VI Dynamic Generalized Quantifiers and Existential Sentences in Natural Languages

Abstract

The central topic to be discussed in this paper is the definiteness restriction in there-insertion contexts. Various attempts to explain this definiteness restriction using the standard algebraic framework are discussed (BARWISE & COOPER 1981; KEENAN 1978; MILSARK 1974; HIGGINBOTTHAM 1987; LAPPIN 1988) and the shortcomings of these attempts are demonstrated. Finally, a new approach to the interpretation of existential there be-sentences is developed within the framework of GROENENDIJK & STOKHOF's (1990) Dynamic Montague Grammar. This approach makes use of a variant of PARTEE's (1986) "type-shifting"-operator BE and it overcomes the shortcomings of the rival analyses. The general conclusion is that Dynamic Montague Grammar has applications other than those which prompted it and advantages other than those GROENENDIJK & STOKHOF claim for it.

1. Introduction

There are two rival theoretic approaches which have elicited promising new lines of research in natural language semantics. The first one is the Generalized Quantifier Theory (GQT) initiated with BARWISE & COOPER (1981), which has continued the approach of MONTAGUE (1974). This line of theorizing aims at a uniform treatment of all NPs as generalized quantifiers, denoting sets of properties of individuals. GQT has been especially useful in clarifying the algebraic properties of natural language quantifiers. The second of the two rival approaches is represented by semantic theories such as KAMP's (1981) Discourse Representation Theory, SEUREN's (1986) Discourse Semantics, or HEIM's (1982) File Change Semantics. In the present paper, let me take KAMP's (1981) Discourse Representation Theory (DRT) as the prototypical example of this family of paradigms, and let me restrict myself to reflections on this theory. DRT (as well as the related theories just mentioned) explicitly rejects the uniform treatment of all NPs as generalized quantifiers and instead proposes a division of labour between (i) a quantificational NP-semantics (quantifiers as restricted + unselective binders) and (ii) a nonquantificational discourse semantics (which translates indefinite NPs as discourse markers + conditions imposed on them).

The recent unification of DRT and GQT within the framework of dynamic intensional logic (GROENENDIJK & STOKHOF 1990) has explicitly challenged this division of labour. The "fall back" of dynamic intensional logic to a uniform treatment of all NPs (NPs as so-called *dynamic* generalized quantifiers) and the emergence of a compositional semantics for discourse may seem conservative. For several reasons I think that this is not the case. Moreover, I am convinced and would like to argue that GROENENDIJK & STOKHOF's dynamic GQT is not just a formal exercise on compositionality and compatibility of frameworks, but may very well have empirical import particularly in domains where neither DRT nor GQT are successful if taken *per se*. The phenomenon to be discussed in some detail is the definiteness restriction in contexts of *there*-insertion. The results support the claim that the theory of dynamic generalized quantifiers forms a new kind of approach to recalcitrant problems of natural language semantics.

The paper is organized as follows. Section 2 gives a review of several attempts to explain the definiteness restriction of existential *there be*-sentences using the standard algebraic framework and it demonstrates the shortcomings of these attempts. Section 3 introduces GROENENDIJK & STOKHOF's (1990) dynamic GQT and it presents the translation of a small fragment of English into the dynamic intensional logic. Finally, in the constructive Section 4 a dynamic approach to the interpretation of existential *there be*-sentences is provided. I hope to demonstrate that this account gives a true explanation of the definiteness restriction involved in this construction and overcomes the shortcomings of the rival attempts discussed in Section 2.

2. Existential *there be*-sentences

The study of the grammatical and semantic properties of existential sentences in English such as

(1) *There are ghosts.*
(2) *There is a man in the garden.*
(3) *There is a man standing on the corner.*

has fascinated transformational linguistics, formal semantics, and discourse pragmatics in various periods of their development. In this section I will highlight some recent results which are of relevance for questioning the general validity of the standard algebraic framework as used in GQT.

2.1 The definiteness restriction in *there*-insertion contexts

It is a long-standing observation that indefinite NPs naturally occur in existential *there*-contexts, whereas definite expressions (and quantificational ones in the narrower sense) are only marginally acceptable.

(4) (a) $$\textit{There is} \left\{ \begin{array}{l} \textit{a boy} \\ \textit{someone} \\ \textit{no donkey} \end{array} \right\} \textit{hungry.}$$

(b) $$\textit{*There is} \left\{ \begin{array}{l} \textit{the boy} \\ \textit{everyone} \\ \textit{my brother} \end{array} \right\} \textit{hungry.}$$

Generally, it can be said that contexts of *there*-insertion represent one of the linguistic environments exhibiting a definiteness restriction (DR), i.e. in *there*-insertion contexts indefinite expressions are typically preferred.[1]

Since (in)definiteness is at least partly a semantic property of expressions it seems appropriate to explain the DR involved in terms of a semantic theory for natural language. The rather extensive semantic literature on (in)definiteness appears to provide a fairly clear-cut characterization of the distributional restrictions. For example, MILSARK (1974) introduced the terms 'weak' and 'strong' as labels for two complementary classes of NPs, roughly those that can and those that cannot appear in the postcopular subject position of existential *there be*-sentences. Furthermore, he proposed a semantic characterization of these classes: weak NPs are those specified by a non-cardinal, quantificational one. Although

MILSARK (1974) gives only an informal treatment of cardinality, he makes quite clear what is the main motivation for providing such a semantic characterization. It is precisely the possibility of reducing the DR with the help of these semantic features to a semantic deviance. In this vein, MILSARK suggests reducing the deviance of *there be*-sentences with strong subjects to a case of vacuous quantification, which exhibits a well-known type of semantic deviance. There is a widespread inclination to follow MILSARK in his two basic methodological insights:

(i) to *describe* the distributional classes involved in the DR in terms of concepts provided by an appropriate *semantic* theory for natural language;
(ii) to explain the DR by reducing this restriction - with the help of those concepts - to some common type of semantic (or pragmatic) deviance.

Furthermore, the general methodological background suggests following the Fregean notion of compositionality

(iii) by analyzing the meaning of existential *there be*-sentences within a compositional framework of semantic interpretation.

Although alternative methodologies are conceivable - SAFIR (1982, 1987), for instance, insists that at least part of the DR in *there*-insertion contexts must be explained with a property that is relevant at S-structure only[2] - let us assume that MILSARK's view of the status of the DR is basically correct.

Now the question arises as to the appropriate semantic theory by means of which (i) the classes of NPs involved may be semantically defined and (ii) the DR can be explained as a case of semantic (pragmatic) deviance. It is common practice to recommend model-theoretic semantics as the appropriate tool. In fact, model-theoretic semantics, especially GQT, has suggested several definitions which are successful in picking out the intended distributional classes quite accurately. It is certainly significant that, for instance, the line between weak and strong NPs can be drawn by a simple model-theoretic definition. But does it contribute anything towards an explanation of the DR? Can GQT really help to explain the DR as the basic intuition (ii) suggests? In the next subsection let me assess several approaches that use the standard algebraic framework (BARWISE & COOPER 1981) in order to explain the DR for existential *there be*-sentences.

2.2 The standard algebraic framework and *there*-insertion contexts

There are two major points of disagreement among existing analyses of *there*-insertion sentences. The first concerns the question as to whether the *there be*-part of existential *there*-sentences does attribute any meaning at all to this construction. Some authors claim it does not (e.g. HIGGINBOTHAM 1987; LAPPIN 1988; KEENAN 1987), others claim it does: MILSARK (1974) suggested an existential quantifier and BARWISE & COOPER (1981) the universal property THING. The second point of disagreement concerns the structure of the coda (the nominal element and the optional predicate governed by the existential verb). Three structures have been proposed for sentences like (5), indicated in (6):

(5) *There is/are* Det *student(s) hungry.*

(6) (a) *There is/are* $[_{NP}$ Det *student(s)*$]$ $[_{XP}$ *hungry*$]$
(b) *There is/are* $[_{NP}$ Det$[_{N'}$ *student(s) hungry*$]]$
(c) *There is/are* $[_{SC}[$Det *student(s)*$]$ $[$*hungry*$]]$

In (6a) NP and XP do not form a constituent but are both sisters of the verb (the 'NP-XP' analysis, cf. MILSARK 1974). According to (6b) the coda is a structure of postnominal modification (the 'bare NP' analysis, cf. JENKINS 1975; WILLIAMS 1984). According to (6c) the coda is a 'small clause' in the sense of WILLIAMS (1975) (the clausal analysis, cf. STOWELL 1981; SAFIR 1982).

Taking into consideration these major points of disagreement let us discuss now some problems that arise if the standard algebraic picture of BARWISE & COOPER (1981) is taken as the basic semantic tool to explain the DR for existential *there be*-sentences. According to this picture each determiner D, let it be definite, universal, or indefinite, is interpreted as a function from ordered pairs of subsets of the interpretation domain E to truth values:

(7) $\|D\|\ (\phi)(\psi) \rightarrow \{T,F\}$, where $\phi \subseteq E$, $\psi \subseteq E$.

