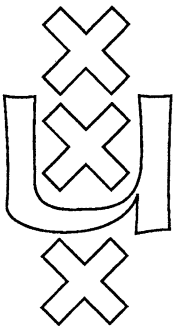


Institute for Logic, Language and Computation

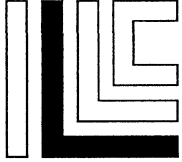
THE INTERPRETATION OF FREE FOCUS

Noor van Leusen
László Kálmán

ILLC Prepublication Series
for Computational Linguistics CL-93-01



University of Amsterdam



Institute for Logic, Language and Computation

Plantage Muidersgracht 24

1018TV Amsterdam

Telephone 020-525.6051, Fax: 020-525.5101

THE INTERPRETATION OF FREE FOCUS

Noor van Leusen

László Kálmán

Department of Computational Linguistics
University of Amsterdam

*ILLC Prepublications
for Computational Linguistics*
ISSN 0928-3293

Coordinating editor: Dick de Jongh

received July 1993

THE INTERPRETATION OF FREE FOCUS

NOOR VAN LEUSEN AND LÁSZLÓ KÁLMÁN
DEPARTMENT OF COMPUTATIONAL LINGUISTICS
UNIVERSITY OF AMSTERDAM
SPUISTRAAT 134, 1012 VB AMSTERDAM, THE NETHERLANDS
noor@mars.let.uva.nl, kalman@mars.let.uva.nl

0. Introduction

The aim of this paper is to provide an analysis of the interpretation of *free focus*. Free focus is focus which is not ‘bound’ by a *focusing adverb*. Utterances containing free focus act as answers to questions or as replies; thus, their use is contextually more restricted than that of bound focus. Utterances containing free focus can only occur felicitously in certain licensing contexts so, in a sense, free focus is ‘bound’ by the context. We will claim that these licensing contexts can be characterised in terms of an *exhaustivity requirement* on the *antecedent* of the focused constituent.

The structure of this paper is as follows. First, in **Section 1**, we will define what we mean by free focus. We will start from the concept of focus as the most prominent constituent of an utterance (**Section 1.1**). Then we will distinguish free focus from three other types of prominent elements, namely, contrastive topic (**Section 1.2**), comment (**Section 1.3**) and bound focus (**Section 1.4**). In **Section 2**, we will outline the semantics of free focus, with special regard to the contextual prerequisites of using it. First, some generally recognised conditions will be explained, in **Section 2.1.1**. It will turn out that these are necessary but not sufficient conditions. We will introduce an additional condition, called the exhaustivity condition, in **Section 2.1.2**. In **Section 3**, we will justify our proposal by examining the various constructions in which free focus is involved. We will make a distinction between various functions that focusing can have (**Section 3.1**), and we will review the various linguistic expression types that can be focused (**Section 3.2**). Finally, in **Section 4**, we formulate certain requirements on the features that a formal semantic theory should have in order to account for the facts related to free focus.

1. What is Free Focus?

1.1. Prominence

In English, focus is commonly understood to be the most *prominent* constituent of an utterance — not the most prominent constituent in an absolute sense, since there may be other equally prominent constituents in the utterance, but prominent in a relative sense, i.e., as standing out against the rest of the utterance.

For example, in (1), the focused constituent is said to be the NP *fish*, since it is the most prominent constituent of the utterance. The small capitals in this and the following examples indicate *prosodic prominence*.

(1) *Charles likes* [NP FISH].

The NP *fish* is not only prosodically prominent, it is also prominent on the level of *interpretation*. An acceptable paraphrase of (1) is ‘what Charles likes is fish’; this paraphrase brings out the difference between ‘background’ and ‘foreground’ information of the utterance: the open proposition ‘Charles likes *x*’ is *familiar* or given in the context and, against the background of that information, the new information that it is fish that Charles likes stands out prominently. It is under this interpretation that we will consider *fish* to be the focus of (1).

Utterances exhibiting prosodic prominence can be ambiguous with respect to the corresponding prominence on the level of interpretation. For example, the prosodic prominence of the utterance in (2) below induces either the interpretation in (2a) ‘what John bought is a car’ or the interpretation in (2b) ‘what John did was buying a car’, or the interpretation in (2c) ‘what happened is that John bought a car’ (a constituent with the superscript ^F is a focused constituent, or simply ‘a focus’):

- (2) *John bought a* CAR.
 a. *John bought* [NP *a* CAR]^F.
 b. *John* [VP *bought a* CAR]^F.
 c. [S *John bought a* CAR]^F.

Though with heavy stress on *car* the interpretation in (2a) is more likely than the ones in (2b–c), reliable disambiguation is possible only if the context of utterance is taken into account. Apart from the ambiguity with respect to *which* constituent is prominent, (2) is also ambiguous with respect to the *interpretation* of the prominent constituent, e.g., the VP in (2b) need not necessarily be a focus, it may also be a *comment*: this issue will be discussed in **Section 1.3**. Again, the context is needed for disambiguation.

The example shows that an analysis of focus in English cannot do without a theory which systematically links up prosodic prominence and prominence on the level of interpretation, while allowing for ambiguity — or, in other words, allowing for more than one constituent to be a potential focus, given some prosodic

prominence. In what follows, it will be assumed that such a theory, for example Selkirk's (1984), is available.

Note that it is not the case that focus is always and in every language marked by prosodic prominence: focus can also be expressed by special syntactic constructions. For example, the English cleft construction is considered to be a focusing construction by some researchers; further, focus can be expressed by placing a constituent in a certain position in the utterance or by using special focusing morphemes. The fact that English only uses prosodic prominence (and/or clefts) is idiosyncratic.

For example, in Hungarian, focusing is expressed by putting a constituent immediately in front of the finite verb stem (and destressing the following constituents), which may mean that the verbal prefix (or other elements that normally precede the verb stem) must appear after the finite verb:

(3) *Hungarian*

a. *János befejezte a cikket.*

John PREF-finished the paper-ACC

'John finished the paper'

b. *János fejezte be a cikket.*

finished PREF

'It is John who finished the paper'

In Ilocano, to take another example, free focus is expressed by fronting the focused constituent, to be followed by the morpheme *ti* (homophonous with a determiner):

(4) *Ilocano* (Schwartz, 1976)

a. *nang-kabil ti babai ti lalaki*

hit DET girl DET boy

'The girl hit a boy'

b. *ti babai ti nang-kabil ti lalaki*

DET girl FOCUS hit DET boy

'It is the girl who hit a boy'

In what follows, we will challenge the view that the focus of an utterance is its most prominent constituent. The reason for this is that the interpretation of prominence in English does not seem to be uniform: an English utterance may have a 'most prominent' constituent which does not fit in the rather homogeneous semantic characterization which we need for focus across various languages. In the following sections, focus will be set apart from two other kinds of prominent constituents, namely, from *contrastive topic* and from *comment*.

1.2. Contrastive Topic Versus Focus

Consider the following conversation (an adaptation of an example from Rooth, 1985):

- (5) — *I invited Charles for a dinner.*
 — *I warn you: he likes few foods.*
 — *Well, he likes [HERRING].*

The most prominent constituent of the third utterance is undoubtedly the NP *herring*. However, the interpretation of this utterance is not quite ‘what he likes is herring’, it is rather ‘an instance of what he likes is herring’ or ‘one of the things he likes is herring’. The interpretation ‘what he likes is herring’ would be appropriate for the answer in (6) below:

- (6) — *What food does Charles like?*
 — *He likes [HERRING]^F.*

The crucial difference between the interpretation of the reply in (5) and the answer in (6) is that, in the former, the prominent element (*herring*) does not exhaust all the food that Charles likes: the utterance says that there may be (and, in fact, suggests that there are) other foods beside herring that he likes, whereas in the latter, the prominent element does exhaust all food that Charles likes.

The prominent element in the reply in (5) has certain features that the element in the answer in (6) lacks; first, it can be fronted, as in (7a), and second, it comes with a special intonational marking (fall/rise intonation, cf. Hirschberg and Ward, 1983) which is distinct from the intonational consequences of prosodic prominence. This marking will be indicated with a \sim sign above the utterance, approximately at the place where it appears phonetically, as in (7a) and (7b).

- (7) a. *Well, [HĚRRING] he likes.*
 b. *Well, he likes [HĚRRING].*

The kind of prominent element we have identified in (5) and (7) is known as *contrastive topic* (the term is due to Szabolcsi, 1981; cf. Chafe, 1976, for a similar description of the phenomenon).

We are aware of the fact that obvious instances of contrastive topic are often called ‘focus’ in the literature (see, e.g., Rooth, 1985). The fact that we separate these two categories, however, is not simply begging the question of what a uniform semantic characterisation of focusing might be. First, the syntactic and semantic differences that we have pointed out in the above are ground enough for a certain doubt. Second, if these two categories were essentially the same, with some subtle ‘pragmatic’ differences, we would expect that other languages will treat them accordingly. Yet, in none of the languages that we have examined from this point of view does a systematic ambiguity between focus and contrastive topic exist. (In fact, even in English, the ambiguity would be systematic only if both the fronting and the fall/rise intonation of contrastive topics were optional, which we

do not believe.) For example, in Hungarian, a contrastive topic constituent can never occupy the focus position illustrated in our earlier example, and vice versa. Japanese consequently marks contrastive topics with the ‘topic’ morpheme *wa* rather than the ‘focus’ morpheme *ga*:

(8) Japanese (Kuno, 1972)

— *Dare ga Mary o butimasita ka?*
 who FOCUS ACC hit QUESTION
 ‘Who hit Mary?’

a. — *John ga butimasita.*
 FOCUS hit

‘It is John who hit her’

*‘John hit her [and maybe others as well]’

b. — *John wa butimasita ga ...*
 TOP hit but

‘John hit her, but...’ [others didn’t or I don’t know]

1.3. Comment Versus Focus

Focus must also be set apart from *comment*. Comment is illustrated in (9) below. The first two sentences provide the context for the third, in which the word *house* is prosodically prominent, so either the NP *a house* or the VP *bought a house* (or, in fact, the entire sentence) is the most prominent constituent.

(9) *John set up an ENTERPRISE. He became RICH.*
He [bought [a HOUSE]].

Given the context in which it is uttered, the third sentence in (9) clearly is not to receive the interpretation ‘what he bought is a house’. So this sentence is not interpreted in the same way as, for example, the NP focus cases in (1) or (6).

The same happens when we try the kind of paraphrase we previously had for VP focus: ‘what he did is buying a house’ is not the right paraphrase of the last sentence of (9) in the context of the first two. The last utterance in (9) only offers some new (eventually unexpected) information about John, namely that he bought a house.

Comment and focus relate differently to the preceding discourse. The paraphrase ‘what he did is buying a house’ would be appropriate for the replies in (10a) or (10b) below, i.e., in contexts in which the utterance is a correction of the preceding utterance or an answer to a question. Those are the contexts in which focus typically occurs.

- (10) a. — *John rented an apartment.*
 — *No, he [bought a HOUSE]^F.*
- b. — *What did John do to have a place to live in?*
 — *He [bought a HOUSE]^F.*

Comment occurs in list structures like the one in (9), in narratives and in out-of-the-blue sentences (which have the peculiarity of consisting of a comment only, without any topic).

As with contrastive topics, we feel no circularity in separating comments from foci in order to provide focus with a uniform semantics. As far as English is concerned, the prosodic structure of an utterance is not sufficient to decide whether a prominent VP in the utterance is a comment or a focus (or contains a focus). In English, the context of the utterance must be taken into account to interpret the utterance in terms of its focusing structure, i.e., to assess whether the prominent constituent is a focus or a comment. Crucially, this ambiguity is not systematic in other languages.

