

# Topic, Focus, and Exhaustive Interpretation

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## Abstract

In this paper we propose that a sentence like ‘John<sub>T</sub> ate broccoli<sub>F</sub>’ should pragmatically be interpreted as follows: (a) Focus should be interpreted exhaustively: John ate only broccoli; (b) Topic must be interpreted exhaustively: Only John ate (only) broccoli; and (c) The speaker takes it to be possible (or even knows, if he is competent) that at least one alternative of the form ‘*x* ate *y*’ not entailed by the sentence is true. It will be shown that in terms of this analysis we can also account for all the scope-inversion data of Büring (1997), without giving rise to some of the problems of the latter analysis.

## 1 Introduction

Consider the following sentence with a typical topic-focus, or hat-contour:

- (1) [John]<sub>T</sub> ate [broccoli]<sub>F</sub>.

In this paper I argue that the (strong) pragmatic interpretation of this sentence is as follows:

- (a) Focus should be interpreted exhaustively: John ate only broccoli.

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- (b) Topic must be interpreted exhaustively: Only John ate (only) broccoli.
- (c) The speaker takes it to be possible (or even knows, if he is competent) that at least one alternative of the form ‘ $x$  ate  $y$ ’ not entailed by (1) is true. From (a) it follows that this alternative cannot be ‘John ate  $y$ ’, with  $y$  different from broccoli; from (b) it follows that this alternative cannot be ‘ $x$  ate broccoli’, with  $x$  different from John. Thus, the alternative must be something like ‘Mary ate the beans’.

In section 2 of this paper I will propose how to interpret focus exhaustively. In section 3, I will defend claim (a), despite the existence of sentences like ‘[Some boys]<sub>T</sub> ate [broccoli]<sub>F</sub>’, by making use of *dynamic exhaustivity*: exhaustive interpretation is sensitive to the denotation of discourse referents. In section 4 I will defend (b) mainly on empirical grounds. But I also suggest that claim (b) already makes sense for conceptual reasons. Section 5 deals with topic accent and the economic encoding of information. Section 6 discusses claim (c), and it will be shown that in terms of it we can account for all the scope-inversion data in Büring (1997), without giving rise to some of the problems of the latter analysis. Section 7 concludes this paper.

## 2 Bare focus, Circumscription, and Exhaustivity

Consider the following sentence:

- (2) John introduced [Bill]<sub>F</sub> to Sue.

In this sentence the item *Bill* is focussed. In what types of contexts can we appropriately use a sentence like (2) with this focal accent, and what is its effect? The central intuition implemented by most theories of focus (e.g. Jackendoff 1972, Rooth 1984) is that (2) can only be used appropriately in a context in which the question expressed by *Who was introduced by John to Sue?* was at issue and in which (2) was not yet common ground. Many theorists (e.g. Rooth 1992, Krifka, 1995) have proposed that focal stress gives, in addition, rise to Gricean Quantity implicatures. In case of example (2), to the implicature that for none of the other individuals under discussion it is true (as far as the speaker knows) that John introduced this other individual to Sue.

There are two popular theories of focus-dependent interpretation on the market that can account for these intuitions: Rooth’s (1984, 1992) alternative semantics, and the structured meaning approach of Jacobs (1984), von Stechow (1990) and Krifka (1995).<sup>1</sup> To start with the latter, assume that a sentence is represented as a Background-Focus pair  $\langle B, F \rangle$ , and that the item in focus gives rise to a set of alternatives  $Alt(F)$ . The background  $B$  indicates that a question of the form *Who has property B?* is at issue. Then we can describe Krifka’s analysis in terms of Jacob’s assertion operator as follows:<sup>2</sup>

- (3)  $\llbracket \mathbf{Assert}(\langle B, F, Alt(F) \rangle) \rrbracket = \llbracket B(F) \rrbracket$  iff  $B(F)$  is assertable and for all  $F' \in Alt(F)$  such that  $B(F') \neq B(F)$ , the speaker has reasons not to assert  $B(F')$ .

Krifka explicitly states that there might be various reasons for not asserting alternative propositions  $B(F')$ : it might be that  $B(F')$  is weaker (entailed by)  $B(F)$ , or that the speaker may know that  $B(F')$  is false or lacks sufficient evidence for it. In particular, it might be that  $B(F')$  is stronger than (entails)  $B(F)$ , and that the speaker knows that this stronger proposition is false. In the latter case, Krifka notices that the assertion operator can account for many scalar implicatures. This is such an important special case of the assertion operator that he defines it as a special operator called ‘Scal.Assert’:

- (4)  $\llbracket \mathbf{Scal.Assert}_1(\langle B, F, Alt(F) \rangle) \rrbracket = \{w \in \llbracket B(F) \rrbracket \mid \neg \exists F' \in Alt(F) : w \in \llbracket B(F') \rrbracket \wedge \llbracket B(F') \rrbracket \subset \llbracket B(F) \rrbracket\}$

According to this interpretation rule, any world that verifies the sentence is excluded for which there is an alternative  $F'$  in  $Alt(F)$  such that replacing  $F$  in the sentence by  $F'$  gives rise to a statement that is true in this world and more informative than the actual assertion given. Obviously, for this analysis to have any effect for a sentence like (2), Krifka has to assume that denotations of conjunctive noun phrases like “Bill and Mary” can be alternatives to (the denotation of) “Bill”, and that the background predicate  $B$

<sup>1</sup>Only later we will discuss another theory that is perhaps not so popular.

<sup>2</sup>This rule slightly differs from the one given explicitly by Krifka in that we assume that  $Alt(F)$  is closed under conjunction (group-forming), instead of Krifka’s assumption that  $F'$  can be any subset of  $Alt(F)$ . This doesn’t seem to make any difference, though.

is *distributive* in nature. But if we do so, we can conclude from (2) that John didn't introduce  $d$  and Bill to Sue, for any  $d \neq \text{Bill}$ , which, in combination with the semantic interpretation of (2), gives rise to the intuitively correct prediction that John introduced only Bill to Sue.

Another nice feature of interpretation rule (4) is that it predicts correctly for an example such as (5):

(5) John introduced  $[\text{Bill and Mary}]_F$  to Sue.

In particular, it doesn't pragmatically rule out the truth of (2) just because there are alternatives to "Bill", namely "Mary" and "Bill and Mary", for which the sentence is true as well.

