschild (1999) and some other ingredients into a bottom-up algorithm of context-oriented focus projection which made it necessary to apply some changes to the definition of GIVEN. In the previous section, I compared the effects of givenness checking (of non F-marked constituents) with the different process of contrast checking (of focus-constituents) (Rooth 1992) and sketched how both of them may sometimes be responsible for the infelicity of sentences in certain contexts.

In what follows, the algorithm will be spelled out – leaving out many details – in a recent version of Bottom-up DRT (Kamp et al. 2004). This will enable us to get an impression of a more formal version of the contextual interactions, which are checking for the givenness of a constituent and checking for the existence of a contrasting set.

Appendix: A Formulation in Bottom-Up DRT

I will deviate from recent work by Kamp (2004) on information structure in DRT to the extent that my representations are simpler and still closer to Structured Meanings. The impact of ˜ will only become visible at sentence level.

Again we assume our simple sentence (7) from the beginning. First, the NP OTTO will be translated as (29). The two boxes represent what is known in Structured Meaning

[9] Of course, this is a bit speculative. There is still much unclarity about the real processes. In particular, there is a general problem concerning accommodation. Sometimes accommoation seems clearly necessary. On other occasions, however, it will blur a clearcut split between information that is either present in the context or not. FIP needs to have certainty with respect to that question in order to be meaningful at all.

theory as the "background" (or "focus frame") and the "focus". Structuring of a semantic representation replaces the F-marking on constituents as in section 3.

(29) a. OTTO$_F$

b. $\left\langle \underbrace{\boxed{x}}_{\text{FF}}, \underbrace{\boxed{\begin{array}{c} o \\ Otto(o) \\ x = o \end{array}}}_{\text{Focus}} \right\rangle$

c. FF Focus

A non-F-marked constituent like (30) is not structured, but carries instead a "givenness requirement", indicated by the curly brackets, which instructs it to look for something in context which is co-referential with or a hyponym to likes.[10]

(30) a. likes

b. $\left\langle \left\{ \boxed{\begin{array}{c} \underline{R} \\ R \subseteq like \end{array}} \right\}, \boxed{\begin{array}{c} s \\ \text{s: } like(\mathbf{y}, \mathbf{z}) \end{array}} \right\rangle$

Depending on whether such an antecedent is found, (29) and (30) combine to either (31) (in case likes is pi-GIVEN) or (32) (otherwise).

(31) a. likes OTTO$_F$

b. $\left\langle \boxed{\begin{array}{c} s \\ s : like(\mathbf{y}, x) \end{array}}, \boxed{\begin{array}{c} o \\ Otto(o) \\ x = o \end{array}} \right\rangle$

(32) a. [likes OTTO]$_F$

b. $\left\langle \boxed{\begin{array}{c} P\ s \\ s : P(\mathbf{y}) \end{array}}, \boxed{\begin{array}{c} o \\ Otto(o) \\ P = \lambda x.like(x, o) \end{array}} \right\rangle$

The difference between (31) and (32) is represented by the position where the information from the verb ends up. In (31) there was no need to project focus to V (nor, subsequently, to VP) because of the fact that likes was found to be pi-GIVEN. In other words, we do not want the verb to become focused, which is why it ends up in the *focus frame* on the left.

In (32), on the other hand, we *do* want likes to be protected from a GIVENness violation. So, we have to put it into the focus part (right box).

As for non-F-marked Mary, it also carries a givenness requirement, which I skip here. The process of its resolution is like in the case of the verb. The representation of the sentence is, thus, (33).

[10] Boldface variables are interpreted as placeholders that get instantiated during semantic composition.

(33) a. Mary likes OTTO$_F$

b. $\left\langle \boxed{\begin{array}{c} s\ m \\ Mary(m) \\ s : like(m,x) \end{array}}, \boxed{\begin{array}{c} o \\ Otto(o) \\ x = o \end{array}} \right\rangle$

We subsequently assume focus interpretation at sentence level, which is achieved by attaching a ˜-operator at S. What we see in (34) is a translation of rule FIP, the contrast requirement, attached to the left of the meaning of the sentence. The representation is a slight variation of what is found in Kamp (2004).

(34) a. ˜[Mary likes OTTO$_F$]

b. $\left\langle \left\langle \left\{ \boxed{\begin{array}{c} \underline{C}\ y \\ y \in C \\ b \in C \\ y \neq o \end{array}} \right\}, \boxed{x \in C} \right\rangle, \boxed{\begin{array}{c} s\ m \\ Mary(m) \\ s : like(m,x) \end{array}}, \boxed{\begin{array}{c} o \\ Otto(o) \\ x = o \end{array}} \right\rangle$

Resolution of the contrast requirement gives us the representation in (35), which may be interpreted as saying that Mary likes Otto, and, among the people she might have liked, at least Mary and Otto are under discussion.

(35) $\left\langle \boxed{x \in \{Otto, Mary, \ldots\}}, \boxed{\begin{array}{c} s\ m \\ Mary(m) \\ s : like(m,x) \end{array}}, \boxed{\begin{array}{c} o \\ Otto(o) \\ x = o \end{array}} \right\rangle$

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