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Pro-active focus[*]

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Abstract

This paper applies a development of Sperber & Wilson's 1986 analysis of focus to interpretational as well as interface issues. It also introduces the idea that procedural meaning can be embodied in pro-active properties of a language. The paper takes a recent semantic approach to focus, that of Rooth (1992, 1995), and draws out what theories of this kind leave to pragmatics to explain. A pro-active analysis of focus couched in a relevance theoretic framework is shown to be able to explain judgements of unacceptability and falsehood contingent on the use of focus. It can explain why focus associates strongly with certain operators and why focus triggers other kinds of effects, e.g. contrast. An analysis of post-nuclear material gives rise to an important generalisation: Predictability. This condition is shown to provide an explanation of certain interface phenomena which is superior to that of Reinhart's interface strategy approach.

1 Introduction

Though focus-related phenomena are inextricably linked to pragmatics, analyses of focus generally abstract away from pragmatic considerations. This paper will present an analysis of focus in English which is articulated within a pragmatic theory. I will try to show that a number of facts related to focus can be accounted for in this way. Essentially, I will develop Sperber and Wilson's (1986/1995) (hereafter, S&W) theory of focus and apply it to both interpretational and other interface issues.

The analysis treats focus as procedural. In particular, S&W claim that focus affects procedures at what I will call the interface, where on-line processing of linguistic stimuli takes place. I take it that these procedures are geared to the recovery of the intended representation of an utterance. It follows that interface strategies are informed not only by grammatical principles but also by pragmatic principles. I will argue that contribution

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of focus at the interface interacts with the least effort clause in the definition of optimal relevance. This effectively makes focus pro-active: it forces certain assumptions to be used in the computation of speakers' intentions. I will show how this fact and other processing considerations explain many facts associated with focus.

The paper is organised as follows: In Section 2 I set out a simple version of my analysis of focus. For purposes of comparison and exposition, I outline Rooth's (1992, 1995) (minimal) theory of focus interpretation and provide a procedural alternative. The generalisation which Rooth's interface constraint on contexts captures in terms of the operator, ~, can be shown to follow from the fact that focus is pro-active. I then survey some of the effects of focus on interpretation and show how these can be explained using relevance-theoretic considerations.

In section 3, I set out a more elaborated version of my analysis of focus. This is in most respects the same as S&W's. The idea is that the interface strategies with which focus interacts involve routine on-line hypotheses concerning the form and content of the utterance being processed. I argue that an important generalisation follows from this view of focus: Predictability. Some discussion of the functional notion of focus, the contrastive/presentational distinction and related matters follows. Section 4 outlines a more general account of judgements about the misuse of proactive elements. This will involve putting a procedural spin on Ariel's (1990) Accessibility Theory, which relates the form of referring expressions to the (cognitive) accessibility of their `referents'. In section 5, I apply the results of sections 3 and 4 to issues surveyed in Reinhart (1995). I argue that empirically, the approach advocated here is superior to Reinhart's Interface Strategy approach.

2 Pro-active focus

2.1 Introduction

I will be mostly concerned in this paper with a relatively narrow domain of inquiry: the effect of prosodic prominence (or focal stress) on processing utterances in English. For instance, I am interested in explaining the effect of focal stress placement (indicated by CAPS) in examples such as (1):

(1) Mary introduced BILL to Sue.

Depending on the situation in which (1) is uttered, focus on 'Bill' could simply make (1) a relevant response to the question, 'Who did Mary introduce to Sue?'. It could lead to the implicature that Mary introduced no one else to Sue. It could allow (1) to be understood as contradicting some assumption held by the audience, for example that Mary introduced John to Sue. In other situations, it could give (1) a similar force of 'Mary even introduced BILL to Sue'.

In other constructions, focal stress placement can have different consequences. Most notably, it can affect the proposition expressed by the utterance. In a scenario where Mary introduced Bill and Tom to Sue and there were no other introductions, (2) would be judged false while (3) would be true:

(2) Mary only introduced BILL to Sue.

(3) Mary only introduced Bill to SUE.

Similarly, (4) would be judged false if Mary occasionally took John to the theatre:

(4) Mary always took John to the MOVIES.

When it interacts with negation, focus gives rise to what has been called an existential presupposition (though this effect disappears in certain situations). (5) is typically described as presupposing that John bought something.

(5) John didn't buy a CAR.

Generally, the effect achieved by focus cannot be predicted without knowing the context in which it will be understood. Such radical interaction between aspects of natural language and context are not uncommon. In the semantic literature, a framework inspired by Stalnaker and Heim is commonly used to deal with it. Taking the meaning of a sentence to be a mapping from contexts to contexts, focus, like definiteness, can be seen as imposing a constraint on the input context. This is the strategy used in Rooth's theory of focus interpretation which will be reviewed in the next section.

An alternative to the idea that such elements encode constraints on context is that they encode procedural information. This is arguably the idea behind Kaplan's treatment of indexicals and demonstratives, whose notion of 'character' is basically an instruction for

use. Just what this could mean in the case of focus will be spelt out in simple terms in Section 2.3 and in a more elaborate version in Section 3.

2.2 Alternative semantics for focus and interface constraints on context

In a series of papers on focus, Rooth (1992, 1995) has argued for a minimal theory of focus interpretation where the function of focal prominence is simply to evoke a set of alternative propositions. On this account, while (1) would express the proposition that Mary introduced Bill to Sue, it would evoke a set of alternative propositions of the form *Mary introduced x to Sue*. Two steps are taken to formalise this idea. A means of determining the alternatives evoked in addition to the ordinary semantic value is provided, and a constraint which captures the effect of evoking alternatives is introduced.

The first task is achieved by Rooth's alternative semantics. The stressed element in an utterance is taken to be the prosodic manifestation of a focused constituent. Alternative semantics recursively defines a focus semantic value in the following way[1]:

i) The focus semantic value of a focused phrase of type τ is the set of possible denotations of type τ
ii) The FSV of a non focused lexical item is the unit set of its ordinary semantic value
iii) Let α be a non-focused complex phrase with component phrases $\alpha_1,...,\alpha_k$, and let Φ be the semantic rule for α, e.g. function application. The focus semantic value of α is the set of things obtainable as $\Phi(x_1,...,x_k)$, where $x_1 \in \|\alpha_1\|^f \wedge ... \wedge x_k \in \|\alpha_k\|^f$

So for example, the relevant structure for (1) is (6),

(6) $[_S$Mary $[_{VP}$introduced $[\text{Bill}]_F$ to Sue]]

and sample focus semantic values are given in (7):

[1]This definition is taken from Rooth 1995, p 10. It is a simplified version of the one given in Rooth 1985, in that it ignores the complexities of intensions, but it is sufficient for the exposition here.

(7) a. $[\![[\text{Bill}]_F]\!]^f$ = E, the set of individuals.
b. $[\![\text{Sue}]\!]^f = [\![\text{Sue}]\!]$
c. $[\![[_{VP}$ introduced $[\text{Bill}]_F$ to Sue$]\!]^f = \{\lambda x\ \textit{introduce}(x,y,s) \mid y \in E\}$
d. $[\![[_S$ Mary introduced $[\text{Bill}]_F$ to Sue$]\!]^f = \{\textit{introduce}(m,y,s) \mid y \in E\}$
(the set of propositions of the form 'Mary introducing y to Sue')

Focus interfaces with possible focus sensitive constructions via the focus interpretation operator ~, which introduces a presupposed alternative set:

(8) Where ϕ is a syntactic phrase and C is a syntactically covert semantic variable, $\phi \sim C$ introduces the presupposition that C is a subset of $[\![\phi]\!]^f$ containing $[\![\phi]\!]$ and at least one other element (Rooth's (18) p7)

The operator can be freely adjoined to any phrase, so that for (1) we could have the structure given in (9a):

(9) a. $[_S[_S$Mary introduced $[\text{Bill}]_F$ to Sue$]\sim C]$.
b. *introduced(m,b,s)*

Given the rule in (8), we can say about (9a) that its assertion adds the ordinary semantic value of the left operand of ~, (9b), to the context and that C is to be identified with some set of propositions of the form *introduce(m,x,s)* which in turn includes the proposition in (9b) and at least one other. That is, the interpretation of focus by ~ effectively constrains the input context to contain a set of alternative propositions of a form determined by alternative semantics[2].

Generally speaking, the problem of determining the value of C is akin to that of determining the antecedent for anaphora. In the cases where (1) is used to answer a question, as in (10), or to contradict a mistaken assumption, as in (11), the preceding discourse would be taken to provide the antecedent to the variable C:

(10) Who did Mary introduce to Sue?

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[2]The focus interpretation operator emphatically does not introduce an existential presupposition. See Rooth 1995 for a discussion of this issue where he observes that the alternative set can be relevant without being true.

(11) Mary introduced John to Sue.

Assuming that (10) determines the set of possible answers to the question, i.e. {*introduce*(*m*,x,*s*) | x is human}, this provides a suitable antecedent for C. (11) introduces the proposition *Mary introduced John to Sue* into the context and one must imagine that the pragmatics of such contrastive use involves a set formed from this proposition and that expressed by the assertion of (9a).