Krifka's analysis is stated in terms of a Background-Focus structure. A very same pragmatic interpretation rule can be stated, of course, in terms of Rooth's (1984, 1992) alternative semantics as well.<sup>3</sup>

(6)  $\llbracket \mathbf{Scal.Assert}_2(\phi) \rrbracket = \{w \in \llbracket \phi \rrbracket \mid \neg \exists \psi \in \text{Alt}(\phi) \mid w \in \llbracket \psi \rrbracket \wedge (\llbracket \psi \rrbracket \subset \llbracket \phi \rrbracket)\}$

The only difference between (4) and (6) is that for the latter we don't assume that the operator 'Scal.Assert' has immediate access to its focussed and backgrounded parts. Instead, it is assumed that we can give a recursive definition of the set  $\text{Alt}(\phi)$ . As far as the analysis of examples like (2) is concerned, it doesn't matter whether we take (4) or (6), as long as also for the latter case we limit ourselves to distributive predicates, and assume that  $\text{Alt}(\phi)$  is closed under conjunction.

Unfortunately, even if we limit ourselves to distributive predicates, the pragmatic interpretation rules (4) and (6) have some serious flaws. They give rise to wrong predictions if the item in focus is of a disjunctive or existential form. Both interpretation rules have the effect that (7-a) and (7-b) pragmatically denote the impossible proposition.

(7) a. John introduced  $[\text{Bill or Mary}]_F$  to Sue.  
 b. John introduced  $[\text{one person}]_F$  to Sue.

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<sup>3</sup>In this rule, and later, we could replace  $\text{Alt}(\phi)$  by a contextually given subset of  $\text{Alt}(\phi)$  as suggested by Rooth (1992), Roberts (1996), and others. We will leave these changes to the reader.

The reason is that one can infer from neither the semantic meaning of (7-a) nor that of (7-b) that any of the standard alternatives is true. Therefore (4) predicts that all these alternatives are false, resulting in the impossible proposition. Assuming that in these cases the alternatives involve generalized quantifiers obviously doesn't help: the original alternatives remain alternatives when we make this shift, and the problems remain as well.

It is easy to see that changing (4) and (6) to interpretation rule (8) doesn't really help. For our purposes, this rule come down to the same as the earlier ones.

$$(8) \quad \llbracket \mathbf{Scl.Assrt}_3(\phi) \rrbracket = \{w \in \llbracket \phi \rrbracket \mid \forall \psi \in \mathit{Alt}(\phi) : w \in \llbracket \psi \rrbracket \rightarrow (\llbracket \phi \rrbracket \subseteq \llbracket \psi \rrbracket)\}.$$

Also this pragmatic interpretation rule gives rise to the false prediction that (7-a) and (7-b) pragmatically denote the impossible proposition: neither the alternative that John introduced Bill to Sue nor the alternative that John introduced Mary to Sue is entailed by (7-a) and both are thus predicted to be false.

We have seen that it is wrong to assume that disjunctive sentences rule out worlds where the *stronger* propositions obtained by the disjuncts themselves are false, and assuming that now (suddenly) these disjuncts are not alternative propositions anymore also doesn't seem to be natural. According to us, Gricean reasoning should just rule out worlds where more of the relevant alternative propositions are true than demanded to verify the sentence. This intuition is directly expressed in the following interpretation rule. For reasons to become obvious soon, we will call this interpretation rule one of *exhaustive interpretation*.

$$(9) \quad \llbracket \mathit{Exh}(\phi) \rrbracket = \{w \in \llbracket \phi \rrbracket \mid \neg \exists v \in \llbracket \phi \rrbracket : \{\psi \in \mathit{Alt}(\phi) \mid v \in \llbracket \psi \rrbracket\} \\ \subset \{\psi \in \mathit{Alt}(\phi) \mid w \in \llbracket \psi \rrbracket\}\}$$

Notice that (9) doesn't give rise to any of the (potential) problems discussed above for sentences (5), (7-a), and (7-b). It is predicted that the sentences can be true in worlds in which John introduced Bill to Sue, because such worlds are among the ones that verify the embedded clauses that make only a minimal number of elements of  $\mathit{Alt}(\phi)$  true. For (5) they are predicted to be the only ones, while (7-a) and (7-b) allow other worlds as well. But (9) predicts that (7-a) and (7-b) are only true in worlds in which John introduced only one person to Sue.

Obviously, if we define the following (partial) ordering relation between worlds, ' $<_{Alt(\phi)}$ ' in terms of the sets of alternative sentences that are true in those worlds,  $v <_{Alt(\phi)} w$  if and only if  $\{\psi \in Alt(\phi) : v \models \psi\} \subset \{\psi \in Alt(\phi) : w \models \psi\}$ , we can define (9) equivalently as  $\llbracket Exh(\phi) \rrbracket = \{w \in \llbracket \phi \rrbracket \mid \neg \exists v \in \llbracket \phi \rrbracket : v <_{Alt(\phi)} w\}$ . Suppose now that  $\phi$  is of the form ' $P(\alpha_F)$ ' and that we define  $Alt(\phi)$  in terms of predicate  $P$  as follows:  $Alt(\phi) =_{def} \{P(\mathbf{d}) \mid d \in D\}$ , with  $\mathbf{d}$  a name for  $d$ . In that case (9) comes down to interpretation rule (10):

$$(10) \quad \llbracket Exh(\phi, P) \rrbracket = \{w \in \llbracket \phi \rrbracket \mid \neg \exists v \in \llbracket \phi \rrbracket : P(v) \subset P(w)\}$$

In van Rooij & Schulz (2004) and Schulz & van Rooij (2006) it is explained that if we would additionally assume a *ceteris paribus* condition for considering alternative worlds, (10) actually comes down to Groenendijk & Stokhof's (1984) principle of exhaustive interpretation, or to McCarthy's (1980) rule of predicate circumscription.

Interpretation rules (9) and (10) make strong predictions. For (2) for instance, it predicts that John introduced no-one else to Sue than Bill. A complaint often heard against interpretation rules like (4), (6), and also (10) has it that all we can conclude by standard Gricean reasoning is that the speaker *only knows* of Bill that he was introduced by John to Sue, leaving it open that he doesn't know that anyone else was so introduced as well.<sup>4</sup> The Gricean interpretation of  $\phi$  that the speaker only knows  $\phi$  can be formalized by the following interpretation rule  $\llbracket \mathbf{Grice}(\phi) \rrbracket = \{w \in \llbracket \square\phi \rrbracket \mid \forall \psi \in Alt(\phi) : w \in \llbracket \square\psi \rrbracket \rightarrow (\llbracket \phi \rrbracket \subseteq \llbracket \psi \rrbracket)\}$ , with ' $\square\phi$ ' meaning that the speaker knows that  $\phi$ . The strengthening from *not know* to *know that not* is then mostly contributed to the extra assumption that the speaker knows who John introduced to Sue. We fully agree with this intuition, and in Spector (2003), van Rooij & Schulz (2004), and Schulz & van Rooij (2006) it is even shown how exhaustive interpretation rules (9) and (10) can be inferred and thus motivated by this type of Gricean reasoning.