Verb phrases containing a focused object are systematically distinguished from comments and focused VPs in all languages that we have looked at (except in English). Hungarian is a good example of this:

- (11) *Hungarian*
- a. *Vett egy házat.*
 bought a house-ACC
 ‘He bought a house’ or ‘what he did was buying a house’
- b. *Egy házat vett.*
 ‘It is a house he bought’

The ambiguity between a VP focus and a comment may be more frequent (though it is very difficult to assess this on the basis of existing literature), but it does not seem systematic cross-linguistically, either:

- (12) *Yiddish* (Ellen F. Prince, p.c.)
- a. *Ikh hob gekoyft a shtub.*
 I have bought a house
 ‘I bought a house’
- b. *A shtub hob ikh gekoyft.*
 a house have I bought
 ‘What I bought is a house (rather than a boat)’
- c. *Gekoyft a shtub hob ikh.*
 ‘What I did was buying a house (rather than moving to a hotel)’

- (13) *Welsh* (John Phillips, p.c.)
- a. *Prynais did.*
I-bought house
'I bought a house'
 - b. *Ty a brynais*
house REL I-bought
'What I bought is a house'
 - c. *(Nid) prynu ty a wneuthum*
(not) buy house REL I-did
'What I did was (not-)buying a house'

- (14) *Thai* (Peansiri Vongvipanond, p.c.)
- a. *Chan suu baan yuu*
I buy house stay
'I bought a house (to stay in it)'
 - b. *Baan taanghaak thii chan suu*
house FOC REL I buy
'What I bought is a house (not a boat)'
 - c. *Chan suu baan yuu taanghaak*
I buy house stay FOC
'What I did was buying a house'

As a matter of course, this does not mean on its own that the homophony of comments and focused VPs in English is a complete accident, but at least justifies the assumption that it is a (perhaps somewhat motivated) coincidence.

1.4. Bound Focus Versus Free Focus

The utterances in (15) below are examples of *bound focus* (marked with a superscript ^{BF}).

- (15) a. *Mary only introduced [BILL]^{BF} to Sue.*
b. *Mary only introduced Bill to [SUE]^{BF}.*

A good approximation of the meaning of (15a) is

$$\forall x : \text{introduced}(\text{Mary}, x, \text{Sue}) \Leftrightarrow x = \text{Bill}$$

and (15b) is interpreted as

$$\forall x : \text{introduced}(\text{Mary}, \text{Bill}, x) \Leftrightarrow x = \text{Sue}$$

These formulae show that the adverb *only* operates on the focus rather than the whole VP. Adverbs like *only* are therefore called *focusing adverbs*, and the focus is called *bound focus* because it is associated with the focusing adverb.

There is abundant literature on the syntactic/semantic analysis of bound focus (e.g., Jackendoff, 1972; Rooth, 1985; Krifka, 1991), in which it is recognised that the VPs of utterances containing bound focus consist of three parts: an operator, which is the focusing adverb, the focus to which the adverb is associated, and the remnant of the VP after the focus has been removed from it. The question arises whether this tripartite structure must be represented at the level of syntax or semantics and how the structure should be derived. Since bound focus is not the subject of this paper, we will not discuss the different approaches and analyses here.

What is important to note given the subject of this paper is that the contexts in which bound focus can occur are less restricted than the contexts in which free focus can occur:

- (16) — *We expected that Mary would introduce these people to Sue.* [Bill is among these people]
- a. — *But she only introduced [BILL]^{BF} to her.*
- b. — *#But she introduced [BILL]^F to her.*

The first sentence of (16) creates a context in which a bound focus, but not a free focus, is licensed. The reason why (16b) is infelicitous in the above context, i.e., the additional constraints that a context licensing a free focus must satisfy, will be discussed in **Section 2.1.2**.

It is extremely difficult to assess to what extent the marking of bound focus coincides with that of free focus cross-linguistically. But even if there was a large overlap, the separation of free focus from bound focus clearly would be legitimate on the basis of the absence versus presence of focusing adverbs.

2. The Semantics of Free Focus

In this section we will characterize informally the semantic peculiarities of utterances containing free focus. The body of this section is about the contextual restrictions on free focus, i.e., those features of a context which make it possible for a certain utterance containing a certain focused element to occur. Then we will very briefly outline the semantic values that such an utterance can have.

2.1. Licensing Contexts

2.1.1. Generally Recognised Contextual Restrictions

What is commonly agreed upon in the existing literature on focus (both free and bound) is that the context of a focus-containing utterance must satisfy the following conditions: first, the *remnant* (i.e., the function which results from abstracting over the focus) must be *salient*. Second, there must be a relation of *contrastive kinship* between the focus and its *antecedent* (i.e., the element in the previous

discourse or the external context that relates to the remnant in the same way as the focus).

2.1.1.1. The Salient Remnant Condition

The first requirement refers to the givenness of the remnant information; the remnant must occur in the immediately preceding discourse or be activated by that discourse or the current non-linguistic context. The latter option is illustrated in the following example.

- (17) [Context: a mother of two sons comes home and finds the teapot in pieces on the kitchen floor. She calls her eldest.]
 — *John?!*
 [He comes running into the kitchen and the first thing he says is:]
 — [PETER]^F *did it!*

A licensing context need not contain an explicit question or statement. The focus-containing utterance in (17) could be an answer to the implicit but salient question ‘Who smashed the teapot?’, or a reply to the implicit but salient accusation ‘You (John) smashed the teapot’.

Obviously, when an utterance is a reply to a question or statement which is salient in the context (be it explicit or not), the Salient Remnant Condition is satisfied.

When we say that the remnant and its antecedent must be identical, we do not mean a linguistic (literal) identity, but the identity of the corresponding discourse referents (and, therefore, denotations):*

- (18) — *Joe broke a Porsche.* [yesterday]
 — *#No, he broke a [TRABANT]^F* [last week].

Even though the remnant ‘Joe broke *x*’ is familiar from the context, the answer in (18) is not felicitous if the events referred to by the remnant and its antecedent are not identical.

Let us now formulate the Salient Remnant Condition:

The Salient Remnant Condition (SRC)

The discourse referent corresponding to the function which results from abstracting over the focus must be salient in the current context.

The SRC also applies to contrastive topics.

* We use the term *discourse referent* as it is used in Discourse Representation Theory. However, we are more liberal in terms of types of discourse referents. For example, a remnant usually is a discourse referent of a functional type.

2.1.1.2. The Kinship Condition

The second generally accepted requirement on the focus and its antecedent is that they must refer to concepts which are in some aspect of their meanings distinct or contrastive, while being akin to each other in some other aspect of their meanings. We will make several observations with respect to this general rule, which we will call the Kinship Condition (KC).

The first observation with regard to the kinship relation is that it can only hold when the focus and the antecedent have a common domain. The common domain of the focus and its antecedent is determined by selectional restrictions of the remnant and contextual restrictions. Such contextual restrictions are needed independently, as the following examples, which do not contain free focus, illustrate:

- (19) a. *Did everybody follow the course on Extensional and Intensional Logic?*
 b. *Mary only* [READ]^{BF} *The Recognitions.* (Rooth)

In (19a), the quantifier *everybody* does not refer to all persons, it only refers to a restricted set of persons relevant in this particular context — for example, the third year philosophy students within hearing distance of the speaker. The utterance in (19b) induces the presupposition that Mary could have done something else than reading *The Recognitions*, but again, all possible relations between Mary and *The Recognitions* cannot count as relevant alternatives — the set of relevant alternatives in this case is likely to be just the set {read, understand}.

The second observation is that ‘contrastivity’ is far too general a concept to capture correctly the possible relations between a focus and its antecedent. In some cases the existence of a common domain and the *distinctness of the denotations* of the focus and its antecedent are sufficient conditions for the Kinship Condition to hold (this is the case that we call *corrective replies*; see **Section 3.1**):

- (20) — *I hear* [LISA]^F *is going to visit you.*
 — *No,* [JOAN]^F *is going to visit me.*

In (20), the focus and its antecedent refer to individuals, and it is the distinctness of these individuals (i.e., the elements of the common domain) that produces the contrastivity effect. We might take the partition of the common domain into individuals to be the kinship relation. So the kinship between the focus and its antecedent in this case consists of being elements of the same common domain.

On the other hand, there are at least two other types of ‘contrast’ which may satisfy the KC. First, it may be the case that the focus refers to a *sub-class* of the denotation of the antecedent (we will call this type of focus-containing utterances *specification replies* in **Section 3.1**):

- (21) — *So Ronald bought a new car.*
 a. — *Yes, in fact, he bought a* [MERCEDES]^F.
 b. — *# Yes, it is a* [SONY]^F!

Without specific information about the context it is not clear whether the common domain of the focus and its antecedent consists of the objects, the vehicles or the cars that Ronald might have bought. However, since nothing depends on the choice we make, we can safely assume for the sake of the argument that the common domain consists of the cars that Ronald might have bought. The kinship requirement is satisfied by a relation of specification between the focus and its antecedent: the focus is more specific than the antecedent, because it specifies the type of the car. Replies like (21b) are excluded because the class referred to by *Sony* is not a sub-class of the one denoted by *car*.

The third type of ‘contrast’ involves *identical denotations*, but different expressions (we will call such sentences *metalinguistic arguments* in **Section 3.1**):

- (22) — *Grandpa is feeling lousy.*
 — *Grandpa isn't [feeling LOUSY]^F, Johnny, he's just [a tad INDISPOSED]^F.*
 — ‘The right description of Grandpa’s health is *a tad indisposed*’

(From Horn, 1989; focusing and paraphrases are ours.)

2.1.1.3. Informativeness

Apart from the SRC and the KC, focus-containing utterances must satisfy a condition which holds in general for assertions: they must be *informative*. Since the remnant must be salient in the context, one would expect the burden of the informativeness requirement to be solely on the focus. However, the requirement can also be satisfied by ‘pragmatic information’ following from the utterance. This is shown in the following example.

- (23) — *They promised they wouldn't invite my ex. And [WHO]^F did they invite?*
 [PAUL]^F. [Paul is the speaker’s ex]
 — [PAUL]^F *was invited. Right.*

The reply in (23) is not informative in the sense that its content does not provide new information. It just echoes the previous information. However, it is informative in the sense that it provides the first speaker of (23) with the information that the hearer got her message and feels the same about it. Note that since the second utterance in (23) echoes the focus of the previous utterance, it ‘inherits’ the antecedent of the echoed focus. So the antecedent is *who* rather than *Paul*. Therefore, replies such as (23) do not run against our earlier observation that the extension of the antecedent and the focus may be identical in metalinguistic arguments only.

2.1.2. The Exhaustivity Factor

As was noted in **Section 1.3**, focus typically occurs in answers and replies; we have shown in the previous section that the corresponding licensing contexts satisfy the SRC and the KC. Both of those conditions apply to bound focus as well. The additional constraint to be investigated in this section is a distinctive feature of free focus.

Why does free focus occur in replies and answers? In what follows, it will be shown that these licensing contexts fulfill yet another requirement than the ones already discussed: they satisfy the *exhaustivity presupposition* induced by the focus-containing utterance. The exhaustivity presupposition is a particular feature of free focus, which explains why utterances containing free focus occur only as answers to questions or as replies.

Consider the following example:

- (24) — *Karl likes* [VEGETABLES]^F.
 — *No, he likes* [FISH]^F.

The context sentence in (24) can be paraphrased as ‘What Karl likes is vegetables’ and the one in the reply in (24) as ‘No, what he likes is fish’. Since the first implies that the only thing Karl likes is vegetables, and the second that the only thing he likes is fish, the second utterance causes the rejection of the first and serves as a correction of the first.

Now compare (25) with (26):

- (25) — *Karl is a vegetarian*.
 — # *No, [IRMGARD]^F is*.
 (26) — *Karl is the director*.
 — *No, [IRMGARD]^F is*.