This is a minimal theory in that the interpretation of focus is decoupled from the constructions and contexts in which focus is used. In its strongest form, there is nothing more to be said about focus interpretation, and there is nothing more for the language learner to master. In particular, there are no construction-specific rules which refer to the focus feature. This version contrasts with semantic accounts where rules make reference to focus on a construction-by-construction basis[3]. The difference can be demonstrated in the case of operators which associate with focus. In the examples in (12), the position of focus affects the proposition expressed. Assuming Horn's analysis of such sentences (see Horn 1992), (12a) says that Mary introduced no one other than Bill to Sue, (12b) says that Mary introduced Bill to no one other than Sue, while both examples presuppose that Mary introduced Bill to Sue.

(12) a. Mary only introduced BILL to Sue.
b. Mary only introduced Bill to SUE.

It is possible to define *only* as an operator which quantifies over alternative propositions. That is, at some level of representation, *only* takes the rest of the sentence as its argument. We would then want to define *only* as saying that for a given set of propositions, none other than the overt argument of the operator is true. In this case, we can see the role of focus in determining the domain of quantification. For instance, in (12a) the set of alternative propositions determined by focus are of the form *Mary introduced x to Sue*

[3]Rooth's (1985) theory took this form. It is preceded by work of Jacobs and von Stechow which capture the facts of alternative semantics by structured meanings. Basically structured meanings are tuples formed according to the schema <B,F_1,F_2,..>, where F_i is the meaning of the ith focused constituent and B is what is left when the meanings have been abstracted. So for (1) above we have <λx[**introduce**(**m**,x,**s**)],**b**> as the structured meaning of the sentence. Semantic rules then refer to these. See von Stechow (1991) for a comparison between the two approaches. See also Krifka (1993) for a development of the structured meaning approach in a dynamic framework.

and, given the gloss for (12a) above, we understand the domain to be of this form. We can capture this fact by making reference to focus in the definition of the operator, as in (13):

(13) only $\phi :\leftrightarrow \forall p[p \in \|\phi\|^f \wedge p \rightarrow p = \|\phi\|]$

In the strongest version of Rooth's minimal theory, the interaction between focus and the operator is seen to be less direct. The definition of *only* is given simply in terms of a free domain of quantification variable, *B*:

(14) only $\phi :\leftrightarrow \forall p[p \in B \wedge p \rightarrow p = \|\phi\|]$

The value of this free variable is left to be determined pragmatically[4]. In (15), we represent this free variable in a structure for (12a). (15) also shows that the presupposed alternative set introduced by focus interpretation has been identified with the set of propositions over which *only* quantifies.

(15) $[_S$only(B) $[_S[_S$Mary introduced $[\text{Bill}]_F$ to Sue$]\sim$B]]

What this means is that in the context of examples such as (12a), the domain of quantification provides a suitable object with which the variable introduced by focus interpretation can be identified. In general, the strong theory suggests that the association with focus of such operators is due to the fact that they introduce the right kind of objects into the context. As such, they are on a par with questions or any other aspect of the context which can furnish such an object. So, there is no need to stipulate association with focus in the definition of *only*, *always* and so on.

It may, however, seem that the way the strong theory is set out here is just too minimal. For instance, in the case of focus sensitive operators like *only*, nothing said so far obliges focus to play a role in determining the domain of quantification. In (15) above, the variable introduced by ~ could just as well have found a value elsewhere in the discourse. Yet, intuitively, association between the two seems obligatory in such cases. However, examples such as (16) below suggest that the minimal version is what is required:

[4]In fact, the domain of quantification would be restricted according to the syntactic type of *only*. See the discussion in Section 2.6.

(16) A: Mary only introduced BILL to Sue.
B: She also only introduced Bill to JANE.

In B's response, *only* can be understood as quantifying over alternatives of the form *Mary introduced x to Jane*. This is not a subset of the focus semantic value. In this example, focus is being put to some other use and we are left to figure out the domain of quantification in the context. So, determining the value of the variable introduced by ~ seems to be a pragmatic matter[5].

The strong theory of focus interpretation seems to be the most desirable, and Rooth's arguments against weaker versions which involve construction-specific rules seem compelling. Semantic approaches to focus on a construction-by-construction basis imply that there is nothing more general to be said on the matter other than that some version of alternative semantics is involved. One consequence of this approach is there could be a language just like English except that *only* does not associate with focus. Surely this is not acceptable.

For an approach to focus with an eye to the pragmatics as well as the semantics, this general theory of focus interpretation seems to provide a clear division of labour. By adding on some pragmatics, we might expect to be able to explain how the antecedent of the variable introduced by ~ is determined. In so doing, we might be able to say something about the pragmatics of contrast, of negation and so on. We ought to be able to say something about why certain operators associate so strongly with focus. These points will be addressed below.

A further consequence of adopting such a general theory of focus interpretation is that judgements concerning unacceptable placement of focus, as in (17), are also left to the pragmatics.

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[5]Actually, there is some slim evidence that there is a class of focus sensitive operators, which includes at least *only*, which encode obligatory association with focus. Rooth incorporates this into a slightly weaker intermediate theory, where selection by such operators can refer to ~. For example, $[_{VP}$only(C) $[_{VP}[_{VP}...]$~C]] would be a selection frame for *only*. By this means, the domain of quantification is constrained by the focus semantic value. In cases such as (16) it would be assumed that there is a second focus feature not realised by main stress. This evidence is not entirely convincing and is discussed in Breheny (1996). In any case, such arguments do not hold for many other operators which just as strongly associate with focus, like *always* (see Krifka 1992). So, for the purposes of the discussion in this section, we can ignore this data.

(17) A: What did Mary do to John?
B: She kissed JOHN.

This is because constraints on contexts of the type Rooth proposes for focus and Heim (1983) proposes for definites say nothing about accommodation — correctly, since such matters are, from the point of view of the grammar, non-deterministic. An example of accommodation and focus, due originally to Lakoff, is given in (18):

(18) John called Mary a republican, and then [[[Mary]$_F$ insulted [John]$_F$]~C].

Here the focus semantic value of the second sentence would be a set of propositions of the form *x insulted y*. The fact that the use of focus triggers the implicature that John insulted Mary by calling her a republican, like those concerning association with focus, are to be explained by a pragmatic theory. The fact that the antecedent of C can be introduced via a piece of world knowledge means that Heim-type constraints on contexts cannot, in principle, explain when an antecedent for C will be available. Again, the acceptability judgements will be accounted for below.

Such is the division of labour implied by Rooth's constraint on contexts. What I want to show in this paper is that a lot of the explanatory purchase that relevance theory has in these pragmatic matters is due to the least effort condition which it incorporates. In the next section I will argue that Rooth's interface condition captured by the constraint imposed by ~ also stems from this least effort condition and hence also lies on the pragmatic side of the divide.

2.3 Pro-active focus determines alternative representations

What Rooth's minimal theory of focus and a weaker case-by-case approach have in common is their recourse to a notion of alternatives. The difference between them is that the minimal theory is an attempt to say something about focus sensitive constructions in general. Modulo the problem of accommodation, the generalisation seems robust. That Rooth (1992) takes (8) above to be a matter for a theory of competence suggests a tacit assumption that such a strong generalisation must perforce be backed by linguistic principles. There is, however, no reason to think that if it were derived from pragmatic principles it would be any less robust. In this section I give a simple version of a procedural account of focus which derives (8) from relevance-theoretic considerations.

We have seen that focal stress leads to the evocation of alternatives. Let us assume it does so by instructing the hearer to construct a representation of such alternatives at what I call the interface, the level at which a representation of the utterance is constructed. We are assuming that processes at this level are informed by pragmatic as well as grammatical principles. So given the stress placement in (19), an alternative representation of a form given in (20) is constructed:

(19) Mary introduced BILL to Sue.

(20) *introduced*(*m*,x,*s*)

We can assume that the variable which replaces the focused element is, other things being equal, of the same type as the element it replaces. Just how the representation is constructed will be spelt out in Section 3 below, but a few words about (20) are in order here. In cognitive terms, the representation corresponds to what we might call a background assumption schema, and the variable in (20) corresponds to a variable over (conceptual) representations. As such, it alternately picks out any object of its type and (20) picks out the set of propositions of this form. The very fact of its construction makes assumptions of this form more salient or more accessible.

To give some idea of what this means, and at the same time introduce some concepts from relevance theory, I will draw an analogy between the action of focus at the interface and that of a gesture such as pointing in the interpretation of utterances.

Let us assume that the act of pointing simply draws the audience's attention to some aspect of the distal environment. This in turns makes manifest, or more manifest (i.e. more accessible), any assumption which can be formed on the basis of information available in this part of the distal environment. Standardly, pointing in utterances is associated with examples such as (21) below. However, there is an equally valid use of such gestures, demonstrated in (22).

(21) (A points in the direction of a fuchsia)
A: That is a fuchsia.

(22) (A points in the direction of the foliage of a honeysuckle, which is in a parlous state)
A: The hot summer this year has really affected the honeysuckle.