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<sup>4</sup>This complaint goes back at least to Soames (1982) and has been taken up by recent defenders of the Gricean picture such as van Rooij & Schulz (2004), Sauerland (2004), and Spector (2003).

### 3 Exhaustive interpretation and discourse referents

It is standardly assumed that the focal phrase of a sentence is marked phonologically by falling intonation. But phrases can also receive a rising intonation and the use of this intonation also seems to have interpretational effects. The denotation of the phrase with rising intonation was called the ‘independent focus’ by Jackendoff (1972), but is more often referred to as the (sentence, or contrastive) *topic* of the sentence, as in the work of Büring (1997, 2003), Roberts (1989), Lee (1999), Kadmon (2001) and others.<sup>5</sup> In this section we will say that such phrases have topical accent and limit ourselves to example sentences with a *hat*-contour, or a bridging accent, i.e., examples with both topical and focal accentuated phrases. Before we discuss how to interpret phrases with topical accents, however, it will prove instructive first to discuss a problem observed by Eckhardt (1995) for the analysis of focus hitherto assumed.

Consider a sentence like (11)

(11) [Half]<sub>T</sub> of the children wore [green]<sub>F</sub> shorts.

Intuitively, this sentence is true if half of the children wore green shorts, and the other half red shirts. Unfortunately, as noted by Eckhardt, this does not come out if we interpret the focal expression exhaustively by using a strong notion of exhaustivity. For if we would do so in the straightforward way, we would predict that for all alternative colors C to ‘green’, the sentence ‘Half of the children wore shorts with color C’ has to be false, which we don’t want.

We have noticed in the previous section that pragmatically interpreting focal accent strongly exhaustive does not always correspond with the facts, and that in general we should interpret focus in a weaker way, saying that of the alternative sentences the speaker does not know that they are true. Perhaps the problem disappears when we assume this weaker notion of exhaustivity. Indeed, in that case we would rightly predict that (11) can still be used truthfully in the situation sketched above. Unfortunately, however, this can not be the whole solution to the problem. To see this, notice that a

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<sup>5</sup>As stressed by Chungmin Lee (1999, and personal communication), it is now generally assumed that a difference should be made between non-contrastive thematic topic (with no focal component) and contrastive topic with focal component. In this paper I always refer to the latter type of topical construction.

speaker might naturally answer a question like ‘What kind of shirts did the children wear?’ with (11) immediately followed by (12):

(12) and the [other half]<sub>T</sub> of the children wore [red]<sub>F</sub> shorts.

And now we don’t want to conclude after (11) that the answerer does not know that (12) is true. Thus, even if we assume that focus should be interpreted in a weakly exhaustive way we would end up with a wrong prediction.

From Eckhardt’s discussion it might seem that the problem discussed above is due to the very particular quantificational expression ‘half’. In fact, however, the problem is of a very general nature. Consider sentences like (13-b) and (13-c) as answers to question (13-a).

- (13) a. What did the boys eat?  
b. [Some boys]<sub>T</sub> ate [broccoli]<sub>F</sub>.  
c. [One boy]<sub>T</sub> ate [broccoli]<sub>F</sub>.

If we would interpret ‘broccoli’ in a strong exhaustive way, and ‘some’ or ‘one’ as ‘at least some/one’, it would mean for (13-c) that for all alternatives  $x$  distinct to broccoli, the sentence (*at least*) *one boy ate x* has to be false. But this gives the wrong result that from (13-b) we can conclude that *none* of the boys ate anything else than broccoli (replacing ‘one’ in (13-c) by ‘some’ gives the same result). Again, weakening exhaustive interpretation by interpreting it as ‘minimal knowledge’ doesn’t really help: it would falsely predict that one cannot continue answer (13-c) by something like ‘and two boys ate the beans’.

In the discussion above we completely ignored the fact that in the sentences that gave rise to the problems the ‘quantified’ expression received a contrastive topical accent. Taking this into account, one obvious solution to the problem seems to be that (at least) in topic-focus constructions, the expression with focal accent should not receive an exhaustive interpretation. But notice that this would be a pity! Among others, we would have to give up the general rule that the item with focal accent should always be interpreted exhaustively.

In contrast to the above suggestion, in this paper we would like to argue that focus should always be pragmatically interpreted in an (at least weakly) exhaustive way, and that the above observations indicate that topical expressions should pragmatically be interpreted somewhat differently than standardly assumed.



To discuss the standard theories of topical accent, let us take a look at the following dialogue.

- (14) a. Who ate what? What did Larry eat?  
 b. [Larry]<sub>T</sub> ate [broccoli]<sub>F</sub>.

Just as it is standardly assumed that by our use of focal, or falling, accent we indicate something about the context in which the sentence is used (i.e., what is the question under discussion) and about how the sentence should be interpreted (i.e., exhaustive with respect to the focal accent), something similar is standardly taken to be the case for our use of rising, or topical accent. First of all, also our use of topical accent is taken to indicate that a set of alternatives is relevant, and that some kind of (general) question is under discussion. Second, it is generally agreed that the topical accent indicates that the sentence that contains the topical phrase does not by itself completely resolve the relevant question for all alternatives under discussion. We share those intuitions, but we do not think that the ways these intuitions are accounted for are fully appropriate.

The perhaps best-known theory of topical accent is due to Büring (1997, 2003). Büring builds his theory of topic on top of Rooth's theory of focus. Just as Rooth (1984) assumed that any sentence  $\phi$  has a focus-semantic value,  $\llbracket\phi\rrbracket^F$ , the value that we denoted so-far by  $Alt(\phi)$ , Büring assumes that all sentences also have a *topic-semantic value*,  $\llbracket\phi\rrbracket^T$ . Consider sentence (14-b). We know already that its focus semantic value,  $Alt((14-b))$ , is the following set of propositions:  $\{\lambda w\llbracket\text{Larry ate } f \text{ in } w\rrbracket : f \in F\}$ , where  $F$  is the set of relevant kinds of food. Hamblin's (1973) identifies this set of propositions as the meaning of the question '*What did Larry eat?*'. Büring (1997) proposes that the topic-semantic value of (14-b) is the following set of Hamblin-questions:

