

The Context Change Potential of Questions and their Foci¹

Minpyo Hong

Myong Ji University

Hong, Minpyo. 1997. **The Context Change Potential of Questions and their Foci.** *Language and Information*. The semantic and pragmatic effect of interrogative illocutionary operator is analyzed in a dynamic setting in the framework of structured meaning representation with respect to the dialogue participants' shared common ground. I propose a framework for an optimal interpretation of focus phrases in interrogatives in such a setting, and show that the free focus in interrogatives share the essential properties of focus in general, namely that they introduce alternatives to be taken advantage of by relevant focus-sensitive operators. The theory makes an interesting prediction on the distribution and interpretation of double questions in which one question gets modified by another. A further extension of the theory is spelled out to account for other non-assertional illocutionary operators like imperatives and their foci.

0. Introduction

Focus phrases can be divided into two major categories depending on the presence or absence of their associated operator within the sentence. When associated with an overt focus-sensitive operator such as *only*, or *even*, as in *John only introduced MARY to Sue*, they are grouped into "bound focus."

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On the other hand, when a focused constituent appears in a sentence that does not contain any such overt focus operators, e.g., *John introduced MARY to Sue*, it remains free within the sentence, and is called "free focus." Those apparently unassociated foci can be found not only in a declarative sentence but also in non-declaratives. That is, we find focus assigned not only to a constituent of a declarative sentence but also to a constituent of an interrogative or even an imperative sentence, without necessarily being associated with any overt focus-sensitive operators, as in *Did John introduce MARY to Sue? Who invited BILL tonight? Read an article by CHOMSKY!*²

This paper is an attempt to account for the semantic and pragmatic effect of free focus in questions. I propose to analyze those free foci in interrogative sentences as not being free, but as being bound by an erotetic illocutionary operator, e.g., INTERROGATION, whose semantic and pragmatic contribution is captured in terms of its context change potential. This is basically an extension of Jacobs' (1984) analysis of focus in natural language, namely that there is a one-to-one correspondence between focus and its operator.³ I go further to characterize the context change potential of questions by defining the INTERR operator as being sensitive to the alternatives introduced by free focus.⁴ A sketch of a relatively informal

²Strings in capital letters indicate that they are focused, usually carrying the phonological prominence on the string.

³Krifka (1991), following Jacobs (1984), proposed to analyze free focus in a declarative sentence as being bound by the illocutionary operator ASSERTION. See section 2 below for further details of their account.

⁴Notice that when there are focus sensitive operators within the interrogative sentence, they will bind the relevant focus. So, the issue reduces down to the analysis of those foci that are not associated with a relevant focus operator, which we call 'free focus.'

analysis of imperative sentences containing free foci will also be presented.

In section 1, I begin with an overview of previous analyses of free focus in interrogatives proposed by Kiefer (1980) and von Stechow (1989), and present some of the problems they have. In section 2, I introduce Jacobs' (1984, 1991) and Krifka's (1991) analysis of free focus in declarative sentences, who argue that the seemingly unassociated focus in a declarative sentence is actually bound by the illocutionary operator, ASSERT(ion). I extend the idea of Jacobs and Krifka to account for the semantic and pragmatic contribution of focus within a question sentence. In addition, I propose to interpret an interrogative sentence with respect to a common ground within a dynamic setting, which has an interesting implication concerning the pragmatics of double questions where a question gets modified by another. I go further to analyze free focus in imperative sentences in the same vein as in section 2. In the last section, I conclude the paper, summarizing the main points and proposing a more general interpretation rule for free focus in non-declaratives.

1. Previous Analyses of Free Focus in Questions

1.1 Wh-Analysis based on Answer Patterns

Some interesting observations are made in Kiefer (1980) concerning what we here call free focus in yes-no questions. One of his claims is that focused yes-no questions should be interpreted as wh-questions. For example, a question like *Is John leaving for Stockholm TOMORROW?* is interpreted as *When is John leaving for Stockholm?* in his analysis. His claim is based on the observation that a simple "no" is not appropriate as an

answer to these questions when the answer turns out to be in the negative. He argues that a negative answer "No" to such a focused question should be followed by a further specification of time, place, or person, which is a typical answer to a wh-question. For example, an appropriate negative answer to *Is John leaving for Stockholm TOMORROW?* should be an answer like *No, the day after tomorrow*, whereas a blunt "no" would seem inappropriate. When the answer is in the affirmative, a simple "yes" will be enough. Thus, the argument goes, when a question is to be answered with a further specification of such additional information, it deserves to be analyzed as a constituent/wh-question. In short, the answerability condition is playing a crucial role in his analysis of focused yes-no questions.

Kiefer's examples, however, do not always fall under the wh-interpretation. We need to look at their specific context of utterance. It seems that the focused yes-no question of the sort discussed above are usually asked by a speaker when there are other alternatives to the focused constituents such that among those alternatives, the question with the focused constituent is the most interesting (or at least, the most relevant) one to the questioner. In other words, the questioner is most curious about the answer to the question involving the focused constituent, as compared to questions involving other salient alternatives to that constituent. For example, *Is JOHN leaving for Stockholm tomorrow?* seems most likely to be asked in a situation in which the questioner somehow overheard the rumor that several of his/her friends, one of whom is the person named *John*, might leave for Stockholm tomorrow and he/she wants to find out whether John is the person who is going to leave. So, the speaker might have asked other similar questions concerning his

friends' plans, e.g., *In SIMON leaving for Stockholm tomorrow?*, but among others the speaker wants to know whether or not it is John who is leaving for Stockholm. The questioner's main interest is in John, not in others.⁵

In addition to such conceptual considerations, I have a very simple piece of evidence against the wh-interpretation of focused questions. If a focused yes-no question is indeed "interpreted" as a wh-question, the question word of which is "uniquely determined by the focused constituent of the yes-no question" (Kiefer 1980: 102), then it should not even be possible to answer such questions with a simple "yes" or "no." This is because wh-questions cannot be answered by 'yes' or 'no' in general, as we see in the following:

- (1) Q: Who came to the party?
A: *Yes. / *No.

It is obvious, however, that we do answer the focused yes-no questions with 'yes' or 'no.' Furthermore, 'yes' or 'no' seems to be an indispensable part of the answer to those questions. For example, *Is John leaving for Stockholm TOMORROW?* cannot be answered simply by "On Tuesday," in contrast to its

⁵Groenendijk & Stokhof (1984) briefly mention the focused yes-no questions, who basically share the same judgement as, but slightly differ from, mine. They argue that a question like *Does JOHN walk?* should be analyzed as "a simple yes/no interrogative," and that the emphatic stress is "an indication that at the background, so to speak, i.e., behind the question that is actually, or literally, posed, there is another question at stake, being the (constituent) question *Who is the one that walks*" (421-424) Note, however, that this view will run into difficulties when part of a wh-question is focused, as in *Who stole JOHN's car?* This is because they argue that focused yes-no questions are used in place of wh-questions. One may wonder what would be the background question for a focused wh-question. See section 3 for further discussions.

wh-counterpart *When is John leaving for Stockholm?* which can be answered by such a simple phrase. Or *Is JOHN leaving for Stockholm tomorrow?* cannot be answered simply by "Mary," in contrast to *Who is leaving for Stockholm tomorrow?* Such an observation seems to imply that the focused yes-no questions are indeed yes-no questions, and not wh-questions, contra Kiefer (1980). One cannot identify a yes-no question with a wh-question simply because it requires the type of answer typical of a wh-question. There might be other reasons, which I think are more or less pragmatically motivated.

In a typical question-answer situation, both speakers obey the maxim of quantity and are cooperative, trying to provide as much relevant information as possible. On the questioner's side, s/he wants to elicit as much information as possible from the addressee, and has basically two options. The first is asking a very broad question, in which case a negative answer will provide her/him with a great deal of information about the issue being questioned, but an affirmative answer will give little information. The second strategy is asking a very specific question, where an affirmative answer will give a good amount of information, but a negative answer in such a situation will give little information for the questioner. Krifka's (1992) metaphor of card deck will better illustrate the point. Suppose that your friend picks up one card from a deck of cards and you are supposed to make a correct guess by asking as few questions as possible to the card holder. In such a situation, if you ask *Is it a diamond?*, which is rather broad compared to *Is it a seven of spades?*, the questioner will obtain a lot of information concerning the identity of the card when it is answered in the negative. Now, compare it with the negative answer to a more specific question *Is it a*

seven of spades?, which still leaves a lot for the questioner to get to the correct guess.