The reply in (25) is infelicitous. The first utterance in (25) means that there is a person, namely Karl, who is a vegetarian, and it is not excluded that there are other persons who are vegetarians. The reply in (25) means ‘No, the person who is a vegetarian is Irmgard’, which implies that there is a unique person who is a vegetarian. One would expect that the uniqueness implied by the focus-containing utterance provides a reason to reject the previous utterance, since if Irmgard is the only one who is a vegetarian (given a contextual restriction to relevant candidates), then it is impossible for Karl also to be a vegetarian. Then why is the reply in (25) infelicitous?

The reason why (25) is infelicitous is that the focus-containing utterance *presupposes* rather than *asserts* the uniqueness of its antecedent. This presupposition is not satisfied by the context in (25): the first sentence does not imply that there is a unique person who is a vegetarian — and this proposition cannot be accommodated unless we activate specific background information, like we are talking about two people so that we know that only one of them is a vegetarian.

The reply in (26) is felicitous. Including the existential presupposition triggered by the definite description, the first sentence in (26) can be paraphrased as follows: ‘There is some unique person who is the director, and this person is Karl’. The paraphrase of the reply in (26) is ‘No, the person who is the director is Irmgard’. Both imply that there is a unique person who is the director, that is why the second utterance causes the rejection of the first and serves as a correction of it.

The idea that focus expresses exhaustive listing is not new. In particular, Szabolcsi (1981, for Hungarian) and Kuno (1972, for Japanese and English) claimed that the focus-containing utterance asserts the exhaustivity of the focus with respect to the remnant. So, for example, the meaning of the sentence in (27a) below should be represented as in (27b) according to Szabolcsi:

- (27) a. [PÉTER]^F *aludt a padlón.*
 Peter slept the floor-ON
 ‘PETER slept on the floor’
 b. $\forall x : \text{slept-on-the-floor}(x) \Leftrightarrow x = \text{Peter}$
 c. ‘The person who slept on the floor is Peter’

This claim puts no restriction on the context of the utterance. As a matter of fact, Szabolcsi (1981) rejects the SRC as well.

The paraphrase which we think is appropriate for (27a) is given in (27c). That paraphrase presupposes that there is a unique person who slept on the floor, and asserts that this unique person is Peter. Thus, our claim is that exhaustivity is not *asserted*, but *presupposed* by the focus-containing utterance. As such, the *exhaustivity factor* becomes a restriction on the context. We formulate this restriction as follows.

The Exhaustivity Condition (EXC)

The context in which the sentence containing a free focus is uttered must entail the existence of an exhaustive (i.e., unique and maximal) entity for which the remnant holds. (That entity is identified by the discourse referent corresponding to the antecedent.)

To see why it is not just uniqueness but also maximality that is required of the antecedent, consider example (28):

- (28) — *So you invited [the TEACHERS]^F.*
 — *No, I invited [the STUDENTS]^F.*

If the remnant ‘you invited x ’ holds for the set of all teachers involved, say, eight teachers, then it also holds for the subsets of this set. Thus there is not a unique set of teachers of which the remnant holds. There is, however, a unique *maximal* set of which the remnant holds, and that is the entity the antecedent refers to.

The idea that exhaustivity is a presupposition of the focus is supported by the fact that it can be accommodated in particular contexts. Consider:

- (29) — *So you invited the teachers.* [No preferred reading given the context]
 — *No, I invited [the STUDENTS]^F.*

For example, in (29), in which there is no preference for a non-exhaustive reading of the first sentence, the proposition that ‘the teachers were the only ones you invited’ can easily be accommodated, and then the focus-containing utterance is felicitous, because its exhaustivity presupposition is satisfied.

- (30) — *So you also invited the teachers.*
 — # *No, I invited [the STUDENTS]^F.*

In (30), the first utterance explicitly states that the teachers were not the only persons invited; to put it differently, the remnant ‘you invited *x*’ does hold of the antecedent ‘the teachers’, but the antecedent is not unique. Since this non-uniqueness is part of the context of the second sentence, the uniqueness of the antecedent is not likely to be accommodated in that context, thus the EXC is not satisfied, and the focus-containing answer is infelicitous. If exhaustivity was asserted rather than presupposed by the reply, then we would have no explanation for its inappropriateness.

The same happens when the non-exhaustiveness of the antecedent is (for some reason or other) assumed in the context, as in (31):

- (31) — *So you invited the teachers.*
 [Preferred reading given context: You invited, among others, the teachers.]
 — # *No, I invited [the STUDENTS]^F.*

Only when there is no preference for the non-exhaustive reading, given the context or the informative content of the first utterance, can the exhaustiveness presupposition be accommodated.

Some further support for the idea that exhaustivity is not asserted but presupposed comes from a comparison of (25) and (32):

- (25) — *Karl is a vegetarian.*
 — # *No, [IRMGARD]^F is.*
 (32) — *Karl is a vegetarian.*
 — *No, only [IRMGARD]^{BF} is a vegetarian.*

In (32), the uniqueness of the focus is asserted through to the adverb *only*. As opposed to (25), the reply in this example is felicitous. If exhaustivity was part of the assertion of the answer in (25), then why would there be any difference in felicity between (25) and (32)? The assumption that in (25) exhaustivity is presupposed rather than asserted explains the difference: in (25), the presupposition fails to be satisfied, thus the utterance is infelicitous; in (32), there is no exhaustivity presupposition to be satisfied, hence the utterance is felicitous.

Finally, here is yet another argument in favour of the EXC. Consider the difference between (33a) and (33b).

- (33) a. — *Who gave Mary a Captain Beefheart CD?*
 — [JOHN and PAUL]^F *did.*
- b. — { ... [unintelligible words] *gave Mary a Captain Beefheart CD.*
John and Paul gave Mary a Captain Beefheart CD.
 — [WHO]^F *gave Mary a Captain Beefheart CD?*
 — [JOHN and PAUL]^F *did.*

The question in (33a) can do without a specific licensing context; the one in (33b), on the other hand, in which the *wh*-word is in focus, typically needs a context as one of the above, the question expresses disbelief or doubt about certain given information. (The question in (33b) is a so-called echo question.) If it was assumed that the exhaustivity of the entity that the remnant holds of is asserted by the focus-containing utterance, then both questions would imply that there exists a set of people who are exactly those people that gave Mary a Captain Beefheart CD. But then why would they differ with respect to their licensing contexts? The assumption that exhaustivity is presupposed explains the difference: the question in (33b) presupposes that there is a set of people that are exactly those people that gave Mary a Captain Beefheart CD; the licensing context fulfils this presupposition.

In the previous examples, we have not distinguished the antecedent from the discourse referent it refers to but, as illustrated in (34), these two levels should be kept separate and the EXC must be applied to the discourse referent rather than the antecedent.

- (34) [Background information: Irmgard is Gerhards ex. Gerhard has a new girlfriend, Ute. Gerhard and Irmgard don't want to see each other anymore, so either the one or the other is invited to the party. Gerhard may bring Ute.]
 — *They invited* [GERHARD]^F *to the party.*
 — *No, they invited* [IRMGARD]^F *to the party.*

The antecedent *Gerhard* is a label for the discourse referent 'Gerhard' or for the discourse referent 'Gerhard and Ute', depending on whether Ute is included in the invitation or not. Suppose both are invited, then the EXC is satisfied by the discourse referent 'Gerhard and Ute', but not by the antecedent *Gerhard*. Given the context, the label *Gerhard* is interpreted as 'Gerhard and Ute', and of course the EXC should be applied to the interpretation and not to the label.

Something similar holds for the remnant, i.e., there is a discourse referent (a relation or function) which corresponds to the actual remnant. Abstraction seems to be possible to some extent:

- (35) — *Did John beat the donkey?*
 — *No, [PETER]^F hit it.*
- (36) — *Did George lose his job?*
 — *No, they fired [WILLIAM]^F.*

To sum up, we have claimed in this section that, apart from the SRC and the KC, the licensing context of an utterance containing free focus must satisfy the EXC as well.

As we have mentioned earlier, the contextual requirements of contrastive topics are less strict than those of foci. In particular, the EXC does not apply to contrastive topics. One of our earlier example clearly shows this:

- (5) — *I invited Charles for a dinner.*
 — *I warn you: he likes few foods.*
 a. — *Well, he likes [HERRING]^{CT}.*
 b. — *# He likes [HERRING]^F.*

The focus-containing utterance (5b) is not felicitous in this context, which does not satisfy the EXC, whereas the contrastive topic in (5a) is fine.

2.2. Semantic values

As we will see in more detail in **Section 4**, the proper semantic characterization of utterances containing free focus is an intricate issue. Focus-containing utterances are often used in replies, in which case the information they carry explicitly contradicts information that has previously been incorporated in the ‘common ground’. In those cases (namely, the cases that we will call ‘corrective replies’ in **Section 3.1**), very non-standard semantic values should be assumed, such as an instruction to ‘downdate’ the common ground, to withdraw information by replacing the denotation of the antecedent with that of the focus, as it were. In other cases, focusing just expresses contrast between less specific and more specific information. We believe that the function of focus in those cases is that it accepts the exhaustivity implied by the antecedent, by replacing it with a more precise, though equally exhaustive description. No ‘downdating’ is involved in these cases, but the semantics of such sentences must take care of ‘passing on’ the exhaustiveness implication in the same way as in the case of corrections.

3. Analyses of Various Focus Constructions

3.1. Functions of Focus-containing Utterances

3.1.1. Corrective Replies

As we have pointed out earlier, the ‘contrastivity’ element of the Kinship Condition is specific for *corrective replies*. As a matter of fact, the existence of a common domain for the antecedent and a focus and their distinctness are necessary and sufficient conditions for the Kinship Condition to hold for them in a corrective reply.

When the focused element denotes a property, the kinship relation induces a partition of the domain of the focus and its antecedent. For example, in (37) below,

the focus *Canadian* and its antecedent *American* are contrastive because Canada is not the same country as America, but at the same time the focus and its antecedent are akin because their domain is the same (in the example that follows, they both apply to people and refer to their home countries). Contrastivity is a result of the partition of this domain induced by the predicates ‘Canadian’ and ‘American’.

- (37) — *So, your [AMERICAN]^F aunt is going to visit you.*
 — *No, my [CANADIAN]^F aunt is.*

- (38) — *So, your [AMERICAN]^F aunt is going to visit you.*
 — # *No, my [CHILDLESS]^F aunt is.*

The reply in (38), however, is infelicitous because there is no sufficient kinship between the focus *childless* and its antecedent *American*: ‘being childless’ and ‘being American’ cannot be constructed as contrastive properties, or disjunct parts of a domain (under our common-sense assumptions about these concepts). Only in a very specific context, for example, one in which the background information is available that I have only two aunts, a Dutch aunt whose most salient property is that she is childless, and an American aunt with four children, could the utterance be acceptable. In such a context, the focus and its antecedent can be understood as properties which serve to divide the now restricted domain, consisting of my two aunts, into two contrasting parts. The properties ‘American’ and ‘childless’ have become like proper names. Compare:

- (39) — *So aunt Bertha is going to visit you?*
 — *No, aunt [LIZZY]^F is.*

3.1.2. Specification Replies

We have also mentioned earlier that replies need not always be corrective. While those replies are characterized by the (bi-)partition of the common domain by the antecedent and the focus, the focus refers to a *sub-class* of the denotation of the antecedent in the other important class of replies. We will call these *specification replies*.

We have shown how the EXC applies to correction replies; it also applies to specification replies:

- (40) — *The police bought some new cars.*
 — *Yes, they bought [twelve PORSCHE]^F.*

The answer in (40) is a specification reply. Due to the first sentence, its context contains an exhaustive set of cars that the police bought.* The presupposition

* Note that we are assuming here a referential interpretation of *some*; in particular, we take it that the discourse referent corresponding to *some new cars* in (40) corresponds to *all* the new cars that the police bought.

of the focus that there is such an exhaustive set is satisfied, therefore the answer in (40) is felicitous.