- (15) a.  $\llbracket(14-b)\rrbracket^F = \{\llbracket Ate(larry, f)\rrbracket : f \in F\} \approx \text{What did Larry eat?}$   
 b.  $\llbracket(14-b)\rrbracket^T = \{\llbracket Ate(d, f)\rrbracket : f \in F\} : d \in D\}$   
 $\approx \text{For each individual of set } D, \text{ what did that individual eat?}$

To account for the first intuition discussed above, Büring proposes that (14-b) can be used appropriately only if both questions (15-a) and (15-b) are under discussion. Obviously, this immediately explains the felicity of the sequence (14-a)-(14-b): the second question of (14-a) is identical to (15-a), while if

one wants to know the complete answer to the first question of (14-a), one has to address all questions in (15-b). To account for the second intuition that all relevant issues are not fully resolved by a sentence like (14-b), Büring demands that the interpretation of (14-b) leaves open some issues addressed in (15-b). And this comes out appropriately as well in case *D* contains other elements than ‘Larry’: whether we interpret the focus in (14-b) exhaustively or not, the sentence only *partially* addresses (15-b) and leaves open the possibility that Bill, for instance, ate something else than broccoli.

Although Büring notices that topical accent many times gives rise to a partitive reading, he does not suggest that as a consequence we should interpret phrases with topical accent in a non-standard way. But, as we saw above, if we interpret the phrases with topical accent in (11), (13-b) and (13-c) in a standard quantificational way, the analysis makes the wrong predictions for these examples once we interpret focus exhaustively. As for (11), Eckhardt herself provided us already with the right intuition: what gives rise to the problem is the assumption that the noun phrase ‘half of the children’ should be interpreted *quantificationally*, and this not only in the sentence (11) itself, but also in all the focal-alternatives that are supposed to be excluded by exhaustive interpretation. Instead, she suggests, we should look at the actual set of children that constitute this half, and assume that by exhaustification it is excluded that any of the other children also were green shorts.

One natural way to account for this intuition is to assume that the speaker had a particular group of children in mind when she used (11), and referred to this group by her use of the topical noun phrase ‘half of the children’. In this paper we don’t want to be committed to such a referential analysis of certain noun phrases, and we want to show that using any form of dynamic semantics will already help us to solve this problem.

Instead of looking at Eckhardt’s original example, we will consider the examples (13-b) and (13-c). What we want to account for is the intuition that the (contrastive) topical accent on ‘Some/One boy(s)’ in (13-b) is used to indicate that more than some boys (one boy) are (is) under discussion, with the result that (13-b) and (13-c) can at most be *partial* answers to question (13-a). Following the suggestion of Eckhard, we propose that in (13-c), for instance, we have to exhaustify the focal expression not with respect to the quantifier ‘one boy’, but with respect to the *denotation* of

the discourse referent introduced by ‘one boy’.<sup>6</sup> Thus, if this denotation is  $S$ , the alternatives that are excluded by exhaustive interpretation are all of the form ‘ $S$  ate  $f$ ’, where  $f$  is some kind of food different from broccoli. The easiest way to state exhaustive interpretation when discourse referents are crucial, we feel, is by using exhaustification rule (10) or its weakly epistemic variant. In that case we can represent (13-c) simply as something like (16).<sup>7</sup>

$$(16) \quad \exists X[Boy(X) \wedge Exh(card(X) = 1 \wedge Ate(X, Broccoli), \lambda y.[Ate(X, y)])]$$

Sentence (13-c) is now predicted to mean that one boy ate broccoli, and, depending on whether the speaker is taken to be competent on the subject matter of discourse, either that this one boy is known to have eaten nothing else, or that the speaker doesn’t know that this one boy ate anything else. As a consequence, the idea to interpret topical quantificational expressions with respect to denotations of discourse referents allows us to interpret (as a default) focus exhaustively also in hat-contours without the undesired consequence: it is still possible that non-members of the denotation of the discourse referent  $X$  ate something else than broccoli, i.e. beans.

Combining the ideas that focal phrases be interpreted exhaustively and topical phrases referentially has an extra appealing consequence. Representing (17-a) by (17-b):

$$(17) \quad \begin{array}{l} \text{a.} \quad \text{and [three boys]}_T \text{ ate [pizza]}_F \\ \text{b.} \quad \exists Z[Boys(Z) \wedge Exh(card(Z) = 3 \wedge Ate(Z, Pizza), \lambda y.[Ate(Z, y)])] \end{array}$$

we correctly predict that if the speaker indicates that he is knowledgeable about the subject matter of the discourse and that the answer is complete

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<sup>6</sup>The suggestion that for the interpretation of topical accent, we need to make use of discourse referents is not new. Vallduvi (1994, p. 7), for instance, claims that “[...] the internal structure of information states which is, in fact, crucially exploited by the different information-packaging strategies used by speakers in pursuing communicative efficiency is at least a system of file cards connected by pointers.”

<sup>7</sup>In this explicit representation, ‘*Exh*’ is used as an operator that can be used freely in the representation of the sentence. This way of representing things here is only for convenience, however. In Schulz & van Rooij (2006) a *dynamic exhaustivity operator* is defined that takes scope over the whole sentence (and in particular over the existential quantifier), but is interpreted just as (16) should intuitively be interpreted. Thus, our proposal is still completely compatible with a Gricean *global* analysis of implicatures.

after sequence (13-c)-(17-a), that 4 boys were under discussion. Thus, we predict that the topical phrases have *disjoint* denotations, as is natural in partitive constructions. The reason is that if all members of  $X$  have only property  $P$  (among the relevant ones) and all members of  $Y$  only property  $Q$  and  $P \neq Q$ , it follows that  $X$  and  $Y$  have mutually disjoint denotations. Notice that this doesn't follow solely from our proposal to interpret the topical phrases in (13-c) and (17-a) 'referentially', as the interpretation of a discourse referent, we needed the extra assumption that the focal phrases be interpreted exhaustively as well.

## 4 Exhaustive interpretation of topics

Eckardt (2003), however, shows that topical phrases do not always have mutually disjoint denotations. Consider the following sequence:

- (18)
- a. At different days of my measles, an increasing numbers of red spots appeared on my face:
  - b. [One spot]<sub>T</sub> had appeared by [Monday]<sub>F</sub>,
  - c. [two spots]<sub>T</sub> by [Tuesday]<sub>F</sub>,
  - d. and [three spots]<sub>T</sub> had appeared by [Wednesday]<sub>F</sub>.