What is going on in Kiefer's (1980) examples seems somewhat related to such mechanics of questions and answers, plus the cooperative principle governing the human dialogue in general. The questioner already knows a lot about John's future plan or at least has overheard something about it, and addresses the question, *Is John leaving for Stockholm TOMORROW?*, which is a very specific one. When the answer is in the affirmative, it provides the questioner with a great deal of information. If, on the other hand, the answer is in the negative, the questioner has got almost nothing. And this is the point where the cooperative principle comes into play. When a specification of further information follows "No", the answerer is showing that s/he abides by the cooperative principle by adding extra information that would make the questioner more satisfied, in which case one might say that the answer is somewhat over-informative. That's why focused yes-no questions can be answered with a blunt "yes" when in the affirmative, whereas we do not feel that a blunt "no" is a good answer to them. Thus, we can say that Kiefer's examples of focused yes-no questions are indeed yes-no questions, not wh-questions.

1.2 Focus is Ignored in Questions: von Stechow (1989)

Even though he does not mention Kiefer (1980) explicitly in his paper, von Stechow (1989) holds a view which goes totally in the opposite direction to Kiefer, claiming that "the focus is ignored under the interrogative operator." (p. 20) His examples are the following:

- (2) a. Has EDE arrived?
 b. Whom did MAX invite?

The inevitability of such a claim seems to result from his own theory-internal reasons. He views the interrogative operator as a kind of focus-sensitive operator, which applies to the background alternative values of a sentence. Thus, a simple yes-no question without any focus as in (3a) will determine the alternative propositions in (3b):

- (3) a. Has Ede arrived?
 b. $\lambda p [p=\underline{\text{has-arrived}}(\text{Ede}) \vee p=\neg\underline{\text{has-arrived}}(\text{Ede})]$

Notice that this set of propositions is provided without focus on *Ede*.

On the other hand, with focus on *Ede*, as in *Has EDE arrived?*, the set of alternatives will be exactly the same as that of the corresponding wh-question, *Who has arrived?* That is, $\{\text{has-arrived}(x): x \in U\}$ will be the meaning of *Has EDE arrived?* in his analysis. The same holds for a wh-question containing a focused constituent as in (2b). This question will also introduce the set of propositions of the following type, since it has two foci, one from the inherent focus of the wh-phrase and the other from the free focus on *Max*:

- (4) $\{\underline{\text{invited}}(x,y): x,y \in U\}$

This is clearly not the right kind of alternative values for the single wh-question in (2b). Rather, this would be the alternative set for interrogatives with two wh-words, like *Who invited*

whom? So, von Stechow needed to distinguish the two cases from each other, and for that purpose he proposes a new analysis of the interrogative operator.

His formulation of the question operator interpretation rule, which is originally expressed in the lambda-categorial language representation, can be informally paraphrased as follows: (c.f., von Stechow 1989: 21, 37)⁶

- (5) An interrogative sentence $?\Phi$ is true at a world w if and only if every proposition in the set of alternative values of Φ *which entails the content value of Φ* is asked in w .

What is crucial to him is the italicized phrase in the above interpretation, which requires, so to speak, that the propositions that are to bear any semantic significance in the meaning representation of an interrogative should entail the literal meaning of its corresponding declarative sentence. Now, the alternative values for the interrogative operator in (2a) are restricted to the set of propositions in (3b), since other propositions would not entail *has-arrived(Ede)*. Similarly, the set of propositions for the wh-question (2b) contains just those alternatives that would actually entail the proposition that Max invited someone. (Note that he treats the wh-phrases as indefinites.)

Such a formulation of the question interpretation can block (2a) and (2b) from being interpreted as a single wh-question and a multiple wh-question, respectively, but with a price: his formulation has lost the significant information of the focus

⁶Notice that von Stechow's notion of interrogative operator is somewhat different from mine. To him, the interrogative operator ("?" in front of the sentence radical) is a combination of what I call the illocutionary operator plus the Q-morpheme in Baker's (1970) sense.

feature on *Ede* and *Max*. Consequently, (2a) which contains a focused phrase is not different at all from a plain question (3a). Similarly, (2b) is interpreted as if it carries the same meaning as the non-focused question *Whom did Max invite?* This result is not welcomed since we have a clear intuition that the two types of questions are different in meaning and thus are used in different contexts. We will propose a new analysis in the following section, in which the focus feature is not ignored, but contributes significantly to the meaning of the sentences that contain it.

That the free focus in question is not actually ignored but contributes significantly to the meaning of a sentence can be seen in a quantified sentence containing an indirect question under a factive predicate. Compare the following pair:

- (6) a. John always remembers who introduced Mary to Sue.
 b. John always remembers who introduced [MARY]_F to Sue.

As for sentence (6a), Berman (1991) has argued convincingly that some indirect questions embedded under factive verbs like *know*, *remember*, etc. are interpreted as open sentences due to presupposition accommodation, giving rise to the restrictor interpretation of the adverbial quantifier. Thus, according to him, (6a) has a reading, among others, in which for all persons that introduced Mary to Sue, John remembers that they introduced Mary to Sue, whose logical form would roughly be the following:

- (7) $\text{ALL}_i [x_i \text{ introduced } m \text{ to } s] [j \text{ remembers that } x_i \text{ introduced } m \text{ to } s]$

(6b) on the other hand seems to have a reading, among others, where for all persons such that they introduced someone to Sue, John remembers that they introduced Mary, but not others, to Sue, as represented in the following:

- (8) $\text{ALL}_i [x_i \text{ introduced someone to } s] [j \text{ remembers that } x_i \text{ introduced } m \text{ to } s]$

Or if we take the quantification over situations into consideration, the sentence seems to have a reading that John remembers, for every situation in which someone x_i introduced someone x_j to Sue, it holds that x_i introduced Mary to Sue, as expressed in (9) below, where s stands for the situation variable:

- (9) $\text{ALL} \{s: \exists x,y [x \text{ introduced } y \text{ to Sue in } s]\}$
 $\{s: \text{John remembers for which } x [x \text{ introd. M. to S. in } s]\}$

As generally assumed in the literature, the focused constituent ends up in the nuclear scope under adverbial quantifiers (Rooth 1985, Partee 1991). Thus, the focus on *Mary* forces its interpretation to end up within the nuclear scope, rather than in the restrictor clause. (8) means roughly that whenever John remembers who introduced someone to Sue, it is Mary that they introduced to Sue. Note that if we strictly follow von Stechow's analysis which totally ignores the focus feature within a question sentence, we would not be able to distinguish the two sentences (i.e., 6a and 6b) in their truth conditions since they would be rendered the same meaning by his interrogative operator interpretation rule, which will not count the focus feature on *Mary*. We will see below that it is not permanently ignored but just temporarily.

If we understand von Stechow's claim that free foci are "ignored" in questions, an even worse case against him might be the sentences where an overt focus operator is in the matrix clause with its associated focus is deeply embedded within an indirect question, as in the following:

- (10) John *only* wonders who introduced [_F MARY] to Sue.

Here, there is no way for the focused NP *Mary* to be interpreted as being associated with the matrix VP operator *only* under von Stechow's analysis since the focus feature on *Mary* would be ignored in the context of question operator in the complement clause. The only readings that he can predict would be those in which *only* is associated with the whole embedded question, or with the matrix VP. It seems to me, however, that the focus within the indirect question does in fact introduce alternatives just like other focused constituents and the alternatives are not used up by the question operator as von Stechow argues, but projected up to the matrix clause where they get resolved by *only*. Thus, we had better understand von Stechow's observation as claiming that the Q-morpheme is indifferent to focus information on constituents other than the wh-words. The question operator does not "use up" the free focus but projects the focus information to a higher operator.