Interestingly, the focus cannot be less specific than its antecedent. ‘De-specification’ replies are not possible:

- (41) — *Does he have a [PORSCHÉ]^F?*
 — # *(No,) he has a [CAR]^F.*

3.1.3. Answers to Questions

Answers to questions fall into the same category as specification replies in the sense that the relationship of the focus to its antecedent is one of specification rather than contrastivity. The *wh*-word refers to a subset of the common domain and the focus must be a specification of that subset. (Again, all types of questions exist with all types of foci in the answers. *Yes/no*-questions are associated with truth-value-type foci, as we will see in **Section 3.3**.) Consequently, answers like the following are excluded:

- (42) — *Who did Peter visit yesterday?*
 — # *He visited [the MAGNUM exposition]^F.*
- (43) — *So he wants to find himself a place to live. What’s he going to do?*
 — # *He’s going to [cook a DINNER]^F.*

The answer in (42) is infelicitous because the focus refers to an inanimate entity, namely the Magnum exposition, while the *wh*-word refers to persons; so the focus cannot be a specification of its antecedent, they are not akin. The answer in (43) is infelicitous because the reference of the *wh*-word is contextually restricted to actions aimed at finding a place to live, while cooking a dinner refers to a completely different kind of action; again, the focus cannot be a specification of the antecedent.

We assume that questions entail the existence of an exhaustive answer. Consider:

- (44) — *Who did Johan invite?*
 — *Johan invited [JOHN, PETER, ANNA and SAUL]^F.*

So the question in (44) entails that there exists a set of people who are exactly those people whom Johan invited. After this question has been uttered, the context entails the existence of a discourse referent which exhaustively identifies this set

This interpretation may not always be the correct one (in particular, it is not when such an NP is a topic constituent), but it is correct for the present case and, in general, for plural indefinites in the predicate of a sentence with a stative verb. This approach also yields correct predictions for celebrated cases like *Harry has some sheep_i. Joe shaves them_i.*

of people. The exhaustivity presupposition of the focus in the answer is satisfied, therefore the utterance is felicitous.

Our assumption that the exhaustiveness of answers originates from the questions themselves is strongly supported by the fact that, in all languages that we examined, *wh*-words are marked as foci:

(45) Japanese (Kuno, 1972)

- a. *Dare ga Mary o butimasita ka?*
 who FOCUS ACC hit QUESTION
 'Who hit Mary?'
 b. **Dare wa Mary o butimasita ka?*
 TOP

(46) Hungarian

- a. *Ki fejezte be a cikket?*
 Who finished PREF the paper-ACC
 'Who finished the paper?'
 b. **Ki befejezte a cikket?*
 PREF-finished

(47) Yoruba (Davison, 1986)

- a. *kín ni Bólá rà ní ojà?*
 what FOCUS Bola buy at market
 'What did Bola buy at the market?'
 b. **kín Bólá rà ní ojà?*
 what Bola buy at market
 c. *níbo ni Bólá rà aṣọ?*
 where FOCUS Bola buy cloth
 'Where did Bola buy cloth?'
 d. **níbo Bólá rà aṣọ?*
 where Bola buy cloth

(48) Ilocano (Schwartz, 1976)

- a. *sadino ti pag-taray-an ti lalaki?*
 where FOCUS run DET boy
 'Where does the boy run?'
 b. **sadino pag-taray-an ti lalaki?*
 where run DET boy

The relationship of a *contrastive topic* to its antecedent is also one of specification. As a consequence, they can occur in every context in which a specification reply can (as an answer to a question, for example). However, as we have seen in **Section 2.1.2**, foci require a more special type of contexts than contrastive topics (see example (5)). Intuitively, contrastive topic expresses the fact that, although it is a specification of the antecedent, it is 'not specific enough'.

3.1.4. Metalinguistic Arguments

Finally, there is a special type of corrective replies, which is not characterized by a (bi-)partition of the common domain nor, in fact, in any partition of the common domain. As a matter of fact, in this case, and only in this case, the denotation of the antecedent and the focus are identical:

- (22) — *Grandpa is feeling lousy.*
 — *Grandpa isn't [feeling LOUSY]^F, Johnny, he's just [a tad INDISPOSED]^F.*
 'The right description of Grandpa's health is *a tad indisposed*'
- (49) — *So you managed to trap two mongeese?*
 — *I didn't manage to trap two [MONGEES]^F, I managed to trap two [MONGOOSES]^F.*
 'The plural of the name of the two animals I managed to trap is *mongoooses*'

(The utterances in (22) and (49) are examples from Horn, 1989; the focusing and the paraphrases are ours. In Horn, 1989, many more of these so-called 'metalinguistic negation' cases can be found.) The difference between the first utterance and the reply is stylistic in (22), whereas it is grammatical (morphological) in (49). It would be difficult to argue that the semantics of the focus and its antecedent are either extensionally or intensionally different in these cases.

These metalinguistic data confront us with the problem of how to find out what information is in focus. Obviously, the information that is contrasted is not part of the content of the utterance, so there must be other information linked to the focus and the antecedent that is being contrasted. This information can only be made available using a not purely semantic discourse representation framework.

3.2. Various Types in Focus

Nearly all the data given in the preceding sections were utterances in which the subject or direct object, referring to people, was in focus. As is shown in the examples below, there are much more possibilities, in fact every constituent in the sentence, including words, can be a focus. The following list of examples illustrates various possibilities, but is not intended to be exhaustive:*

* In these examples, and in some others later, the antecedent is in focus. Of course, all statements that we make about the interpretation of focus apply to a focused antecedent as well; however, the interpretation of the antecedent-containing utterance and the way in which that interpretation is arrived at can be assumed given while we concentrate on the analysis of the focus in the succeeding utterance.

- (50) *A set of entities:*
— *Did [the TEACHERS]^F borrow the old car?*
— *No, [the STUDENTS]^F did.*
- (51) *A property of a proposition:*
— *Did the students borrow the car [TODAY]^F?*
— *No, they borrowed it [YESTERDAY]^F.*
- (52) *A property of an object:*
— *Did the students borrow a [BRAND NEW]^F car?*
— *No, they borrowed an [OLD]^F one.*
- (53) *A two-place relation:*
— *Did the students [STEAL]^F the car?*
— *No, they [BORROWED]^F it.*
- (54) *A one-place relation:*
— *Did the students [WALK]^F?*
— *No, they [borrowed an old CAR]^F.*
- (55) *A quantifier:*
— *The students visited [ALL]^F pubs in town, didn't they?*
— *No, they visited [MOST]^F of them.*

There are certain types of focus which are especially interesting. They will be discussed in the sub-sections that follow.

3.2.1 Emphatic Focus: Focus and Negation

An *emphatic focus* is a focus that does not highlight some part of the content of a sentence, but rather the truth of the proposition expressed. It brings out that the proposition is a fact according to the speaker, either as a correction (when it has a negative utterance as an antecedent) or as an answer (to a *yes/no*-question). So emphatic focus is really an instance of free focus when the focus is of the type of truth values. This is how the interaction of focus with negation comes into the picture.

First, we will give an analysis of data containing a negation and a focus. These data can be, and usually are, instances of bound focus, since the negation can act as a focusing adverb when there is a focus around. The focusing-adverb negation influences the licensing conditions of these utterances. Second, we will show how our treatment of free focus applies to data with emphatic focus proper. Although the interaction with focusing adverbs complicates the picture, it will become clear that the licensing conditions applying to free focus apply to emphatic focus as well.

Consider the following example.

- (56) a. *Helen didn't introduce [BILL]^{BF} to Sue.*
 'The person Helen introduced to Sue was not Bill'
 'Bill is not among the people that Helen introduced to Sue'
- b. *Helen didn't introduce Bill to [SUE]^{BF}.*
 'The person Helen introduced Bill to was not Sue'
 'Sue is not among the people that Helen introduced Bill to'

These utterances illustrate the behaviour of a negation acting as a focusing adverb. The negation takes the element in focus as its argument. As with free focus, there are certain restrictions on the context in which utterances like these can be uttered felicitously. The remnant ('Helen introduced *x* to Sue') must be salient, but the context need not entail the existence of an exhaustive entity for which the remnant holds. We get the first readings following the examples if the bound focus is also assigned a free focus function, the second readings if it is not (see Krifka, 1991, for the discussion of these two possibilities).

As for the Kinship Condition, there clearly is a difference between free focus and focus bound by negation: whereas the identity of the denotations of the antecedent and the focus is excluded from our definition of kinship, a focus bound by negation must be identical to its antecedent. The identity requirement which holds for focus bound by negation is due to the fact that the negation in the utterances under consideration expresses the denial of some piece of information which is — or is supposed to be — available in the context; the focus refers to the same information as the antecedent and thereby makes it into the argument of the negation.

The claim that negation requires the identity of the focus and the antecedent is confirmed by the fact that an utterance containing a focus and a negation operating on it is infelicitous when this requirement is not satisfied; this happens, for instance, when the contextual information is a *wh*-question.

- (57) — *Who went to the afternoon lecture?*
 a. #*[HENK]^F didn't go, [REMKO]^F did.*
 b. *[HENK]^{CT} [DIDN'T]^F go, but [REMKO]^{CT} [DID]^F.*

The reply in (57a) means: Remko went to the afternoon lecture instead of Henk. The reply is only felicitous if it has been claimed or suggested in the context that Henk went to the afternoon lecture. Then the identity requirement would be satisfied; the *wh*-word in (57), however, does not ensure this on its own. The reply in (57b) means: of all the people who might have gone to the afternoon lecture, Remko went to it, but Henk did not. It is not excluded that other people went to the afternoon lecture as well. The interpretation of (57b) shows that the first prominent constituent in this reply is in fact a contrastive topic (see **Section 1.2**); furthermore, the reply contains an emphatic focus (*didn't*), which incorporates the negation. Emphatic focus will be discussed below, and we will say more about replies like (57b) in the next section.

Focus bound by negation is not different from other bound foci in that contexts in which a negation-bound focus may occur need not meet the Exhaustivity Condition, except when the bound focus is also assigned free-focus function (cf. the first paraphrases following (56a–b)).

The utterances in (56) and (57b) are interpreted in such a way that the negation is not part of the remnant but, depending on the context, it may happen that the negation is included in the remnant.

- (58) a. — *I heard she introduced* [BILL]^F *to Sue.*
 — *No, she didn't introduce* [[BILL]^{BF}]^F *to Sue, she introduced* [ALAN]^F *to Sue.*
- b. — *So Helen didn't introduce* [PETER]^F *to Sue.*
 — *No, she didn't introduce* [BILL]^F *to Sue.*

The reply in (58a) is of the same kind as the utterance in (56a) under its first reading, i.e., it can be paraphrased as ‘The person whom she introduced to Sue is not Bill, it is Alan’. The reply in (58b), however, is to be interpreted as ‘The person whom she did not introduce to Sue is Bill’. In this case, the remnant (‘Helen didn’t introduce *x* to Sue’) includes the negation. Consequently, the focus (*Bill*) is a simple free focus, it is not bound by the negation. Thus, all the conditions put down in **Section 2.1** apply to this case: the remnant must be salient, there must be an exhaustive entity of which the remnant holds, and there must be a kinship relation — not the identity relation! — between focus and antecedent.

Replies of the kind exemplified in (59) below seem to be problematic for our account of the interaction between focus and negation:

- (59) — *I heard Helen didn't introduce* [BILL]^{BF} *to Sue.*
 — *Indeed, Helen didn't introduce* [[BILL]^{BF}]^F *to Sue, she introduced* [PETER]^F *to Sue.*

The interpretation of the reply in (59) is ‘I agree with you that the person whom Helen introduced to Sue was not Bill; it was Peter’, so the negation functions as a focusing adverb, and the remnant of the denial is ‘Helen introduced *x* to Sue’. The remnant is clearly not expressed by the previous utterance, so how can the Salient Remnant Condition be satisfied? We must assume here that either the expectation that Helen would introduce Bill to Sue, or the suggestion that Helen introduced Bill to Sue, is already available in the context, since the first utterance itself assigns free-focus function to *Bill*.