Now we don't conclude that we are talking about 6 different spots. The reason is, intuitively, that in contrast to (13-c) and (16) the only thing that is crucial for the interpretation of the numerical expressions here is the *quantity* of spots involved, not their identity. In accordance with many others making use of dynamic semantics, we suggest that phrases like *one N* can have both a '*referential*' reading – where discourse referents are introduced immediately –, and a '*quantificational*', one, where discourse referents are introduced only after the interpretation of the whole sentence. An exhaustive reading of the focal expressions in (18-b) now doesn't have the effect that the specific spot introduced had appeared only by Monday, but rather just that only on Monday one spot had appeared. This has the result that the topical expressions in (18-b) and (18-c) need not denote mutually disjoint sets of spots anymore.

But the resulting proposal that at least some numeral expressions with topical accent receive a quantificational interpretation gives rise to some wrong predictions. First, and worst, we are back to our original problem: on a quantificational reading of *one spot* (and the assumption that focus

should be interpreted exhaustively) we falsely predict from (18-b) that on all other days than Monday no spot appeared. Second, the analysis doesn't predict the inappropriateness of a sequence like (13-c) followed by (19):

(19) and [three boys]<sub>T</sub> ate [broccoli]<sub>F</sub>.

Intuitively, sequence (13-c)-(19) is out because the speaker could have coded the expressed information more economically by just saying that *all* boys ate broccoli. But the proposal under discussion has to stipulate an extra constraint to account for this. Similarly, we don't account for the intuition that (18-b) implicates that on Monday *only* one spot appeared.

To account for these problems we propose/suggest that in sentences with a hat-, or bridge-contour, not only the item with focal accent, but also the one with topical accent should (by default) be interpreted exhaustively (with respect to the relevant domain).

There are at least two reasons why a uniform analysis of focal and topical accent is at least *prima facie* desirable. First, it would be unnatural to propose quite different meaning contributions to a supposed phonetic distinction that can hardly, if at all, be observed experimentally.

How much 'meaning' do you have to attach to specific accent types, if it turns out that it is hard to make a phonetic distinction among them?

Experiments have shown that every speaker realizes a sentence in a different fashion. However, hearers *are* able to determine whether a phrase is accented or not [...]. Our working hypothesis, then, is that it does not matter *what* accent is used by a speaker, but *that* he uses an accent. (Krahmer and Swerts, 2007)

A second reason for why a uniform analysis of focal and topical accent is desirable is given by Féry (1992, p. 60): "As a matter of fact, it is nearly always possible to replace a hat pattern by a sequence of two falling accents". But she mentions two restrictions, however, for when this replacement is appropriate. First, the replacement is in order only if the two accents have approximately the same prominence. Second, the hat pattern is necessary and cannot be replaced by a sequence of two falling accents in case of explicit contrast and gapping. To illustrate the case of contrast, Féry (1992) claims that (20-a) is acceptable, but (20-b) is not:

(20) a. John is often sick, [Mary]<sub>T</sub> [never]<sub>F</sub>.

- b. \*John is often sick, [Mary]<sub>F</sub> [never]<sub>F</sub>'.

For a simple sentence with a hat-contour like (14-b) our proposal that not only the item with focal accent, but also the one with topical accent should (by default) be interpreted exhaustively means that in case the speaker is taken to be competent about the subject matter of discourse, it is interpreted not only as saying that Larry ate only broccoli, but also that only Larry ate (only) broccoli. When the topical phrase is of a more complex nature, like in (13-c), with a denotational reading of 'one boy', the proposed analysis predicts that (the speaker knows) only (of) the boy introduced (that he) ate only broccoli, while (18-b), with a quantified reading, implicates that on Monday (as far as the speaker knows) only one spot appeared. Note that we also make the intuitive correct prediction for

- (21) a. A: Did your wife kiss other men?  
b. B: [My wife]<sub>T</sub> [didn't]<sub>F</sub> kiss other men.

Just as Büring (1997) we predict that the reply (21-b) gets the reading that the speaker knows only of his own wife that she didn't kiss other men, suggesting that he is not so sure of A's wife.

In general we predict that not only topical phrases that are interpreted referentially, but also the ones we interpret quantificationally give rise to *contrastive* readings. The prediction that topical phrases involve a contrast is behind almost any analysis of topical accent. According to Bolinger (1986),

[...] contrast involves cases where one or more individual items are singled out from a larger (but limited) set as being true regarding some relationship whereas others in the same set are untrue.

There are some doubts, however, whether not only focal, but also topical accent really has this strong contrastive effect. We have seen already that we predict such a contrastive reading only in case we take the speaker to be competent about the subject matter. But even then this seems to be a too strong prediction. First, it seems possible that one can answer question (22-a) appropriately by a sequence like (22-b)-(22-d):

- (22) a. Who ate what?  
b. Let's see.... [Larry]<sub>T</sub> ate [broccoli]<sub>F</sub>.  
c. [John]<sub>T</sub> ate [broccoli]<sub>F</sub>.  
d. And [Bill]<sub>T</sub> had [the beans]<sub>F</sub>.

We agree, but are also convinced that this can be done appropriately only in case the speaker has to check for herself with respect to each individual (Larry, John, and Bill) what he ate, and does so just before she uttered (22-b), (22-c), and (22-d) respectively. Thus, we think that the answerer cannot have uttered (22-b) appropriately when she already had the plan, or strategy, to continue the answer with (22-c) and (22-d). But in that case the sequence is not a counterexample to our assumption that both focal and topical expressions should be interpreted exhaustively also in topic-focus sentences: if we interpret both exhaustively with weak epistemic force, we receive the correct prediction (or so we feel) that at the moment the speaker utters (22-b), she does not know yet whether someone else (i.e. John) also ate (only) broccoli.

A second, though very similar, kind of example that seems problematic for our assumption that topical accent involves a strong form of contrast that follows from our proposal that also topical phrases be interpreted exhaustively are sequences like (23-a)-(23-b).

- (23) a. Where can I find find the cutery?  
 b. The [forks]<sub>T</sub> are in [the cupboard]<sub>F</sub>, and the [knives]<sub>T</sub> and [spoons]<sub>T</sub> too.

At first it seems that these examples cannot be ‘explained away’ in a similar way as we dealt with (22-a)-(22-d): the topical phrases are now mentioned in the same sentence. Still, we feel that there is something special about (23-b): if one wants to give an answer like this, one is *required* to use an additive focus particle like *too* in the second conjunct (as stressed by Henk Zeevat, p.c.). Indeed, it seems that an answer like (23-b) without the focus particle is fully inappropriate. We would like to suggest here that this is because by the use of such an additive focus particle in the second conjunct, the speaker suggests that the hearer is not allowed to interpret the first conjunct exhaustively, i.e., that he should *cancel* the implicature induced by exhaustive interpretation.