In (22), unlike (21), the gesture does not help to determine the proposition expressed. Rather, in gesturing at the foliage, A has made more manifest certain assumptions which she expects her audience to use in establishing the relevance of what she is saying. Here, relevance is to be understood in the theoretical sense of S&W. The Principle of Relevance and the definition of optimal relevance are given in (23) and (24)[6]:

(23) **The (second) Principle of Relevance**: Every act of communication communicates a presumption of its own optimal relevance.

Optimal relevance is defined as follows:

(24) **The revised presumption of optimal relevance**:
   a. The ostensive stimulus is relevant enough for it to be worth the addressee's effort to process it.
   b. The ostensive stimulus is the most relevant one compatible with the communicator's abilities and preferences.

For present purposes we may use the following rule of thumb in applying the theory[7]:

(25) The principle of relevance tells us that when we process an utterance, we do so in the expectation of at least adequate effects, for no unjustifiable effort. It follows from this principle that, when this expectation is satisfied, we should stop processing which is geared toward recognising the speaker's intention and assume that it was the speaker's intention that we derive the cognitive effects that we did.

Cognitive effects are just what we extract from any new information in the context of information we have to hand: implications, contradictions, strengthenings and so on. The least effort condition incorporated into the definition of optimal relevance means that some cognitive notion of accessibility of information plays an important role in the theory. At any one time, certain assumptions are cognitively more accessible, and hence cheaper

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[6]These are the revised version of earlier definitions given in S&W (1986) and are quoted directly from the postface of S&W (1995).

[7]The actual pragmatic criterion proposed by relevance theory is more sophisticated, taking into account such things as the fact that we are sometimes told what we already know. See the postface of S&W 1995 for a discussion.

to construct or retrieve, than others. The more accessible assumptions are more likely to be used as part of the context for processing new information. So, the least effort condition dictates a strategy of processing an utterance in contexts in order of accessibility.

Returning now to our second pointing example, (22), we can say that the gesture, in drawing our attention to the foliage, has made information about this foliage more accessible and so more likely to be used as part of the intended context. We could say, then, that the role played by the gesture plays as part of the ostensive stimulus is a contextual role.

The more familiar use of pointing exemplified in (21), could be seen in a similar light. The difference is that, (21) contains a demonstrative. Let us assume, following Kaplan (1989), that the character of the demonstrative takes the form of an instruction to put the object of the speaker's directing intention into the proposition expressed. Figuring out the object of the directing intention, by hypothesis, is done in a context of assumptions. Some of these, presumably, are drawn from information made more accessible by the gesture.

If we reconsider the examples of focus given above, we can see an analogy between pointing and focus: they both have the effect of making assumptions more accessible, and these assumptions may play a contextual role in processing the utterance. For example, in the case of *only*, focus makes certain alternatives more accessible which may be drawn upon in constructing a domain of quantification. By analogy with the case of pointing, we could say that focus also plays a contextual role.

However, there is another important property that focus and pointing share. This has to do with the fact that, unlike other sources of contextual information, pointing and focus seem to make it obligatory for some of the assumptions they make more manifest to be utilised in processing the utterance. This is the fact that Rooth's generalisation in (8) captures. I would like to argue that it follows from the least effort clause of the definition of optimal relevance.

Notice that both constructing an assumption schema, as in (20) above, and paying attention to some aspect of the distal environment cost some processing effort. The principle of relevance dictates the strategy of processing an utterance in the expectation of at least adequate effects, achieved for no unjustifiable effort; hence, the audience can assume that the effort they expend in processing these gestures will not be gratuitous. It follows that focus and pointing not only make certain assumptions more accessible, but that the deployment of such gestures makes it mutually manifest that some such assumptions must play a contextual role in processing the utterance. Thus, Rooth's constraint on context follows from the pragmatic principle of relevance. Note that the

denotation of the assumptions which do actually play a contextual role will be that subset of the FSV of a sentence which constitutes the value of the variable C introduced by the operator ~.

I will, in general, refer to any formal property of an utterance which interacts with the principle of relevance in a way which 'forces things to happen' during the processing that utterance as pro-active. Focus is pro-active.

2.4 Misplaced focus and acceptability judgements

We have in the above account a straightforward explanation of judgments of infelicity. In relevance-theoretic terms, pragmatic unacceptability can result when the hearer is put to gratuitous processing effort in arriving at the intended interpretation. In the case of pointing, we can demonstrate this by varying (26) slightly:

(26) (A points in the direction of the perfectly healthy foliage of a clematis)
A: The hot summer this year has really affected the honeysuckle.

A similar judgement results when focus puts the audience on the wrong track:

(27) A: What did Mary do to John?
B: She kissed JOHN.

In both cases, the most plausible interpretation does not involve processing the utterance in the context of any assumptions made manifest by the gesture. For example, in (27), the best we can do is to take B's utterance to be a direct response to the question. This only involves utilising contextual assumptions of the form *Mary R-ed John*, which are made manifest by the question. Thus, we are put to gratuitous effort and judge the utterance as unacceptable.

Notice, however, that in cases where the placement of focus does not conform to the question/answer paradigm, our judgements vary to the extent that we can see further implications attendant on the use of focus:

(28) (Scenario: Teacher and student are discussing the reading list for the advanced syntax course)
Teacher: So what have you read?
Student: Well I READ 'Bare phrase structure'

Here we take the student to be not only answering the question but to be implying that she perhaps did not fully understand what she read. We will see how such an effect comes about through the use of focus in similar examples of contrastive use in the next section.

2.5 Scalar implicatures, exhaustive list and contrastive uses of focus

In Section 2.2, I noted that one of the tasks of a pragmatic theory is to account for the effects of focus in different circumstances. In this section, I will show that a pro-active focus account can shed light on cases where focus triggers scalar implicatures and related exhaustive list readings, as well as some seemingly unrelated contrastive cases.

Rooth (1992) observes that the Horn scales supposedly deployed in deriving scalar implicatures can serve as a possible context for focus, i.e. a possible value for C. The pragmatically interesting fact is that focus in an utterance gives rise to scalar implicatures when an un-focused alternative would not. One example given involves the following scenario: Mats, Steve and Paul take a test on a teach-yourself calculus course. George asks Mats how it went. He answers:

(29) I_F passed

This suggests that the other guys did not pass. Note that (30) does not carry this implicature:

(30) I passed.

Rooth's analysis is as follows: the assertion can be placed on a scale containing alternative assertions which can be ordered by entailment, as in (31):

(31) $\left\{ \begin{array}{l} \textbf{pass(m)}, \textbf{pass(s)}, \textbf{pass(p)} \\ \textbf{pass(s}\oplus\textbf{p)}, \textbf{pass(s}\oplus\textbf{m)}, \textbf{pass(p}\oplus\textbf{m)} \\ \textbf{pass(s}\oplus\textbf{p}\oplus\textbf{m)} \end{array} \right.$

Here groups are included in the domain of individuals, and $\oplus$ is the group sum operator. Standardly, asserting a proposition on the scale implicates the negation of those higher up the scale. Rooth's point is that this set is a potential antecedent for the variable C introduced by the focus interpretation operator. Let us examine the pragmatics of this case in more detail.

In general, scalar implicatures arise only under certain circumstances (in certain contexts). This can be demonstrated using two examples from S&W 1995:

(32) Henry: If you or some of your neighbours have pets, you shouldn't use this pesticide in your garden.
Mary: Thanks. We don't have pets, but some of our neighbours certainly do.

(33) Henry: Do all, or at least some of your neighbours have pets?
Mary: Some of them do.

Mary's utterance in (32) does not carry a scalar implicature that not all of the neighbours have pets, while in (33) it does. We shall not go into the details of how S&W account for this or how it can account for cases that a Gricean account cannot. Suffice to say that in (33) it is mutually manifest that a more informative alternative utterance would have been more relevant. In such cases, clause (b) of the definition of optimal relevance dictates the following strategy:

> ...[here] the speaker has deliberately chosen to express a less informative proposition when a closely related, equally accessible and more informative proposition would have demanded no more effort, either from [the speaker] or from the hearer. All such cases have a similar analysis. If the more informative proposition would not have been more relevant, there is no implicature. *If the more informative proposition would have been more relevant,* the utterance will be taken to implicate either that the speaker is unwilling or, (more commonly) that she is unable to provide the more relevant information. In the latter case, the communicator's inability may be due either to her not knowing whether the more relevant information is true, or her knowing it to be false. If either of these two possibilities is manifest and relevant, it will be taken to be implicated (S&W 1995 pp38-39; emphasis mine).

Let us turn now to the examples above. First, consider the unfocused version in (30). Notice that, even though the example assumes that George is aware that Steve and Paul also took the test, the response in (30) to such a general question does not necessarily give rise to any further implicatures, since it would presumably be relevant enough to George to know that Mats passed.

We have seen that, given the pro-active nature of focus, the utterance in (29) makes alternative assumptions of the form *x passed* more accessible. We also have the further condition that some assumptions of this form must play a contextual role in processing the utterance. So, we can reason that whatever context is utilised in processing this utterance, it should contain assumptions of this form. Now, given the situation described, assumptions corresponding to the elements of the Horn scale (*pass*(*s*), *pass*(*p*), *pass*(*m*+s) etc.) would be the most accessible assumptions of this form, so we can assume that at least these assumptions will play a contextual role. We therefore have the situation described in the quote above. Through the use of focus, it becomes mutually manifest that the speaker has chosen to express a less informative proposition when a more informative version is equally accessible and would have demanded no more effort from the interlocutors. Assuming that effects are achievable from information concerning the fate of any of the three who sat the test, the implicature goes through as described above.