2.2.1 Barwise & Cooper (1981)

BARWISE and COOPER themselves propose an analysis which is temptingly simple. The authors adopt the 'bare NP' analysis of *there*-insertion structures and interpret sentences like (5) as indicated in (8):

```
(8)   [S There is/are   [NP Det [N' student(s) hungry]]]
         ------------       --- ---------------------
         THING               D   STUD   ∩   HUNGRY
                            ------------------------------
                             D(STUD  ∩  HUNGRY)
      ---------------------------------------------------
                             D(STUD  ∩  HUNGRY) (THING)
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BARWISE & COOPER (1981) give the following definition of what they understand as the explication of MILSARK's terms 'strong' and 'weak':

(9) A determiner D is positive strong$_{BC}$ (or negative strong$_{BC}$, respectively) if for every model $M = \langle E, \|\ \|\rangle$ and every $\phi \subseteq E$, if $\|D\|(\phi)$ is defined then $\|D\|(\phi)(\phi) = T$ (or F, respectively). If D is not (positive or negative) strong$_{BC}$, then D is weak$_{BC}$.

When the determiner D of the postcopular NP is strong$_{BC}$, then the translation D(STUD∩HUNGRY)(THING) is logically true or logically false.[3] BARWISE & COOPER conclude from this fact that strong$_{BC}$ determiners are excluded from *there*-insertion sentences because they give rise to tautologies or contradictions which are not informative. Although BARWISE & COOPER's filter condition

(10) The determiners naturally excluded from existential *there*-sentences are just the (positive or negative) strong ones

is quite correct for the most common determiners[4], their explanation for this condition is questionable. Note that by their account sentences such as (11a) and (11b) are semantically equivalent and should be accepted or excluded for the same semantic-pragmatic reasons.

(11) a. *There is the student hungry
b. The hungry student exists

The problem is that although (11a) is ill-formed, (11b) is not. The analysis under discussion leaves exactly this unexplained. Why should a logically trivial sentence like (11b) be grammatical but the corresponding *there*-sentence (11a) be ungrammatical? BARWISE & COOPER (1981) do not provide any answer. Therefore, they fail to give a true explanation for the DR in *there*-insertion contexts.[5]

2.2.2. Keenan (1987)

KEENAN (1987) is another author who has used GQT for analyzing *there*-insertion sentences. In contrast to BARWISE & COOPER (1981), KEENAN (1987) assumes that the *there be*-part is semantically empty. Furthermore, he rejects the 'bare NP' analysis and maintains that the postcopular phrase is a small clause of the form [$_{SC}$ NP XP]. With these premises a sentence like (5) is translated as indicated in (12):

```
(12) [S There is/are [SC [NP  Det student(s)] [XP hungry]]]
        ------------          --- ---------    ----------
             ∅                 D    STUD         HUNGRY
                          -------------------
                                D(STUD)
     ------------------------------------------------------
                            D(STUD)(HUNGRY)
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Next, remember Keenan's (1987: 291) definition of existential determiners: Existential determiners are either basic determiners D satisfying the existence condition (13)

(13) For each model $M = \langle E, \|\ \|\rangle$ and each $\phi \subseteq E$, $\psi \subseteq E$:
$\|D\|(\phi)(\psi) = \|D\|(\phi \cap \psi)(E)$

or are built of such basic determiners by a specified number of operations, such as Boolean combination, composition with an adjective phrase, or the exception operator (e.g. *no ... but John*).

KEENAN's account explains that only in the case of existential determiners are sentences like (14) and (15) semantically equivalent.

(14) a. There is/are Det Student(s) hungry
b. D(STUD)(HUNGRY)

(15) a. Det hungry student(s) exist(s)
b. D(STUD ∩ HUNGRY)(THING)

Therefore, sentences like (14) get an existential interpretation only when the determiner of the postcopular NP is existential.

It is important to note that KEENAN's analysis doesn't give an explanation for the fact that the sentence (16a) is unacceptable, while (16b) is fine.

(16) a. *There is each student hungry
b. Each student is hungry
c. EACH(STUD)(HUNGRY) (≡ EACH(STUD ∩ HUNGRY)(THING))

All that can be said is that (16a) and (16b) have an interpretation in common, namely (16c), and that this interpretation is *not* an existential one. It seems to me that this is not saying enough.

Of course, one could exclude nonexistential determiners from *there*-insertion contexts by requiring that these structures acquire an existential interpretation, perhaps by stipulating a filter condition like (17):

(17) The determiners natural in existential *there*-sentences are just the existential ones.

This condition is possibly the most rigorous characterization of the DR in *there*-insertion contexts. But it remains a stipulation. If this condition is semantically based it is not clear where the feature of the interpretation of existential *there*-sentences expressed by this requirement comes from. LAPPIN (1988) argues convincingly that it would have to be added as a noncompositional aspect of the meaning of the entire construction.

2.2.3. Milsark (1974) (reconstructed within GQT)

MILSARK (1974) has proposed the, by now, classical analysis that provides a semantic interpretation of standard *there*-insertion and accounts for its DR. MILSARK adopts the 'NP-XP' analysis and argues that the *there be*-part in structures like (6a) represents an existential quantifier that must bind some variable. Whether such a variable is available for binding or not depends on the type of the determiner of the NP in the coda. MILSARK sets up two lists of expressions, one of weak (indefinite) determiners, which function as cardinality predicates having no quantificational force, and one of strong (definite) determiners or quantifiers proper. The "ambiguous" indefinite determiners (e.g. *some (some of, sm), many (many of, mny), twelve (twelve of, twlve)*) appear in both lists. According to MILSARK's analysis, only codas with weak (cardinal) determiners (which can be considered as cardinality attributes) provide the free variable to be bound by *there*. Codas with strong (≈ non-cardinal) determiners do not provide such a variable free for binding by *there* and hence are unacceptable in such a structure.

Adopting the standard algebraic picture of BARWISE & COOPER (1981), it is possible to formalize MILSARK's intuitive idea that weak (cardinal) determiners function as cardinality predicates and to give a more formal treatment of the DR involved in *there*-insertion structures. The following is a convenient approximation of what various authors (e.g. HIGGINBOTHAM 1987; LAPPIN 1988) propose as definitions for cardinal or adjectival determiners:

(18) D is a cardinal determiner iff for every model $M = \langle E, \|\,\| \rangle$ and every $\phi \subseteq E$, $\psi \subseteq E$:

$$\|D\| \ (\phi)(\psi) = \begin{cases} T \text{ if } |\phi \cap \psi| \in K \\ F \text{ otherwise} \end{cases}$$

where $|\ |$ designates cardinality and K is a set of cardinal numbers determined by D independently of ϕ and ψ.

Let us call K the (cardinal) core of the cardinal determiner. A simple example is

(19) $$\|TWELVE\| \ (\phi)(\psi) = \begin{cases} T \text{ if } |\phi \cap \psi| = 12 \\ F \text{ otherwise} \end{cases}$$

Evidently, the cardinal core in this case is the set K = {12}. Using BARWISE & COOPER's (1981) definitions it is a simple task to show that the intuitively indefinite (or weak) determiners like SOME, NO, TWELVE are cardinal determiners, while the intuitively definite (or strong) determiners like EVERY, ALL, MOST, THE, THE TWELVE, BOTH are noncardinal ones.[6]

It is possible to associate with each cardinal determiner D a certain predicate expression, which I will call π(D), for convenience. The interpretation domain of these predicate expressions is the domain of plural objects (or individual sums) in the sense of LINK (1983). Technically, let me introduce this domain as *E = a complete Boolean algebra generated by E, where E is the set of atoms in *E. Now let K be the core of the cardinal determiner D. The interpretation of π(D) is as follows:

(20) $$\|\pi(D)\| \ (\alpha) = \begin{cases} T \text{ if } card(\alpha) \in K \\ F \text{ otherwise} \end{cases}$$

where $\alpha \in {}^*E$ and card(α) = the number of atoms that generate α.[7]

With this definition at hand the predicate function of the cardinal determiner TWELVE, by way of example, can be expressed as

(21) $$\|\pi(TWELVE\| (\alpha) = \begin{cases} T \text{ if } card(\alpha) = 12 \\ F \text{ otherwise} \end{cases}$$

The philosophical chestnut (22a) will then be construed as (22b), where A represents the individual sum of the apostles (this example is taken from HIGGINBOTHAM 1987).

(22) (a) *The apostles are twelve.*
(b) $[\pi(TWELVE)](A)$

A predicate nominal with a cardinal determiner as in (23a) gets its predicative interpretation as shown in (23b): The associated predicate π(D) acts as a modifying adjective and modifies the head noun.

(23) (a) *They are* $[_{NP}$ *twelve students*].
(b) $\lambda x.\ [[\pi(TWELVE)](x) \wedge {}^*STUD(x)]$

Going back to existential sentences, MILSARK's analysis of our example (5) may be reconstructed within the present framework as shown in (24):

(24) $[_S$ *There is/are* $[_{NP}$ Det *student(s)*$]$ $[_{XP}$ *hungry*$]]$

$\lambda P.\exists x\ P(x)$ $\quad \pi(D)$ $\quad {}^*STUD$ $\quad$ HUNGRY

$\pi(D) \cap {}^*STUD$

$\pi(D) \cap {}^*STUD \cap HUNGRY$

$\exists x \quad [\pi(D) \cap {}^*STUD \cap HUNGRY](x)$

Evidently the derived semantic structure is interpretable only for cardinal determiners - and this would explain MILSARK's thesis

(25) The determiners natural in existential *there*-sentences are just the cardinal ones.

Appreciating the attractiveness of *Milsark*'s analysis, however, there are at least two problems in his approach that have to be noted. The first problem is that MILSARK's analysis doesn't give the right interpretation in some cases. For instance, consider the sentence (26a), which would get the interpretation (26b).[8] This interpretation sharply contradicts the intended one, which is something like (26c).