Although we propose that both topical and focal expressions should be interpreted exhaustively, this doesn’t mean that we predict that it is irrelevant how a phrase is accentuated, as long as it is accentuated. If we would claim that, we would end up with the wrong prediction that there is no difference in meaning between sentences with bridging accent and sentences with double focal accent. We propose, however, that the function of using the second topical accent, instead of a second focal accent, is that the sentence should

receive an exhaustive reading with respect to *two predicates* (or two sets of alternative sentences), and not with respect to *one relation*, which would (or at least could) be the result if the sentence contains a double focal accent.<sup>8</sup> To illustrate, for a double focal example such as  $[Larry]_F \text{ ate } [pizza]_F$ , we only minimize the sentence *one* time, with respect to relation *ate*, and conclude that (as far as the speaker knows) only one eating event took place and that the answer was complete; for bridging accent with a topical accent on ‘Larry’, however, we minimize with respect to focus *and* topic. In the latter case we end up with the interpretation that only Larry ate only pizza, and it is left open whether Bill, for instance, ate broccoli. The double focus sentence is interpreted as (24-a), the topic-focus sentence as (36):

- (24) a.  $Exh(\text{John ate Pizza}, \lambda xy[Ate(x, y)])$   
 b.  $Exh(Exh(\text{John ate Pizza}, \lambda y[Ate(j, y)]),$   
 $\lambda x[Exh(Ate(x, p), \lambda y[Ate(x, y)]))]$

Notice that as a consequence we predict that in contrast to a sentence with a double focal contour, a sentence with bridging contour is allowed if the speaker only *partially* answers the question under discussion. In section 6 we will discuss whether giving a partial answer should be associated with topical accent.

## 5 Strategic economic encoding

According to the above analysis, topical and focal items are both interpreted exhaustively, but we exhaustify the topical expression ‘later’ than the focal one.<sup>9</sup> What is the reason for this difference? We believe that it reflects the strategy of how to *economically encode* the to be transmitted information.

Roberts (1996), Kadmon (2001), and Büring (2003) correctly propose that a topical accent indicates that a set of questions is under discussion and that a *strategy* is at stake. However, we feel that they underestimate the role of the answerer. It is the *answerer* who has to decide how to economically

<sup>8</sup>This seems compatible with Féry’s first constraint on when we can replace a hat-pattern with two times focus accent.

<sup>9</sup>This doesn’t mean that as a result the topical expressions should always have wide scope. If so, it would give rise to the prediction that  $[Alle]_T \text{ Politiker sind } [nicht]_F \text{ korrupt}$ . receives the small-scope reading of negation, which is wrong as made clear by Büring’s (1997). We will come back to this example in the next section.



encode the complete information she has to convey such that the hearer can still process it. In this section we want to propose that the information structure of the sentence, or its topic-focus structure, reflects the strategy of the speaker to economically encode the information to be transmitted.

Consider multiple *wh*-question (25).

(25) Who ate what?

Let us adopt a partitional analysis of questions. If we now assume that only John and Mary and only broccoli and pizza are under discussion, it follows that the semantic meaning of (25) is identical to the intersection of the semantic meanings of (26-a) and (26-b), and also to the intersection of the semantic meanings of (27-a) and (27-b).

(26) a. What did John ate?  
b. What did Mary ate?

(27) a. Who ate broccoli?  
b. Who ate pizza?

More concretely, if we denote the partition that represents the meaning of interrogative sentence  $S$  by  $\llbracket S \rrbracket$ , and if we define  $Q \sqcap Q' = \{q \cap q' : q \in Q \ \& \ q' \in Q' \ \& \ q \cap q' \neq \emptyset\}$  for two partitions  $Q$  and  $Q'$ , we see that  $\llbracket (25) \rrbracket = \llbracket (26-a) \rrbracket \sqcap \llbracket (26-b) \rrbracket = \llbracket (27-a) \rrbracket \sqcap \llbracket (27-b) \rrbracket$ . Now suppose that John ate only broccoli, and Mary only pizza. We believe that (25) can in these circumstances equally well be answered by the sequence (28-a)-(28-b) as by the sequence (29-a)-(29-b) with the respective topic-focus patterns:

(28) a.  $[\text{John}]_T$  ate  $[\text{broccoli}]_F$ ,  
b. and  $[\text{Mary}]_T$  ate  $[\text{pizza}]_F$ .

(29) a.  $[\text{broccoli}]_T$  was eaten by  $[\text{John}]_F$ ,  
b. and  $[\text{pizza}]_T$  was eaten by  $[\text{Mary}]_F$ .

Roberts (1996) proposes that a sentence like (28-a) presupposes both (30-a) and (30-b), while Kadmon (2001) and Büring (2003) argue that it rather presupposes both (30-a) and (30-c)

(30) a. What did John eat?  
b. For each individual, what did that individual eat?  
c. Who ate what?

Notice that although (30-b) and (30-c) differ in that whereas the former denotes a set of questions, the latter denotes only one questions, on a partitional analysis of questions the two are closely related: as we have seen above,  $\llbracket(30-c)\rrbracket$  is just the intersection of the set of questions denoted by (30-b), i.e.  $\llbracket(26-a)\rrbracket \cap \llbracket(26-b)\rrbracket$ .

Similarly, a sentence like (29-a) presupposes both (31-a) and (31-b) according to Roberts (1996), while it presupposes both (31-a) and (30-c) according to Kadmon (2001) and Büring (2003):

- (31) a. Who ate broccoli?  
 b. For each kind of food, who ate it?

Obviously, also here it holds that if these questions have a partition semantics, and if we take the intersection of the whole set of questions, then both (30-b) and (31-b) will correspond with the question (30-c).

Now suppose that John and Mary are still the only relevant individuals, but they not only had a main dish, but also a desert, either an ice cream or a cake. Then, we think, the only natural way to answer (25) is to ‘go by individuals’:

- (32) a.  $[\text{John}]_T$  ate  $[\text{broccoli and an icecream}]_F$ ,  
 b. and  $[\text{Mary}]_T$  had  $[\text{a pizza and a cake}]_F$ .

One might think that this is just because ‘going by individuals’ is more natural than ‘going by food’. This doesn’t seem to be the crucial factor, however, because we observe the same effect with a question of the form *Who kissed whom?* where only individuals are involved. How this latter question is typically answered also typically depends on how many kissers versus kissed ones there are. A more natural reason why in the above case we answer question (25) by ‘going by individuals’ is because of the form of the question: ‘who’ was mentioned before ‘what’ in (25). What has to be explained now, though, is why the questioner didn’t ask (33).

