The Dependent Plural and the Analysis of Tense

THE DEPENDENT PLURAL AND THE ANALYSIS OF TENSE

SJAAK DE MEY

(INSTITUTE OF GENERAL LINGUISTICS, GRONINGEN)

0. This paper is about dependent plurals. In the first part of it the term and the phenomenon will be discussed in some detail. As will turn out in the course of the paper my principal interest is not so much directed toward dependent plurals as such, but rather toward general questions pertaining to the analysis of plurality and tense in a Montague grammar framework. The second part of this paper will go into some of these questions. My data are partly taken from Dutch.

1. The Dependent Plural

1.1. The sentence

(1) Er gaan regelmatig treinen van hier naar Amsterdam
= There go regularly trains from here to A =
- From here trains leave regularly for Amsterdam -

means that there are trains leaving for Amsterdam at regular intervals, but it does not say too clearly how many trains leave at a time: it may be just one or more than one at a time. Although I do not want to commit myself to particular answer to the question of whether (1) is ambiguous or vague (compare for such questions Kempson & Cormack (unpubl)) I will nevertheless speak of its two readings. In the reading in which only one train is leaving at a time (1) may, but need not, be synonymous with

(2) Er gaat regelmatig een trein van hier naar Amsterdam
= goes a train =
- From here a train leaves regularly for Amsterdam -

and it is quite legitimate to ask why a plural 'treinen' ('trains') can be used in what would appear to be a singular meaning.

Chomsky (1975) discusses the sentence
(3) Unicycles have wheels.
Chomsky suggests that in sentences like this "plurality is, in a sense, a semantic property of the sentence rather than the individual noun phrase in which it is formally expressed" (p. 81; compare Sag (1976, p.143ff) for an elaboration of this idea). I will call the reading of (1) and (3) in which the plural must be taken in what is apparently a singular meaning the 'dependent reading'. What I mean by 'dependent' must be closely similar to what Chomsky expressed by saying that plurality is a property of the sentence. I differ from Chomsky, however, in letting a plural like 'wheels' depend not so much on the sentence as a whole, but more in particular on a certain part of it. In my terminology, 'wheels' depends on 'unicycles' in (3) and 'treinen' ('trains') on 'regelmatig' ('regularly') in (1).

As it is convenient to have a term that means: the plural expression on which a dependent plural depends, I will speak of its antecedent.

1.2. I will now list what seem to be the main properties of dependent plurals.
a - Although (1), in its dependent reading, may be synonymous with (2), this need not be the case. If there is one and only one train that keeps leaving and returning to its point of departure, then (2) and not (1) can be used to describe the situation properly. This shows that we cannot account for the dependent plural in our grammar by just introducing a rule that replaces, under suitable circumstances, a singular by a plural. Also this is instrumental in explaining that a dependent reading in
(4) A unicycle has always oval wheels
is possible only under specific circumstances, in spite of the fact that 'always' is a suitable antecedent for 'wheels'. That is, a dependent reading of (4) is possible only if we think of unicycles as vehicles of which the wheels are being constantly changed. According to (4), ovality is the property that all the wheels that a particular unicycle over a period may have had, share.
b - Dependent readings can arise only in cases where there is additional information of a pragmatic or lexical nature that makes such a reading probable or even mandatory. (3) is a telling example in this context.
c - Yet, it would be a mistake to think that the dependent plural phenomenon is of a wholly pragmatic character. Only sentences with certain structural properties can be read dependently at all. We have the following structural properties:

I - a dependent plural must have a plural expression as its antecedent. Of special interest are sentences in which the antecedent is not an NP, but a conjunction or adverbial of time as in

(5) Hij draagt altijd nette pakken
- He always wears decent suits -
(6) De meester tekende altijd vlaggen op het bord als er kinderen jarig waren
- Whenever children had their birthdays the teacher drew flags on the blackboard -

II - The antecedent must be higher in the analysis tree than the plural itself. Hereby we mean that a subject NP may depend on a time adverbial, and a direct object NP on a subject NP, but a subject NP may not depend on a direct object NP. That is,

(7) A unicycle has wheels

does not have a reading in which it is synonymous with (3). There are a lot of other cases that would have to be discussed when we try to give a more specific content to the notion 'to be higher in the analysis tree': compare

(8) (a) Sommigen hadden messen in hun handen
(b) Sommigen hadden een mes in hun handen
(c) Sommigen hadden messen in hun hand
- (a) Some had knives in their hands
(b) Some had a knive in their hands
(c) Some had knives in their hand
(9) (a) Mannen met baarden - Men with beards
(b) Mannen met een baard - Men with a beard
(c) Een man met baarden - A man with beards

The (b)-sentences do, and the (c)-sentences do not have a dependent reading.