So far, we have seen that neither Kiefer's nor von Stechow's analysis correctly predicts the meaning of free focus in interrogatives. One major problem to be solved for a correct analysis of free focus is to make the focus feature available for the focus-sensitive operator or the illocutionary operator outside of the question domain. In the next section, we will introduce

some helpful tools for an optimal account of free focus in questions.

2 Interrogatives and their Foci in Context

2.1 Focus Sensitivity of Illocutionary Operators

Krifka (1991) develops a theory that would allow a compositional derivation of background-focus structures within the structured meaning representation and proposes to treat free focus in declarative sentences as contributing to the assertion speech act. One of the crucial assumptions that he works with comes from Jacobs (1984), namely that there is a one-to-one mapping between focus operators and foci, which paves the way to treat the illocutionary operators as focus-sensitive.⁷ The one-to-one correspondence hypothesis implies that ultimately there is no free foci in a strict sense. Once a focus feature is introduced, it should be "consumed" by a relevant operator. Thus, an apparently unassociated free focus as in (11a) is analyzed as being bound by the ASSERT operator, as in (11b), which carries the illocutionary force of assertion, as opposed to interrogation or command.⁸

⁷Of course, in the case of multiple focus as in (i), one may argue that the one-to-one correspondence does not hold.

(i) John *only* introduced BILL to SUE

Note, however, there are ways out of this problem. For example, as in Krifka's (1991) analysis of multiple focus, it can be circumvented by assuming that both *BILL* and *SUE* form a list-focus. See below for the discussion of list formation.

⁸One might argue that the focal stress on *Sue* in sentence (11a) indicates that the VP is in focus. For simplicity's sake, however, I have ignored that possibility by explicitly marking the focus feature [F] on the object *Sue*, excluding the VP focus.

- (11) a. John introduced Bill to [F SUE]
 b. ASSERT($\langle \lambda T.T(\lambda x.\text{introduce}(j,b,x)), \lambda P.P(s) \rangle$)

Note that this analysis is based on his recursive rules and enlarged type system, which allow the meaning of a deeply-embedded focus to be stored in a strictly compositional way, up to the point of calculating the meaning of a higher node, where the focus meaning is used up or interpreted by a relevant operator. The relevant rules are given below: (Krifka 1991: 133)

(12) Recursive Definition of Functional Application

- a. If α is of type $(\sigma)\tau$, and β is of type σ , then $\alpha(\beta)$ is of type τ and is interpreted as functional application.
- b. If $\langle \alpha, \beta \rangle$ is of type $\langle (\sigma)(\tau)\mu, \sigma' \rangle$ and ν is of type τ , then $\langle \alpha, \beta \rangle(\nu)$ is of type $\langle (\sigma)\mu, \sigma' \rangle$, and is interpreted as $\langle \lambda X_{\sigma} . [\sigma(X)(\nu)], \beta \rangle$.
- c. If ν is of type $(\sigma)\tau$ and $\langle \alpha, \beta \rangle$ is of type $\langle (\mu)\sigma, \mu' \rangle$, then $\nu(\langle \alpha, \beta \rangle)$ is of type $\langle (\mu)\tau, \mu' \rangle$, and is interpreted as $\langle \lambda X_{\mu} \nu(\alpha(X)), \beta \rangle$.
- d. If $\langle \alpha, \beta \rangle$ is of type $\langle (\sigma)(\tau)\mu, \sigma' \rangle$ and $\langle \nu, \delta \rangle$ is of type $\langle (\nu)\tau, \nu' \rangle$, then $\langle \alpha, \beta \rangle(\langle \nu, \delta \rangle)$ is of type $\langle (\sigma \cdot \nu)\mu, \sigma' \cdot \nu' \rangle$, and is interpreted as $\langle \lambda X_{\sigma} Y_{\nu} . [\alpha(X)(\nu(Y))], \beta \cdot \delta \rangle$, where X, Y are distinct variables.

(12a) is for ordinary function application which does not involve any $\langle B, F \rangle$ structure. (12b) ensures the focus to be inherited from an operator and (12c) from an argument. (12d) takes care of multiple foci by forming a list of terms.⁹

⁹See below for further discussion on this list formation rule (12d), the application of which will be further specified.

Notice that these rules can capture one of the fundamental assumptions in focus theory; namely that focus creates the partitioning of a semantic representation of a phrase into background and foreground. This semantic partitioning is expressed in Structured Meaning analysis of focus in terms of background and focus, $\langle B, F \rangle$. Thus, when an NP 'John' is in focus, whose translation would be $\lambda P.P(j)$, the ordinary meaning translation will be stored in the focus whereas an identity function $\lambda T.T$ (where T is of type generalized quantifier) forms the background, so that the $\langle B, F \rangle$ structure of $[_F \text{John}]$ would look like $\langle \lambda T.T, \lambda P.P(j) \rangle$. In short, the rules in (12) make sure that the meaning of focus is stored until the associated operator exploits the focus however deeply it is embedded within a clause.

The assertion operator in (11) is interpreted as influencing both the propositional content of the background-focus structure and the felicity conditions of the assertion speech act, with respect to a common ground, where the common ground is the set of possible worlds that represents the shared information up to the present point of conversation.¹⁰ This means, for the sentence (11a), that the set of possible worlds where John introduced Bill to Sue is added to the common ground (the meaning proper) and in addition that

¹⁰His definition of ASSERT-operator is as follows (Krifka 1991: 129-130):

ASSERT($\langle \alpha, \beta \rangle$) maps a common ground c to a common ground c' , where c' is the intersection of c with the set of possible worlds for which $\alpha(\beta)$ is true, i.e., $c' = c \cap [[\alpha(\beta)]]$, along with the following felicity conditions.

- a. $c' \neq c$ (asserting $\alpha(\beta)$ makes difference in the common ground),
- b. $c' \neq \emptyset$ (the truth of $\alpha(\beta)$ must not be already excluded by c),
- c. There are X , with $X \neq \beta$ and $X \neq \beta$, such that $\alpha(X)$ could have been asserted with respect to c .

That is, it would have changed c , $c \cap [[\alpha(X)]] \neq c$, it would not be excluded by c , $c \cap [[\alpha(X)]] \neq \emptyset$, and would have yielded a different output context, $c \cap [[\alpha(X)]] \neq c \cap [[\alpha(\beta)]]$.

the assertion of this sentence is informative at the current point of conversation, and is not excluded previously, and that there are other persons to whom John might have introduced Bill instead. Krifka's analysis of illocutionary operators as being sensitive to focus suggests a very important methodological insight into the nature of constructions that we are dealing with, namely how to interpret the free focus in interrogative sentences.

2.2 Questions in Context

We have discussed briefly how Krifka's theory accounts for the seemingly free focus in a declarative sentence, as in fact being bound by the illocutionary operator of ASSERT(ion). In this section, we will apply the same idea to account for the examples that we have introduced in the previous section: the apparently free foci are bound by an illocutionary operator INTERR(ogation) whose interpretation gives rise to a totally new insight into the context change potential of questions in general.¹¹

2.2.1 Wh-focus and co-indexing between an operator and its focus

There is one technical problem in implementing this idea when we take into account the wide range of constructions involving wh-questions in natural language, namely that wh-phrases tend

¹¹I should emphasize that the illocutionary operator INTERROGATION is different from Baker's (1970) Q-morpheme in the sense that the former is a somewhat pragmatic notion which reflects the intention of a speaker in uttering the semantic content expressed by the "sentence radical" whereas the latter is a more or less semantic/truth-conditional notion that one may regard as part of sentence grammar.

to be focused in many languages, an observation that needs to be incorporated somewhere in our analysis.¹² Let us assume, following Hong (1995, 1996), that the *wh*-phrases are focused, and furthermore that they are associated with the Q-morpheme, which amounts to saying that we have two focus operators (namely, the illocutionary operator and the Q-morpheme) and two focus phrases (namely, the *wh*-phrase and the free focus). Thus, we need a procedure that would allow us to keep track of the meaning contribution of the free focus, suppressing the interpretation of the free focus for the time being, until the Q-morpheme gets its interpretation by being fed by the focus on a *wh*-phrase only. In short, we need a technical way of blocking the free focus from being interpreted by the Q-morpheme. The following schematic representation shows a typical interrogative structure involving a free focus:

$$(13) \quad \text{Op} \quad \dots \quad \text{Q} \quad [\dots \text{wh-F} \dots \text{X}_F \dots]$$

Now, the question here is which operator is to be associated with which focus. One simple way out is of course co-indexing along with a constraint on list formation between two foci. According to the theory of focus proposed in Krifka (1991), however, a focus operator does not need to be co-indexed with its focus because his focus interpretation rule is formulated in such a way that a focus operator binds the most comprehensive focus within its domain. In contrast, in the above configuration, it seems that we do need coindexing, contra his original suggestion, and I will

¹²See Rochemont (1986) and Svolacchia & Puglielli (1995) for such an observation, a compositional semantic account of which is proposed in Hong (1995, 1996).

assume that focus-sensitive operators are coindexed with its associated focus.