- (33) What was eaten by whom?

We believe that (33) should be asked instead of (25) if there were more people than kinds of food, because in that case the answer can most economically be given by first mentioning the food, as in answers like:

- (34) a.  $[\text{Broccoli}]_T$  was eaten by  $[\text{John, Paul and Mary}]_F$ ,

- b. and [pizza]<sub>T</sub> was eaten by [Bill, Sue, and Peter]<sub>F</sub>.

Our suggestion is related to a proposal made recently by Komagata (2003). Komagata proposes that the information structure of a sentence is a means to *balance* the information load carried by the theme (topic) and the rheme (focus) of an utterance. It is natural to measure the information load of a question as the average information load of its answers. Using information theory and a natural balancing principle, he shows that the ordering of an expected theme followed by a surprising rheme is more desirable than the ordering of a surprising theme followed by an expected rheme.<sup>10</sup> We will not make use of information theory in this paper to make Komagata’s suggestion more precise. But already our informal description explains why the natural way to answer (25) is to ‘go by individuals’ if John and Mary are the only relevant individuals, but they not only had a main dish, but also a desert, either an ice cream or a cake. If, however, there are more people than kinds of food, Komagata’s balancing principle explains why the answer to (25) should ‘go by food’.

## 6 Topical implicatures

We have not yet discussed Büring’s (1997) demand that the use of topical accent implicates the existence of an open question. As is well-known, it is in terms of this extra constraint that he explains a number of interesting scope data as observed, among others, by Féry (1992). Let us inspect the best-known example, (35), which in principle could have 2 readings, (35-a) and (35-b):

- (35) [Alle]<sub>T</sub> Politiker sind [nicht]<sub>F</sub> korrupt.  
 all politicians are not corrupt.  
 a. It is not the case that all politicians are corrupt. ( $\neg\forall$ )  
 b. No politician is corrupt. ( $\forall\neg$ )

The empirical observation is that only the first reading is observed. It is worthwhile to see that we cannot yet explain this observation. A natu-

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<sup>10</sup>However, if the theme is totally predictable (i.e., has zero entropy), the ordering does not affect the information balance. Examples like *Q: Who knows the secret? A: Peter<sub>F</sub> knows it*, which are problematic for more naive ‘old things first’-hypotheses, can now be accounted for.

ral explanation would be that only one of the readings is compatible with the exhaustive inferences we have proposed above. It is easy to see how the implicatures of the  $\neg\forall$  reading are computed: exhaustive interpretation due to ‘[nicht]<sub>F</sub>’ doesn’t give rise to any additional inference (because the alternative ‘ $\forall x[P(x) \rightarrow C(x)]$ ’ is already entailed to be false), but exhaustive interpretation due to ‘[Alle]<sub>T</sub>’ leads to the implicature that (the speaker thinks it is possible that) at least some politicians are corrupt (the alternative ‘ $\neg\exists x[P(x) \wedge C(x)]$ ’ is not (known to be) true). This implicature is consistent with the assertion, meaning that there is nothing to prevent (35) to receive the  $\neg\forall$  reading. On first thought it seems that for the  $\forall\neg$  reading, on the other hand, a problem will occur, because now one of the exhaustivity inferences will be in conflict with what is asserted. The exhaustive interpretation due to ‘[Alle]<sub>T</sub>’ leads now to the implicature that it is not the case that (the speaker knows that) there is a politician who is not corrupt ( $\neg\Box\exists x[P(x) \wedge \neg C(x)]$ , or equivalently  $\Diamond\forall x[P(x) \rightarrow C(x)]$ ), which is incompatible with what is asserted (on the  $\forall\neg$ -reading). On second thought, however, this is not really the case: the alternative  $\exists x[P(x) \wedge \neg C(x)]$  is already entailed by (and thus weaker than) what is asserted (if it is presupposed that there are politicians), so this sentence is *not* implicated to be (possibly) false. So, nothing is implicated that is inconsistent with the  $\forall\neg$  reading, and we cannot yet explain the observation that this reading does not exist.

Just as Büring (1997), we propose to explain these empirical observations by an extra implicature triggered by the topical accent. However, we won’t adopt Büring’s proposal, because that gave rise to the so-called ‘last-answer problem’. Instead, like Wagner (2007), we make a *weaker* proposal, namely that a contrastive topic used in hat-contour comes with the following felicity condition.

(36) Topic Felicity Condition:

There exists at least one alternative that is derived from substituting topic and focus values for other salient objects that is (i) not entailed by the assertion, and (ii) compatible with what the speaker knows.

In case the speaker is taken to be knowledgeable, condition (ii) is strengthened from  $\Diamond\psi$  to  $\Box\psi$ . Notice that condition (36) gives rise to the pragmatic inference, or implicature, that some non-entailed alternative has to be (possibly) true, and in terms of this implicature we propose to account for Büring’s (1997) scope data. To see the working of condition (36), consider the example

I started out with:

- (37) a. Who of John and Mary ate broccoli and pizza?  
b. [John]<sub>T</sub> ate [broccoli]<sub>F</sub> and [Mary]<sub>T</sub> ate [pizza]<sub>F</sub>

The first conjunct of (37-b) gives rise to the focus-exhaustive inference that John didn't eat pizza, and the topical-exhaustive inference that Mary didn't eat broccoli.<sup>11</sup> On the strong version of our new felicity condition of topic marking, it must be the case that one of the following alternatives must be true: {Ate(j,p), Ate(m,b), Ate(m,p)}. Because the first two are ruled out by the focus- and topic-exhaustive inferences, it immediately follows that the last one has to be true: Mary ate pizza.

But if this is the inference, why is it still appropriate to assert the second conjunct of (37-b)? The reason is that exhaustive interpretation is based on (i) standard *Gricean interpretation*, and (ii) the assumption that the speaker is (maximally) *competent*. In general, the competence assumption cannot be assumed, and all that is left is the Gricean interpretation. According to the Gricean interpretation, the first conjunct of (37-b) gives rise to the focus-based inference that it is not known that John ate pizza, and to the topic-based inference that it is not known that Mary ate broccoli. The felicity condition is weaker as well: at least one of the following alternatives is not ruled out: {Ate(j,p), Ate(m,b), Ate(m,p)}. Notice that in this case all three of them are still possible, which means that the second conjunct from (37-b) cannot yet be derived from the first conjunct and its (weak) pragmatic implicatures. Only in case it is assumed that the speaker is competent – i.e. knows the extension of the question-predicates of ‘what did John eat’ and ‘who ate broccoli’ –, we can derive from the first conjunct of (37-b) given as answer to question (37-a) that Mary ate pizza, and thus that the second conjunct is superfluous.