III - Only a few subcategories of NPs allow a dependent reading. For instance, bare plurals and plural possessives do, but singular possessive plurals and numeral plurals like 'five children', 'some children', do not have a dependent reading. Compare

(10) Alle jongens hebben hun vaders meegebracht
- All the boys have brought their fathers along -
(11) Elke jongen heeft zijn vaders meegebracht
- Each boy has brought his fathers along
(12) De jongens hebben elk hun vaders meegebracht
- The boys have each brought their fathers along -

Whereas the 'pragmatic pressure' (so to say) to interpret (11) dependently is as strong as is the pressure to read (10) dependently, (11) definitely does not have a dependent reading. 'Elke jongen' (' each boy') is not a plural expression. If (12) can be read dependently--and I think this is indeed the case--we have further evidence that Each-Hopping has a semantic effect.

It must be added though, that singular possessives like 'zijn vaders' ('his fathers') do in principle allow a dependent reading, although it would be strange in the case the NP is 'father'. Compare however

(13) Hij neemt altijd zijn vriendinnetjes mee naar zulke feestjes
- He always takes his girl-friends to such parties -

Here the antecedent is the time adverbial 'altijd' ('always') and the plural 'zijn vriendinnetjes' ('his girl-friends') means something like: whoever is his girl-friend then.

d - It would appear, then, that there are two distinct cases:
I - sentences in which the antecedent is a time adverbial
II - sentences in which the antecedent is a plural NP
I will call the former case the temporal variant and the latter the non-temporal variant of the dependent plural.

e - finally, it must be added that inmany cases the use of a dependent plural is either obligatory, possible or forbidden for purely idiomatic reasons. In English it is idiomatic to say: The sailors lost their lives, whereas it would be strange to use a plural in the Dutch equivalent.

1.3. From now on I will concentrate on the sentences (1) and (10), the former representing for me all the cases of the temporal variety and the latter representing all the cases of the non-temporal variety. By restricting my attention to just two sentences I do not want to imply that the analysis of other cases will become trivial once we have an analysis of (1) and (10). I just want to be as explicit as is possible within the limits of time.

In analyzing (1) I assume that the adverb 'regelmatig' ('regularly') can be used properly only when there is a period and a series of events within it. The semantic structure of (1), then, can be itemized as follows:

(14) - there is a set $\underline{t}$ of trains, there is also a period $\underline{p}$, and a subset $\underline{d}$ of $\underline{p}$ of moments of departures; $\underline{t}$ and $\underline{d}$ are in a certain relationship to each other.
- there is a mapping (distinct from the relationship mentioned under the previous item) between $\underline{t}$ and $\underline{d}$ such that each member of $\underline{d}$ is associated with a subset of $\underline{t}$.
- $\underline{t}$ must be a plural set (the Plurality Requirement)
- in the dependent reading the subsets of $\underline{t}$ must all be singletons, whereas in the non-dependent reading each subset may but need not be a singleton set.

When we turn to (10) we get something very similar:

(15) - there is a set $\underline{b}$ of boys and a set $\underline{f}$ of fathers, and $\underline{b}$ and $\underline{f}$ are in a certain relationship to each other.
- there is a mapping between $\underline{b}$ and $\underline{f}$ such that each member of $\underline{b}$ is associated with a subset of $\underline{f}$.
- in the dependent reading the subsets must all be singletons whereas in the non-dependent reading each subset may but need not be a singleton set.
- $\underline{f}$ must be a plural set.

It is a well-known fact that plurals may be either interpreted collectively or distributively. If there are two plural expressions in the sentence we have, as a consequence, four different meaning possibilities according as we take neither of the plurals, one of the plurals or both of the plurals collectively.

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If we look at (14) and (15) it would appear that the first clause represents a collective-collective reading, with either the verb (in the case of (1)) or both the verb and the possessive (in the case of (10)) expressing relations between the two sets. The second and the fourth clause represent the distributive-distributive reading.