Note that such an indexing is independently motivated in an account of examples of the following kind, as first observed in Rooth (1992):

- (14) a. Farmers that GROW rice often only EAT rice.
 b. ASSERT_i Farmers that GROW_i rice often only_j [VP EAT_i rice_j].

Without indexing between the operators and their associated foci, the second focus operator *only* will be interpreted as being associated with the embedded VP since the most comprehensive focus within the domain of *only* is the VP, contrary to the intuitive reading where it is associated with *rice*. Thus, coindexing is indeed necessary in an analysis of such constructions where multiple foci appear within one sentence.

2.2.2 The Context Change Potential of Questions

In this section, I will present a definition of the erotetic illocutionary operator so that it could give us an appropriate reading of focused questions. I will work with an example sentence that illustrates the intended semantic rules, instead of giving a fragment with explicit interpretation rules. Let me start with some important background assumptions. First, as for the semantics of questions, I will assume that questions denote a set of propositions, following Hamblin (1973), which can be obtained via focus-semantic interpretation of the Q-morpheme.¹³ Note that,

¹³See below for such an interpretation of Q-morpheme, and Hong (1996) for

from previous discussions on the pragmatics of focused questions in section 1, we want the following sets of alternative "questions" (not alternative "propositions") so that the illocutionary operator INTERR would exploit them:

- (15) a. Is JOHN leaving for Stockholm tomorrow?
 a'. {*Is x leaving for Stockholm tomorrow?*: $x \in D$ }
 b. Whom did MAX invite?
 b'. {*Whom did x invite?*: $x \in D$ }

How could we get such a set of questions within the framework of focus semantics? As a general representation language for sentence interpretation, I will adopt Krifka's (1991) structured meaning representation in Gallin's (1975) Ty-2 language. Krifka's background-focus structure allows us to keep track of the meaning of focus deeply embedded within an expression until an appropriate operator comes into play and gives an interpretation as given in (12). Gallin's two-sorted type language allows for an explicit quantification over possible worlds so that we can account for the propositional meaning contribution of questions in an explicit way in the translation. I will write the world arguments as subscripts so that $A(w)$ will be abbreviated to A_w .

Let us first look at a wh-question (15b). A wh-phrase is interpreted as an indefinite without any quantificational force, following Berman (1991). So, *who* will be translated into $\langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle$, just as in the standard Discourse Representation Structure, containing a set of variables and a set of conditions. As in Krifka (1991), the focus feature on a

further details.

constituent will create a partition of background-focus ($\langle B, F \rangle$) structure, thus translating $[who]_{F_j}$ into $\langle \lambda T \lambda w T_w, \langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle \rangle$, where T is a variable of type generalized quantifier.¹⁴ Notice that in Krifka's structured meaning framework, an identity function forms the background as distinct from the meaning of the focus as discussed in section 2.1.

As for the interpretation of Q-morpheme as a focus-sensitive operator, I will assume the theory proposed in Hong (1995, 1996): it will be interpreted as taking a background-focus structure as its argument, producing the set of alternative propositions as in Hamblin (1973).

$$(16) \quad Q_i (\langle B, F_i \rangle \rightsquigarrow) \{p: \exists F' \in \text{ALT}(F_i) \wedge p = B(F')\}.$$

In the case of wh-questions, the wh-phrase is treated as containing the focus feature. In yes-no questions, the truth-polarity is taken as being in focus.¹⁵ Then, the semantic interpretation of (15b) up to the sentence radical will undergo the following steps:

$$(17) \quad \text{INTERR}_i Q_j [[\text{MAX}]_{F_i} \text{ invited } [\text{whom}]_{F_j}]$$

$$\begin{aligned} [\text{whom}]_{F_j} &\rightsquigarrow \langle \lambda T \lambda w T_w, \langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle \rangle [= \mathbf{A}] \\ | \quad \text{invite} &\rightsquigarrow \lambda w \text{invite}_w \\ | / & \\ \text{invited } [\text{whom}]_{F_j} &\rightsquigarrow \lambda R \lambda T \lambda w \lambda x. T_w(\lambda y. R_w(x, y))(\lambda w \text{invite}_w)(\mathbf{A}) \end{aligned}$$

¹⁴The translation of the wh-indefinite *who* in terms of the pair of DRS conditions and discourse referents here, e.g., $\langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle$ should not be confused with the apparently similar $\langle B, F \rangle$ notation. This is just for typographical reasons.

¹⁵See Hong (1995) for a motivation for such an analysis of yes-no questions and other related discussions.

$$\begin{aligned}
 | &= \lambda T \lambda w \lambda x. T_w(\lambda y. \lambda w \text{invite}_w(x,y))(\mathbf{A}) \\
 | &= \langle \lambda T \lambda w \lambda x T_w(\lambda y \text{invite}_w(x,y)), \langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle \rangle \\
 | & [Max]_{Fi} \quad \sim \rangle \quad \langle \lambda T' \lambda w T'_w, \lambda w \lambda P P_w(m) \rangle [= \mathbf{M}] \\
 | & / \\
 | & [Max]_{Fi} \text{ invited } [whom]_{Fj} \quad \sim \rangle \\
 & \mathbf{M}(\langle \lambda T \lambda w \lambda x T(\lambda y \text{invited}_w(x,y)), \langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle \rangle)
 \end{aligned}$$

Here we have to prevent the two focused terms from forming a list individual, since they are not bound by one operator, but separately bound by different operators. Probably, we'll have to modify the list-formation rule in such a way that only those foci that are bound by the same operator can be merged into a list expression. Thus, I propose to handle the issue with the following constraint on complex foci:

(18) Constraint on list-formation:

List representation is limited to those foci that are bound by the same focus operator.

This means that we have to treat the structured meaning for $[Max]_{Fi}$ as if it were not structured, but just like an ordinary term. This reflects von Stechow's insight that focus is somehow ignored in interrogatives. As we will see, however, it is not totally ignored but will be exploited later, contrary to what von Stechow claims. Then, our Q-morpheme interpretation rule (16) will give us the following derivation.

$$\begin{aligned}
 (19) & [Max]_{Fi} \text{ invited } [whom]_{Fj} \\
 & = \langle \lambda T [\mathbf{M}(\lambda w \lambda x T_w(\lambda y \text{inv}_w(x,y)))] , \langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle \rangle \\
 | & \quad Q_i (\langle B, F_i \rangle) \quad \sim \rangle \quad \{p: \exists F' \in \text{ALT}(F_i) \wedge p = B(F')\}
 \end{aligned}$$

| /

$$\begin{aligned}
& Q_j [Max]_{Fi} \textit{invited} [whom]_{Fi} \sim\sim\sim\langle \\
& \quad \{p: \exists F' \in ALT(\langle \lambda P \lambda w [P_w(x_j) \wedge \textit{person}_w(x_j)], x_j \rangle) \\
& \quad \quad p = \lambda T [M(\lambda w \lambda x T_w(\lambda y \textit{invited}_w(x, y)))](F')\} \\
& = \{p: \exists F' \in ALT(\langle \lambda P \lambda w [P_w(x_j) \wedge \textit{person}_w(x_j)], x_j \rangle) \\
& \quad p = \langle \lambda T' \lambda w T'_w(\lambda x F'_w(\lambda y \textit{invited}_w(x, y))), \lambda w \lambda P.P_w(m) \rangle\}
\end{aligned}$$