The previous examples have shown that negation interacts with focus in two ways: first, it can act as a focusing adverb (and the bound focus can be assigned free-focus function at the same time), or it can act as emphatic focus, when the focus is of the truth-value type. The following example illustrates typical cases of emphatic focus.

- (60) — (*I heard that*) *Paul has written a thesis.*
 a. — *No, he* [HASN'T]^F (*written a thesis*).
 b. *Indeed, he* [HAS]^F (*written a thesis*).

The context in (60) provides us with a candidate fact about the world, namely the proposition 'Paul has written a thesis'. The emphatic foci in the replies highlight that this proposition is false ((60a)) or true ((60b)). In other words, the emphatic focus expresses what the truth value of the proposition is according to the speaker.

It seems that emphatic focus in English is commonly expressed by prosodic prominence of the auxiliary. It may well be the case that the same effect can be obtained by making other elements in the utterance prosodically prominent, but at present we do not know how that works. (In the next section, for example, in connection with contrastive topics and multiple foci, we will come across a candidate for emphatic focus in English which is not expressed by an auxiliary.) Of course, the effect of emphatic focus can also be obtained by the use of certain adverbs, e.g., *really, certainly, no doubt*, and by constructions like *it is true/a fact that...*, but we restrict the discussion to focus.

As the following data show, focusing a truth value is not a peculiarity of English.

- (61) *Irish Gaelic* (Caoimhin P. Ó Donnaile, Breannán Ó Nualláin, p.c.)
Cheannaigh me teach go dearbh
 Bought I house is-a-fact
 'I DID buy a house'
- (62) *Welsh* (John Phillips, p.c.)
FE brynaís dy.
Fe BRYNAIS dy.
 POSITIVE I-bought house
 'I DID buy a house'
- (63) *Yiddish* (Ellen F. Prince, p.c.)
Ikh hob YO gekoyft a shtub.
 I have yes bought a house
 'I DID buy a house'
- (64) *German* (Höhle, 1992)
 a. (*Nein,*) *Karl HAT nicht gelogen.*
 no Karl has not lied
 '(No,) Karl DIDn't lie'
 b. (*Ja,*) *er HÖRT ihr zu.*
 yes he listens her-DAT to
 '(Yes,) he DOES listen to her'

(67) *Dutch*

— *Het schijnt dat Paul zijn proefschrift niet heeft afgemaakt.*

not

‘It seems that Paul hasn’t finished his thesis’

a. — ?(^{OK}*Maar*) *hij HEEFT zijn proefschrift afgemaakt.*

but

‘(But) he DID finish his thesis’

b. — *Hij HEEFT (inderdaad) zijn proefschrift niet afgemaakt.*

indeed

‘(Indeed) he DIDn’t finish his thesis’

c. — (*Maar*) *hij heeft zijn proefschrift WEL afgemaakt.*

but

POSITIVE

‘(But) he DID finish his thesis’

d. — ?*Hij heeft zijn proefschrift (^{OK}inderdaad) NIET afgemaakt.*

indeed

‘(Indeed) he did NOT/DIDN’T finish his thesis’

(68) *Dutch*

— *Heeft Paul zijn proefschrift afgemaakt?*

‘Did Paul finish his thesis?’

a. — *Ja, hij HEEFT zijn proefschrift afgemaakt.*

yes

‘Yes, he DID finish his thesis’

b. — *Nee, hij HEEFT zijn proefschrift niet afgemaakt.*

no

‘No, he DIDN’T finish his thesis’

c. — ?*hij heeft (^{OK}inderdaad) zijn proefschrift WEL afgemaakt.*

indeed

POSITIVE

‘(In actual fact,) he DID finish his thesis’

d. — *Nee, hij heeft zijn proefschrift NIET afgemaakt.*

no

‘No, he he DIDN’T/did NOT finish his thesis’

(69) Dutch

— *Heeft Paul zijn proefschrift niet afgemaakt?*

‘Didn’t Paul finish his thesis?’

a. — ?*Hij HEEFT zijn proefschrift* (^{OK}*wel*) *afgemaakt.*

POSITIVE

‘(But) he DID finish his thesis’

b. — *Hij HEEFT (inderdaad) zijn proefschrift niet afgemaakt.*

indeed

‘(Indeed,) he DIDN’T finish his thesis’

c. — (*Integendeel,*) *hij heeft zijn proefschrift WEL afgemaakt.*

to the contrary

POSITIVE

‘(To the contrary,) he DID finish his thesis’

d. — ?*Hij heeft* (^{OK}*inderdaad*) *zijn proefschrift NIET afgemaakt.*

indeed

‘(Indeed) he did NOT/DIDN’T finish his thesis’

In the examples above, the alternatives in (a–b) contain a focused finite verb, whereas those in (c–d) are replies in which the operators *wel/niet* (‘POSITIVE/not’) are in focus. As in the first pair of alternatives, the focus in the second pair highlights the truth value of the proposition under consideration. There is, however, a difference in behaviour: focusing of the operator is only felicitous when the effect of the utterance is the rejection of the proposition involved, in other words, *wel/niet* focus can only be used contrastively.

The confirmative examples (66c), (67d), (68c) and (69d) are infelicitous unless the sentence adverb *inderdaad*, which expresses agreement, is added. We assume that the presence of the adverb *inderdaad* facilitates the accommodation of contrastive material, e.g., in (67d), the adverb helps to accommodate the suggestion or claim that Paul would finish his thesis. Thus, the reply in (67d) rejects the accommodated information, not the explicit assertion in the context.

Interestingly, even when the proposition under consideration is questioned in the context (as in (68) and (69)), the answers with an operator in focus must be used contrastively. This indicates that the answers in (68c–d) and (69c–d) do not simply specify the truth value of the proposition, they contrast a truth value suggested or claimed about the proposition in the context. Either the question itself provides the suggested truth value ((68d) and (69c)), or (again with the help of the adverb *inderdaad*) the contrastive information is accommodated ((68c) and (69d)).

If we take into account that the focusing of the *wel/niet* operators can only be used contrastively, that is, the specification option in the Kinship Condition is ruled out, the licensing conditions for free focus apply straightforwardly to these cases. We assume that the assertion of a proposition *p* (or $\neg p$) induces the saliency in the context of the fact that *p* is true (false), and that the question *p?* ($\neg p?$)

induces the saliency of the suggestion that p is true (false). This salient information satisfies the Salient Remnant Condition of the rejections (66d), (67c) (68d) and (69c), and it provides an antecedent (truth or falsity) for the focus (falsity or truth). The EXC holds, since there is an entity ‘of which the remnant holds’, namely, a truth value, and that entity is trivially exhaustive because a proposition can only have one truth value at a time.

As we stated previously, the confirmative replies (66c), (67d), (68c) and (69d) need the help of accommodation. The information that must be accommodated is not induced by the assertion or question in the context: both the assertion/question and the reply are interpreted as reactions to the information that is to be accommodated. The SRC and the EXC are satisfied by the accommodated information.

The replies with the finite verb in focus (the (a) and (b) alternatives) seem to be suitable both as confirmation and as rejection of a proposition available in the context, witness (66a–b) and (68a–b). However, the rejections in (67a) and (69a) are not felicitous unless some element indicating contrastiveness (*maar* in (67a) and *wel* in (69a)) is present. We assume that emphatic focus is essentially non-contrastive, but can be given a contrastive character by linking a contrastive element to it. In (66b) and (68b) the negation *niet* would be the contrastive element. The same is true for other types of foci as well, but — probably because the truth or falsity of an entire proposition are really special denotations — this restriction seems stronger in the case of emphatic foci.

What about our claim (in the first part of this section) that the focus and the antecedent must be identical if the negation is a focusing adverb? It is not unreasonable to assume that, because of the particular character of an emphatic focus (it highlights a truth value), the interaction with negation differs from other foci: because the emphatic focus and the negation express the same type of information, they fuse and adopt the behaviour of a negation in focus. Thus, the identity requirement of the negation is lost.

Given these assumptions, the SRC, KC and EXC applied to the contexts of the (a-b) alternatives are satisfied in the same way as for the (c-d) alternatives.

3.2.2 Multiple Focus, List Focus and Contrastive Topic

In this section we will examine how the semantic characteristics of free focus proposed earlier, especially the licensing conditions, apply to utterances with *multiple focus* and with *list focus*.

It is well-known that an utterance may contain more than just one focus. Consider the following example.

- (70) — *Sue invited Lisa.*
 — *No, [LISA]^F invited [SUE]^F.*

The answer in (70) contains a so-called *multiple focus* (see Krifka, 1991). The focus in this utterance is an ordered pair, namely, $\langle \text{Lisa}, \text{Sue} \rangle$. The Exhaustivity Condition requires the presence of an exhaustive entity in the context for which the remnant holds. The remnant in this case is the function $\lambda \langle x, y \rangle. \text{invited}(x, y)$. The entity that satisfies the EXC is $\langle \text{Sue}, \text{Lisa} \rangle$, who constitute the unique maximal inviter/invitee pair in the event that the remnant refers to. Furthermore, the Salient Remnant Condition is obviously satisfied. However, in what way does the Kinship Condition apply to ordered pairs?

- (71) — *Sue invited Lisa.*
 a. — *No, [PETER]^F invited [MARTIN]^F.*
 b. — *# No, [SUE]^F invited [LIZZY]^F.*

In (71), two variations of the previous multiple focus reply are given. They show that the components of the focused ordered pair need not be the same as those of the antecedent ((71a)), and that there can only be a relation of contrastivity between ordered pairs if both the first and the second components of the focus are contrastive with respect to the respective elements of the antecedent ((71b)).

- (72) — *He sent us some notes on official looking paper.*
 — *To be precise, he sent you [a CONTRACT]^F on [NOTEPAPER with the UNIVERSITY LOGO]^F.*

The relation between a multiple focus and its antecedent may also be a relation of specification, as is illustrated in (72). Again, each component of the focused ordered pair must be a specification of the corresponding component of the antecedent. This account of the application of the KC also covers metalinguistic multiple focus. It could also be generalised to cover mixed multiple foci, i.e., one could claim that a kinship relation holds between two ordered pairs if there is a kinship relation between the first components and the second components. That would license replies like the following — which we find less felicitous than the unmixed cases.

- (73) — *Charles gave his son a car.*
 — *?# You mean he gave [his DAUGHTER]^F [a PORSCHE]^F.*

Another case in which several foci seem to appear in an utterance is called *list focus*. List focus is characterised by a sequence of focus-containing utterances, each with (roughly) the same remnant. Such a piece of discourse is interpreted as having one single focus, which is the ‘sum’ of the individual foci:

- (74) — *Who did Sue invite?*
 — *She invited [the STUDENTS]^F, she invited [the TEACHERS]^F, and she invited [the OFFICIALS]^F.*

The peculiarity of such utterances is that they cannot be interpreted as the simple conjunction of the proposition of each clause, because that would lead to contradiction. In fact, we wonder to what extent the equivalents of (74) are felicitous

in languages with less ambiguous focus marking. They are definitely marginal in Hungarian, for example; typically, a single clause with co-ordinated focus or a list of clauses without foci would be normally used as answers to a question like the one in (74):

(75) Hungarian

— *KIT hívott meg Zuzsa?*
 who-ACC invited-INDEF-OBJ PREF Sue
 ‘Who did Sue invite?’

— a. # *A DIÁKOKAT hívta meg és a TANÁROKAT hívta meg.*
 the students-ACC invited-DEF-OBJ PREF and the professors-ACC
 invited-DEF-OBJ PREF

‘It’s the students and the professors she invited’

— b. *A DIÁKOKAT és a TANÁROKAT (hívta meg).*
 ‘It’s the students and the professors she invited’

— c. *Meghívta a diákokat és (meghívta) a tanárokat.*
 PREF-invited PREF-invited
 ‘She invited the students and the professors’

(75a) is marginal; (75b) is the most natural answer to the question, whereas (75c) contains no free focus (as a consequence, it could not be used as a corrective reply), but it is conceivable as an answer to the question. An intonation contour suggesting a complete enumeration is required, however, just like in the English example in (74), for an interpretation similar to that of real list foci. We cannot speak of list focus in (75c).