It seems a reasonable thing to say that the dependent reading is a special subcase of the collective -collective reading, in that the relations between the members of the two sets (compare the mappings in the second clause) are not expressed explicitly, but may be assumed to be determinable from the pragmatic context and the lexical content of the words. For instance, the set of fathers and the set of boys are just put into relation with each other. That each boy may have only one father although several boys may share a father, is something that is apparent from the lexical (and cultural) meaning of the word 'father' only.

When we go back to the list of properties of dependent plurals, we see that the characterization of dependent plurals as a special subcase of a collective-collective reading is in keeping with item 1 (the plurality of the antecedent), and item 5 (the idiomatic character of dependent plurals) and is especially fit to explain item 2 (the pragmatic or lexical nature of dependent plurals), because a collective-collective reading leaves the specification of the relations between the members of the two sets vague and open to lexical or pragmatic determination. It is items 3 (dependent plurals obey structurally well-defined rules) and 4 (there are two different cases of dependent plurals) that lead to the further questions of why this is so.

When we look once again at (14) and (15) we see that these are rather primitive ways of accounting for semantic properties of sentences. These would be much more clearly brought out if we rendered the sentences, say, into the Intensional Logic (IL) of Montague Grammar (MG). This will be the aim of the second part of the paper.

2. Plurality and Tense

I will now turn to a discussion of how to accomodate plurals and tenses in the framework of MG.The questionsthat I will discuss are brought under three different headings:

2.1. Plurals
2.2. Tense and Plurality
2.3. The Theory of Tense

As to the relation between the two parts of the paper, I use the dependent plural phenomenon as a testing-case: a theory of plurality and tense that cannot account for dependent plurals is not adequate. In order to make this relation more transparent I have formulated two questions both left over from the first part:

- 1: why are there two different cases of dependent plurals?

- 2: in which sense can we say that time adverbials like 'regel-

matig' ('regularly') are plural expressions?
Question 1 will be answered in 2.1; question 2 in 2.3; 2.2 is the connecting link between these two sections.

2.1. What we can learn from dependent plurals in the first place is that our grammar must assign different representations to plural and singular expressions. Sentence (10) is therefore a crucial example, because it forces us to find ways of differentiating between 'elk' ('each') and 'alle' ('all (the)'), and between singular and plural possessives. When we say that the expressions must be assigned formally different representations, this means that the difference must be traceable on the level of logical form. This, in turn, means that we must not assign sentences containing such expressions logically equivalent representations.

A second requirement on our grammar is that the differences between distributive and collective readings be accounted for.

A third requirement on our grammar is that the different readings a sentence may have be systematically related. For instance, two quantifying expressions may be assigned various scopes such that the scope assigned to one of them may either include or exclude the scope assigned to the other. We find in PTQ, more in particular in rules S 14-16, a very elegant way of accounting for such differences in quantifier scope assignment. In Kempson & Cormack we find an attempt to account in a systematic way for the differences between collective and distributive readings and the different interactions between those, in case there is more than one plural expression in the sentence.This task is considerably more difficult to complete and I do not think that this attempt is really convincing.Yet, the account as such is of great interest. I must confess that I have not been able to find anything better.As a result the grammar I propose in this paper will be fragmentary and ad hoc.

2.1.1. Before engaging in a discussion of how the representations will have to look like, I want to make a quite general remark. Most of the attention paid in the literature to plurals has been focused on the difference between group readings and individual readings. As Remco Scha (Scha (forthcoming)) points out, correctly to my mind, such an approach breaks down when we consider more complicated sentences. He himself discusses
(16) The sides of R1 run parallel to the sides of R2.
In such a sentence we have two sets of sides, s_1 and s_2. For each side of s_1 there is a side of s_2 running parallel to it and for each side of s_2 there is a side of s_1 running parallel to it. It is not difficult to recognize in this a pattern very similar to the one we discussed in connection with our example sentences (1) and (10). Compare (14) and (15). The paradigm is this. In sentences with two plurals, we have two sets being re-

lated to each other. Moreover, in many cases the members of the sets themselves stand in a particular relationship to each other. This paradigm can be found back in all sentences with two (or more) plurals, and consequently also in reciprocal sentences. The latter are discussed in Langendoen (1978), who observes, be it in a different context, that the semantics of reciprocals cannot be discussed while leaving the semantics of plural sentences in general out of consideration.