(26) (a) *There is no student hungry.*
(b) $\exists x[\mathrm{CARD}(x)=0 \wedge {*}\mathrm{STUD}(x) \wedge \mathrm{HUNGRY}(x)]$
(c) $\sim\exists x[\mathrm{CARD}(x)=1 \wedge {*}\mathrm{STUD}(x) \wedge \mathrm{HUNGRY}(x)]$

The second problem concerns role expressions like those in (27) (the example is taken from DORON 1988):

(27) (a) *John is vice-president of the club.*
(b) *John is the vice-president of the club.*

(Note that the only interpretation of (27a) conforms to the predicative reading of (27b)). MILSARK's interpretive rule would predict that role expressions are fine in existential *there*-constructions as well. The following example falsifies this prediction:

(28) (a) **There is vice-president of the club.*
(b) *?There is the vice-president of the club.*
(list reading only)

2.2.4. Higginbotham (1987) and Lappin (1988)

HIGGINBOTHAM's (1987) and LAPPIN's (1988) account - outlined here in a slightly modified way - avoids the problems just mentioned. Both authors adopt the 'bare NP' view of *there*-insertion structure advocated by WILLIAMS (1984) and follow WILLIAMS also in regarding the *there be*-part as semantically empty. Given these premises, it is necessary to treat the postcopular NP as a predicational structure which bears the burden of the proposition expressed by the sentence. Note that this view indirectly extends the claim put forward by WILLIAMS (1983) and PARTEE (1986) that NPs semantically represent different logical types: the basic NP types e "referential", (e,t) "predicative", and ((e,t),t) "quantificational". We have to extend this list now by introducing the type t for postcopular NPs in *there*-insertion structures.

It has been pointed out that a determiner D basically denotes a function from ordered pairs of sets to truth values, where the first element of this pair is realized by a restricting set term. If the postcopular NP in *there be*-sentences is a predicational structure (type t), then it is necessary to associate an unrestricted, or absolute, determiner function with the postcopular determiner, since its usual restriction, the N', no longer serves that function. HIGGINBOTHAM (1987) and LAPPIN (1988) argue that it is possible to associate with each *cardinal* determiner such an absolute determiner function which I will call ABS(D). ABS(D) applies to a distributive predicate and forms a predication with it. Let K be the core of a cardinal determiner D. The interpretation of ABS(D) is as follows:

(29) $\|\mathrm{ABS(D)}\|\ (\phi) = \begin{cases} \mathrm{T} & \text{if } |\phi| \in \mathrm{K} \\ \mathrm{F} & \text{otherwise} \end{cases}$

where $\phi \subseteq \mathrm{E}^9$

Now we are ready to derive the semantic representation of examples like (5) as it is indicated in (30):

(30) $[_{\mathrm{S}}$ *There is/are* $[_{\mathrm{NP}}$ Det $[_{\mathrm{N'}}$ *student(s) hungry*$]]]$

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     ----------- ---  -----------------------
          ∅      ABS(D)     STUD  ∩  HUNGRY
                 ------------------------------
                 [ABS(D)]  (STUD  ∩  HUNGRY)
-------------------------------------------------
                 [ABS(D)]  (STUD  ∩  HUNGRY)
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The resulting semantic form can be interpreted only for cardinal determiners, since only in this case the function $\|\mathrm{ABS(D)}\|$ has been defined. This leads to the following DR:

(31) The determiners natural in existential *there*-sentences are just the cardinal ones.

This is exactly MILSARK's thesis (25), but HIGGINBOTHAM (1987) and LAPPIN (1988) have derived it in another way.

It can be argued that HIGGINBOTHAM's and LAPPIN's account avoids the main problems of MILSARK's. However, it raises others. Let me note two. The first concerns the justification of type t as a basic NP type. It seems to me that there is no general justification and that this claim is completely *ad hoc*.

The second problem arises if we consider languages other than English. HUANG (1987) provides a very interesting description of existential sentences in Chinese. He convincingly argues that existential sentences in Chinese cannot be properly analyzed along the lines of the 'bare NP' theory. Nevertheless, Chinese existentials exhibit a DR. How, then, can this restriction be explained? HUANG's analysis implies that a universal explanation for the DR in existential sentences, if it involves the structural properties of the coda, must appeal to them only indirectly. It seems to me that HIGGINBOTHAM's (1987) and LAPPIN's (1988) analysis is based on the 'bare NP' analysis too directly. Their account, for instance, cannot be extended to a 'NP-XP' coda (HUANG's preference for Chinese).

Let us summarize this section. We have assessed several model-theoretic approaches that use the standard algebraic framework and claim to explain the DR for existential *there be*-sentences. However, we have not found anything like a coherent and truly explanatory theory that accounts for this construction. Instead, the proposals that claim to explain the DR are rather artificial for the most part and suffer from various shortcomings. Furthermore, the proposals do not extend to other constructions exhibiting a DR (cf. BLUTNER (1990) for a discussion of this point in connection with predicate nominals and *donkey*-sentences). Therefore, a new beginning seems to be absolutely necessary.

3. Dynamic GQT (Groenendijk & Stokhof 1990)

In the previous section we have concluded that the standard algebraic framework is not sufficient to explain the DR for existential *there be*-sentences. In my opinion, one general reason for this insufficiency is that GQT does not account for the dynamics of this construction. Clearly, existential *there be*-sentences have dynamic effects that should be accounted for. Intuitively, they are presentational. That means, they introduce (or deny) the presence of a certain object (or group of objects) in the domain of discourse or in a context-relevant subdomain. Since the original GQT does not work any better with anaphoric phenomena and dynamic effects than more traditional accounts, we must make generalized quantifiers more dynamic and powerful.

DRT is a semantic theory that champions a dynamic conception of meaning. However, DRT cannot be considered simply as a way to make generalized quantifiers more dynamic and powerful; rather, it seems to follow a more radical line of reconstructing NP semantics. On this road DRT abandons central principles of NP semantics, such as the uniform treatment of all NPs, the compositionality principle of semantic interpretation, and the conservativity postulate for determiners (KEENAN & STAVI 1986). Appreciating the efforts of DRT to overcome the limitations and shortcomings of Montague Grammar and GQT, I think that DRT does it partly too radically and abandons central principles too fast. On the other hand, there are some problems that suggest that DRT (in one of its original forms) is not rigorous enough in accounting for dynamic effects. A case in point is the proportion problem of *donkey*-sentences (e.g. KADMON 1987; HEIM 1990; KAMP & REYLE to appear; CHIERCHIA 1988); another is modal subordination (e.g. ROBERTS 1989) and other accommodation phenomena (cf. GROENENDIJK & STOKHOF 1990; CHIERCHIA 1988). The semantics of existential *there be*-sentences and the explanation of the DR involved in this construction may provide another argument for being cautious with regard to the use of DRT.

Though it seems possible to modify DRT gradually and to overcome its problems step by step, I think a radically new reconstruction of NP semantics is unavoidable. Such a reconstruction appears methodologically preferable if it is of theoretical importance (integration of different theoretical frameworks, use of general restricting principles) and if it has some empirical import. The dynamic conception provided by GROENENDIJK & STOKHOF (1990) strikes me as particularly promising in this regard. These authors have developed a strictly compositional account that incorporates the insights of DRT into Montague's intensional logic. In this way, they have provided a sound unification of DRT and GQT. CHIERCHIA (1988) has used this theory in order to account for the proportion problem of *donkey*-sentences and for the treatment of *when*-clauses. GROENENDIJK & STOKHOF (1990) themselves give some hints as to how to deal with modal subordination in a fully compositional way. In the next section I hope to demonstrate how this approach throws a new light on the treatment of existential *there be*-sentences.

3.1 An introduction to dynamic intensional logic

The basic idea of dynamic semantics is that the meaning of a sentence resides in its information change potential. According to GROENENDIJK & STOKHOF's (1990) theory, the information change potential of a sentence tells us - informally speaking - which propositions are true after its contents have been processed. This view contrasts with the traditional one, which identifies the meaning of a sentence with its truth conditions. An important aspect of

GROENENDIJK & STOKHOF's theory is that this static notion of meaning is retained in their formalism, but as a secondary one, which can be derived from the primary notion of information change potential.

In order to illustrate the basic idea and some crucial notations, let us now look at the sample discourse (32a). The usual predicate-logical translation of the sentences of this discourse is indicated in (32b). The problem with this account is that the anaphoric relation between the indefinite NP and the pronoun cannot be expressed by the binding relation of standard logic. A more satisfying translation cannot be obtained in a straightforward (compositional) way.

(32) (a)	*A*	*student*	*walks in.*	*He is hungry.*
(b)	$\exists x$	[STUD(x) $\wedge$	WALK-IN(x)] $\wedge$	HUNGRY(x)
(c)	$\exists x$	[STUD(x) $\wedge$	WALK-IN(x) $\wedge$	HUNGRY(x)]
(d)	$\mathcal{E}d_i$	[$\uparrow$STUD(d_i) ;	$\uparrow$WALK-IN(d_i)] ;	$\uparrow$HUNGRY(d_i)

GROENENDIJK & STOKHOF overcome the obvious conflict between the binding relation in logical syntax and that in the representation of discourse by separating the meaning of a sentence from its truth-conditional import. These authors would translate the discourse (32a) into a formula of dynamic logic as shown in (32d). Here $\mathcal{E}d_i$ designates the so-called dynamic existential quantifier (over the discourse marker d_i). The up-arrow ($\uparrow$) converts static expressions denoting truth values into dynamic expressions denoting information change potentials. The semicolon designates dynamic conjunction. Before the relevant definitions are given we should have a look at the structure of the dynamic representation (32d). Notice that the syntactic scope of the dynamic quantifier $\mathcal{E}d_i$ is restricted to material introduced by the first sentence of the discourse. However, by converting the dynamic formula (32d) back to its truth-conditional counterpart, the expression (32c) results (as will be shown immediately). In the latter expression the existential quantifier has scope over the whole discourse, and this provides a "dynamic binding" for the pronoun in the second sentence of our discourse.