We may conclude that genuine list focus is literally a list of foci in an enumeration, in which case the grammar of the language must specify that the ‘sum’ of the foci is to be interpreted as focus (English may have such a construction; it is very marginal in Hungarian). In other languages, a list of foci with the same remnant may give rise to inconsistency: in those languages, the only solution may be to focus a co-ordinated constituent.

The EXC applies to a list focus in exactly the same way as to a ‘single’ free focus. In (74), the context of the utterance containing list focus must entail the existence of an exhaustive entity of which the remnant ‘she invited *x*’ holds. This entity is the maximal unique set of people she invited. The existence of this entity is entailed by the question in (74), therefore the EXC is satisfied. As for the Kinship Condition, it must apply as in the case of single focus, i.e., kinship must hold between each individual focus and the elements of the antecedent.

In the following example, list focus and multiple focus are combined; to be precise, it exhibits a list of multiple foci.

- (76) [Context: chess tournament; participants: William, Susan and George]
 — *Who beat who?*
 — [WILLIAM]^F *beat* [SUSAN]^F, [WILLIAM]^F *beat* [GEORGE]^F, *and* [SUSAN]^F
beat [GEORGE]^F.

How do the licensing conditions for free focus apply to listed multiple foci? Reasoning from the analyses given for multiple focus and list focus separately, we arrive at the following account for (76). The remnant of (76) is $\lambda(x, y).beat(x, y)$. It is clear that the Salient Remnant Condition is satisfied by the context of (76). The EXC requires the existence of an entity of which the remnant holds exhaustively. We will assume that the question in (76) entails that there exists an exhaustive set of winner/loser pairs; this set is the entity that satisfies the EXC. Thus the presupposed entity is a set of ordered pairs. The individual multiple focus pairs refer to the elements of this set.

As for the Kinship Condition, under the assumption that the multiple foci taken together refer exhaustively to the antecedent, the same holds as for listed single foci: the Kinship Condition is applied to each of the individual multiple foci separately: there must be a kinship relation between each multiple focus and an element of the antecedent and, furthermore, the kinship relation must be of the same kind for all the first components, and also for all the second components. One could also opt for a stronger condition, namely that all kinship relations involved must be of the same kind.

Let us now turn back to the concept of *contrastive topics*, discussed in **Section 1.2**. Contrastive topics, list foci and multiple foci are related in an interesting way. First, in a list of foci, each individual (simple or multiple) focus refers to only one element of a virtual focus, which is also a characteristic feature of contrastive topics. Second, contrastive topics very often co-occur with foci, together forming something very similar to a multiple focus. So much so that, for example, Chafe (1976) considered what we call contrastive topic here a sub-case of multiple foci. For example, consider the following example:

- (77) — *When did John see the play?*
 — [*The PLAY*]^{CT}, *John saw* [YESTERDAY]^F.

According to Chafe (1976), ‘the addressee is assumed to have in mind certain possible pairings of theatrical events with certain times that John might be attending or have attended them. The speaker is providing the information that one correct pairing is of “the play” with “yesterday”’.

An utterance containing a contrastive topic usually has the pragmatic effect of arousing the implicature that other candidates that could fulfil the same function as the contrastive topic (in the example above, other theatrical events) are worth examining from the same point of view (in our example, from the point of view of when John saw them). Thus, its effect is either to urge the addressee to inquire about them or just leave the question open to which other candidates the remnant

holds, and thereby suggest that it may well hold/not hold for other candidates. Now, it seems that in English the very same effect can be achieved by interrupting a list of foci (i.e., uttering a list focus without the intonation contour characteristic for complete enumerations). As a matter of fact, one of our earlier examples could as well be analysed in this way:

- (7) b. — *I invited Charles for a dinner.*
 — *I warn you: he likes few foods.*
 — *Well, he likes [HĚRRING]^{CT}.*

Perhaps it is not unjustified to say that the last utterance of this discourse is actually the beginning of an interrupted list focus. The implicature of this utterance is ‘he may not like most foods, but he likes at least herring, and maybe others as well’. That is, if we think of the remnant as a characteristic function (from foods to truth values) expressing what Charles likes, the ‘interrupted list focus’ type of contrastive topic highlights the positive part of that characteristic function.

On the other hand, the other version of this reply, the one in (7a), can hardly be considered an interrupted list focus, because the position of the contrastive topic there is incompatible with such an analysis:

- (7) a. — *I invited Charles for a dinner.*
 — *I warn you: he likes few foods.*
 — *Well, [HĚRRING]^{CT} he likes.*

This is the genuine contrastive topic, called ‘fronted focus’ by Chafe (1976) although, at first sight, it does not seem to contain a focused constituent which should accompany the ‘fronted focus’. Still, if we think of (77), we can find ‘the pairings that the addressee is assumed to have in mind’ in (7a) as well, namely, each food should be paired with a truth value, as we said above. Therefore, we could safely argue that the reply in (7a) does contain a free focus, namely, an emphatic focus, which highlights the truth value of the remnant applied to the contrastive topic:

- (78) a. — *I invited Charles for a dinner.*
 — *I warn you: he likes few foods.*
 — *Well, [HĚRRING]^{CT} he [LIKES]^F.*

It is instructive to look at similar utterances in Hungarian:

(79) Hungarian

- a. *A GYEREKEKNEK KENYERET adott.*
 the children-DAT bread-ACC gave
 ‘[To the CHILDREN,]^{CT} (s)he gave [BREAD]^F’
- b. *A GYEREKEKNEK ADOTT kenyeret.*
 ‘[To the CHILDREN,]^{CT}, (s)he [DID]^F give bread.’

Interestingly enough, neither of these sentences can be interpreted as not containing free focus at all. As a matter of fact, no Hungarian utterance can contain a

contrastive topic without also containing a free focus, and interrupting a list of foci may not express contrastive topic.

Be it as it may, we think that Chafe's approach is basically correct, and that contrastive topics are always associated with 'pairings', and they have many similarities with multiple foci for that matter. However, they cannot be considered components of genuine multiple foci, both for their syntactic behaviour (fronted position) and their interpretation.

Our conclusion is that contrastive topics should be treated separately from both list focus and multiple focus, although on the one hand, interrupting a list focus may have an effect similar to that of contrastive topics and, on the other, contrastive topics involve tuples.

4. Requirements for a Formal Theory of Focus

In this section, we will draw some conclusions on what would be needed for a formalization of the proposals and facts discussed in this paper. Formalization would be extremely important, because it is very difficult to either make precise predictions or test such predictions without a system in which calculations can be made. We will split this problem into two parts: the account for felicity conditions, and the semantic values of utterances containing free focus.

4.1. Felicity Conditions

The simplest way of thinking of the felicity conditions of utterances is to assume that an utterance whose felicity conditions are not met is assigned a degenerated (undefined) semantic value. Nothing that follows hinges on this assumption, however.

We have proposed three felicity conditions for free focus: the SRC, the KC and the EXC. Let us review them briefly here.

4.1.1. The Salient Remnant Condition

The SRC applies to utterances containing free or bound focus alike. It stipulates that the remnant is salient in the current context. It is entirely unclear how this can be put in formal terms, both for us and the literature that we are familiar with. The fact that the remnant must be somehow 'present' in the current context c_0 may be expressed as

$$\text{for some } X, R(X) \in \text{Descr}(X, c_0).$$

X is any discourse referent, and R is the discourse referent corresponding to the remnant, i.e., a λ -expression that expects an argument of the type of X . By a

context we mean a *representation* of the linguistic and extra-linguistic information about the setting and the history of a discourse in the form of *conditions* about discourse referents. The *description* of X in the context c_0 , written $\text{Descr}(X, c_0)$ above, is the set of conditions in c_0 which contain occurrences of X . We consider the presence of the remnant a necessary but not sufficient condition for the remnant to be salient.

There are two main conclusions related to the definition of saliency (both of which are also relevant for what follows). First, we need discourse referents of all types, including the type of truth values (which should not be identical to the type of propositions!) and of n -tuples (for every $n < \omega$). This is obvious from the analyses in **Section 3.2**. Second, we need an essentially ‘representationalist’ theory, in which the meta-linguistic function ‘Descr’ can be defined. The set of conditions which constrain the denotation of a discourse referent cannot be reproduced from the possible denotations themselves, i.e., ‘Descr’ is an essentially syntactic rather than semantic notion. As is clear from the case of meta-linguistic arguments (see **Section 3.1.4**), the representations must also contain the linguistic features of the conditions, i.e., the utterances which have given rise to the conditions (as in Kamp’s, 1981, Discourse Representation Structures, for instance).

4.1.2. The Kinship Condition

The KC also applies to both free and bound foci. Its formulation is a serious challenge for any semantic theory. Since the KC is not a presupposition, it must hold in the *resulting* context c_1 rather than the initial context c_0 . As we have pointed out in **Section 2.1.1**, the kinship between the focus (F) and its antecedent (A) requires the existence of a ‘common domain’ C , i.e., a discourse referent that refers to a set (‘those under consideration’) to which both A and F belong. That is,

$$\emptyset \neq C = \{X : F \leq_{c_1} X\} \cap \{Y : A \leq_{c_1} Y\},$$

where $X \leq_{c_1} Y$ expresses that Y is a *contextually relevant superclass* of X in the context c_1 , and will be defined shortly. In addition, the focus and its antecedent must stand in either of the following four relations:

- (a) *specification*: $F \leq_{c_1} A$ (i.e., A is a superclass of F), and $|A|_{c_1} \neq |F|_{c_1}$ (i.e., the extensions of A and F are not identical in c_1);
- (b) *contrastivity*: $|F|_{c_1} \neq |A|_{c_1}$ and A and F do not stand in a specification relation;
- (c) *metalinguistic argument*: $|F|_{c_1} = |A|_{c_1}$ (i.e., the extensions of F and A are identical in c_1), but $\text{Descr}(F, c_1) \neq \text{Descr}(A, c_1)$ (i.e., the description of F in the context c_1 is not the same as that of A in c_1).

Intuitively, the relation \leq_c stands for a hierarchy of natural classes that is modified by the context, i.e., classes which are not relevant in the context are

filtered out, and sets of objects that are normally not considered to be natural classes can be inserted in the hierarchy if they are salient in the context. As yet, we do not know how to implement a notion of ‘contextual relevant information’, but we consider it to be a crucial factor in the analysis of discourse interpretation.

The relation \leq_c is defined as follows: For any discourse referents X, Y and context c , $X \leq_c Y$ holds iff either

- (a) $|X|_c = |Y|_c$ and for some P, R , $P(X) \in \text{Descr}(X, c)$ and $R(Y) \in \text{Descr}(Y, c)$, $P \leq_c R$ and $R \leq_c P$; or
- (b) $|X|_c \subset |Y|_c$ and for some P, R , $P(X) \in \text{Descr}(X, c)$ and $R(Y) \in \text{Descr}(Y, c)$, $P \leq_c R$.

Apart from the requirement on the extensions of the discourse referents, these clauses contain a condition on the descriptions of X and Y in c . The reason for this is that it must be avoided that the extensions of the discourse referents are ‘accidentally’ identical or stand in a subset relation to each other. For example, in a certain context *the man on the balcony* and *the Pope* may have the same extension. In order to exclude accidental identity of the extensions, these discourse referents must share at least one property, that is, the man on the balcony must be the Pope, or the Pope must be the man on the balcony. To illustrate clause (b), consider the situation that the extension of *Louis and Francness* is a subset of the extension of *the students*. Again, we don’t want this to be accidental, that is, there must be a link between the two discourse referents within their descriptions. In this case, the information that, for instance, Louis and Francness are both first-year students would satisfy the requirement.