As it stands, it is not a normal meaning representation since there still remains a background-focus structure unresolved in the translation. This will have to be resolved by the illocutionary operator, INTERR(ogation). So, the question is what is the rule for interpreting the illocutionary operator INTERR(ogation)? As we have noted previously, the intuition behind the free focus in questions is that "there are other alternative questions that the speaker could have asked, but this is the question that the questioner wants to know the answer to." Thus, we will need the following kind of formulation of the INTERR operator:

(20) INTERR-operator Rule:

Given a background-focus structure $\langle \alpha, \beta \rangle$, or a structure containing $\langle \alpha, \beta \rangle$, INTERR($\langle \alpha, \beta \rangle$) is interpreted with respect to a common ground c as follows:

a. It is asked $\alpha(\beta)$: that is, the new common ground c' formed by asking $\alpha(\beta)$ with respect to the common ground c , is the set of common grounds such that each proposition within the denotation of the question $\alpha(\beta)$ is intersected with the input common ground, i.e., $c' = \{c \cap p: p \in \alpha(\beta)\}$.

b. Felicity condition (among others):

There are X , comparable with β , and $X \neq \beta$, such that $\alpha(X)$

could have been asked (with respect to the common ground), but there are reasons not to ask $\alpha(X)$.

A few comments are in order here. First of all, the focus-sensitivity of INTERR operator is expressed by the requirement that the $\langle B, F \rangle$ structure be resolved by applying the background meaning to the focus meaning. Secondly, following Krifka's (1994) suggestion, the meaning proper of the interrogation speech act is defined from a dynamic point of view as creating the **set of new common grounds** whose elements are determined by each proposition denoted by the question. This is so, because when a question is addressed, it in a sense "unfolds" all the possibilities of the state of affairs that the questioner knows of (which is represented by the set of propositions the interrogative denotes in our analysis). And it will eventually enlarge all the possibilities of updating the common ground set of possible worlds. In a theory that conceives the common ground as a set of possible worlds (cf., Stalnaker 1979), this can be best captured by the set of intersections of the set of worlds of the existing common ground with the sets of worlds where each alternative proposition denoted by the question sentence is true (because each proposition within our framework corresponds to each cell of a partition on the set of possible worlds in Groenendijk & Stokhof's (1984) theory). To this enlarged set of common grounds, the answer to the question will pick up one common ground, including those possible worlds where the answer sentence is true, since the answers are defined as a kind of assertion, which intersects the previous common ground with the meaning of the answer sentence. This can be understood as a dynamicized version of Groenendijk & Stokhof's

partition semantics of questions: the illocutionary effect of a question is partitioning the **set** of common grounds.

Let's take an example, a simple yes/no question like *Is it raining?* The context-change potential of this question as defined in our interpretation rule (20a) is that the previous common ground c is turned into a set of common grounds C' such that each proposition in the denotation set of the sentence (cf., Hamblin 1973) is intersected with the previous common ground. Thus, the following holds (where $+$ stands for the discourse-updating function):

$$\begin{aligned} (21) c + \text{Is it raining?} \\ &= \{c' : \exists p \in \text{Is it raining?} \wedge c' = c \cap p\} \\ &= \{c \cap \{w : \text{It-is-raining at } w\}, c \cap \{w : \text{It-is-not-raining at } w\}\} \end{aligned}$$

An answer like *Yes* with respect to this set of common grounds does nothing but just picking up one of the cells in the partition, and help all these possibilities shrink down to one new common ground, namely in this case, $c \cap \{w : \text{It is raining at } w\}$.

On the other hand, the felicity condition requires that the questioner have reasons not to ask another alternative question which can be obtained by replacing the focused constituent by constituents of the same type, and that the question being asked at the current point of the conversation is the one that the questioner most wants to obtain an answer to. In general, it seems that a free focus introduces alternatives of semantic objects to which an illocutionary operator can apply: the free focus in a declarative sentence introduces alternative propositions and those in an interrogative sentence introduces alternative **question** denotations.

Thus, our example sentence containing a free focus *Whom did [MAX]_{Fi} invite?* will be interpreted in the following way:

$$\begin{aligned}
 (22) \text{ It is asked with respect to the input common ground } c: \\
 \{p: \exists F' \in \text{ALT}(\langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle) \wedge \\
 \quad p = \lambda T' \lambda w T'_w(\lambda x F'_w(\lambda y \text{invited}_w(x, y)))(\lambda w \lambda P. P_w(m)) \} \\
 = \{p: \exists F' \in \text{ALT}(\langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle) \wedge \\
 \quad p = \lambda w \lambda P. P_w(m) w(\lambda x F'_w(\lambda y \text{invited}_w(x, y))) \} \\
 = \{p: \exists F' \in \text{ALT}(\langle \lambda P \lambda w [P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle) \wedge \\
 \quad p = \lambda w F'_w(\lambda y \text{invited}_w(m, y)) \}
 \end{aligned}$$

Suppose that our domain contains two individuals *Max* and *Sue*, and let's not get distracted by the fact that normally one does not invite oneself. Let us also assume that the focused wh-phrase introduces alternatives of an individual type. Then the new common ground c' that arises after the question is asked will be the following, which shows that the meaning proper of the focused question is just like a normal question without focus:¹⁶

$$(23) \{c \cap \{w: \text{Max-invited-both-Max-and-Sue at } w\}, c \cap \{w: \text{Max-invited-Max at } w\}, c \cap \{w: \text{Max-invited-Sue at } w\}, c \cap \{w: \text{Max-invited-nobody at } w\} \}$$

This representation seems to express the right semantic object of the question. An interrogative sentence unfolds all the possibilities that the speaker knows of about the issue s/he is interested in. This is represented by the partition on the set of possible

¹⁶Notice that the last block that indicates the set of worlds at which nobody was invited by Max can be obtained through the set union and complementation in Hamblin's framework, which we are assuming here.

extensions of the input common ground in the above representation. Now let us turn to the felicity condition, which will specify the main contribution of the free focus.

(24) Felicity Condition:

There are X , comparable with $\lambda P\lambda w.P_w(m)$, and $X \neq \lambda P\lambda w.P_w(m)$, such that $\{p: \exists F' \in \text{ALT}(\langle \lambda P\lambda w[P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle) \wedge p = \lambda w X_w(\lambda x F'_w(\lambda y \text{invited}_w(x,y)))\}$ could have been asked (with respect to the common ground), but there are reasons not to ask $\{p: \exists F' \in \text{ALT}(\langle \lambda P\lambda w[P_w(x_j) \wedge \text{person}_w(x_j)], x_j \rangle) \wedge p = \lambda w X_w(\lambda x F'_w(\lambda y \text{invited}_w(x,y)))\}$

That is, the speaker could have asked *Whom did Sue invite?* instead of *Whom did Max invite?* in this context, but there are reasons not to do so, which may vary depending on the kind of situation the speaker is located. For example, suppose that the domain contains three individuals, j(ohn), m(ax), and e(de). Then the focused yes-no question *Is JOHN leaving for Stockholm tomorrow?* is interpreted as increasing the common ground by adding the possibilities of John's leaving for Stockholm tomorrow. For its felicitous utterance, the context should be in such a way that the alternative questions "Is Ede leaving for Stockholm tomorrow?" or "Is Max leaving for Stockholm tomorrow?" could have similarly unfolded the possibility of intersecting the common ground with the set of propositions denoted by each cell of the partition, but the speaker indicates that s/he has chosen not to ask those questions (possibly, due to his interest in John and disinterest in Max or Ede, or he might have in mind those alternative questions to be asked later).