We will be strict in our use of the terms collective and distributive. 'Collective' means only that a set as such is involved in some relation, whereas 'distributive' means that the members of some such set are also involved in some relationship. Now the difference between singulars and plurals appears to be construable in terms of the notions 'distributive' and 'collective'. Note that it would not do to associate singulars with entities and plurals wit sets.In the first place, as singleton sets can be identified with their single element this would lead to considerable formal problems. Moreover, even if we eliminated singletons altogether from our language, then still we cannot ignore the fact that singulars often denote sets. Compare:

(17) Each student has a student advisor and all these advisors gather once a month

The real difference between a singular and a plural, then, seems to be that the former cannot be used collectively. Now, this is still not quite correct, because singulars can be said to denote singletons rather than entities. According to our terminology they can be said to have a collective interpretation. Maybe the right thing to say is that a plural may have either a collective or a distributive reading without these two readings being logically equivalent. Singulars, if they denote an entity, that is a singleton set, do not have both a collective and a distributive reading such that they are not logically equivalent. If they denote plural sets, as in example (17), they only have distributive readings. Note that (17) has two different distributive readings, provided we omit the second conjunct. There may be one advisor for all the students, or there may be several advisors. It is a consequence of the terminology chosen that the former of these two readings may be called either a distributive or a collective reading. For reasons of commodity, however, we will never call such a reading a collective reading.

2.1.2. Let us turn now to more technical details. A number of references could be cited in which we find proposals for how to deal with plurals. All of them agree in assigning sets to plurals. First, let us call the set denoted by a common noun or an intransitive verb or verb phrase its predicate set. A plural, then, is analyzed as denoting a subset of the predicate set of its inherent predicate. This calls for the introduction of an operator forming subsets. For instance, we could write, as in Kroch (1975):

(18) (VX) X $\subseteq$ Boy'.

However, I prefer a suggestion done by Klein. Compare Klein (unpubl). He introduces an operator Pl' and defines it as follows:

(19) $(\forall X)[[Pl'(A)(X)] \equiv (\forall x)[^{\vee}X(x) \rightarrow [^{\vee}A(x) \;\&\; \text{Cardinality}'(^{\vee}X) \geq 2]]]$

I want to avoid introducing set-theoretical symbolism into the language of IL and take Pl' as a primitive symbol. Its Extension with respect to a reference point <w,i> is defined as in

(20) $[Pl'(A)(^{\vee}X)]^{A,w,i,g}$ is 1 iff:

the cardinality of $[^{\vee}X]^{A,w,i,g} \geq 2$, and

for all $x \in D_{<i,e>}$: if $x \in [^{\vee}X]^{A,w,i,g}$ then $x \in [^{\vee}A]^{A,w,i,g}$.

Note that for a formula containing the operator Pl' to be well formed it should contain two arguments denoting sets: in (20) A and X. "Pl'(A)($^{\vee}$X)" can be read as: $^{\vee}$X is a plural subset of A". In a completely similar way we now can introduce other operators like "Two'", "More-Than-Two'","At-Least-Two'", "Many'", "At-Least-One'". The only thing to be changed in the definition is the clause about the cardinality of the subset. A and X are of type <i,<<i,e>,t>>, x is of type <i,e>. I will come back to the question of why these types are chosen this way. The translation of

(21) Three boys find two unicorns

will be, assuming the grammar as defined in Dowty (1979,p.350ff), extended so as to contain the operator Pl' and with the change of types to be discussed:

(22) three boys $\Rightarrow \lambda P\,(\forall Q)\,[Three'(\hat{}Boy')(^{\vee}Q) \;\&\; Three'(P)(^{\vee}Q)]$ [2]

two unicorns $\Rightarrow \lambda P(\forall Q')[Two'(\hat{}Unicorn')(^{\vee}Q') \;\&\; Two'(P)(^{\vee}Q')]$

find $\Rightarrow \lambda P\,\lambda x\; ^{\vee}P(\hat{}\lambda y\; Find'(^{\vee}y)(^{\vee}x))$ [3]

find two unicorns $\Rightarrow [\lambda P\,\lambda x\,^{\vee}P(\hat{}\lambda y Find'(^{\vee}y)(^{\vee}x)](\hat{}\lambda P(\forall Q')$
$[Two'(\hat{}Unicorn')(^{\vee}Q') \;\&\; Two'(P)(^{\vee}Q')])$

(21) $\Rightarrow (\forall Q)[Three'(\hat{}Boy')(^{\vee}Q) \;\&\; Three'(\hat{}\lambda x(\forall Q')$
$[Two'(\hat{}Unicorn')(^{\vee}Q') \;\&\; Two'(\hat{}\lambda y\;\; Find'(^{\vee}y)(^{\vee}x))(^{\vee}Q')])(^{\vee}Q)]$

Note the complex middle term in the second conjunct of the translation of (21): it says that the extension of Q has three members and is a subset of the set of all x that find two unicorns.