Now let us give a fairly precise characterization of the basic techniques of dynamic semantics (as developed by GROENENDIJK & STOKHOF 1990). In trying to incorporate the insights of DRT within MONTAGUE's (1974) intensional logic, GROENENDIJK & STOKHOF develop the language DIL (Dynamic Intensional Logic), which is a variant of the system of intensional type theory IL (used in MONTAGUE's PTQ). We will give only a sketch of DIL, following the simplifications used by DEKKER (1990).

The **types** of DIL are the same as those of IL. The **syntax** of DIL is extended by adding a set of discourse markers $d_1, d_2, \ldots$ to the expressions of type e. Quantified expressions are constructed with the help of these discourse markers: $\exists d_i\ \phi$, $\forall d_i\ \phi$ (ϕ of type t).

A **model structure** of DIL is a triple M = <E, S, F>. Instead of worlds, a DIL model structure contains a set of states S. These states can be identified with assignments of individuals to discourse markers. As usual, E designates the domain of individuals. The interpretation function F for the constants of the language is state-insensitive. Further, the set of (ordinary) variable assignments is denoted by G. The expression g[x/o], where x is a variable and o an object of the corresponding type, should denote an assignment that is just like g with the possible exception that it maps x to o. The related notation s[d/o] can be applied to states (where d is a discourse marker and $o \in E_e$).

The **semantics** of DIL is stated by defining the notion $\| \varepsilon \|_{M,s,g}$, the interpretation of the expression ε with respect to the model M, state s, and variable assignment g. The differences in semantic interpretation only relate to discourse markers:

(33) (a) $\|d\|_{M,s,g} = s(d)$, for every discourse marker d

(b) $\|\exists d\ \phi\|_{M,s,g} = 1$ iff there is an $o \in E_e$ such that $\|\phi\|_{M,s[d/o],g} = 1$

$\|\forall d\ \phi\|_{M,s,g} = 1$ iff for all $o \in E_e$ it holds that $\|\phi\|_{M,s[d/o],g} = 1$

(c) $\|{}^\wedge\beta\|_{M,s,g}$ = the function $h \in E_b{}^S$ such that $h(s) = \|\beta\|_{M,s,g}$ for all $s \in S$, where b is the type of β

$\|{}^\vee\beta\|_{M,s,g} = \|\beta\|_{M,s,g}(s)$.

The interpretation of a discourse marker is the value it has in the state of evaluation. Quantification over the values of discourse markers is mediated by quantification over these states (not over ordinary variable assignments). The intension operator abstracts over states; the extension operator applies an intension to the state of evaluation.

The principle of λ-conversion (for extensional type theory)

(34) (a) $[\lambda\nu.\beta](\delta)$ equals $[\delta/\nu]\beta$ if all free variables in δ are free for ν in β

does not hold with full generality in DIL, but is subject to restrictions similar to those which it is subject to MONTAGUE's IL. However, the possibility of abstracting over states and to close the argument term intensionally has the following pleasant consequence for λ-conversion in DIL:

(34) (b) $[\lambda\nu.\beta]({}^\wedge\delta)$ equals $[{}^\wedge\delta/\nu]\beta$ if all free variables in δ are free for ν in β.

Note that no condition on discourse markers in δ need be obtained. Although their interpretation is state-dependent, the fact that ${}^\wedge\delta$ is intensionally closed and hence state-independent is sufficient to validate the equivalence (34b).

The following example demonstrates how this equivalence can be used for providing a *dynamic* binding relation - i.e. a binding relation where a discourse quantifier binds a discourse marker outside of the syntactic scope of the quantifier:

(35) $[\lambda p.\ \exists d[Q(d) \wedge {}^\vee p]]({}^\wedge P(d))$ equals $\exists d[Q(d) \wedge P(d)]$ (Note that the subsequent occurrence of $^\vee$ and $^\wedge$ cancels out.)

We see that the λ-term $\lambda p.\ \exists d[Q(d) \wedge {}^\vee p]$ in fact is dynamic in the indicated sense: indirectly (via λ-conversion) the embedded existential quantifier binds a discourse marker that occurs in the argument expression of the λ-term, i.e. a discourse marker outside of the syntactic scope of the existential quantifier.

We are now ready for a systematic introduction of the notational conventions that will facilitate the representation of the information change potential of sentences or pieces of discourse. We will use ${}^\wedge a$ as short for the type (s,a), and $\underline{t}$ as short for $({}^\wedge t,t)$ - the type of the information change potential.

In the simplest case, the information change potential of a sentence is introduced by means of the dynamic operator $\uparrow$:

(36) $\uparrow\phi = \lambda p.\ [\phi \wedge {}^\vee p]$, where ϕ is an expression of type t and p is a variable for propositions (type ${}^\wedge t$).

The dynamic operator $\uparrow$ maps the static semantic value of an expression of type t into its dynamic counterpart. Formally, $\uparrow$ can be viewed as a type shifting operator which maps expression of type t into expressions denoting sets of propositions ($\uparrow : t \mapsto \underline{t}$).

The converse of the dynamic operator $\uparrow$ is the static operator $\downarrow$. Given the information change potential of a sentence, the static operator retrieves its truth-conditional import, simply by applying it to a tautology.

(37) $\downarrow\underline{\phi} = \underline{\phi}({}^\wedge TRUE)$, where $\underline{\phi}$ is an expression of type $\underline{t}$, and TRUE is an arbitrary tautology.

A straightforward computation shows that $\downarrow$ followed by $\uparrow$ cancels out:

(38) $\downarrow\uparrow\phi$ is equivalent to ϕ

As pointed out by GROENENDIJK & STOKHOF (1990), the operator $\downarrow$ may be looked upon as a kind of closure operator, one which closes a piece of text and "freezes" any dynamic effects it may have had. Once closed off, a piece of text remains that way, even if raised again to the higher type by means of $\uparrow$.

A further notion that we have already used in representing the sample discourse (22a) is ";"-conjunction.

(39) $[\underline{\phi}_1;\underline{\phi}_2] = \lambda p.\ \underline{\phi}_1({}^\wedge\underline{\phi}_2(p))$, where $\underline{\phi}_1$ and $\underline{\phi}_2$ are expressions of type $\underline{t}$, and p is a variable of type ${}^\wedge t$.

The expression $[\underline{\phi}_1;\underline{\phi}_2]$ represents the dynamic conjunction, or sequence, of two sentences. Semantically, dynamic conjunction is simply a form of function composition, one that makes provision for MONTAGUE's intension operator. A straightforward computation shows the close correspondence between dynamic conjunction and ordinary conjunction for sentences without truly dynamic effects:

(40) $[\uparrow\phi_1;\uparrow\phi_2]$ is equivalent to $\uparrow(\phi_1\wedge\phi_2)$, where ϕ_1 and ϕ_2 are of type t.

Next, we have *dynamic* existential quantification over discourse markers (i.e. existential quantification over discourse markers occurring in a dynamic formula):

(41) $Ed\ \underline{\phi} = \lambda p.\ \exists d\ \underline{\phi}(p)$, where $\underline{\phi}$ is an expression of type $\underline{t}$, p is a variable of type ${}^\wedge t$, and d is a discourse marker.

Given the associativity of function composition it immediately follows that the dynamic existential quantifier has the following property (cf. GROENENDIJK & STOKHOF's (1990: 25) Fact 7):

(42) $Ed{\uparrow}Q(d);\ {\uparrow}P(d)$ is equivalent to $Ed[{\uparrow}Q(d);{\uparrow}P(d)]$, where P and Q denote ordinary predicates of type (e,t).

Furthermore, in order to determine the truth-conditions of dynamic formulas by means of $\downarrow$, we can replace $\downarrow Ed\ \underline{\phi}$ by $\exists d\ \downarrow\underline{\phi}$. (This fact immediately follows from the definition (41)).

Now it is a straightforward task to prove the following reformulation of the equivalence given in (35):

(43) $\downarrow$[Ed$\uparrow$Q(d);$\uparrow$P(d)] is equivalent to $\exists$x[Q(x) $\wedge$ P(x)]

This equivalence provides a clear demonstration of the dynamic binding relation established by means of the dynamic quantifier Ed. In the formula on the left-hand side of this equivalence the syntactic scope of the dynamic quantifier is restricted to the first conjunct. However, taking into consideration its truth-conditional import given on the right-hand side, the existential quantifier has scope over both conjuncts.

This is the place to look once again at the sample discourse (32a) and its dynamic translation (32d). Using the equivalences expressed in (40) and (43), it is obvious that the application of the static operator $\downarrow$ relates the dynamic translation (32d) to the predicate-logical expression (32c) which represents the truth-conditional import of the sample discourse.

We have presented an idea of some basic mechanisms of DIL needed in the subsequent discussion. Two general facts should now be added in order to get a more complete impression of DIL. The first one concerns the possibility to express DRT within DIL. GROENENDIJK & STOKHOF (1990, 1991) have provided a meaning-preserving translation of DRT to DIL. In this way they have shown that DIL is at least capable of providing an account for the same phenomena that DRT can handle.