Similarly, the focused wh-question *Who did MAX invite?* is

interpreted as enlarging the common ground by turning the previous common ground into a set of new common grounds obtained from intersecting the old common ground with propositions in its denotation such as Max invited Ede, Max invited John, etc., along with the felicity condition that the speaker is most interested in Max, but s/he could have asked questions like "Who did John invite?" or "Who did Ede invite?" which would have changed the common ground with the equal force as the question "Whom did Max invite?"

2.3 Interrogatives in Discourse and the Pragmatics of Free Focus

Now, an interesting issue that deserves further investigation in this context is what would make the speaker disinterested in an alternative question, but stick to the current question. Obviously, the speaker seems to disfavor an alternative that is already solved in the common ground, either positively or negatively. For example, let us consider the following discourse:

- (25) a. I know that Bill has arrived. But has JOHN arrived?
 b. I know that Bill is not here yet. But has JOHN arrived?

(a) shows the case where an alternative question other than *Has JOHN arrived?* is suppressed due to the input common ground, which has already positively established one of the alternative questions, *Has Bill arrived?* In (b), an alternative is excluded by the common ground, so the speaker is not interested in that alternative question, but sticks to *Has JOHN arrived?*

What does this analysis of question meaning along with our

characterization of the illocutionary operator *INTERR* predict concerning the possible answer patterns in focused questions? First, we cannot only explain why a blunt "no" is felt to be inappropriate as a negative answer to the focused yes-no question, as Kiefer has originally observed (see section 1.1), but also account for the pattern of possible affirmative answers. As we have pointed out earlier, a simple negative answer to a highly specific question (such as the one with a free focus in it) does not provide any significant information to the questioner, which is more likely to make the questioner feel that the answerer is not cooperative. Thus, the questioner tries to show cooperativeness to the conversation by providing further information, by adding something else to "no." Furthermore, it seems that the additional information added to the "yes" or "no" follow a certain dimension as we see in the following:

- (26) a. Q: Did BILL come to the party last night?
 A: No, (but) JOHN (did).
 Yes, and MARY (did), too.
 I don't know, but SUE (did).
- b. Q: When did EDE arrive?
 A: At five, and BILL arrived at six.
 I don't know, but JOHN arrived at six.

Compare this with the following, where the additionally provided information does not match the focus of the original question, resulting in unacceptable question-answer pairs:

- (27) a. Q: Did BILL come to the party last night?
 A: #No, (but) the day before yesterday.

#Yes, and to school, too.

#I don't know, but last weekend.

b. Q: When did EDE arrive at the party?

A: #At five, and he arrived at the house.

#I don't know, but he went to school.

We see that the additional answers after the particles *yes* or *no*, regardless of whether they are in the affirmative or negative, should be in fact those answers to the alternative questions that we have argued to be introduced by the free focus, separate from the original question. For example, the first type of answer in (26a) *No* is in principle uttered as an answer to the original "foreground" question. The additional answer *but John did* is the kind of information about the alternative question *Did John come to the party last night?*, which is different from *Did Bill come to the party?* Similarly, in (26b), the first type of answer *At five, and Bill arrived at six*, the additional answer *Bill arrived at six* is in fact given to a question *When did Bill arrive?* In the unnatural examples (27), there is a disagreement between the focus of the question sentence and the additional answer sentence. We see a consistent pattern here: all the additional information following 'yes' or 'no' can be identified with the kind of answers to the alternative questions determined by the focus phrase. There is an axis along which the additional answers all follow. This is explained as follows: by using the free focus, the speaker indicates that s/he has other alternative questions in mind, which s/he does not ask for some reasons, and since those alternatives are already determined along a certain dimension by the focus, then the hearer can show his or her cooperativeness by being somewhat over-informative, being already aware of the

speaker's tentative questions other than the current one, and thus s/he gives an answer to those alternative questions signaled by the focus. Those are the answers that we see in (26).

As for the focus that appears within an embedded interrogative sentence, but nevertheless is associated with an operator outside of the question domain, e.g., our previous example repeated below, we can apply the same strategy as above, but the focus is not bound by the illocutionary operator here. Instead, it is bound by an overt operator *only* under the matrix VP.

(28) John *only* wonders who introduced [_F MARY] to Sue.

We have seen that if one follows von Stechow's (1989) claim literally, we are not able to predict that *Mary* can be associated with *only* since it is ignored within the context of the indirect interrogative operator, which blocks all the focus values to be projected up to a higher constituent. Let us see how our analysis predicts the right reading for this sentence. The meaning of the matrix VP including the embedded interrogative will give us the following representation, where the focus meaning is stored in the background-focus structure waiting to be consumed by the matrix operator *only*:¹⁷

(29) *wonders* Q_i [*who*]_{Fi} *introduced* [*MARY*]_{Fj} *to Sue*

introduced [*MARY*]_{Fi} *to Sue* $\sim\sim\langle$
 $| \quad \langle \lambda T \lambda w \lambda x [T_w(\lambda w \lambda z [\text{introd}_w(x,s,z)])] \rangle, \lambda P \lambda w [P_w(m)] \rangle$

¹⁷The meaning of the VP operator *only* is roughly given as follows, where $X \approx \beta$ is read as '*X* is comparable with β ' or '*X* is an alternative to β ':

$$\text{only} \langle \alpha, \beta \rangle := \alpha(\beta) \wedge \forall X [[X \approx \beta \wedge \alpha(X)] \rightarrow X = \beta]$$

| $[who]_{F_j} \rightsquigarrow \langle \lambda T \lambda w T_w, \langle \lambda P \lambda w [P_w(x_j) \wedge \underline{person}_w(x_j)], x_j \rangle \rangle$

| /

| $[who]_{F_j} \text{ introduced } [MARY]_{F_i} \text{ to Sue } \rightsquigarrow$

| $\langle \lambda T \lambda w T_w (\langle \lambda T' \lambda w \lambda x T'_w (\lambda w \lambda z \underline{introd}_w(x, y, z)), \lambda P \lambda w P_w(m) \rangle),$

| $\langle \lambda P \lambda w [P_w(x_j) \wedge \underline{person}_w(x_j)], x_j \rangle \rangle$

| $= \langle \langle \lambda T \lambda T' \lambda w. T'_w [\lambda x T_w (\lambda w \lambda z \underline{introd}_w(x, s, z))], \lambda P \lambda w P_w(m) \rangle,$

| $\langle \lambda P \lambda w [P_w(x_j) \wedge \underline{person}_w(x_j)], x_j \rangle \rangle$

|

| $Q_i (\langle B, F_i \rangle) \rightsquigarrow \lambda p [\exists F' \in \text{ALT}(F_i) \wedge p = B(F')]$

| /

| $Q_j [who]_{F_j} \text{ introduced } [MARY]_{F_i} \text{ to Sue } \rightsquigarrow$

| $\lambda p [\exists F' \in \text{ALT}(\langle \lambda P \lambda w [P_w(x_j) \wedge \underline{person}_w(x_j)], x_j \rangle) \wedge$

| $p = \langle \lambda T' \lambda w. T'_w [\lambda x F'_w (\lambda w \lambda z \underline{introd}_w(x, s, z))], \lambda P \lambda w P_w(m) \rangle]$

| $= \lambda p \exists x_i [\underline{person}_w(x_i) \wedge p = \langle \lambda T' \lambda w. T'_w (\lambda w \lambda z \underline{introd}_w(x_i, s, z)),$

| $\lambda P \lambda w P_w(m) \rangle]$

|

| $wonders \rightsquigarrow \lambda w \underline{wonder}_w$

| /

| $wonders Q_j [who]_{F_j} \text{ introduced } [MARY]_{F_i} \text{ to Sue } \rightsquigarrow$

| $\lambda w \lambda x \underline{wonder}_w(x, \lambda p \exists x_i [\underline{person}_w(x_i) \wedge$

| $p = \langle \lambda T' \lambda w. T'_w (\lambda w \lambda z \underline{introd}_w(x_i, s, z))], \lambda P \lambda w P_w(m) \rangle)]$

|

| $\text{only} \langle \alpha, \beta \rangle \rightsquigarrow \alpha(\beta) \wedge \forall x [[x \approx \beta \wedge \alpha(x)] \rightarrow x = \beta]$