It is possible that what is often referred to as the 'exhaustive listing reading' of focused phrases can be handled along similar lines. Sometimes focusing a constituent as in (34) gives rise to an interpretation as in (35):

(34) John gave Mary a BOOK

(35) John gave Mary a book (and nothing else)

The 'and nothing else' implicature can be derived along lines similar to that above. Given the placement of focus in (34), we can assume that some assumptions of the form $\exists x[John\ gave\ Mary\ x \wedge P(x)]$ will play a contextual role. One could argue that the exhaustive list reading arises when the more accessible alternatives of this form would give rise to extra effects in the context. If this is the case, then through the use of focus, the speaker has made it manifest that she has deliberately chosen a less informative formulation when an equally accessible, more informative one would have been more relevant. If it thereby becomes manifest that the speaker is unable to provide the more relevant information because she knows it to be false, then this will be implicated. Thus the reading described would be inferred.

A certain type of contrastive use of focus can also be explained along similar lines. By contrastive focus, I mean focus which is used to, say, correct a mistaken belief. Consider (36):

(36) A: I hope Sue likes the book John gave her.
B: He gave MARY a book

Note first that this kind of contrastive utterance has a dual effect. It both contradicts an assumption held by the audience and provides information by answering a relevant question (like: well if he didn't give Sue a book then who did he give a book to?). Now in the context created by A's utterance, the proposition *John gave Mary a book* could potentially have two kinds of effect (be relevant in two ways). It could add to the list of book recipients or it could amend the list of one recipient. Notice that it cannot do both. Notice also that if it were mutually manifest that John gave a book to only one relevant recipient, then the utterance can achieve relevance in only one of these ways.

As always, assumptions of the form *John gave x a book* should be utilised in the context for processing the utterance. In this case, the assumption that John gave Sue a book would be accessed. We can also see that we can form a Horn scale along the lines indicated for (29) above. The question is whether the more informative proposition *John gave Sue and Mary a book* would be more relevant. To see that this is so we need to consider the immediate context which focus sets up in this example. As will be discussed in Section 3, the background assumption schema which focus triggers gives rise to a relevant question. In this case, it is 'Who did John give a book to?'. In this immediate context, the proposition that John gave a book to both Mary and Sue would give rise to any effects that the proposition expressed does and more. As such the reading described for this example would be inferred.

2.6 Association with focus sensitive operators

Among the tasks of a pragmatic theory mentioned above was that of explaining why focus strongly associates with certain propositional operators (*only*, *always*, negation etc). In treating this problem in this section, we will uncover some interesting facts about judgements of truth and falsity in such cases.

There are two types of case, which deserve slightly different treatment. What they both have in common is that a similar interface strategy applies, and that the pragmatics of

enrichment is involved. The first type of case involves operators which systematically underdetermine their domain of quantification, so that enrichment processes have to be used to establish an interpretation which is relevant enough (cf clause (a) of DOR above). Such operators include *only*, *even*, *always*, *usually* and so on. I will deal with *only* here. The second type of case, that of negation, involves free enrichment of proposition expressed.

Let us assume, for the sake of simplicity and uniformity, the definition of *only* given in (37):

(37) $only\ q : \leftrightarrow \forall p[p \in B \wedge p \rightarrow p = q]$

Here, *q* is the proposition contributed by the overt argument of *only* and *B* is a free domain of quantification variable. In a more adequate definition, the domain of quantification would be restricted according to the selectional properties of *only*. For instance, when selection is for a VP, the restriction $B = \{\lambda X[A(X)](Y) \mid Y \in D_{<e,t>}\}$ would be encoded, where $\lambda X[A(X)]$ is obtained by abstracting the VP meaning. Since a relevance treatment of the pragmatics of domain restriction works in much the same way in either case, and since other operators such as *always* probably do introduce a free variable, we will settle for (37) as our definition.

Consider (38), in which focal stress falls within the scope of the operator:

(38) Mary only introduced BILL to Sue.

As shown above, the placement of stress affects our intuitions concerning the proposition expressed in such examples. Here (38) would mean, roughly, that Mary introduced no one other than Bill to Sue. The task is to explain how this comes about.

Abstracting away from the presence of focus, and given the definition in (37), the semantics for (38) tells us that for some set of propositions, none other than the proposition that Mary introduced Bill to Sue is true. Generally speaking, this would not be relevant in its own right, so some pragmatic enrichment is required. The relevance-theoretic strategy for enriching a domain of quantification is a special case of the general processing strategy: choose a domain compatible with the most accessible context which

would result in an interpretation consistent with the principle of relevance[8]. Let us call this context K.

We factor in the effect of focus in the following way: As a propositional operator is involved, we can assume that the processing strategies for (38) yield a background assumption schema corresponding to (39).

(39) *introduce*(*m*,x,*s*)

As always, we are required to utilise some assumptions of this form in processing the utterance. Such assumptions are also made more accessible; so, generally speaking, they would be likely candidates to provide a domain for the operator. Notice now that focus imposes the extra condition that assumptions of this form must play a contextual role. This means that whatever else K contains, it must contain assumptions of this form, whether or not they are the source of the supposition concerning the domain in question. Now, in examples such as (38), there is no obvious role that these assumptions could play other than contributing to the domain of quantification (cf (16) in Section 2.2, where they are put to some other use). Hence, one can only assume that, given the principle of relevance, in such cases this is their intended role.

This analysis has the satisfying consequence that it can account for judgements of falsehood, while semantic approaches cannot. Let us reconsider such an example, elaborated here for perspicuity:

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[8]Wilson & Sperber 1993 discuss examples of enrichment similar to the one here, involving the interval problem posed by examples such as in (i):

(i) I've had breakfast.

In this case and the one involving *only*, the semantics suggests the additional strategy narrowing the interval or expanding the domain until we get a relevant enough interpretation. With regards to domain restriction, this only applies in the case of operators with universal force (*only*, *everyone*, *no one* etc) and does not apply to others. That is, if $A \subseteq B$ and p_A and p_B are propositions involving such a universal quantifier whose domain is taken to be A and B respectively, then p_B entails p_A. eg, *Every student in semantics 101 and 102 passed* entails *Every student in semantics 101 passed.* However, the strategy mentioned in the text applies to all cases. So, for the sake of generality we will take the strategy adopted in the text to be in operation in all cases.

(40) a. Scenario: At a gathering of students, Mary introduces Bill and Tom to Sue and there are no other introductions (since, otherwise, everyone knows everyone). We report the event as follows:
b. Mary only introduced BILL to Sue.

The judgement is that (40b) is false. For expository purposes, let us take Rooth's intermediate theory of association with focus (mentioned in fn.6) as this is more in line with weaker theories of focus[9]. Then the structure for (40b) would be something like (41):

(41) $[_S$only(C) $[_S$Mary introduced $[\text{Bill}]_F$ to Sue$]\sim$C]

This construction constrains the value of C to be some subset of the FSV which includes the proposition that Mary introduced Bill to Sue and at least one other. Of course, there is nothing in the semantics which says that we must include the proposition that Mary introduced Tom to Sue as a member of the set of alternatives over which we quantify. So (41) does not explain our judgement that (40b) is false in the scenario described. This observation is entirely consistent with our earlier one about accommodation: such facts, in principle, fall outside of the domain of a semantic account.

The relevance-theoretic account follows the reasoning outlined above. In this case, assumptions of the form *Mary introduced x to Sue* would be taken to provide a source for the set of alternatives over which the operator quantifies. Now in the situation described, the assumption that Mary introduced Tom to Sue is at least as accessible as any other of this form. So in any context which is used to process this utterance, this assumption will be present. Not using it as an alternative for quantification would diminish the relevance of the utterance, as its construction costs effort. Hence, clause (b) of the definition of

[9]Such as that of von Stechow, Krifka op cit. What they all have in common is the that FSV (or its equivalent in the structured meaning framework) can only constrain the domain of quantification. This is acknowledged in Krifka and abstracted away from in von Stechow. Rooth (1992) argues that such contextual determination is necessary in examples such as (i):

(i) John only READ The Recognitions.

where the FSV is the set of propositions of the form John R-ed The Recognitions. If this set of alternatives were taken to be the domain, then (i) would come out false every time as John would presumably bear more relations to the book than the reading relation, eg, being born in the same century as the author of etc. Rooth's stronger theory, of course, leaves the determination of C entirely up to contextual factors.

optimal relevance rules that it is included in the intended set of alternatives and the judgement follows.

It is difficult to see how any pragmatic criterion which does not involve notions of effort and accessibility could account for such judgements. Certainly, they could not be captured by applying Grice's maxims to this problem of enrichment[10]. In the Gricean framework, one would presumably construct a domain consistent with the presumption that the speaker is observing the maxim of truthfulness. (cf Lewis' (1983) discussion of accommodation. See also Wilson (1992)).