In this translation I still ignore the tense of the sentence. It is apparent that using the operator Pl' the way we do yields the distributive-distributive reading, that is, the reading in which there are for each boy two unicorns such that he finds each of these.

Although the operator Pl' seems to be a suitable device for representing the distributive use of plural NPs, it is not difficult to show, however, that it is inadequate to represent the collective use of plural NPs. Let us for this purpose turn to the sentences

(23) All the boys forget their books
and
(24) Each boy forgets his books
The translations are as follows:
(25) all the boys⇒ $\lambda P(VQ)[Pl^{\vee}(\hat{}Boy^{\vee})(^{\vee}Q) \& Pl^{\vee}(P)(^{\vee}Q)]$ [4]
each boy⇒ $\lambda P(VQ)[Pl^{\vee}(\hat{}Boy^{\vee})(^{\vee}Q) \& (\forall x)[\ ^{\vee}Q(x) \rightarrow {}^{\vee}P(x)]]$ [5]
x_o's books⇒$\lambda P(VQ^{\vee})[Pl^{\vee}(\hat{}Book^{\vee})(^{\vee}Q^{\vee}) \& Pl^{\vee}(\hat{}\lambda y$
$Poss^{\vee}(y)(x_o))(^{\vee}Q) \& Pl^{\vee}(P)(^{\vee}Q^{\vee})]$
(23)⇒ $(VQ)[Pl^{\vee}(\hat{}Boy^{\vee})(^{\vee}Q) \& Pl^{\vee}(\hat{}\lambda x_o(VQ^{\vee})$
$[Pl^{\vee}(\hat{}Book^{\vee})(^{\vee}Q^{\vee}) \& Pl^{\vee}(\hat{}\lambda y\, Poss^{\vee}(y)(x_o))(^{\vee}Q^{\vee}) \&$
$Pl^{\vee}(\hat{}\lambda y\ Forget^{\vee}(^{\vee}y)(^{\vee}x_o))(^{\vee}Q^{\vee})])(^{\vee}Q)]$

(24)⇒ $(VQ)[Pl^{\vee}(\hat{}Boy^{\vee})(^{\vee}Q) \& (\forall x)[\ ^{\vee}Q(x) \rightarrow (VQ^{\vee})$
$[Pl^{\vee}(\hat{}Book^{\vee})(^{\vee}Q^{\vee}) \& Pl^{\vee}(\hat{}\lambda y\, Poss^{\vee}(y)(x))(^{\vee}Q^{\vee}) \&$
$Pl^{\vee}(\hat{}\lambda y\ \ Forget^{\vee}(^{\vee}y)(^{\vee}x))(^{\vee}Q^{\vee})]]]$

Two remarks are in order here. In the first place, note that the translations of singular and plural possessives do not differ. It looks as if only one translation, namely of "x_o's NP", suffices. The reason for this is to be found in the strategy used in translating terms in general. The general schema according to which terms are translated in MG is:
(26) λP (Quantifier x)[Predicate (x) connective $^{\vee}P(x)$]
in which the variable 'P' marks an open space for the translation of an IV, say the IV of the sentence. Irrespective of whether the term quantified in is a plural or a singular, the translation of the phrase "x_o's NP" will always appear within the scope assigned to this term and consequently will be bound either by a plural or a singular. Yet, it must be doubted that we, indeed, can treat singular and plural possessives in the same way. I will come back to this point.

Note that the way of translating possessives here is subject to the same restrictions that the quantificational approach to pronouns in PTQ is subject to in general. For instance, backwards pronominalization cannot be accounted for.

Secondly, when we compare the translations in (23) and (24), we see that they are logically equivalent. Now this may be as it should be, because indeed (24) is synonymous to some reading of (23). But, as we have seen, the expressions 'all the boys' and 'each boy' are not interchangeable in every context, if only because the former can and the latter cannot serve as the antecedent of a dependent plural.