The second fact concerns the possibility to deal within DIL with a wider range of phenomena than DRT is able to cope with. As a case in point, consider the sequences (44a) and (44b):

(44)(a) **Every man$_1$ walks in the park. He$_1$ whistles.*
(b) *Every player$_1$ chooses a pawn. He$_1$ puts it on square one.*

The pronoun in the second sentence of (44a) cannot be interpreted as an anaphor which is bound by the universal term in the first sentence. However, in the sequence (44b) the anaphoric relation of the indicated kind is possible. DRT only accounts for the first case; in order to deal with the second case, an additional mechanism would be necessary (e.g., transformational operations on logical forms, cf. ROBERTS 1989). DIL can handle both cases in a principled way, using two kinds of negation (cf. GROENENDIJK & STOKHOF 1990). Though GROENENDIJK & STOKHOF's way of handling the examples (44a,b) may appear insufficient for various reasons, it convincingly demonstrates that DIL is more than just the sum of orthodox Montague grammar and DRT (for more discussion see DEKKER 1990).

3.2 Translation of a sample discourse into DIL

Let me outline now how a small fragment of English can be assigned a compositional dynamic interpretation through translation into DIL. The fragment chosen is the one crucially involved in the sample discourse (32).

First, let us assign to each lexical expression of the fragment its translation into DIL. In what follows u is a variable for individual concepts (type ^e); $\underline{P}$ and $\underline{Q}$ are variables for dynamic properties (type ^(^e,$\underline{t}$)); STUD, WALK-IN, and HUNGRY are constants of type (e,t); the d_i are discourse markers. The list presented in (45) now will be taken as our sample lexicon.

(45)(a) [$_N$ student] $\rightsquigarrow$ λu. ↑STUD(ˇu)
(b) [$_{VP}$ walk in] $\rightsquigarrow$ λu. ↑WALK-IN(ˇu)
(c) [$_{AP}$ hungry] $\rightsquigarrow$ λu. ↑HUNGRY(ˇu)
(d) [$_{NP}$ he$_i$] $\rightsquigarrow$ λ$\underline{P}$. ˇ$\underline{P}$(^d_i)
<d_i *given* w.r. to previous context>
(e) [$_{Det}$ a$_i$] $\rightsquigarrow$ λ$\underline{Q}$λ$\underline{P}$. Ed$_i$[ˇ$\underline{Q}$(d_i);ˇ$\underline{P}$(d_i)]
<d_i *new* w.r. to previous context>
(f) [$_{Aux}$ be] $\rightsquigarrow$ λ$\underline{P}$λu. ˇ$\underline{P}$(u)

The translations (a)-(c) are like those from standard Montague Grammar. The only difference is the occurrence of the operator ↑ which makes sure that a formula such as STUD(ˇu) which is of type t is raised in the appropriate way to λp.[STUD(ˇu) ∧ ˇp] to represent the information change potential.

The translation (d) takes pronouns basically as discourse markers and raises them to functions from dynamic properties into information change potentials (type (^(^e,$\underline{t}$),$\underline{t}$)). For obvious reasons, expressions of this type are called dynamic generalized quantifiers. Intuitively, a pronoun refers to an entity that is *given* with regard to the conversation domain. This (dynamic) condition is put in brackets as a condition on the discourse marker d_i.

Regarding the indefinite determiner - translated by (e) - the main difference from standard Montague Grammar is that the dynamic conjunction occurs instead of the static one and that we use the dynamic existential quantifier. An important point is that we need to choose a particular discourse marker in the translation, which is indicated by the index that occurs in the determiner itself. The (dynamic) condition that an indefinite NP refers to an entity that is newly added to the conversation domain is put in brackets as a condition on the discourse marker d_i.[10]

The translation (f) takes as the meaning of the auxiliary *be* the operator 'apply predicate' (neglecting tense and modals). In this regard we follow WILLIAMS (1983) and PARTEE (1986), but depart from MONTAGUE (1974). As will be suggested in the next section, we will treat MONTAGUE's PTQ translation of English *be* as a type-shifting functor that we apply to the generalized quantifier meaning of a NP whenever we find the NP in a predicative position.

Next, in order to construct the translation of a compound expression from its immediate parts, we need semantic operations that are associated (in familiar ways) with syntactic rules. There are two semantic operations in the present fragment, called FA and GDC:

(46)(a) FA (Functional Application): for γ of type (^a,b) and δ of type a:
FA(γ,δ) = γ(^δ)

(b) GDC (Generalized Dynamic Conjunction):
(i) for γ,δ of type $\underline{t}$: GDC(γ,δ) = [γ;δ]
(ii) for γ,δ of type (a,b):
GDC(γ,δ) = λx_a. GDC(γ(x_a),δ(x_a))

(Intensional) Functional Application is a standard from Montague Grammar. Note that the occurrence of the ^-operator makes the corresponding expression ^δ intensionally closed. This is of importance for applying λ-conversion (34b). Generalized Dynamic Conjunction is a straightforward extension of HENDRIKS' (1989) Generalized Conjunction. It extends ordinary dynamic conjunction to the conjunction of dynamic predicates, dynamic properties, and so on.

By way of illustration let us follow the translation of a_i *student*, which is given in (47):

(47)

$$\begin{array}{lll}
[_{NP}\ [_{Det}\ a_i\ ] & [_N\ student]] & (45a,e) \\
\lambda\underline{\underline{Q}}\lambda\underline{\underline{P}}.\ \mathrm{Ed}_i[\,{}^{\vee}\underline{\underline{Q}}({}^{\wedge}d_i);{}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i)] & \lambda u.\ \uparrow\mathrm{STUD}({}^{\vee}u) & (46a) \\
\hline
\lambda\underline{\underline{Q}}\lambda\underline{\underline{P}}.\ \mathrm{Ed}_i[\,{}^{\vee}\underline{\underline{Q}}({}^{\wedge}d_i);{}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i)] & ({}^{\wedge}\lambda u.\ \uparrow\mathrm{STUD}({}^{\vee}u)) & \text{reduction} \\
\hline
\lambda\underline{\underline{P}}.\ \mathrm{Ed}_i[\uparrow\mathrm{STUD}(d_i);{}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i)] & & \text{via (34b)}
\end{array}$$

The resulting DIL expression is a dynamic generalized quantifier (type $({}^{\wedge}({}^{\wedge}e,\underline{t}),\underline{t})$).

Now it can be shown that the translation of our sample discourse (32a) really results in (32d). The following presents the obvious derivation:

(48) (a)

$$\begin{array}{llll}
 & [_S\ [_{NP}\ [_{Det}\ a_i\ ] & [_N\ student]] & [_{VP}\ walks\ in]] \\
 & \lambda\underline{\underline{Q}}\lambda\underline{\underline{P}}.\ \mathrm{Ed}_i[\,{}^{\vee}\underline{\underline{Q}}({}^{\wedge}d_i);{}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i)] & \lambda u.\uparrow\mathrm{STUD}({}^{\vee}u) & \lambda u.\uparrow\mathrm{WALK\text{-}IN}({}^{\vee}u) \\
\mathrm{FA} & \lambda\underline{\underline{P}}.\ \mathrm{Ed}_i[\uparrow\mathrm{STUD}(d_i);{}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i)] & & \\
\mathrm{FA} & \mathrm{Ed}_i[\uparrow\mathrm{STUD}(d_i);\uparrow\mathrm{WALK\text{-}IN}(d_i)] & &
\end{array}$$

(48) (b)

$$\begin{array}{llll}
[_S\ [_{NP}\ he_i] & [_{Aux}\ is] & [_{AP}\ hungry]] & \\
\lambda\underline{\underline{P}}.{}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i) & \lambda\underline{\underline{P}}\lambda u.\lambda\underline{\underline{P}}(u) & \lambda u.\uparrow\mathrm{HUNGRY}({}^{\vee}u) & \mathrm{FA} \\
 & \lambda u.\uparrow\mathrm{HUNGRY}({}^{\vee}u) & & \mathrm{FA} \\
 & \uparrow\mathrm{HUNGRY}(d_i) & &
\end{array}$$

(48) (c)

$$\begin{array}{lll}
[_S\ a_i\ student\ walks\ in\ ] & [_S\ he_i\ is\ hungry] & \\
\mathrm{Ed}_i\ [\uparrow\mathrm{STUD}(d_i);\ \uparrow\mathrm{WALK\text{-}IN}(d_i)] & \uparrow\mathrm{HUNGRY}(d_i & \mathrm{GDC} \\
\hline
[\mathrm{Ed}_i[\uparrow\mathrm{STUD}(d_i);\ \uparrow\mathrm{WALK\text{-}IN}(d_i)]; & \uparrow\mathrm{HUNGRY}(d_i)] &
\end{array}$$

4. Existential *there be*-sentences: a dynamic approach

In this section we return to the treatment of existential *there be*-sentences. In order to account for the specific character and for the dynamics of these sentences, their translation into DIL is a desirable task. The application of dynamic generalized quantifiers helps us to cope with this task.

4.1 Predicative interpretation of noun phrases

For the following it is necessary to make the category-to-type relationship more flexible than in Montague's approach. In order not to introduce too many novelties at the same time, let me first develop the basic idea concerning the kind of flexibility desired for a sublanguage which is essentially static.

In agreement with WILLIAMS (1983) and PARTEE (1986) I propose *three* logical types for the syntactic category NP: e "referential", (e,t) "predicative", and ((e,t),t) "quantificational". PARTEE (1986) argues that the last, the type of generalized quantifiers, is the most general: all NPs have meanings of this type, while only some have meaning of type e and/or type (e,t). Furthermore, she proposes general principles for predicting from the generalized quantifier interpretation of a given NP what possible e-type and/or (e,t)-type interpretations it will have.