Let us turn now to the association of negation with focus, as in (42):

(42) John didn't buy a CAR

Standardly, this kind of example is described loosely in terms of presuppositions. The placement of focus in (42) indicates the presupposition that John bought something. Following a suggestion by Deirdre Wilson (see Wilson & Sperber 1981, also Kempson & Cormack 1981) I will take an enrichment approach to such cases. However, the type of reasoning which leads to enrichment of the content in the case of negation is different form that in the case where the semantics generally leaves some aspect of the content open to contextual specification, as discussed above. In the latter case, enrichment takes place whether or not the operator associates with focus since otherwise the utterance would not be relevant enough to be worth one's attention. In the case of negation, enrichment occurs only if the operator associates with focus.

First we need to show that the so-called presupposition contributes to the truth-conditional content of the utterance. A standard way of showing this is to embed an appropriate sentence within the scope of a logical operator. I will adapt some examples due to Dretske mentioned in Rooth (1985, 1995)[11]. Consider the following situation:

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[10]Of course, Grice only discussed the application of the CP and maxims to inferring implicatures. He seems to have ignored or been unaware of the pragmatics of determining the proposition expressed. Still, a more recent pragmatic approach to determining content (Asher and Lascarides (1993)) apply strategies based on some of Grice's maxims to determining the proposition expressed.

[11]The difference here is that the examples are not counterfactuals. This step is made to simplify matters since counterfactuals introduce extra complications. However, I do not see that the treatment of such examples would differ greatly from that of the straight conditionals given here. That is, it seems that they all involve enrichment.

(43) Clyde has been having a relationship with Bertha for some time. It is one which suits them both since she is out of town half of the time, and so it does not involve too much commitment. However, he learns that he must marry before he is thirty in order to inherit some money. So he plans to marry Bertha and carry on the relationship as before, in order to keep his personal life uncomplicated.

Given this situation, (44) and (47) would be judged true, while (45) and (46) would be judged false.

(44) T If Clyde doesn't marry BERTHA, his personal life will not remain uncomplicated.

(45) If Clyde doesn't marry BERTHA, he will not be eligible for the inheritance.

(46) If Clyde doesn't MARRY Bertha, his personal life will not remain uncomplicated.

(47) T If Clyde doesn't MARRY Bertha, he will not be eligible for the inheritance.

We can see that some enrichment of the antecedent is being triggered by focus if we consider that (44) and (47) would turn out false if the antecedent in each case were just the proposition that Clyde does not marry Bertha. To see how this comes about, let us consider first a less complicated example:

(48) A: I heard John bought a car.
B: He didn't buy a CAR.

Given a Boolean semantics of negation, and abstracting away from the effect of focus, B's response expresses the proposition that it is not the case that John bought a car. In the circumstances of (48), this would possibly be relevant enough, since it would have the effect of contradicting and eliminating A's assumption to the contrary, as well as any effects attendant on that (eg. it might alter A's plans to get John to drive her to work, etc). In many situations, it is possible that examples involving negation, such as (48B), may not be relevant enough. In those cases, enrichment would be driven by clause (a) of the definition of optimal relevance. However, the enrichment would be sensitive to focus since the background assumption would provide the most accessible supposition as to how to enrich the proposition expressed, along the lines set out below. In the case we are

examining, the enrichment is driven by clause (b) of the definition of optimal relevance. We enrich to get the most relevant interpretation. I have chosen to look at this case as it provides a more general treatment of association of focus with negation since, even if enrichment is not driven by clause (a), the use focus itself will trigger enrichment given clause (b).

As I argued in Breheny (1995), enrichment is driven by clause (b) of the definition of optimal relevance when it is possible to construe na utterance in two or more ways (let us say, as having one of several distinct propositional contents differing in informativeness), but when it costs no more effort to process the utterance in either way. In such a case, choosing the most relevant interpretation would amount to choosing the more informative form, if this gave rise to more effects. Now, usually, different ways of establishing the intended content of an utterance cost differing amounts of effort (see Wilson & Sperber 1993). It is only in cases where the different contents are compatible with the same intended context that this condition obtains. We will now see how focus in (48) brings about this situation.

As in the case of *only* above, negation is a propositional operator, and so the background assumption schema determined by focus for (48) above would be of the form *John bought X* (where *X* is a variable over second-order properties)[12]. By the same reasoning as for *only*, we can see that whatever context is assembled for processing this utterance, it will include some assumptions of the form *John bought X*. We can now go further and show that any assumptions of this form used in this context will be of one of two types: they will either entail that John bought something or they will entail that John bought nothing. No context will contain assumptions of both types. Let us call contexts which contain assumptions of the first type K_1, and of the latter type, K_2.

Now the proposition that John bought nothing entails that he did not buy a car. So, if a context of the type K_2 is assembled then it would be mutually manifest that the speaker has deliberately chosen a less informative proposition when a closely related, equally accessible and more informative proposition would have demanded no more effort. We have, then, the conditions for a scalar implicature which would generally go through. So in K_2, we would get the implicature that John bought something.

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[12]I have assumed, for purposes of generality, that focus 'takes scope' over the whole NP. In fact, given the more elaborate version of how this background assumption is constructed, I suggest that we would have something of the form $\exists x[\text{bought}(j,x) \wedge P(x)]$, where P is a variable over properties. In this case, the reasoning below would be less complicated and the argument for enrichment would go through a fortiori.

If a context of the type K_1 were assembled, we would have the conditions for a kind of scalar explicature. In this case, the speaker will have deliberately made more manifest assumptions that entail that John bought something. This process has cost some effort and so would diminish overall relevance unless they are put to use. Now it is obvious that the proposition *John bought something and John did not buy a car* entails the proposition *John did not buy a car*. Generally speaking, the former proposition would generate more effects in the context assembled. So attributing to the speaker the intention to express this proposition would lead to a more relevant interpretation. The speaker has done nothing to block this move. So we can assume that this was her intention.

Generally speaking, a context of type K_1 would most likely be the one assembled[13]. So, in the normal course of events, the proposition expressed would be freely enriched.

This differing treatment of association of propositional operators with focus neatly accounts for what happens in the case of exceptions. In the case of operators like *only*, when focus is put to some other use, the semantics still underdetermines the content and so some pragmatic enrichment will take place anyway. In the case of negation, the enrichment is not mandatory. If the focus is being put to some other use, the reasoning which led to the enrichment will not go through and so the presuppositional effect vanishes. We also have a treatment of the Dretske type examples described above. In the case of (44), the judgement that it is true comes about because we can only take it that the intended antecedent is that John marries someone and he does not marry Bertha.

3 How focus determines alternative representations

In this section, I will integrate my analysis of focus as pro-active with the processing theory of focus outlined in S&W[14]. By adapting such an approach, we will have a plausible account of where the alternative representation introduced in Section 2 comes from. Also, we will preserve S&W's arguments against functional approaches to focus. Though there is some difference in the presentation of the semantics, the main difference here is that I will not adopt the strongest form of their theory, which says that focus is not

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[13]In circumstances where K_2 type contexts are more likely, the information that John bought something probably communicated via implicature:

(i) A: John shopped around for weeks and he bought nothing.
B: Well, he didn't buy a CAR.

[14]The analysis in S&W revises an earlier version (Wilson & Sperber 1979) within an RT framework.

a property of the grammar. However, this difference is more apparent than real, for the claim in S&W that 'focus' is not a part of the grammar mostly amounted to a claim that any kind of syntactic correlate of a functional level of representation is unnecessary. In that we shall agree. Here I leave things open by making the slightly weaker assumption that an F-feature is freely added to a lexical item and that this focus element is interpreted at PF and LF. But at LF, it is interpreted simply as an instruction to manipulate what we will call the set of anticipatory hypotheses. We will also see that the processing account leads to a lower-level generalisation, Predictability. This will play a role in accounting for certain examples where the placement of focus is judged to be unacceptable.