I therefore propose to introduce an operator $c^{\vee}$ and will read "$c^{\vee}(^{\vee}Q)$" as: the collective Q, or: Q taken collectively.[6] Collectives are individuals, that is
(27) If Q is of type <i,<<i,e>, t>> then $c^{\vee}(^{\vee}Q)$ is of type<i,e>.

Note, first, that the introduction of the $c^{\vee}$-operator does not render the $Pl^{\vee}$-operator superfluous, as can be seen

from the following translation of all the boys:
(28) $\lambda P(VQ)[Pl'(\hat{}Boy')(^{V}Q) \& {}^{\cap}P(c'(^{V}Q))]$
That is, we assume that a predicate like Boy' always has a distributive interpretation, although the verb phrase with which the term is combined may be interpreted collectively.

Second, how exactly the c'-operator will have to be interpreted is not easy to determine, because of the pragmatic and lexical features that enter into the interpretation of plural NPs. The way I deal with the operator here will be admittedly ad hoc. Let us look at how the different readings of (21) will translate:
(29)-collective-collective reading:
$(VQ)[Three'(\hat{}Boy')(^{V}Q) \& (VQ')[Two'(\hat{}Unicorn')(^{V}Q') \& Find'(^{\vee}c'(^{V}Q'))(^{\vee}c'(^{V}Q))]]$
-collective-distributive reading:
$(VQ)[Three'(\hat{}Boy')(^{V}Q) \& (VQ')[Two'(\hat{}Unicorn')(^{V}Q') \& Two'(\hat{}\lambda y\ Find'(^{V}y)(^{\vee}c'(^{V}Q)))(^{V}Q')]]$
-distributive-collective reading:
$(VQ)[Three'(\hat{}Boy')(^{V}Q) \& Three'(\hat{}\lambda x(VQ')[Two'(\hat{}Unicorn')(^{V}Q') \& Find'(^{V}c'(^{V}Q'))(^{V}x)])(^{V}Q)]$
I will come back to the interpretation of the parts: "$Find'(^{V}y)(^{\vee}c'(^{V}Q))$" and "$Find'(^{\vee}c'(^{V}Q'))(^{V}x)$" (which say that the collective of three boys find y, or that x finds a collective of two unicorns).

Note that by quantifying in the object term after the introduction of the subject term we will get four more readings, which represent the readings in which the direct object has wider scope than the subject term. The collective-collective readings will be logically equivalent. Note also that the interpretation of numeral NP should be worked out in much greater detail. For instance, the difference between a reading in which just two unicorns or three boys are meant and the one in which two particular unicorns or three particular boys are meant is not accounted for. These readings arise especially in intensional contexts. We will not pursue these topics here.

When we turn now to the sentences
(30) All the boys bring their father along
and
(31) All the boys bring their fathers along
we are confronted with several problems. In the first place, the rendering of the predicate 'father' can be chosen differently. For instance as
(32)(a) father⇒ $\lambda y\ \lambda x\ Father'(y)(x)$
or as
(32)(b) father⇒ $\lambda x(Vy)\ Father'(y)(x)$
I opt for the former because it fits in better with the sentences dealt with here. In the second place, both sentences have several different readings. (30) has two distributive readings according as there is one person who is the father of

all the boys or there are more fathers involved. The relationship between the fathers and the boys in (31), however, is far more complicated, if we are ready to ignore for the moment the lexical restrictions on the interpretation imposed by the word 'father'. We shall not try to list all the possibilities exhaustively. We are interested in the case in which there is a group of men such that each of them is the father of one or more of the boys. Then still there are two different readings. It may be the case that each boy brings along his own father, or it might be that each boy brings along the whole group of fathers. This may not be a probable reading for the case at hand, but we can alter the example slightly, for instance:

(33) All the children showed their fathers what they had made in school

interpreting this in such a way that each child shows to all the fathers whatever it had made in school.

The latter of these two readings will be called the distributive-collective reading, the former is, of course, the dependent reading. What is interesting about the dependent reading is that the relationship between the boys and the fathers might be called collective-collective, but the relation between the boys and the bringing along is distributive-distributive.