As can be seen from these clauses, the relation ‘ \leq_c ’ is also defined for predicates occurring in conditions (as a matter of fact, we have not excluded that discourse referents, which can be of any type, occur as predicates in conditions themselves):

- (c) If P and R are atomic predicates, and $|P| \subseteq |R|$, then $P \leq_c R$ (e.g., $\text{PORSCHER} \leq_c \text{CAR}$, $\text{TRUE} \leq_c \text{TRUTHVALUE}$);
- (d) $\lambda x.\phi \leq_c \lambda y.\psi$ iff $\phi \leq_c \psi$ (e.g., $\lambda x.\text{MOTHER}(x) \leq_c \lambda y.\text{PARENT}(y)$);
- (e) $P(x) \leq_c R(y)$ iff $P \leq_c R$ (e.g., $\text{VIOLET}(x) \leq_c \text{FLOWER}(y)$);
- (f) $\phi \wedge \psi \leq_c \xi$ iff $\phi \leq_c \xi \wedge \psi \leq_c \xi$ (e.g., $\text{MOTHER}(x, y) \wedge \text{TEACHER}(x, y) \leq_c \text{AUTHORITY}(x, y)$);
- (g) $\neg\phi \not\leq_c \psi$ for any ψ (e.g., $\neg\text{SLEEP}(\text{PAUL}) \not\leq_c \text{SWIM}(\text{PAUL})$).

The conclusion from these definitions is that we need a uniform relation ‘ \subseteq ’ over the domain, which is defined at least for pairs of entities which correspond to the same type of discourse referents (e.g., it should be defined over n -tuples of the same length).

4.1.3. The Exhaustivity Condition

The EXC applies to free focus only. It stipulates that, for some discourse referents X and C s.t. $X \leq_{c_0} C$,

$$c_0 \models \text{Max}(R', |X|_{c_0}, |C|_{c_0}),$$

that is, the initial context entails that the property R' , which corresponds to the remnant R , maximally holds for the extension of X within a ‘potential common domain’ C . The relation Max is defined as follows:

$$\text{Max}(P, U, V) \Leftrightarrow P(U) \ \& \ \bigwedge_{U' \subseteq V} (P(U') \Rightarrow U' \subseteq U),$$

that is, every entity U' within V for which P is true is either identical to or part of U if P maximally holds for U .

This definition does not impose any new constraint on the framework, since it only uses the ordering ‘ \subseteq ’ of the domain of the model.

4.2. Semantic values

We can only think of a formal theory suitable for the treatment of focus as one in which the semantic value of an utterance is an instruction to update a context. It may be necessary to depart from the standard approach of dynamic semantics, where the semantic value of an utterance is a (potentially partial) *function* from contexts to contexts. The reason for this is that the way in which a context is updated according to a new utterance need not be uniquely determined. In particular, it is not clear what the effect of updating a context with a corrective reply is. When the hearer wants to incorporate a corrective reply, (s)he must reject some of the information (s)he is committed to in order to retain consistency. There may be several plausible ways in which such a ‘revision process’ can take place.

We do not have a concrete proposal as to what formal objects instructions are; however, they should satisfy the following desiderata: (i) an instruction should specify certain features of the resulting context (e.g., that it should entail a certain proposition), and (ii) the contexts that may result from carrying the instruction out must in some sense ‘minimally differ’ from the original context. These two criteria amount to the usual concept of updating a context if there is no belief revision involved. Otherwise, very little is known about what exactly instructions should do.

The instruction corresponding to an utterance containing free focus instructs the hearer to produce a resulting context c_1 which has the following feature:

$$c_1 \models \text{Max}(R', |F|_{c_1}, |C|_{c_1})$$

where C is the common domain (see **Section 4.1.2**). According to (ii) above, this effect should be achieved by some ‘minimal modification’ of the context.

References

- Chafe, W.L. 1976. 'Givenness, contrastiveness, definiteness, subjects, topics, and point of view'. In: Ch.N. Li, ed., *Subject and Topic*. Academic Press, N.Y., pp. 25-55.
- Davison, R. 1986. 'The pragmatic morpheme *ni* in Yoruba'. *CLS 22, Papers from the Parasession on Pragmatics and Grammatical Theory*, Chicago.
- Hirschberg, J., and G. Ward. 1983. 'A semantico-pragmatic analysis of fall-rise intonation'. *CLS, Papers from the Parasession on the Interplay of Phonology, Morphology and Syntax*, Chicago.
- Höhle, T.N. 1992. 'Über Verum-Focus im Deutschen'. In J. Jacobs, ed., *Informationsstruktur und Grammatik*. Linguistische Berichte: Sonderheft. Westdeutscher Verlag.
- Horn, L. 1989. *The Natural History of Negation*. University of Chicago Press, Chicago.
- Jackendoff, R. 1972. *Semantic interpretation in generative grammar*. MIT Press, Cambridge MA.
- Kamp, H. 1981. 'A theory of truth and semantic representation'. In: J. Groenendijk, Th. Janssen and M. Stokhof, eds., *Formal Methods in the Study of Language*. Mathematisch Centrum, Amsterdam.
- Krifka, M. 1991. 'A compositional semantics for multiple focus constructions'. In: J. Jacobs, ed., *Informationsstruktur und Grammatik*. Sonderheft 4 der Linguistischen Berichte.
- Kuno, S. 1972. 'Functional sentence perspective: A case study from Japanese and English'. *Linguistic Inquiry* 3, 269-320.
- Rooth, M. 1985. *Association with Focus*. Ph.D. thesis, University of Massachusetts, Amherst.
- Schwartz, A. 1976. 'On the universality of Subject: The Ilocano case'. In: Ch.N. Li, ed., *Subject and Topic*. Academic Press, N.Y., pp. 519-543.
- Selkirk, E.O. 1984. *Phonology and Syntax: The Relation Between Sound and Structure*. MIT Press, Cambridge MA.
- Szabolcsi, A. 1981. 'Compositionality in focus'. *Folia Linguistica* 15, 141-161.

The ILLC Prepublication Series

1990 *Logic, Semantics and Philosophy of Language*

- LP-90-01 Jaap van der Does A Generalized Quantifier Logic for Naked Infinitives
 LP-90-02 Jeroen Groenendijk, Martin Stokhof Dynamic Montague Grammar
 LP-90-03 Renate Bartsch Concept Formation and Concept Composition
 LP-90-04 Aarne Ranta Intuitionistic Categorical Grammar
 LP-90-05 Patrick Blackburn Nominal Tense Logic
 LP-90-06 Gennaro Chierchia The Variability of Impersonal Subjects
 LP-90-07 Gennaro Chierchia Anaphora and Dynamic Logic
 LP-90-08 Herman Hendriks Flexible Montague Grammar
 LP-90-09 Paul Dekker The Scope of Negation in Discourse, towards a Flexible Dynamic Montague grammar
 LP-90-10 Theo M.V. Janssen Models for Discourse Markers
 LP-90-11 Johan van Benthem General Dynamics
 LP-90-12 Serge Lapierre A Functional Partial Semantics for Intensional Logic
 LP-90-13 Zhisheng Huang Logics for Belief Dependence
 LP-90-14 Jeroen Groenendijk, Martin Stokhof Two Theories of Dynamic Semantics
 LP-90-15 Maarten de Rijke The Modal Logic of Inequality
 LP-90-16 Zhisheng Huang, Karen Kwast Awareness, Negation and Logical Omniscience
 LP-90-17 Paul Dekker Existential Disclosure, Implicit Arguments in Dynamic Semantics

Mathematical Logic and Foundations

- ML-90-01 Harold Schellinx Isomorphisms and Non-Isomorphisms of Graph Models
 ML-90-02 Jaap van Oosten A Semantical Proof of De Jongh's Theorem
 ML-90-03 Yde Venema Relational Games
 ML-90-04 Maarten de Rijke Unary Interpretability Logic
 ML-90-05 Domenico Zambella Sequences with Simple Initial Segments
 ML-90-06 Jaap van Oosten Extension of Lifschitz' Realizability to Higher Order Arithmetic, and a Solution to a Problem of F. Richman
 ML-90-07 Maarten de Rijke A Note on the Interpretability Logic of Finitely Axiomatized Theories
 ML-90-08 Harold Schellinx Some Syntactical Observations on Linear Logic
 ML-90-09 Dick de Jongh, Duccio Pianigiani Solution of a Problem of David Guaspari
 ML-90-10 Michiel van Lambalgen Randomness in Set Theory
 ML-90-11 Paul C. Gilmore The Consistency of an Extended NaDSet

Computation and Complexity Theory

- CT-90-01 John Tromp, Peter van Emde Boas Associative Storage Modification Machines
 CT-90-02 Sieger van Denneheuvel, Gerard R. Renardel de Lavalette A Normal Form for PCSJ Expressions
 CT-90-03 Ricard Gavaldà, Leen Torenvliet, Osamu Watanabe, José L. Balcázar Generalized Kolmogorov Complexity in Relativized Separations
 CT-90-04 Harry Buhrman, Edith Spaan, Leen Torenvliet Bounded Reductions
 CT-90-05 Sieger van Denneheuvel, Karen Kwast Efficient Normalization of Database and Constraint Expressions
 CT-90-06 Michiel Smid, Peter van Emde Boas Dynamic Data Structures on Multiple Storage Media, a Tutorial
 CT-90-07 Kees Doets Greatest Fixed Points of Logic Programs
 CT-90-08 Fred de Geus, Ernest Rotterdam, Sieger van Denneheuvel, Peter van Emde Boas Physiological Modelling using RL
 CT-90-09 Roel de Vrijer Unique Normal Forms for Combinatory Logic with Parallel Conditional, a case study in conditional rewriting
 X-90-01 A.S. Troelstra Remarks on Intuitionism and the Philosophy of Mathematics, Revised Version
 X-90-02 Maarten de Rijke Some Chapters on Interpretability Logic
 X-90-03 L.D. Beklemishev On the Complexity of Arithmetical Interpretations of Modal Formulae
 X-90-04 Annual Report 1989
 X-90-05 Valentin Shehtman Derived Sets in Euclidean Spaces and Modal Logic
 X-90-06 Valentin Goranko, Solomon Passy Using the Universal Modality: Gains and Questions
 X-90-07 V.Yu. Shavrukov The Lindenbaum Fixed Point Algebra is Undecidable
 X-90-08 L.D. Beklemishev Provability Logics for Natural Turing Progressions of Arithmetical Theories
 X-90-09 V.Yu. Shavrukov On Rosser's Provability Predicate
 X-90-10 Sieger van Denneheuvel, Peter van Emde Boas An Overview of the Rule Language RL/1
 X-90-11 Alessandra Carbone Provable Fixed points in $\Lambda_0 + \Omega_1$, revised version
 X-90-12 Maarten de Rijke Bi-Unary Interpretability Logic
 X-90-13 K.N. Ignatiev Dzhaparidze's Polymodal Logic: Arithmetical Completeness, Fixed Point Property, Craig's Property
 X-90-14 L.A. Chagrova Undecidable Problems in Correspondence Theory
 X-90-15 A.S. Troelstra Lectures on Linear Logic

1991 *Logic, Semantics and Philosophy of Language*

- LP-91-01 Wiebe van der Hoek, Maarten de Rijke Generalized Quantifiers and Modal Logic
 LP-91-02 Frank Veltman Defaults in Update Semantics
 LP-91-03 Willem Groeneveld Dynamic Semantics and Circular Propositions
 LP-91-04 Makoto Kanazawa The Lambek Calculus enriched with Additional Connectives
 LP-91-05 Zhisheng Huang, Peter van Emde Boas The Schoenmakers Paradox: Its Solution in a Belief Dependence Framework
 LP-91-06 Zhisheng Huang, Peter van Emde Boas Belief Dependence, Revision and Persistence
 LP-91-07 Henk Verkuyl, Jaap van der Does The Semantics of Plural Noun Phrases
 LP-91-08 Víctor Sánchez Valencia Categorical Grammar and Natural Reasoning
 LP-91-09 Arthur Nieuwendijk Semantics and Comparative Logic
 LP-91-10 Johan van Benthem Logic and the Flow of Information