Throughout the previous sections, I have assumed that the interface is the space in which the actual processing of an utterance takes place. I have claimed that these processes are informed by pragmatic as well as grammatical principles. The analysis of focus in S&W starts with the observation that such processes take place on line and over time. Their specific claim is that a series of anticipatory hypotheses are made while processing the stimulus, about both the syntactic structure and the intended propositional form. To give a simple example, the assumption is that at any point in the processing of an utterance such as (49),

(49) Mary invited John

parsing strategies (or heuristics) select a tentative continuation from the space of possible continuations. So, in the normal course of events, we might get a set of hypotheses about the syntactic structure of the sentence as given in (50):

(50) $[[_{NP}\text{Mary}]\ [_{VP}\ ]]$
$[[_{NP}\text{Mary}]\ [_{VP}[_{V}\text{invited}]\ [_{NP}\ ]]$
$[[_{NP}\text{Mary}]\ [_{VP}[_{V}\text{invited}]\ [_{NP}\text{John}]]$

It is known that tentative disambiguations take place at this level. There is also evidence that such decisions can be affected by not only semantic knowledge (of theta roles etc) but also by world knowledge[15]. We might then assume that a similar and parallel set of hypotheses about the propositional form and content are being made at the same time. So, in the case of (49), we assume that a parallel set of hypotheses concerning the meaning

[15]See for example, Perlmutter & MacDonald (1992).

of the utterance are being made. This is shown in (51) where I simplify matters by ignoring intensions:

(51) a. P(*m*)
b. λx[*invite*(*m*,x)](Y)
c. *invite*(*m*,*j*)

The meaning hypotheses can be constructed on the basis of the syntactic hypotheses. Loosely speaking, this is done by constructing a formula in which the empty syntactic node is represented by a variable of the appropriate type. We assume here that the (extensional) type for the VP is <e,t> and that it is <<e,t>,t> for the object NP. For perspicuity, the series in (51) assumes that the construction of these meaning hypotheses is quite fluid, and we revert to canonical types wherever this won't affect the meaning — at negligible extra cost. It is possible that in this system we could begin to account for the relative ease with which an operator in a given structural position takes scope by postulating that the equivalent of type-shifting costs effort (cf Partee 1992). However, we will resist this temptation here and assume that a strategy of *abeyance* applies to all propositional operators. That is, on encountering such an operator, it will be assumed that the rest of the series of hypotheses will be concerned with constructing its argument. Though the relative scope of operators in an utterance is ultimately a pragmatic matter, we will abstract away from this decision process here. An example of this abeyance strategy is given for (52) in (53), ignoring focus:

(52) Only Mary invited John.

(53) a. P(*m*)
b. λx[*invite*(*m*,x)](Y)
c. *only* (*invite*(*m*,*j*))

We follow S&W in taking these meaning hypotheses to be associated with assumption schemas, that is, schematic representations of the content of the proposition being expressed. We will not go into the details of S&W's discussion of how the form of an utterance such as (49) above should lead the audience through a series of correct hypotheses in the normal course of events. The reader is referred to the text. Needless to say, this process is guided by relevance considerations.

An interesting point raised by S&W, however, concerns the status of these hypotheses. Basically each hypothesis determines a set of possible propositions and each successive hypothesis builds on the previous one by narrowing down that set. Since the sets so determined correspond to those associated with the corresponding question and assuming the speaker is doing her job right, each hypothesis will raise a *relevant* question which the next hypothesis will at least partially answer. For (51a. and b.), these would correspond to 'What about Mary?' and 'Who did Mary invite?'. If this is the only role that these hypotheses play, they are called background hypotheses, or background assumption schemas. However, sometimes these hypotheses may be relevant in their own right. For example, the information that Mary invited someone might, in some situation, give rise to adequate effects. Such assumptions are called foreground assumption schemas. It is cases such as these which lead to the judgement that focus takes 'wider scope'. That is, where an anticipatory hypothesis such as (51b.) is a foreground hypothesis, the VP is judged to contain 'new information'. Such judgements, on this account, are epiphenomenal and the need to invoke functional notions in a theory of focus is seen as redundant. Of course, a hypothesis which is a foreground assumption will also play a role as a background assumption for the next hypothesis in the series.

Focus actively intervenes in this process by imposing a condition on the construction of these hypotheses. This can best be demonstrated by example. The set of hypotheses for (54) and (56) are given in (55) and (57) respectively:

(54) Mary INVITED John

(55) a. P(*m*)
b. R(*m*,*j*)
c. *invite*(*m*,*j*)

(56) MARY invited John

(57) a. λx[*invite*(x,*j*)](T)
b. *invite*(*m*,*j*)

On encountering the focused element, the hearer is instructed to construct the last anticipatory hypothesis by inserting a variable in the place of this element in the ultimate form of the proposition being expressed. This means that what was referred to as the alternative representation in Section 2 corresponds to the last assumption schema in the

series. Though it is clear from this account that each anticipatory assumption must be used in the processing of the utterance, we can take it that earlier hypotheses tend to play very much a background role. In any case, the alternative representation must be utilised, and the arguments from Section 2 carry over to this analysis.

This more elaborate analysis raises quite a few questions. Many are more apparent than real, but space considerations will limit me to two of the more important ones. The first has to do with the presentational/contrastive distinction. The second concerns the status of material which follows focal stress.

It is clear that an utterance with focal stress on the final element will give rise to a set of anticipatory hypotheses identical to that given for (49) above. In fact, there is no reason to assume that in so-called presentational sentences, with a 'neutral' stress pattern, the nature of focus is any different. Given the discussion in Section 2, it would not be difficult to argue that intuitions about the difference between contrastive and presentational use have more to do with context than anything else.

Still, there is an intuition that at least non-sentence-final stress is often, in some sense, contrastive. This intuition arises because, under this analysis, focus imposes a processing condition on post-nuclear (PN) material. If we look again at the set of hypotheses determined by focus on the verb in (54), we can see that, in general, focus can usually only be reasonably used if the PN material is in some sense predictable. To be more precise, the use of focus would raise the expectation that the PN material is predictable. We need to clarify the notion of predictability.

Let us look at (54) again in more detail:

(54) Mary INVITED John

(55) a. P(*m*)
b. R(*m*,*j*)
c. *invite*(*m*,*j*)

Consider the first hypothesis, (55a). Let us assume that the tentative reference assignment to 'Mary' made in this hypothesis is correct. The hypothesis then determines a space of possibilities for the proposition being expressed. Given standard relevance-theoretic assumptions concerning least effort, we can assume that this space is structured by the relative accessibility of information which may be used to process the utterance. Information that we have about Mary will obviously figure prominently as will information from the previous discourse and so on. Let us call the last hypothesis

constructed before the one which is triggered by focus, the *penultimate assumption schema*. In this example, the penultimate assumption schema is (55a). Then, other things being equal, we could say that the proposition which is ultimately expressed will answer a relevant question accessible in a space determined by the penultimate hypothesis. So, in the normal course of events, if the speaker has done her job right, a question like 'What about Mary and John?' will be accessible in a space determined by the penultimate hypothesis.

We can say a little more about the nature of this accessibility space by considering the accommodation example discussed briefly in the last section:

(58) John called Mary a Republican and then MARY insulted JOHN.

Although this example has something of a rhetorical flavour, we can see that the second part of the utterance is meant to be processed in a context containing information that calling someone a Republican is an insult. This is in many ways reminiscent of the phenomenon of bridging cross-reference associated with definite descriptions:

(59) I am doing a course in Linguistics. The lectures are pretty boring.

Let us assume that the use of a definite description raises an expectation that its antecedent would have been predictable from the preceding material. This means that, other things being equal, the audience can expect to locate an antecedent for the description within what we will call the bridging space, or B-space. An antecedent is accessible in a B-space iff it is accessible in a P-space (for pronoun space) or it can be introduced via mutually manifest encyclopedic information associated with material in the P-space. The P-space, in turn, is a very local accessibility space which typically includes material introduced overtly into the discourse and other very salient referents. The notion of mutual manifestness is to be understood in terms discussed in S&W (1986 ch 1).

As far as I can tell, this B-space is involved in the processing of focus. That is, in the normal course of events, the proposition expressed will answer a relevant question accessible in the B-space of the penultimate hypothesis. Consequently, the use of focus will raise the expectation that this is the case. These considerations lead to the following processing generalisation:

(60) **Predictability**: Other things equal, PN material will be predictable in the context, where material is predictable iff it is accessible in the B-space of the penultimate hypothesis.

This condition will be invoked to account for certain facts concerning misplaced focus judgements below. For now, we might note that this processing analysis of focus goes a long way toward accounting for the kind of data which traditionally makes the analysis of focus in functional terms so difficult. Consider the following example adapted from Selkirk (1984):

(61) (Scenario: Mary has been commissioned to write a book. John asks Bill how it is going)
Bill: Well, she has sent an OUTLINE to the publisher.

The judgement here is that in Bill's response, the VP is the new information and, in a functional theory, it would carry the focus feature. The problem this kind of example poses has to do with determining an algorithm which relates focal stress to the syntactic feature. Selkirk proposes a system of embedded focus features. That is, the stressed element is annotated with the feature F and any node dominating it can be annotated with this feature. So the structure in (62) is consistent with this algorithm and with functional judgements:

(62) She has $[_{VP}$sent [an [outline]$_F]_F$ to the publisher$]_F$.

In the system proposed here, there is only one focus element, i.e. the lexical item which carries the feature interpreted at PF and LF, as indicated above[16]. The hypothesis set for (61) would be something like (63), where we ignore scope considerations and abeyance, and simplify by taking 'the publisher' to be denoted by **p**:

[16]That is, I cannot see any need for a process of percolation of the F-feature up to higher nodes. Though I am only discussing here focus in English, one could imagine that if this F-feature were involved in syntactic movement, one might assume some kind of relation between a focused element and a focus phrase, as with Wh- features, elements and phrases.