Though the type-splitting of an NP is a semantic notion, not a syntactic one, different syntactic environments may restrict the assignment of the appropriate logical-semantic type. In accordance with MILSARK (1974) I will assume that both predicate nominals and the NPs in codas of existential *there be*-sentences are restricted semantically to the type (e,t) of predicates. In order to construct these predicates from generalized quantifiers, I will adopt PARTEE's type-shifting operator BE. This operator is essentially MONTAGUE's PTQ translation of English *be*. Here is the slightly simplified version of PARTEE (1986):

(49) $\mathrm{BE}(\mathcal{P}) = \lambda y.\mathcal{P}(\lambda x.\ x=y)$

The operator BE applies to a generalized quantifier $\mathcal{P}$, finds all the singletons therein, and collects their elements into a set. For the generalized quantifier meaning of *a student*, $\lambda P.\ \exists x[\mathrm{STUD}(x) \wedge P(x)]$, this gives the predicate of being a student, as shown in (50):

(50) $\mathrm{BE}(\lambda P.\ \exists x[\mathrm{STUD}(x) \wedge P(x)]) = \lambda y.\ \exists x[\mathrm{STUD}(x) \wedge x=y]$

Let us apply this predicate to a variable x_n (different from x). This variable can be taken as the e-type translation of the pronoun he_n. When we perform the corresponding λ-conversion, it results in $\exists x[\mathrm{STUD}(x) \wedge x=x_n]$ which reduces to $\mathrm{STUD}(x_n)$. Evidently we have found the adequate translation of he_n *is a student* in this way. Now let us apply the predicate given by (50) to the variable x: $[\lambda y.\ \exists x[\mathrm{STUD}(x) \wedge x=y]](x)$. In this case, we are not allowed to convert because the free occurrence of the variable x in the argument would become bound in the resulting expression. Unfortunately, this is precisely what we want in the case of existential sentences: $\exists x[\mathrm{STUD}(x) \wedge x=x]$ (or, after reduction, $\exists x\mathrm{STUD}(x)$) would be nice as a translation of the existential sentence *there is a student*. Note that the variable x would be taken as the e-type translation of existential *there* in this case. The close correspondence between the semantics of ordinary pronouns and existential *there* will prove to be a striking feature of this kind of analysis and it will yield a number of pleasant consequences (discussed in Section 4.4).

To maintain the pronoun-like analysis of existential *there*, an approach needs to be provided to λ-conversion bringing free variables in the scope of quantifiers binding them. A particularly simple solution, inspired by MONTAGUE's treatment of the same problem in connection with intensionality, is to use GROENENDIJK & STOKHOF's (1990) extension and intension operators *sensitive to states* (= assignments of values to discourse markers). This solution runs as follows. First, we adopt the state-sensitive variant (51) of PARTEE's (extensional) type shifter BE.

(51) $\underline{\mathrm{BE}}(\mathcal{P}) = \lambda u.\mathcal{P}({}^\wedge\lambda v.\ {}^\vee v={}^\vee u)$, where u,v are variables of type ^e, and $\mathcal{P}$ is an expression of type (^(^e,t),t).

Apart from the use of states instead of possible worlds, this variant is identical with MONTAGUE's origin translation of English *be*. Next, let us apply this operator to the state-sensitive generalized quantifier meaning of a_i *student*, $\lambda\underline{P}.\ \exists d_i[\mathrm{STUD}(d_i) \wedge {}^\vee\underline{P}({}^\wedge d_i)]$, using the (static) discourse quantifier $\exists d_i$ ($\underline{P}$ is a variable of type ^(^e,t)):

(52) $\underline{\mathrm{BE}}(\lambda\underline{P}.\ \exists d_i[\mathrm{STUD}(d_i) \wedge {}^\vee\underline{P}({}^\wedge d_i)]) = \lambda u.\ \exists d_i[\mathrm{STUD}(d_i) \wedge d_i = {}^\vee u]$

In order to get the translation of he_n *is* a_i *student*, we have to apply the property given by (52) to the (intensionally closed) discourse marker ${}^\wedge d_n$ ($n \neq i$). We are allowed to perform λ-conversion, and it results in $\exists d_i[\mathrm{STUD}(d_i) \wedge d_i = d_n]$, or, equivalently $\mathrm{STUD}(d_n)$.

Now let us apply the property given by (52) to the discourse marker ${}^\wedge d_i$ (where d_i is the same discourse marker as that introduced by the state-sensitive translation of a_i *student*): $[\lambda u.\exists d_i[\mathrm{STUD}(d_i) \wedge d_i={}^\vee u]]({}^\wedge d_i)$. Since the argument term ${}^\wedge d_i$ is intensionally closed, we are again allowed to convert, and it results in $\exists d_i[\mathrm{STUD}(d_i) \wedge d_i=d_i]$. The latter can be demonstrated to be equivalent to $\exists x\ \mathrm{STUD}(x)$ - the fairly correct truth-condition of the existential $there_i$ *is* a_i *student*. This derivation demonstrates how the binding problem in connection with λ-conversion mentioned above can be overcome as a technical problem if state-sensitive tools are used. Importantly, the close correspondence between the semantic translation of pronouns and existential *there* is maintained in the analysis.

Up to now we have used an essentially static approach of analyzing existential *there*-sentences. This approach accounts nicely for the existential feature in the corresponding truth conditions, but it does not account for the presentational character of these sentences. Hence it is insufficient for explaining that *there*-insertion sentences license discourse anaphora. In the next subsection I want to demonstrate how this problem can be solved if the dynamic element of GROENENDIJK & STOKHOF's theory is incorporated.[11]

4.2 The type-shifting operator BE in dynamic semantics

It is a simple task to adjust the type-shifter BE to the demands of GROENENDIJK & STOKHOF's (1990) dynamic theory. Starting from MONTAGUE's origin expression, we have only to introduce the up-arrow at the right place:

(53) $\underline{\underline{\mathrm{BE}}}(\mathcal{P}) = \lambda u.\mathcal{P}({}^\wedge\lambda v.\uparrow{}^\vee v={}^\vee u)$, where u,v are variables of type ^e, and $\underline{\underline{\mathcal{P}}}$ is a dynamic generalized quantifier (type (^(^e,$\underline{t}$),$\underline{t}$)).

Let us apply this dynamically adjusted type-shifter to the dynamic generalized quantifier meaning of a_i *student* (cf. (47)):

(54) $\underline{\underline{\mathrm{BE}}}(\lambda\underline{\underline{P}}.\mathcal{E}d_i[\uparrow\mathrm{STUD}(d_i);{}^\vee\underline{\underline{P}}({}^\wedge d_i)] = \lambda u.\mathcal{E}d_i[\uparrow\mathrm{STUD}(d_i);\uparrow d_i={}^\vee u]$

In order to get the translation of the sentence (55a), we have to apply the expression (54) to the discourse marker ${}^\wedge d_n$ ($n \neq i$) as done in (55b).

(55) (a) He_n *is* a_i *student.*
(b) $[\lambda u.\ \mathcal{E}d_i[\uparrow\mathrm{STUD}(d_i);\uparrow d_i={}^\vee u]]({}^\wedge d_n)$, with $n \neq i$
(c) $\mathcal{E}d_i[\uparrow\mathrm{STUD}(d_i);\uparrow d_i=d_n]$
(d) $\exists x[\mathrm{STUD}(x) \wedge x=d_n]\ (\equiv \mathrm{STUD}(d_n))$

After performing λ-conversion, the expression (55c) results; its truth-conditional import is given by (55d). The latter outcome is identical with the result found earlier by using a purely static semantics.

Now let us assume again that existential *there* refers to a discourse marker and that this discourse marker is exactly the same as the one which is newly introduced by the indefinite NP in the coda of our existential sentence. Consequently, the translation of the existential sentence (56a) should be (56c).

(56) (a) $There_i$ *is* a_i *student.*
(b) $[\lambda u.\ \mathcal{E}d_i[\uparrow\mathrm{STUD}(d_i);\uparrow d_i={}^\vee u]]({}^\wedge d_i)$
(c) $\mathcal{E}d_i[\uparrow\mathrm{STUD}(d_i;\uparrow d_i=d_i]$
(d) $\exists x[\mathrm{STUD}(x) \wedge x=x\ (\equiv\exists x\ \mathrm{STUD}(x))$

After performing λ-conversion, the expression (56c) results. It has the truth-conditional import given in (56d). Note that the latter result is the same as that found in the previous subsection by using state-sensitive, but purely static means. The advantage of the present dynamic approach is that it accounts for the fact that *there*-insertion sentences license the binding of discourse pronouns. For example, the discourse (57a) would be represented as (57b), with a dynamic binding relation established by means of the dynamic discourse quantifier $\mathcal{E}d_i$.

(57) (a) $There_i$ *is* a_i *God.* He_i *is omnipotent.*
(b) $[\mathcal{E}d_i\uparrow\mathrm{GOD}(d_i);\uparrow\mathrm{OMNIPOTENT}(d_i)]$

4.3 Dynamic GQT and existential *there be*-sentences

The aim of the present subsection is to present the proposed dynamic approach to English existentials in a more systematic form. To this end let us extend the fragment given in Section 3.2 as follows. First, we add an entry for existential *there* to the sample lexicon (45):

(45) (g) $[_{NP}\ there_i] \rightarrow \lambda\underline{\underline{P}}.\ {}^\vee\underline{\underline{P}}({}^\wedge d_i)$
<d_i *new* w.r. to previous context>

The dynamic condition in brackets distinguishes *there* from ordinary pronouns and gives it a touch of indefiniteness. In order to enforce that the discourse marker introduced by *there* and that by the postverbal (indefinite) NP are identical, a second condition is required. This condition can be stated as follows:

(58) In a dynamic formular of type $\underline{\underline{t}}$ each discourse marker has to be dynamically bound

Since the discourse marker introduced by *there* has to be new w.r. to previous context (see the condition in brackets in (45g)), the only possibility to get it bound is by the existential operator contained in the postverbal indefinite NP. Consequently, the discourse marker introduced by *there* and that by the postverbal indefinite NP have to be identical.