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<sup>11</sup>The most obvious way to formally account for our extra topical inference of  $\phi =$  “[John]<sub>T</sub> ate [broccoli]<sub>F</sub>” is as follows:  $\exists\psi \in \{Ate(x, y) : x \in T \ \& \ y \in F \ \& \ \phi \neq Ate(x, y)\} : \Diamond\psi$ , with  $T$  and  $F$  the set of topical and focal alternatives to John and broccoli, respectively. However, there are reasons to prefer the following formulation of basically the same idea:  $\exists\psi \in \{Ate(x, y) : x \in (T - \{j\}) \ \& \ y \in (F - \{b\}) \ \& \ \phi \neq Ate(x, y)\} : \Diamond\psi$ . The main reason for preferring this alternative is that in this way we can easily explain why a sentence like “John did [not]<sub>T</sub> eat [five]<sub>F</sub> apples” seems to implicate that John ate at least one apple (without it being required that he ate exactly four apples). The reason is that the predicted topical inference is now that the speaker thinks it is possible that John ate at least one apple, which after strengthening gives the desired result.

As already indicated above, Büring’s (1997) original proposal of how to interpret topical accent gives rise to the *last answer problem*. If it is assumed that after the interpretation of a clause with a topical accent there still must be an open question, it is predicted that after the second conjunct of (37-b) is asserted, it should be an open question what John ate, or an open question whether Mary ate broccoli. Intuitively, however, this is not the case: after the second conjunct of (37-b) is interpreted we know exactly who ate what. Despite the fact that our proposal is very close to Büring’s (1997) analysis, it is easy to see that this ‘last answer problem’ does not arise on our analysis.<sup>12</sup> The reason is that we predict only that (at least) *one* possibility statement must be true, which is weaker than Büring’s requirement that an issue is unresolved, meaning that (at least) *two* possibility statements must be true. In our case, the topical condition predicts that the second conjunct of (37-b) can be felicitously uttered only if one of the following propositions must be (possibly) true:  $\{\text{Ate}(j,b), \text{Ate}(j,p), \text{Ate}(m,b)\}$ . But this condition is obviously satisfied, because it is explicitly asserted by the first conjunct of (37-b) that the proposition expressed by the first element of this set is true.

Let us now return to the scope-data, and in particular to (35). We have seen already before that none of the exhaustivity implicatures can rule out one of the two possible readings of this sentence. However, the new topical implicature *can* do so. The new topical implicature for both readings of the sentence will now be that (the speaker thinks it is possible that) at least some politicians are corrupt ( $\diamond\exists x[P(x) \wedge C(x)]$ ). This implicature is compatible with the  $\neg\forall$  reading of the sentence, but *incompatible* with its  $\forall\neg$  reading. For this reason, or so we propose, example (35) doesn’t have the latter reading.

Our approach can also account for further German data discussed by Büring (1997). (38), for instance, is predicted to be infelicitous since it fails to have any extra topical-implicature in any scope ordering. Thus, condition (i) of rule (36) is not met.

- (38) \* $[\text{Alle}]_T$  Politiker sind  $[\text{immer}]_F$  betrunken.  
all politicians are always drunk

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<sup>12</sup>Of course, the problem doesn’t show up in Büring’s (2003) newer analysis either. But the explanation in this latter paper is rather different from the one adopted in Büring (1997), while the one we proposed is very similar in spirit to this earlier proposal, it is just weaker.

Both orderings (all>always and always>all) are semantically equivalent. The assertion in either ordering entails all the alternatives. Hence, (38) cannot be uttered with the topic-focus contour.

The following example, (39), is claimed to have only the surface (No>always) reading.

- (39) [Kein]<sub>T</sub> Politiker ist [immer]<sub>F</sub> betrunken.  
no politician is always drunk

In the non-surface reading (always>no) the extra topical inference that (the speaker thinks it is possible that)  $\exists t\exists x[P(x) \wedge B(x, t)]$  is incompatible with what is asserted ( $\forall t[\neg\exists x[P(x) \wedge B(x, t)]]$ ), and thus is ruled out. On the other hand, the surface reading (No>always) is available, because this time the extra topical inference is compatible with and not entailed by what is asserted. Intuitively, (39) uttered with a topic-focus contour indeed induces an interpretation that some politicians are sometimes drunk. The predicted implicature is attested.

By similar reasoning, one can show that we predict in accordance with Büring (1997) that (40) and (41) are ambiguous between their two scopal readings: the proposed extra topical implicature that (the speaker thinks it is possible that) some politicians are sometimes drunk is not entailed but still compatible with what is asserted on both of their readings.

- (40) [Kein]<sub>T</sub> Politiker ist [nie]<sub>F</sub> betrunken.  
no politician is never drunk
- (41) [Alle]<sub>T</sub> Politiker sind [selten]<sub>F</sub> betrunken  
all politicians are rarely drunk

What this shows is that our analysis can predict the scope data discussed in Büring (1997).

## 7 Conclusion

In this paper we proposed that a sentence like (1), [John]<sub>T</sub> ate [broccoli]<sub>F</sub>, should pragmatically be interpreted as follows:

- (a) Focus should be interpreted exhaustively: John ate only broccoli.
- (b) Topic must be interpreted exhaustively: Only John ate (only) broccoli.

- (c) The speaker takes it to be possible (or even knows, if he is competent) that at least one alternative of the form ‘ $x$  ate  $y$ ’ not entailed by (1) is true. From (a) it follows that this alternative cannot be ‘John ate  $y$ ’, with  $y$  different from broccoli; from (b) it follows that this alternative cannot be ‘ $x$  ate broccoli’, with  $x$  different from John. Thus, the alternative must be something like ‘Mary ate the beans’.

In section 2 we argued in favor of an exhaustivity rule that differs somewhat from some better-known standard alternatives. In sections 3 and 4 we considered some problems for this rule, and argued that exhaustive interpretation should be sensitive to discourse referents and that also topics should be interpreted exhaustively. This holds for topical expressions in general, whether they have a ‘referential’ or a ‘quantificational’ reading. Our unified interpretation of topical and focal expressions does not predict that the accents are interchangeable: in section 5 we argued that the different kinds of accents reflect the way the speaker economically encodes the information she wants to communicate, while in section 6 we proposed that topical accent gives rise to an extra implicature on top of the one due to exhaustive interpretation. It is shown that this extra topical implicature is weaker than a similar implicature proposed by Büring (1997), but still can account for the relevant scope data.

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