(63) a. P(*m*)
b. λxy[*sent_to*(*m*,x,y)](X)(Y)
c. ∃x[λy[*sent_to*(*m*,x,y) ∧ P(x)](Y)]
d. ∃x[*sent_to*(*m*,x,*p*) ∧ P(x)]
e. ∃x[*sent_to*(*m*,x,*p*) ∧ *outline*(x)]

The fact that the VP is judged to be focused in the sense of 'new information' is accounted for as above. That is, in this situation, the possibility that Mary has sent something to someone would be relevant in its own right. So (63b) would be a foreground assumption schema. We can assume that the proposition expressed achieves relevance by answering the question 'what did Mary send to the publisher' set up by (63d). And it is not difficult to see that, in a situation where Mary's being commissioned to write a book is being discussed, this question will be accessible in the B-space of hypothesis (63b). Though (63b) is the ante-penultimate hypothesis, whatever is predictable given this assumption schema is a fortiori predictable from the penultimate schema, (63c). So Predictability accounts for the judgements which systems such as Selkirk's trades on in order for her algorithm to work. That is, that a non-focused constituent which is c-commanded by a node annotated with F is 'given information'. The advantage of this non-functional treatment is that it makes predictions about the counter-examples to Selkirk's system. A counter-example would arise when PN material within the focus is not, by any stretch of the imagination, 'given'. These will be discussed in the context of a review of Reinhart's interface strategy alternative to Selkirk, which we will take up after a brief discussion of acceptability judgements.

4 Acceptable use of pro-active elements

I mentioned in Section 2 that judgements about pragmatic acceptability are most often connected in relevance-theoretic terms to the fact that the audience is put to gratuitous processing effort. There are two sources of unacceptability when it comes to focus. The first was dealt with above. This is when the alternative representation determined by focus does not play a contextual role in processing the utterance; hence the audience is put to gratuitous effort in constructing such a schema. The relevant example is repeated here:

(64) A: What did Mary do to John?
B: She kissed JOHN.

In the next section, I will show that the other source of unacceptability associated with focus involves Predictability. To give some background for this account, I will briefly discuss how accessibility indicators in general bring about judgements of infelicity.

By using the term 'accessibility indicators' I am endorsing the view that the use of NP-types in some way indicate the relative salience of their antecedents or 'referents'. So, for example, it is commonly observed that using a pronoun indicates that its referent is very salient, while using a definite NP indicates that its referent may not be so salient and so on. Needless to say, the details of such generalisations are not easy to establish. Ariel (1990), using relevance-theoretic assumptions, gives a fairly comprehensive account in terms of relative accessibility. Though one hopes that ultimately a theory can be developed which will explain how a certain NP-type comes to indicate accessibility, I will simply assume here that at least two of them do. These are pronouns and definite descriptions. I will set out briefly here an accessibility theory which differs from Ariel's in the following ways: I will assume that these NP types are pro-active in determining an antecedent. However, they are pro-active in different ways. I will also assume only two accessibility spaces, P-spaces and B-spaces, as defined above.

On my simple accessibility theory, the use of a pronoun instructs the hearer to search for its antecedent (or referent) in the P-space of the preceding material in the discourse. For the sake of the argument, I will assume that this instruction has the effect of a rule, i.e. it is inviolable. The use of a definite description, by contrast, merely raises an expectation in the audience that they will be able to locate an antecedent (or referent) in the B-space of the preceding material in the discourse, i.e. it is predictable. So there is a difference in the character of these pro-active elements in that the condition imposed by predictability is violable so long as there are extra effects.

Judgements of unacceptability for these NP-types, I claim, usually arise when the audience is instructed or encouraged to fruitlessly search some space for an antecedent. The standard example of misuse of pronouns is given in (65):

(65) John had ten marbles. He dropped them. He found nine of them.
It was under the sofa.

The antecedent of the pronoun 'it' is accessible here in the B-space of the preceding material. That is, an antecedent could be introduced by a train of inference from mutually manifest information (mostly associated with what we know about dropping things and finding things). However, it is not accessible in the P-space. Having been instructed to look somewhere in vain and then having to revise our processing strategy, we have been

put to gratuitous effort in arriving at the interpretation. Hence the utterance is judged unacceptable.

The use of a definite description almost never leads to judgements of unacceptability. This is understandable given the nature of B-spaces and the facts of bridging cross-reference. However, one can get judgements of differing acceptability when the crucial information to be used for introducing an antecedent into the context is not mutually manifest. Compare (66) with (67):

(66) Just then, a colonel stumbled in. The officer had been stabbed.

(67) Just then, an officer stumbled in. The colonel had been stabbed.

In (67), it is not mutually manifest, at the end of the first sentence, that the officer who stumbled in is a colonel. Under these circumstances, coreference between the definite description in the second sentence and the indefinite description in the first sentence can only be established via a rhetorical use of the description. That is, the expectation of predictability is violated but this is offset by the extra effects attendant upon the background implicature that the officer who stumbled in was a colonel (cf (66) and (58) above). Of course, the free use of definites in narratives to introduce referents is quite common. But it constitutes a rhetorical use of such descriptions. That is, their violation of Predicability is offset by extra effects — albeit weak ones, in the technical sense of RT. Notice also that we predict that pronouns cannot be used in this rhetorical way: the effort wasted in fruitlessly searching the P-space will not be offset by extra effects.

We will see some clear cut violations of Predictability in the next section, where focus is involved and no ready source of background implicatures is available.

5 Interface strategies

I will turn now briefly to the theory of focus sketched in Reinhart (1995). Her analysis, on the surface, might seem similar to mine, since it involves interface strategies and some kind of economy condition applying at the interface. However, on closer inspection, the two accounts have very little in common. The fundamental difference is that Reinhart makes no serious use of pragmatics in her account. She appeals to a notion of global economy which seems to be linked to some kind of discourse grammar. Consequently, this interface strategy approach, when applied to focus or any other issue[17], comes at a

very high price: it crucially involves comparing interpretations. From the cognitive point of view, this move should be avoided at all costs. This kind of conceptual objection is presumably all too evident to those who contemplate applying such a theory, and it could be reasonably ignored if the system works and there is nothing else around that does. The purpose of this section is to demonstrate that Reinhart's system does not work in the case of focus and that the system being outlined in this paper does.

The relevant chapter of Reinhart (1995) is entitled Focus: The PF interface. Much of it is concerned with analyses of movement in Dutch and German, eg in Diesing (1992) and De Hoop (1992). This is only indirectly related to the treatment of focus and I will concentrate on focus here.

Reinhart aims to revive some notion of markedness for focal stress. She draws on recent work by Cinque (1993) which advocates a neutral stress rule (NSR). The idea is that focal stress placement in a way not determined by the NSR is marked. Just what this assumption buys depends on one's theory of focus and what one is trying to do. For example, it is generally held that what you do not get from a notion of markedness is a straightforward distinction between presentational and contrastive focus. That is, given the functional notion of focus used in most theories of the relation between stress and focus, marked stress placement does not always involve 'narrow focus'. The example taken from Selkirk (repeated in (68)) is an illustration.

(68) (Scenario: Mary has been commissioned to write a book. John asks Bill how it is going)
Bill: Well, she has sent an OUTLINE to the publisher.

The analysis is repeated in (69):

(69) She has $[_{VP}$sent [an [outline]$_F]_F$ to the publisher$]_F$

Nevertheless, Reinhart sets out a markedness theory of the relation between stress and focus which, though sketchy, uncovers some interesting facts that an interface approach should be able to deal with.

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[17]See inter alia Reinhart (1995) and Fox (1995) for a treatment of scope along these lines. It seems to me that the data analysed in Fox could be dealt with using the process oriented approach set out in this paper. That is, assuming that we have canonical types for object quantifiers and assuming that the parallelism constraint on ellipsis is semantic, we could account for the judgements concerned.

Firstly the issues raised by examples such as (68) are dealt with simply by assuming that the indirect object is not a member of the set of focused constituents. The justification is that, in such cases, the relevant material is d-linked ('given') or 'light' (i.e. predictable). Like most theories of this aspect of focus, Reinhart makes crucial use of intuitions about appropriateness of focus to a context without referring to an explicit theory of focus interpretation in which these intuitions can be explained. Recall that appropriateness to a context was shown in Section 2 to be a pragmatic matter. So one would expect the focus set that this theory defines to link up with a pragmatic theory at some point. Troubling though this issue is, it is a general issue for all such theories and so I will not dwell on it any longer. Instead, I will cite the definition of the focus set given in the text and move on to the interface strategies.

(70) Focus Set:
The focus set of IP contains any sequence of constituents of IP, which includes the main stress of IP. (Reinhart's (65) p 26)

That is, the only constraint on the relation between focus and stress is that the stressed constituent is included in the set. In (68) above, the indirect object would not be taken to be included in the set.

As far as the grammar is concerned, focal stress is always determined by the neutral stress rule. Here, we can take this to mean that stress, as determined by the NSR, falls on the most embedded constituent. However, a marked operation can apply which simply relocates stress. From the point of view of global economy, this makes the derivation less economical. Then, following the general pattern of argument in the interface strategy approach, we have the following generalisation:

(71) Stress placement which is not determined by NSR is marked, and therefore would violate economy unless it achieves an interface goal not achievable by stress determined by NSR.

What this means for the examples we will be considering is that a marked stress placement will be judged ungrammatical unless the most deeply embedded constituent is not a member of the focus set. To show how this system works, we will consider in some detail the kind of example which is meant to demonstrate the benefit of interface strategies. In (72), three elements have been annotated, A, B, and C. These are the

potential sources of contrast in the range of discourse continuations which we will consider.