| /

| $\text{only } wonders \text{ who introduced } [F \text{ MARY}] \text{ to Sue } \rightsquigarrow$

| $\lambda w \lambda x \underline{wonder}_w(x, \lambda p \exists x_i [\underline{person}_w(x_i) \wedge p = \lambda w \underline{introd}_w(x_i, s, m)]) \wedge$

| $\forall x [[x \approx \lambda P P_w(m) \wedge \lambda w \lambda x \underline{wonder}_w(x, \lambda p \exists x_i [\underline{person}_w(x_i) \wedge$

| $p = \lambda w. x w (\lambda w \lambda z \underline{introd}_w(x_i, s, z))]]] \rightarrow x = \lambda P P_w(m)]$

|

| $John \rightsquigarrow \lambda w \lambda P P_w(j)$

| /

John only wonders who introduced [MARY]_F to Sue ~>

$$\lambda w \underline{wonder}_w(j, \lambda p \exists x_i [\underline{person}_w(x_i) \wedge p = \lambda w \underline{introd}_w(x_i, s, m)]) \wedge \\ \forall x [[x \approx \lambda PP_w(m) \wedge \lambda w \underline{wonder}_w(j, \lambda p \exists x_i [\underline{person}_w(x_i) \wedge \\ p = \lambda w.xw(\lambda w \lambda z \underline{introd}_w(x_i, s, z))]]) \rightarrow x = \lambda PP_w(m)]$$

If we restrict our alternatives to proper names, the above formula will be further reduced to the following:

$$(30) \lambda w \underline{wonder}_w(j, \lambda p \exists x_i [\underline{person}_w(x_i) \wedge p = \lambda w \underline{introd}_w(x_i, s, m)]) \wedge \forall y \\ [[y \approx m \wedge \underline{wonder}_w(j, \lambda p \exists x_i [\underline{person}_w(x_i) \wedge p = \lambda w \underline{introd}_w(x_i, s, y)])] \rightarrow y = m]$$

This gives us the reading in which John is in the wondering-relation to the question who introduced Mary to Sue, and for no other person does John belong to the wondering-relation towards whether s/he introduced someone to Sue, which is the right reading for the sentence. Note that von Stechow could not derive this reading, but only the reading where the whole indirect question or the matrix VP is in focus, because the interrogative operator in his analysis totally ignores the focus information within its scope. The correct reading of the sentence could be obtained in our analysis mainly due to the focus feature on *MARY* which is not ignored but "stored" within our structured meaning representation, even under the context of interrogative sentences.

3. Pragmatics of Double Questions

One interesting implication of our analysis of questions and alternatives being interpreted with respect to a common ground is

that we can give a uniform account of the phenomena where a question is modified by another question in an on-going discourse. Notice that a question interpreted with respect to a common ground produces an output which we express as a set of new common grounds. (cf., 20) What would happen if another question is asked with respect to this set of common grounds? Would the second question lead to a still higher-order common grounds, e.g. a set of sets of common grounds? It seems in most cases that the second question does not lead to a new set of sets of common grounds, but modifies the set of common grounds that results from the first question. Further, there is a certain principle in the modification: the second question leads either to a "coarser" set of common grounds, or to a "more fine-grained" set of common grounds.

The first type of modification in which the second question somehow conflates the set of common grounds into a simpler one can be seen in a certain class of tag questions, which seem to have similar answer patterns as focused yes/no questions, as noted in Bauerle (1979), for example in the following kind of questions.

- (31) a. Who has eaten the pudding, Mary?
b. What has Mary eaten, the pudding?

Note also that, as von Stechow (personal communication) points out, these questions seem to be asking for the same kind of information and used virtually in the same situation as the following yes/no questions containing free foci:

- (32) a. Has MARY eaten the pudding?
 b. Has Mary eaten THE PUDDING?

We can explain the similarity between the two types as follows: under our analysis, the questions in (31) will be decomposed into two connected questions, a step which is independently motivated by the intonation pattern observed in those questions. (Note that there is a long pause between the first and the second questions.) So, (31a) and (b) will be interpreted on a par with the following (33a) and (b), respectively:¹⁸

- (33) a. Who has eaten the pudding? (Has) Mary (eaten it)?
 b. What has Mary eaten? (Has she eaten) the pudding?

First, let's suppose that the context contains three individuals, *John*, *Mary*, and *Sue*. The first question in (33a) *Who has eaten the pudding?* will change the current common ground *c* into a new one *c'* as in the following:

- (34) $c + \textit{Who has eaten the pudding?}$
 = $\{c' : \exists p \in \textit{Who has eaten the pudding?} \wedge c' = c \cap p\}$
 = {
 $c \cap \textit{John has eaten the pudding,}$
 $c \cap \textit{Mary has eaten the pudding,}$
 $c \cap \textit{Sue has eaten the pudding,}$
 $c \cap \textit{John \& Sue has eaten the pudding}$
 $c \cap \textit{John \& Mary has eaten the pudding...}$

¹⁸One can equally think of the meaning of the tag something like "Is the answer to the first question *Mary?*" as pointed out by M. Krifka (p.c.). However, there still remain the issue of how to get the "reconstruction" of the parenthesized elements in the second question, into which I will refrain from going further in this paper.

This amounts to the following partition of the set of possible extensions of the common ground:¹⁹

(35)

<u><i>c</i>nJohn has eaten the pudding</u>
<u><i>c</i>nMary has eaten the pudding</u>
<u><i>c</i>nSue has eaten the pudding....</u>

What the speaker implies by raising the second question *Mary?* in (31) even before the first question is answered by the hearer is that s/he is retreating from the first question, and that s/he has come up with a more relevant question, namely the second one. Thus s/he asks the hearer to pick up a cell based on a different partition, namely the cell that consists of the worlds where John has eaten the pudding, or the cell containing the worlds where John has not eaten the pudding. This basically means that the above partition (35) is somehow "conflated" into the following, which is much simpler and coarser than the first one:

(36)

<u><i>c</i>nMary has eaten the pudding</u>
<u><i>c</i>nMary has not eaten the pudd</u>

Note that all the cells except the one in which Mary has eaten the pudding, that is, *c*n*John has eaten the pudding*, *c*n*Sue has eaten the pudding*, etc. in (35), are merged into the cell *c*n*Mary*

¹⁹I have opted for the partitional fragment in (35) just for expository purposes because the semantic and pragmatic effect of questions can be seen more clearly with the concept of partition.

has not eaten the pudding as we see in (36). So, basically the same process is taking place here as in the corresponding focused yes-no question (32a) *Has MARY eaten the pudding?* in the sense that the speaker's implication that s/he has alternative questions in mind is indicated implicitly in this case, whereas the intention is shown directly by using the focus in the case of focused yes/no questions.

The second type of question-modification where the second question leads to a more fine-grained set of common grounds can be similarly accounted for, as illustrated in the following examples:

- (37) a. Has John eaten the pudding? (And) without a spoon?
 b. Who has eaten the pudding? (And) when?

The interpretation of the first question (37a) with respect to a common ground c will produce the following set of common grounds in our analysis:

- (38) { $c \cap$ John-has-eaten-pudding, $c \cap$ John-has-not-eaten-pudding}.

Based on this set, the second question of (37a) *without a spoon?* will lead to a new partition of the set as follows:

- (39) { $c \cap$ John-has-eaten-the-pudding-without-a-spoon,
 $c \cap$ John-has-eaten-the-pudding-with-a-spoon,
 $c \cap$ John-has-not-eaten-the-pudding-without-a-spoon,
 $c \cap$ John-has-not-eaten-the-pudding-with-a-spoon }

The original set of common grounds is modified into a more

granulated set. The example (37b) involving the *wh*-questions falls under the same analysis, too. Presenting an additional question before a previous question is answered seems possible only if the new question leads either to a coarser common ground set or to a more fine-grained set, which follows from our theory of interrogative interpretation as presented in (20).