Notice that the condition (58) is motivated for reasons that are completely independent of interpreting existential *there*-sentences. It ensures that each ordinary pronoun and each definite NP (old discourse markers!) is dynamically bound by an operator that has introduced the corresponding antecedent and brings about the anaphoric relationship between the anaphoric expression and its antecedent. Obviously, this corresponds to a standard case of local coherence. In this sense, the condition (58) can be grasped as a standard condition of local coherence (of course, it is not the only condition of local coherence that ought to be formulated).

Now let us look at the 'novelty condition' in brackets in (45g) again. Together with the (essentially pragmatic) condition (58) it excludes definite NPs (*old* discourse markers!) from contexts of *there*-insertion. Consequently, it can be said that this condition constitutes the *dynamic* trigger of the definiteness restriction in contexts of *there*-insertion.

Up to now we have not considered the question of how the lexical element *there* should be analyzed *syntactically*. According to current GB theory, *there* is usually analyzed as an expletive element (i.e. *not contentful expression*) that occupies the non-theta subject position, and its distribution is tied to the Extended Projection Principle (see CHOMSKY (1986) for example). Recently, this view has been criticized by HORNSTEIN (1991). In his analysis HORNSTEIN assumes that 'pleonastic' expressions such as English *there*, German *es*, and Icelandic *bad* syntactically are LF operators occupying a non-argument-adjoined position at LF: $[_{IP}\ t_i$ INFL $[_{VP}$ there$_i$ $[_{VP} \ldots]]]$. As discussed by HORNSTEIN (1991) in detail, this assumption yields a unified approach to the restricted distribution of English and Germanic 'expletives'. Furthermore, it yields a principled approach to a variety of island effects that existential constructions in English and Icelandic have.

Regarding the semantic side of the coin, HORNSTEIN (1991) is far less explicit than regarding the syntactic one. Corresponding to the notion that *there* is an operator at LF, HORNSTEIN assumes that this operator indeed has semantic import. This assumption contrasts with the standard GB view that treats *there* as a pleonastic element with no semantic content. What then is *there*'s interpretation? HORNSTEIN suggests the following: "*There* is an operator with very limited quantificational force: it is a minimal lambda operator. By 'minimal' I mean to suggest that in contrast to other types of overt lambda abstractors, e.g. WH relative pronouns, it does not itself have a range." (HORNSTEIN 1991: 33). Unfortunately, HORNSTEIN (1991) does not try to characterize his minimal lambda operator in more precise terms.

Given current standards of model-theoretic semantics, I think, HORNSTEIN's suggestion concerning the semantic content of *there* is rather unsatisfactory. However, I feel that the main part of HORNSTEIN's semantic intuitions may be made explicit if the operator given in (45g) is taken as the semantic content of existential *there*. Semantically, this operator applies to the (type-shifted) content of the coda of the existential *there be*-sentence. Now condition (58) applies and ensures that the discourse marker introduced by this operator and that by the postverbal (indefinite) NP are identical.[12]

In order to interpret our simple fragment let us next consider the semantic operations that are used to construct the translations of compound expressions following the syntactic rules. These operations are as above and extensive use is made of GDC for modifying head nouns and for forming 'NP-XP' codas. Last but not least, the type-shifting operator $\underline{\underline{BE}}(\mathcal{P})$ is introduced as an operator that freely applies (to dynamic generalized quantifier expressions $\mathcal{P}$).

Let us now throw a closer look at existential *there be*-sentences as exemplified in (59):

(59) *There$_i$ is a$_i$ student hungry.*

Let us first assume a 'bare NP' analysis of this sentence, as shown in the first line of (60)[13], and let us take the bare NP (= the coda) as a dynamic generalized quantifier. Next, let us apply the dynamic type shifter $\underline{\underline{BE}}$ to it. The resulting dynamic property (third line of (60)) functions as the argument of the translation of *there*. After λ-conversion, the expression in the fourth line results. This expression licenses the binding of discourse pronouns. Its truth-conditional import is as expected for the existential sentence under discussion.

(60)

$$
\begin{array}{lll}
[_S\ [_{NP}\ there_i] & is\ [_{NP}\ a_i\ [_{N'}\ student\ \ hungry\ ]]] & \\
\lambda \underline{\underline{P}}.\ {}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i) & \lambda \underline{\underline{P}}.\ \mathrm{E}d_i[\uparrow \mathrm{STUD}(d_i);\uparrow \mathrm{HUNGRY}(d_i);{}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i)] & \\
\hline
 & \lambda u.\mathrm{E}d_i[\uparrow \mathrm{STUD}(d_i);\uparrow \mathrm{HUNGRY}(d_i);\uparrow d_i={}^{\vee}u] & \underline{\underline{BE}} \\
\hline
 & \mathrm{E}d_i[\uparrow \mathrm{STUD}(d_i);\uparrow \mathrm{HUNGRY}(d_i);\uparrow d_i=d_i] & \mathrm{FA}
\end{array}
$$

Truth-conditional import: $\exists x[\mathrm{STUD}(x) \wedge \mathrm{HUNGRY}(x)]$

Now let us see how the present theory can be applied to the 'NP-XP' analysis. The first line of (61) shows the 'NP-XP' analysis for our sample sentence (59)[13]. In the second line the semantic translations of its main constituents are given. The translation of $[_{NP}\ a_i\ student]$ as a dynamic generalized quantifier has been type shifted via application of $\underline{\underline{BE}}$. The fourth line results from applying GDC to the elements of the coda, and the next one represents the result of applying the translation of *there* to the rest of the sentence. It is noteworthy that this result is essentially the same as that in case of the 'bare NP' analysis shown in (60).

(61)

$$
\begin{array}{llll}
[_S[_{NP}\ there_i] & is\ [_{NP}\ a_i\ \ student\ ] & [_{XP}\ hungry]] & \\
\lambda \underline{\underline{P}}.\ {}^{\vee}\underline{\underline{P}}({}^{\wedge}d_i) & \lambda \underline{\underline{P}}.\ \mathrm{E}d_i[\uparrow \mathrm{STUD}(d_i);{}^{\vee}\underline{\underline{P}}(d_i)] & \lambda u.\uparrow \mathrm{HUNGRY}({}^{\vee}u) & \\
\underline{\underline{BE}} & \lambda u.\ \mathrm{E}d_i[\uparrow \mathrm{STUD}(d_i);\uparrow d_i={}^{\vee}u] & & \\
\mathrm{GDC} & \lambda u.[\mathrm{E}d_i[\uparrow \mathrm{STUD}(d_i);\uparrow d_i={}^{\vee}u];\uparrow \mathrm{HUNGRY}({}^{\vee}u)] & & \\
\hline
 & [\mathrm{E}d_i[\uparrow \mathrm{STUD}(d_i);\uparrow d_i=d_i];\uparrow \mathrm{HUNGRY}(d_i)] & &
\end{array}
$$

Truth-conditional import: $\exists x[\mathrm{STUD}(x) \wedge \mathrm{HUNGRY}(x)]$

This outcome demonstrates that the present approach, while involving the structural properties of the coda, applies to them only indirectly. In striving for a linguistically universal characterization of (in)definiteness this result may be interesting.

4.4 Discussion and conclusions

Finally, let me list some advantages of the proposed theory and let me refer to some open questions. Furthermore, a word of caution should be given concerning rash generalizations about this study.

Let me start with the advantages.

(i) The conceptual advantage: Beside the most elementary type e we only need two basic NP-types - that of dynamic generalized quantifiers (type $(\hat{}(\hat{}e,\underline{t}),\underline{t})$) and that of dynamic predicates (type $(\hat{}e,\underline{t})$). Furthermore, the shift between generalized quantifiers and predicates is provided in a principled way: by the type-shifting functor $\underline{\underline{BE}}$. This functor is indeed "natural", both intuitively and by various criteria as demonstrated by PARTEE (1986) for the static case. It remains left to the reader to contrast this view with that of HIGGINBOTHAM (1987) and LAPPIN (1988) who need an extra NP-type t and an arbitrary shifting device for approaching the postcopular NP in existential *there be*-sentences.

(ii) The present approach does not depend on the structural properties of the coda too directly. It holds both for 'bare NP' codas (English) and for 'NP-XP' codas (Chinese). This fact is important for a universal characterization of the DR. Correspondingly, the present framework overcomes a further disadvantage of HIGGINBOTHAM's (1987) and LAPPIN's (1988) theory, which only holds for 'bare NP' codas and cannot be extended to 'NP-XP' codas in a straightforward way.

(iii) The present analysis preserves the advantages of MILSARK's (1974) theory without being burdened with its disadvantages. As discussed in Section 2.3, a first disadvantage concerns negative NPs like *no student*. According to the present approach, the application of the type shifter $\underline{\underline{BE}}$ gives the correct result:

(62) (a) no_i *student* $\rightarrow \lambda\underline{P}\ \sim Ed_i[\uparrow STUD(d_i); {}^{\vee}\underline{P}(d_i)]$
(~ closed negation in the sense of GROENENDIJK & STOKHOF 1990)

(b) $BE(no_i\ student\ ') = \lambda u.\ \sim[Ed_i[\uparrow STUD(d_i); \uparrow d_i = {}^{\vee}u]]$
$= \lambda u.\ \sim[\underline{\underline{BE}}(a_i\ student\ ')](u)$
(' designates the DIL-translation of the corresponding expression of English)

(c) $there_i$ *is* no_i *student hungry* $\rightarrow$
$\sim Ed_i[\uparrow STUD(d_i); \uparrow HUNGRY(d_i)]$

A further problem concerns the treatment of role expressions. According to MILSARK's (1974) theory, the sentence (28a)

(28) (a) **There is vice-president of the club.*

gets an existential interpretation and would count as acceptable. This is certainly incorrect. In the present analysis (28a) comes out as unacceptable because the predicate VICE-PRESIDENT-OF-THE-CLUB doesn't contain an (implicit) existential quantifier that can bind the discourse marker arising from *there* (only this would give the whole sentence an existential interpretation). Instead, the new discourse marker introduced by *there* remains unbound (independent of the discourse surrounding it). Such structures do not give an interpretable truth-conditional import in (partial) dynamic semantics and therefore should count as unacceptable.