The translation of (30) is as follows:

(34) father $\Rightarrow \lambda y\, \lambda x\, \text{Father}'(y)(x)$

's $\Rightarrow \lambda P \lambda P^2 \lambda Q\ {}^{\vee}P(\hat{}\lambda y(Vx)[(\forall z)[{}^{\vee}P^2(y)(z) \rightarrow z = x] \,\&\, {}^{\vee}Q(x)])$ {P^2 is of type <i,<<i,e>,<<i,e>,t>>> }

he$_o$ $\Rightarrow \lambda P\ {}^{\vee}P(x_o)$

his$_o$ $\Rightarrow \lambda P^2 \lambda Q\ (Vx)[(\forall z)[{}^{\vee}P^2(x_o)(z) \rightarrow z = x] \,\&\, {}^{\vee}Q(x)]$

his$_o$ father $\Rightarrow \lambda Q(Vx)[(\forall z)[\text{Father}'(x_o)(z) \rightarrow z = x] \,\&\, {}^{\vee}Q(x)]$

all the boys $\Rightarrow \lambda P(VQ)[Pl'(\hat{}\text{Boy}')({}^{\vee}Q) \,\&\, Pl'(P)({}^{\vee}Q)]$

(30) $\Rightarrow$ $(VQ)[Pl'(\hat{}\text{Boy}')({}^{\vee}Q) \,\&\, Pl'(\hat{}\lambda x_o\ (Vx)[(\forall y)[\text{Father}'(x_o)(y) \rightarrow x = y] \,\&\, BA'({}^{\vee}x)({}^{\vee}x_o)])({}^{\vee}Q)]$

This is a distributive-distributive translation as can be seen from the rendering of 'all the boys'. It automatically assigns 'father' narrower scope than 'his$_o$'. That is, if we quantify in the plural term all the boys for he$_o$ we get the reading in which there is for each boy exactly one father. We now proceed with (31); the distributive-collective reading will be rendered as

(35)(a) $(VQ)[Pl'(\hat{}\text{Boy}')({}^{\vee}Q) \,\&\, (VQ')[\text{Father}'(c'({}^{\vee}Q))(c'({}^{\vee}Q')) \,\&\, Pl'(\hat{}\lambda x\ BA'(c'({}^{\vee}Q'))({}^{\vee}x))({}^{\vee}Q)]]$

The dependent reading will be rendered as:

(35)(b) x_o's fathers $\Rightarrow \lambda P(VQ')[\text{Father}'(x_o)(c'({}^{\vee}Q')) \,\&\, {}^{\vee}P(c'({}^{\vee}Q'))]$

(31) $(VQ)[Pl'(\hat{}\text{Boy}')({}^{\vee}Q) \,\&\, (VQ')[\text{Father}'(c'({}^{\vee}Q))(c'({}^{\vee}Q')) \,\&\, BA'({}^{\vee}c'({}^{\vee}Q'))({}^{\vee}c'({}^{\vee}Q))]]$

If we now assume the following meaning rule:

(36) $(\forall Q)(\forall Q')[\text{Father}'(c'({}^{\vee}Q'))(c'({}^{\vee}Q)) \,\&\, {}^{\vee}P^2(c'({}^{\vee}Q'))(c'({}^{\vee}Q))]$

$\Leftrightarrow [^{\vee}Q = [\lambda y\ \text{Father}'(x)(y) \ \&\ {}^{\vee}P^2(y)(x)]]$
and apply this rule to the translation of (31), the result will be a correct representation of the dependent reading of the sentence and a correct representation of the distributive-collective reading.

The meaning rule imposes a distributive reading not only on the predicate Father' but also on the verb phrase. This is as it should be. One of the characteristics of the dependent reading in such sentences like (31) is that the predicate and the verb phrase are interpreted in the same way, although the existence of the distributive-collective reading shows that this is not so in all readings.

The meaning rule is ad hoc in that it is written for the case of a direct object only. It is moreover ad hoc in being based on a specific translation of the plural possessive. That is, it was written for the direct object case because we quantify in the possessive NP. Pronouns in subject position in non-conjunctive main clauses are hard to account for in MG. As to the translation of the plural possessive, let us note in the first place that we were right in guessing that plural and singular possessives should not always be translated in the same way. Furthermore, the translation of "x_o's books" differs from the translation of "x_o's fathers" in several respects as can be seen from the translations presented. However, it is impossible to tell in a general way, when we must use the one and when the other way of translating plural possessive plurals. It is also unclear whether there are more than two different translations for plural possessives.