4. Free Focus in Imperatives

We have seen above that the so-called free focus is bound by the illocutionary operator. An obvious extension of this idea would account for the free focus in imperative sentences and non-declaratives in general. In this section, we will examine imperative sentences containing free focus. Note that the treatment of free focus in imperatives, as spelled out in this section, is just a short sketch. A detailed account will be postponed for another occasion. Let us first consider the sentences of the following kind:

- (40) a. Read an article by Chomsky!
 b. Read an article by [_F CHOMSKY]!
- (41) a. Introduce Mary to Sue!
 b. Introduce [_F MARY] to Sue!

The difference between the plain imperatives in (a)-examples and focused imperatives in (b)-examples is that (a) sentences are used in a neutral context whereas (b) sentences need an enriched context to be felicitous. That is, (40b) for example is more likely to be uttered in a situation where the speaker could have

requested the hearer to read an article by an author other than Chomsky, such as Bloomfield or Saussure, but s/he is most interested in the hearer's future action of reading Chomsky's article, and that is what the requester wants the hearer to read. Again, similar observations that we have made in interrogative sentences seem to apply to imperative sentences. The free focus in imperative sentences can be said to be bound by an illocutionary operator, e.g. COMMAND in this case, just as in interrogative sentences. But first, we need a background semantic analysis of imperatives for our argumentation. I will briefly introduce an analysis of imperatives proposed by Hausser (1980, 1983). Note, however, that our analysis does not hinge on a particular choice of imperative semantics.

Hausser (1983) proposes to analyze imperative sentences as denoting the properties of individual concepts, which corresponds to the type $\langle s, \langle \langle s, e \rangle, t \rangle \rangle$ and to the category IV (i.e., the intransitive verb in PTQ). This is the property that the speaker wants the hearer to acquire. Thus, a simple imperative like (40a) and (41a) will be translated in his system as follows (ignoring intensionality and glossing other irrelevant aspects):

(42) $\lambda x [\Gamma_2(x) \wedge \text{read-an-article-by-Chomsky}(x)]$

(43) $\lambda x [\Gamma_2(x) \wedge \text{introduce-Mary-to-Sue}(x)]$

Here, Γ_2 is a variable whose value is provided by a particular context of utterance and corresponds to the property of being the hearer or the second person, and it is the presence of this variable that distinguishes an ordinary IV phrase from an imperative in his system. (42) and (43), thus, denote the property of being the addressee and of reading an article by Chomsky and

the property of being the hearer and of introducing Mary to Sue, respectively.

Now, we apply the same idea as before to the analysis of free focus in imperatives. The focus feature in imperatives, thus, will similarly introduce a background-focus structure and (40b) and (41b) will be expressed as follows, assuming that we have a COMM(and) operator for this speech act:

$$(44) \text{ COMM}(\langle \lambda y \lambda x [\Gamma_2(x) \wedge \text{read-an-article-by-}y(x)], \mathbf{c} \rangle)$$

$$(45) \text{ COMM}(\langle \lambda y \lambda x [\Gamma_2(x) \wedge \text{introduce-}y\text{-to-Sue}(x)], \mathbf{m} \rangle)$$

The sets of alternatives determined by the background-focus structure in (44) and (45) are the following:

$$(46) \{ \text{read an article by } x! : x \in D \}$$

$$(47) \{ \text{introduce } x \text{ to Sue!} : x \in D \}$$

These alternatives are again imperatives, as we see above. Now, the COMM operator will take these alternatives and make a felicitous speech act, which is defined in the following:

$$(48) \text{ COMM}(\langle \alpha, \beta \rangle) \text{ is fulfilled by the speaker } s \text{ toward the hearer } h \text{ at time } t, \text{ iff } \exists t' [t \leq t' \wedge \Gamma_2(h) \wedge [[\alpha(\beta)(h)]]^{t'} = 1] \text{ along with the following felicity conditions (among others): There are } X, \text{ compatible with } \beta, \text{ and } X \approx \beta, \text{ such that } \alpha(X) \text{ could have been commanded (toward the hearer), but there are reasons not to command } \alpha(X).$$

A rather dynamic treatment of imperatives can also be achieved within a dynamic semantics of context change if we modify the

notion of common ground for imperatives. (Krifka, personal communication) The assertion of a declarative sentence changes the input context to a new context. What is changed with an imperative utterance, however, is not the set of worlds that contain the real world, or our knowledge of the world, but the set of worlds that would satisfy the obligations to the hearer. Let's call such a set of worlds where the hearer fulfills his/her obligations, \mathcal{O}^h , then updating a command Φ , which we have characterized as a property to be obtained by the hearer, will be the intersection of \mathcal{O}^h and $\Phi(h)$, where h stands for the hearer:

- (49) $\mathcal{O}^h + \text{COMM}(\Phi)$ is mapped to a new obligation ground $\mathcal{O}^h \cap \Phi(h)$.

Now, when an imperative with a free focus is uttered, the speaker implicates that there are other commands that he could have asked the hearer to perform. Thus, (48) will be modified as follows:

- (50) $\text{COMM}(\langle \alpha, \beta \rangle)$ with respect to an obligation ground \mathcal{O}^h :

- (i) $\mathcal{O}^h + \text{COMM}(\langle \alpha, \beta \rangle)$ is mapped to $\mathcal{O}^{h'}$ where $\mathcal{O}^{h'} = \mathcal{O}^h \cap \alpha(\beta)$.
- (ii) Felicity Condition (among others): There are X , comparable with β , and $X \neq \beta$, such that $\alpha(X)$ could have been commanded (toward the hearer), but there are reasons not to command $\alpha(X)$.

This amounts to saying that the obligation-world change potential of an imperative can be represented as a kind of set intersection just as we did for declarative sentences.

Furthermore, when an imperative sentence contains a free focus, the speaker implicates that there are other compatible imperatives that s/he could have commanded but that the context makes the focused imperative most relevant at the current stage of conversation, and the hearer knows that there are reasons for the speaker not to address the alternative imperatives. The speaker in turn know that the hearer knows that, and therefore can generate such implicatures. Thus, if we assume that the context contains three individuals, c(homsky), m(ary), and s(ue), (40b) and (41b) implicates that the speaker could have ordered to read an article by Sue or Mary, and to introduce Chomsky to Sue, respectively.

Just as we have seen in the answer patterns of focused questions and question modification, an interesting prediction on the type of responses to a focused imperative seems to follow from our conception of free focus: they are pivoted around a certain dimension along the axis provided by the focus. For example, as a response to an imperative *Read an article by CHOMSKY!*, the hearer may reorganize his/her obligation world so that articles by other authors are dropped out of consideration.

5. Summary

We have seen that the so-called free focus is not ignored as von Stechow (1989) argues, nor interpreted as a *wh*-phrase as claimed by Kiefer (1980). Instead, it is argued that the seemingly ignored focus is in fact bound by the illocutionary operators such as interrogation or command and that focus introduces alternatives regardless of whether it is bound or free. My analysis seems to be in complete accordance with the general concept of focus and its semantic contribution in contemporary

semantic literature. That is, focus simply introduces alternatives and provides some sort of domain for focus sensitive operators to play with. We can now formulate a generalized interpretation rule for free focus in general, regardless of the nature of illocutionary operators that are used, in particular one of their felicity conditions, as follows:

(51) Generalized Felicity Conditions for Free Focus

$ILL(\langle \alpha, \beta \rangle)$ carries the following felicity condition: There are X compatible with β , and $X \approx \beta$, such that $\alpha(X)$ could have been *ILL*-ed (toward the hearer), but there are reasons not to *ILL* $\alpha(X)$, where *ILL* refers to an appropriate performative verb.

This generalized form will more perspicuously embody the idea that focus in general introduces alternatives, which get projected to the last cycle of interpretation, where illocutionary operators manipulate the semantic objects associated with the sentence forms, i.e., declaratives, interrogatives, or directives, etc.

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Minpyo Hong

English Dept., Myong Ji University

Nam-dong San 38-2, Yong-in, Kyungki-do 449-728, Korea

E-mail: mphong@wh.myongji.ac.kr

Fax: +82-335-30-6262

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