(iv) The present approach can be extended to plural NPs in a straightforward way if groups or plural objects are treated as entities in the sense of LINK (1983). A simple example must be sufficient to demonstrate this point:[14]

(63) (a) *twelve students* $\rightarrow$
$\lambda\underline{P}.\ Ed_i[\uparrow CARD(d_i)=12; \uparrow {*}STUD(d_i); {}^{\vee}\underline{P}(\hat{}d_i)]$

(b) $\underline{\underline{BE}}(twelve_i\ students') =$
$\lambda u.Ed_i[\uparrow CARD(d_i)=12; \uparrow {*}STUD(d_i); \uparrow d_i = {}^{\vee}u]$

(c) $there_i$ *are* $twelve_i$ *students hungry* $\rightarrow$
$Ed_i[\uparrow CARD(d_i)=12; \uparrow {*}STUD(d_i); \uparrow HUNGRY(d_i)]$

(v) According to the present theory, DRs derive from two different sources. The first source has to do with the set-theoretic peculiarities of the type-shifting functor BE. Although BE is a total function, it sometimes leads to a pragmatically degenerate result. For example, *be every student* corresponds to a degenerate case in which *be the only student* would be more appropriate. Therefore, pragmatic reasons can be taken to exclude

(64) (a) **John is every student.* (degenerate world)
(b) **There is every student.* (tautology)

The second source of the DR has to do with the violation of the dynamic condition imposed on the discourse markers involved. It has already been outlined that the special condition imposed on *there* excludes definite NPs like *the president* and *my friend* from *there*-insertion contexts. On the other hand, these NPs are fine as predicate nominals (contrast (65a) with (65b): the b-cases have list readings only).

(65) (a) *John is* { *the president.* / *my friend.* }

(b) **There is* { *the president.* / *my friend.* }

The semantic peculiarities of these NPs as predicate nominals can be accommodated within the present theory as well (cf. BLUTNER 1990). Consequently, the present theory seems to be a promising approach to explaining the slightly different DRs for predicate nominals and existential *there*-sentences.

Summing up these findings and observations, I conclude that GROENENDIJK & STOKHOF's dynamic variant of GQT provides a uniform semantic framework for explaining some peculiarities of existential sentences. In this way it has been found that dynamic Montague grammar has applications other than those which prompted it and advantages other than those GROENENDIJK & STOKHOF claim for it.

However, there are many open questions and also some potential objections to the proposed theory. Remember first that the present theory restricts itself to the treatment of existential *there be*-sentences. It would have been nice if the solution was straightforwardly generalizable to other *there*-insertion contexts and explained - for example - contrasts like those in (66) and (67) (cf. JENKINS 1975).

(66) (a) There ran a man into the room.
(b) *There ran a man *around the track.

(67) (a) There began a riot.
(b) *There ended a riot.

Following DAVIDSON (1967), HIGGINBOTHAM (1987) and others, it appears that we have to assume that sentences are all interpreted as making use of an event variable. At present it is rather unclear to me whether the DAVIDSONian idea can be combined with the present theory in an interesting way that would lead to the desirable generalizations and consequences. Further research is necessary in order to clarify this point.

Another point where further research would be desirable concerns the integration of a more mature syntax with the proposed semantic approach. This point has to do with the question of whether we may expect model-theoretic semantics to be able to contribute to solutions for what seem to be language-particular, hence syntactic, facts. HORNSTEIN's (1991) comparative study of English and Icelandic may be important here. I think the crucial parts of HORNSTEIN's syntactic analysis can be interpreted within the proposed dynamic framework. This will be a challenge for the future.

Thirdly, it should be mentioned that we have adopted from GROENENDIJK & STOKHOF (1990) the idea that dynamic logic is necessary for the interpretation of pronouns both in intrasentential contexts and in *donkey*-sentences. However, their theory runs into problems if it comes to evaluating (i) the very close correspondence between natural language determiners and adverbs of quantification, (ii) the proportion problem and the phenomenon of asymmetric quantification in the context of *donkey*-sentences, (iii) the integration of dynamic binding with the E-type strategy. Various proposals have been made to improve the original theory (cf., for example, CHIERCHIA, 1988; DEKKER, 1990). It is not so clear whether these improvements are compatible with the present approach to existential sentences in natural language.

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Notes

1 Other environments exhibiting a definiteness restriction are, for example, predicate nominals, *donkey*-sentences, partitive NP-constructions, clefts, and pseudo-clefts (cf. HIGGINBOTHAM 1987; BLUTNER 1990).

2 For a criticism of SAFIR (1982, 1987) see HEIM (1987) and HIGGINBOTHAM (1987).

3 This is a simple consequence of the universal of conservativity, $D(A)(B) \equiv D(A)(A \cap B)$, which states that $D(A)(THING) \equiv D(A)(A)$. For positive (negative) $strong_{BC}$ determiners the proposition D(A)(A) is logically true (false); therefore the same holds for D(A)(THING).

4 For a critical discussion of the descriptive correctness of the filter condition (10) see KEENAN (1987) and LAPPIN (1988).

5 For a more detailed discussion of this problem and related ones, see KEENAN (1987). Recently, JOHNSEN (1987) has proposed an improved version of the BARWISE & COOPER (1981) account. The main argument presented above against this account, however, seems likewise available for JOHNSEN's analysis.

6 Determiners like MANY, A FEW, MORE ... THAN, which are weak intuitively, are classified as noncardinal by condition (18). LAPPIN (1988) extends the cardinality condition, so that these determiners are classified as cardinal ones with a relational core.

7 It is tempting to represent the general "ambiguity" exhibited by indefinites (cf. MILSARK 1974) by associating with each cardinal determiner both the original determiner function D (type ((e,t),((e,t),t))) and the "derived" predicate function π(D) (type (e,t)). For a criticism of this solution and for alternative proposals see LÖBNER (1984).

8 Use the common interpretation of the determiner *no* as given in (i):

(i) $\|NO\|\ (\phi)\ (\psi) = \begin{cases} T \text{ if } |\phi \cap \psi| = 0 \\ F \text{ otherwise} \end{cases}$

The transition to the associated cardinality predicate leads to:

(ii) $\|\pi(NO)\|\ (\alpha) = \begin{cases} T \text{ if } card(\alpha) = 0 \\ F \text{ otherwise} \end{cases}$

9 Note the close correspondence between the absolute determiner expression ABS(D) and the predicate expression π(D):

(i) $[ABS(D)](P) \equiv [\pi(D)](\sigma x P(x))$; valid for each cardinal determiner D and each distributive predicate P (σ is LINK's (1983) sum operator).

HIGGINBOTHAM's (1987) and LAPPIN's (1983) accounts deviate from the reconstruction presented here. Both authors identify sets with plural objects. In this way, they mix up the group (individual) perspective and the set perspective, which leads to some inconsistencies. The present reconstruction avoids this mixture and relates set perspective and group perspective by means of relationships like (i).

10 Note that for a sound treatment of the terms 'given' and 'new' the use of *partial* information states (= *partial* assignment functions) instead of total ones is required (see HEIM 1982: 302 ff.).

11 Some authors, e.g. ZEEVAT (1990), seem to accept the state-sensitive account as means to deal with the binding problem of λ-conversion, but they are rather sceptical with regard to the dynamic aspect of GROENENDIJK & STOKHOF's theory. I cannot see whether the static mechanism proposed by ZEEVAT (1990) for dealing with pronoun binding has some particular advantage in the context of *there*-insertion constructions.

12 Notice that in an earlier paper (BLUTNER, 1990) another condition had been used instead of the condition (58). This condition was stated in terms of 'novelty': d_i (the discourse marker introduced by *there*) has to be *given* with respect to the coda. This formulation is problematic for various reasons. First of all, it gives the wrong impression that *there* really functions like a pronoun - a pronoun of which the

antecedent must be found in the coda. Taking *there* as a kind of pronoun, however, leads to a violation of the REINHART rules (the direction of pronominalization is odd, see REINHART 1976). Furthermore, the earlier formulation seems to violate, at least in spirit, the novelty condition that one would like to impose on the postverbal indefinite NP. In this proposal, the indefinite NP introduces a discourse marker that has already been introduced by the 'pronoun' *there*. I am indebted to an anonymous reviewer of the JOURNAL OF SEMANTICS for bringing these inconsistencies of the earlier formulation to my attention.

13 This is a simplified representation that leaves out crucial parts of HORNSTEIN's analysis. However, it seems to be sufficient for the present purpose.

14 It has been argued that indefinite determiners like *some, few, many* are "ambiguous" between an unstressed variant and a stressed form, the former being a vague cardinality predicate and the latter a proper quantifier. In accordance with LÖBNER (1984) I will not take this ambivalence as a case of true lexical ambiguity; rather, I will consider it as a kind of unspecified interpretation. As such it should be treated within the present dynamic formalism; note that the translation presented by (62) accounts for the unstressed variant only.

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