Mathematical Logic and Foundations

- ML-91-01 Yde Venema Cylindric Modal Logic
 ML-91-02 Alessandro Berarducci, Rineke Verbrugge On the Metamathematics of Weak Theories
 ML-91-03 Domenico Zambella On the Proofs of Arithmetical Completeness for Interpretability Logic
 ML-91-04 Raymond Hoofman, Harold Schellinx Collapsing Graph Models by Preorders
 ML-91-05 A.S. Troelstra History of Constructivism in the Twentieth Century
 ML-91-06 Inge Bethke Finite Type Structures within Combinatory Algebras
 ML-91-07 Yde Venema Modal Derivation Rules
 ML-91-08 Inge Bethke Going Stable in Graph Models
 ML-91-09 V.Yu. Shavrukov A Note on the Diagonalizable Algebras of PA and ZF
 ML-91-10 Maarten de Rijke, Yde Venema Sahlqvist's Theorem for Boolean Algebras with Operators
 ML-91-11 Rineke Verbrugge Feasible Interpretability
 ML-91-12 Johan van Benthem Modal Frame Classes, revisited

Computation and Complexity Theory

- CT-91-01 Ming Li, Paul M.B. Vitányi Kolmogorov Complexity Arguments in Combinatorics
 CT-91-02 Ming Li, John Tromp, Paul M.B. Vitányi How to Share Concurrent Wait-Free Variables
 CT-91-03 Ming Li, Paul M.B. Vitányi Average Case Complexity under the Universal Distribution Equals Worst Case Complexity
 CT-91-04 Sieger van Denneheuvel, Karen Kwast Weak Equivalence
 CT-91-05 Sieger van Denneheuvel, Karen Kwast Weak Equivalence for Constraint Sets
 CT-91-06 Edith Spaan Census Techniques on Relativized Space Classes
 CT-91-07 Karen L. Kwast The Incomplete Database
 CT-91-08 Kees Doets Levationis Laus
 CT-91-09 Ming Li, Paul M.B. Vitányi Combinatorial Properties of Finite Sequences with high Kolmogorov Complexity
 CT-91-10 John Tromp, Paul Vitányi A Randomized Algorithm for Two-Process Wait-Free Test-and-Set
 CT-91-11 Lane A. Hemachandra, Edith Spaan Quasi-Injective Reductions
 CT-91-12 Krzysztof R. Apt, Dino Pedreschi Reasoning about Termination of Prolog Programs

Computational Linguistics

- CL-91-01 J.C. Scholtes Kohonen Feature Maps in Natural Language Processing
 CL-91-02 J.C. Scholtes Neural Nets and their Relevance for Information Retrieval

The ILLC Prepublication Series

Other Prepublications

- X-91-01 Alexander Chagrov, Michael Zakharyashev The Disjunction Property of Intermediate Propositional Logics
- X-91-02 Alexander Chagrov, Michael Zakharyashev On the Undecidability of the Disjunction Property of Intermediate Propositional Logics
- X-91-03 V. Yu. Shavrukov Subalgebras of Diagonalizable Algebras of Theories containing Arithmetic
- X-91-04 K.N. Ignatiev Partial Conservativity and Modal Logics
- X-91-05 Johan van Benthem Temporal Logic
- X-91-06 Annual Report 1990
- X-91-07 A.S. Troelstra Lectures on Linear Logic, Errata and Supplement
- X-91-08 Giorgie Dzhaparidze Logic of Tolerance
- X-91-09 L.D. Beklemishev On Bimodal Provability Logics for Π_1 -axiomatized Extensions of Arithmetical Theories
- X-91-10 Michiel van Lambalgen Independence, Randomness and the Axiom of Choice
- X-91-11 Michael Zakharyashev Canonical Formulas for K4. Part I: Basic Results
- X-91-12 Herman Hendriks Flexibele Categoriale Syntaxis en Semantiek: de proefschriften van Frans Zwarts en Michael Moortgat
- X-91-13 Max I. Kanovich The Multiplicative Fragment of Linear Logic is NP-Complete
- X-91-14 Max I. Kanovich The Horn Fragment of Linear Logic is NP-Complete
- X-91-15 V. Yu. Shavrukov Subalgebras of Diagonalizable Algebras of Theories containing Arithmetic, revised version
- X-91-16 V.G. Kanovei Undecidable Hypotheses in Edward Nelson's Internal Set Theory
- X-91-17 Michiel van Lambalgen Independence, Randomness and the Axiom of Choice, Revised Version
- X-91-18 Giovanna Cepparello New Semantics for Predicate Modal Logic: an Analysis from a standard point of view
- X-91-19 Papers presented at the Provability Interpretability Arithmetic Conference, 24-31 Aug. 1991, Dept. of Phil., Utrecht University
- 1992 *Logic, Semantics and Philosophy of Language* Annual Report 1991
- LP-92-01 Víctor Sánchez Valencia Lambek Grammar: an Information-based Categorical Grammar
- LP-92-02 Patrick Blackburn Modal Logic and Attribute Value Structures
- LP-92-03 Szabolcs Mikulás The Completeness of the Lambek Calculus with respect to Relational Semantics
- LP-92-04 Paul Dekker An Update Semantics for Dynamic Predicate Logic
- LP-92-05 David I. Beaver The Kinematics of Presupposition
- LP-92-06 Patrick Blackburn, Edith Spaan A Modal Perspective on the Computational Complexity of Attribute Value Grammar
- LP-92-07 Jeroen Groenendijk, Martin Stokhof A Note on Interrogatives and Adverbs of Quantification
- LP-92-08 Maarten de Rijke A System of Dynamic Modal Logic
- LP-92-09 Johan van Benthem Quantifiers in the world of Types
- LP-92-10 Maarten de Rijke Meeting Some Neighbours (a dynamic modal logic meets theories of change and knowledge representation)
- LP-92-11 Johan van Benthem A note on Dynamic Arrow Logic
- LP-92-12 Heinrich Wansing Sequent Calculi for Normal Modal Propositional Logics
- LP-92-13 Dag Westerståhl Iterated Quantifiers
- LP-92-14 Jeroen Groenendijk, Martin Stokhof Interrogatives and Adverbs of Quantification
- Mathematical Logic and Foundations*
- ML-92-01 A.S. Troelstra Comparing the theory of Representations and Constructive Mathematics
- ML-92-02 Dmitrij P. Skvortsov, Valentin B. Shehtman Maximal Kripke-type Semantics for Modal and Superintuitionistic Predicate Logics
- ML-92-03 Zoran Marković On the Structure of Kripke Models of Heyting Arithmetic
- ML-92-04 Dimitar Vakarelov A Modal Theory of Arrows, Arrow Logics I
- ML-92-05 Domenico Zambella Shavrukov's Theorem on the Subalgebras of Diagonalizable Algebras for Theories containing $\Delta_0 + EXP$
- ML-92-06 D.M. Gabbay, Valentin B. Shehtman Undecidability of Modal and Intermediate First-Order Logics with Two Individual Variables
- ML-92-07 Harold Schellinx How to Broaden your Horizon
- ML-92-08 Raymond Hoofman Information Systems as Coalgebras
- ML-92-09 A.S. Troelstra Realizability
- ML-92-10 V.Yu. Shavrukov A Smart Child of Peano's
- Computation and Complexity Theory*
- CT-92-01 Erik de Haas, Peter van Emde Boas Object Oriented Application Flow Graphs and their Semantics
- CT-92-02 Karen L. Kwast, Sieger van Denneheuvel Weak Equivalence: Theory and Applications
- CT-92-03 Krzysztof R. Apt, Kees Doets A new Definition of SLDNF-resolution
- Other Prepublications*
- X-92-01 Heinrich Wansing The Logic of Information Structures
- X-92-02 Konstantin N. Ignatiev The Closed Fragment of Dzhaparidze's Polymodal Logic and the Logic of Σ_1 conservativity
- X-92-03 Willem Groeneveld Dynamic Semantics and Circular Propositions, revised version
- X-92-04 Johan van Benthem Modeling the Kinematics of Meaning
- X-92-05 Erik de Haas, Peter van Emde Boas Object Oriented Application Flow Graphs and their Semantics, revised version
- 1993 *Logic, Semantics and Philosophy of Language*
- LP-93-01 Martijn Spaan Parallel Quantification
- LP-93-02 Makoto Kanazawa Dynamic Generalized Quantifiers and Monotonicity
- LP-93-03 Nikolai Pankrat'ev Completeness of the Lambek Calculus with respect to Relativized Relational Semantics
- LP-93-04 Jacques van Leeuwen Identity, Quarrelling with an Unproblematic Notion
- LP-93-05 Jaap van der Does Sums and Quantifiers
- LP-93-06 Paul Dekker Updates in Dynamic Semantics
- LP-93-07 Wojciech Buszkowski On the Equivalence of Lambek Categorical Grammars and Basic Categorical Grammars
- Mathematical Logic and Foundations*
- ML-93-01 Maciej Kandulski Commutative Lambek Categorical Grammars
- ML-93-02 Johan van Benthem, Natasha Alechina Modal Quantification over Structured Domains
- ML-93-03 Mati Pentus The Conjoinability Relation in Lambek Calculus and Linear Logic
- ML-93-04 Andreja Prijatelj Bounded Contraction and Many-Valued Semantics
- ML-93-05 Raymond Hoofman, Harold Schellinx Models of the Untyped λ -calculus in Semi Cartesian Closed Categories
- ML-93-06 J. Zashev Categorical Generalization of Algebraic Recursion Theory
- ML-93-07 A.V. Chagrov, L.A. Chagrova Algorithmic Problems Concerning First-Order Definability of Modal Formulas on the Class of All Finite Frames
- ML-93-08 Raymond Hoofman, Ieke Moerdijk Remarks on the Theory of Semi-Functors
- ML-93-09 A.S. Troelstra Natural Deduction for Intuitionistic Linear Logic
- ML-93-10 Vincent Danos, Jean-Baptiste Joinet, Harold Schellinx
- ML-93-11 Lex Hendriks The Structure of Exponentials: Uncovering the Dynamics of Linear Logic Proofs
- Computation and Complexity Theory* Inventory of Fragments and Exact Models in Intuitionistic Propositional Logic
- CT-93-01 Marianne Kalsbeek The Vanilla Meta-Interpreter for Definite Logic Programs and Ambivalent Syntax
- CT-93-02 Sophie Fischer A Note on the Complexity of Local Search Problems
- CT-93-03 Johan van Benthem, Jan Bergstra Logic of Transition Systems
- CT-93-04 Karen L. Kwast, Sieger van Denneheuvel The Meaning of Duplicates in the Relational Database Model
- CT-93-05 Erik Aarts Proving Theorems of the Lambek Calculus of Order 2 in Polynomial Time
- CT-93-06 Krzysztof R. Apt Declarative programming in Prolog
- Computational Linguistics*
- CL-93-01 Noor van Leusen, László Kálmán The Interpretation of Free Focus
- Other Prepublications*
- X-93-01 Paul Dekker Existential Disclosure, revised version
- X-93-02 Maarten de Rijke What is Modal Logic?
- X-93-03 Michiel Leezenberg Gorani Influence on Central Kurdish: Substratum or Prestige Borrowing
- X-93-04 A.S. Troelstra (editor) Metamathematical Investigation of Intuitionistic Arithmetic and Analysis, Corrections to the First Edition
- X-93-05 A.S. Troelstra (editor) Metamathematical Investigation of Intuitionistic Arithmetic and Analysis, Second, corrected Edition
- X-93-06 Michael Zakharyashev Canonical Formulas for K4. Part II: Cofinal Subframe Logics