(72) I heard Mary wanted$_A$ to kiss$_B$ Bill$_C$

From the point of view of this interface strategy approach, contrasting one of these elements in the continuation is not very interesting. In (73), we contrast A and consider our judgements about different stress placements:

(73) a. Actually, she was PAID to kiss Bill
b. # Actually, she was paid to KISS Bill
c. # Actually, she was paid to kiss BILL

In (73a), marked stress on A is used, but we assume that this achieves an interface goal that stress determined by the NSR (i.e. on C) could not achieve: it is the only way to obtain an LF with element A in focus alone, given the definition of the focus set. Notice that we again have to assume that some theory can be supplied to tell us why the stress placement in (73a) achieves an interface goal that neutral stress placement does not achieve. That theory must also be able to account for judgements of unacceptability due to inappropriate use of focus in a context. This is so because in (73c) the NSR is observed, so there is no question of an interface economy violation. We need to be able to say why any focus set determined by this stress placement would be judged unacceptable in the context. Of course, in the pro-active analysis presented in this paper, we have an account of why stress placement in (73a) leads to the contrastive interpretation. We also have an account of why the misplaced stress in (73b) and (73c) yields the judgements indicated: because they put the audience to gratuitous effort in processing the utterance.

We can vary this example slightly if we contrast two of the elements (A, B, C) in the continuation, but use only a single focal stress placement. This variation highlights some interesting facts. It may appear, at first, that Reinhart's system goes some way toward accounting for them. However, if we look closely we see that there is a generalisation to be made about this interface phenomenon. The condition of Predictability captures this generalisation, but Reinhart's system does not.

In the following examples, I consider all the possible ways of contrasting two of the elements with a single focal stress placement. (Note that the readings are generally robust if the intonation is strong and we do not allow any secondary focus).

(74) I heard Mary wanted$_A$ to kiss$_B$ Bill$_C$

(75) A,B a. # Actually, she was PAID to punch Bill ←
b. Actually, she was paid to PUNCH Bill
c. # Actually, she was paid to punch BILL

(76) A,C a. # Actually, she was PAID to kiss Max ←
b. # Actually, she was paid to KISS Max
c. Actually, she was paid to kiss MAX

(77) B,C a. # Actually, she WANTED to punch Max
b. # Actually, she wanted to PUNCH Max ←
c. Actually, she wanted to punch MAX

There is one unacceptable example in each set which can be handled by an account along the lines of that given for the misplaced focus in (64) above. These are (75c), (76b) and (77a). There is also one unacceptable example in each set (indicated by the arrow ← to the right) which cannot be ruled out on the misplaced focus account. Let us see how Reinhart's system deals with these.

Consider the set in (76), where the elements A and C are being contrasted. Here we would have to assume that the interface goal is achieved by a focus set which includes elements A and C but excludes B. Given the definition of the focus set, we could achieve this goal by placing stress anywhere except on B. So we have two real options, stress on A or stress on C. Stress on A is marked, and since there is an unmarked option, it is ruled out by economy. So Reinhart's system seems to work in this case. A similar account would work for (77).

However, there is a problem with (75), where A and B are being contrasted. Here, any stress placement except on C would give us the required focus set. And given interface considerations, stress on either A or B, though marked, should be acceptable, since either would achieve an interface goal that unmarked stress would not. However, (75a) is judged bad. So this system makes the wrong predictions.

Reinhart acknowledges this problem. The obvious solution is to tighten up the definition of the focus set to exclude any sequence of the tree except what is c-commanded by the focally stressed constituent. But this, by her own admission, does not work in other examples. Consider (78), an example due to Schmerling, where the whole sentence is meant to be in focus:

(78) NIXON died

If the definition of the focus set were to stipulate that material in the c-command domain of the stressed constituent is excluded, then we could not account for the intuition that the whole sentence is focused. Notice that if we say that, in this case, the VP does not need to be included in the focus set, we simply raise the question why, in (75a) above, the element B has to be in the focus set.

Rather than pursue this line of analysis with yet more ad hoc stipulations, let us take stock and review the whole paradigm again. Recall that the interesting cases are those which are judged unacceptable and yet cannot be ruled out as simply inappropriate to the context, indicated by ←. If we look closely at these examples, a striking generalisation emerges. This is stated in (79):

(79) Contrasting n elements with only one strong prosodic prominence is acceptable only if prominence falls on the last contrasted element in the linear order of the utterance.

We can see that this is the correct generalisation by considering the case where n = 3:

(80) I heard Mary wanted$_A$ to give$_B$ a diamond$_C$ to the contessa$_D$.

(81) # Actually, she was PAID to steal a painting from the contessa
Actually, she was paid to STEAL a painting from the contessa
Actually, she was paid to steal a PAINTING from the contessa

We can also see that it is the linear order by considering (82):

(82) I heard Mary persuaded the man in the blue suit to leave.

(83) # Actually, she persuaded the man in the PINK suit to stay.

(84) Actually, she persuaded the man in the pink suit to STAY.

If Reinhart's interface strategy approach is to be of any real value, it should be able to account for the ← examples. Not only does it make the wrong predictions for one of these,

but it seems that there is no way that the quite obvious generalisation relating these examples could be captured.

We can see how Predictability accounts for this generalisation by returning to (75a) and (75b). If we take the acceptable example (75b) first, we can represent the penultimate and ultimate assumption schema as in (85)

(85) ∃x[*paid*(x,*m*,(P(*m*)))]
∃x[*paid*(x,*m*,(R(*m*,*b*)))]

The question raised by the ultimate schema (*What was Mary paid to do to Bill?*), would be, in the context, predictable on the basis of the penultimate schema. For the bad example, (75a), we have the schemas in (86):

(86) ∃x[R(x,*m*)]
∃x[U(x,*m*,(*punch*(*m*,*b*)))]

Here the relevant question is something like, 'What was Mary's motivation/attitude to punching Bill?'. And this, it seems, would not be accessible in the B-space of the penultimate schema, since, in the context, it is not mutually manifest that Mary might have some motivation/attitude to punching anyone. The condition of Predictability raises an expectation to the contrary. On the basis of this expectation, the B-space would be fruitlessly searched. Thus, we have been put to gratuitous processing effort and judge the utterance to be unacceptable.

The generalisation in (79) follows from such considerations. In a case where n elements are being contrasted, focus on any contrasted element except the last one will raise a relevant question which is not predictable from the penultimate schema; hence the audience will be put to gratuitous effort and the utterance will be judged to be bad.

Of course, as predictability is a cognitive matter, we expect to find the kind of exceptions noted in the rhetorical use of definites discussed above. We will consider a variation on (28) Section 2:

(87) A: Who did Mary kiss?
B: (?) Well, she KISSED Bill.

As noted previously, the acceptability of examples like these depends on the extent to which we can see further effects following from the use of focus. Let us for the moment

assume that we can see an implicature here along the lines of, 'but her kissing him does not mean what you might think'. Without going into the details of this kind of denial-of-expectation use of focus, it is not difficult to see that some contextual assumptions of the form *Mary R-ed Bill* would be utilised (eg *Mary was attracted to Bill*) and that they would have been accessible in the B-space of the penultimate hypothesis. Needless to say, non-pragmatic approaches cannot deal with these facts.

So it seems that, though there are some interesting interface facts related to the placement of focus, Reinhart's approach falls some way short of dealing with them. By contrast, my pro-active analysis of focus more than adequately deals with these facts. This is a satisfactory result since it means that we do not need to burden ourselves with the kind of undesirable assumptions used in Reinhart's system.

6 Conclusion

Let me sum up what I think I have shown. With regard to the interpretation of focus, I set up a division of labour between the tasks of semantic and pragmatic theory on the basis of Rooth's minimal theory of focus. The facts left to pragmatics were dealt with by the pro-active analysis. Moreover, I suggested that Rooth's interface condition also stemmed from pragmatic principles. This leaves the semantics for focus very minimal: it is just the semantics of the anticipatory hypotheses constructed at the interface.

On the side of syntax, I hope to have shown that we can also have a very minimal account of focus. Focus features are freely added to lexical items. These features are interpreted at LF as an instruction to manipulate the set of anticipatory hypotheses, and at PF as determining focal stress.

I have endorsed S&W's arguments against functional conceptions of focus and have extended them by developing the notion of Predictability. This has also enabled me to deal with certain interface effects of focus.

Limitations of space have prevented me from presenting an account of multiple focus here. However, using S&W's system, I show in Breheny (1996) that it is possible to get an interesting analysis of multiple focus which preserves Rooth's original non-movement theory in the face of evidence to the contrary.

The main drawback of this approach is that it is tied very closely to the treatment of focus in English. How one deals with cross-linguistic variation is a problem for the more elaborated version of the theory presented in Section 3. However, I believe that this

problem is not as severe as might first appear. We can, if necessary, allow for variation both in the kind of processing strategies assumed here and in the kind of instruction which focus provides to these strategies. In this way we could deal with the problems posed by OV languages such as German and Dutch, where 'neutral' stress falls on the object.

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