Here the discussion of sentences like (10) ends. There is one question left over from our discussion: how should we interpret formulas like $\text{Find}'(^{\vee}y)(^{\vee}c'(^{\vee}Q))$? This will be taken up in the next section.

2.2. Although the studies refered to earlier are promising attempts at analyzing plurality, one thing seems to have been completely overlooked. It is what I call 'the essential involvement of tense in plural relations'. I can explain what I mean by this by citing an example discussed in Langendoen (1978):
(37) They scratched one another's backs.
Langendoen denies this sentence a symmetric reciprocal meaning, probably taking the past tense as expressing simultaneity. However, it seems to be completely reasonable to interpret (37) as saying that first A scratched B's back and then B scratched A's back.

It seems a reasonable thing to say that tenses denote periods rather than moments. Such a period is the period within which the event expressed in the sentence takes place. Events themselves however may have a rather complex structure. In (37) the event is the scratching of one another's backs. This event can be divided into 'subevents', one of which is earlier than the other. Each

has its own temporal structure, which is determined by the time schema of the verb phrase. The term 'time schema' is meant in the sense of Vendler (1967). The fact that the period denoted by the tense of the sentence (which period I call the Reference Period, RP for short) can be occupied by two subevents of which the one is later than the other, is a particularity of the past tense. In (21), where we have a present tense,such a structure is not possible: whatever subevents the sentence has have to be simultaneous, because they all have to be simultaneous with the 'moment of speech'. What is traditionally called the moment of speech is also a period (the RP of the present tense) and must be long enough to contain an occurrence of the event expressed in the sentence. In the readings of (21) in which the subject is read distributively we have as many 'subevents' as the subject set has members.

Let us call the members of the subject set and the object set $b_{n+1}, b_{n+2}, b_{n+3}$, and u_{n+1}, u_{n+2} respectively. Let us further use B^3 to indicate a set of three boys, U^2 to indicate a set of two unicorns and let us use different subscripts for sets that are not necessarily equivalent. Then the different subevents of a distributive-distributive reading of (21) can be indicated as:

(38) $\langle now, \langle b_1, u_1 \rangle \rangle$ $\langle now, \langle b_2, u_3 \rangle \rangle$ $\langle now, \langle b_3, u_5 \rangle \rangle$
$\langle now, \langle b_1, u_2 \rangle \rangle$ $\langle now, \langle b_2, u_4 \rangle \rangle$ $\langle now, \langle b_3, u_6 \rangle \rangle$

and the subevents of the collective-distributive reading:

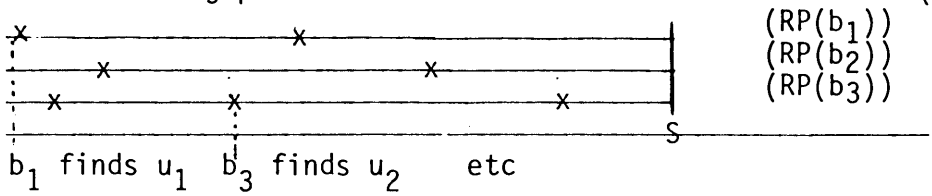
(39) $\langle now, \langle B_1, u_1 \rangle \rangle$ $\langle now, \langle B_1, u_2 \rangle \rangle$

Had we taken, instead of (21), the sentence

(40) Three boys have found two unicorns

the subevents would not necessarily have been simultaneous. May-be the following picture clarifies what I have in mind for (40):

(41)



Langendoen (1978) uses the schema

(42) A r B

to denote that in a sentence with two plural terms denoting the sets A and B respectively, these two sets enter into a specific relationship. My proposal is to replace (42) by

(43) T r_1 (A r_2 B)

in which T denotes a set of intervals.

Of special importance for our subject is the question of how time adverbials fit into this framework. In particular we must ask whether also T can be taken either distributively or collectively. Let us for that purpose turn to

(44) Yesterday, ten people got killed in a traffic accident.

This sentence has two readings according as we assign 'in a traffic accident' wide scope or narrow scope with respect to

the subject term. Now it is well known that adverbials like 'yesterday' should be interpreted as meaning 'sometime yesterday'. They are 'frame adverbials'. It is interesting to note, however, that this holds true only in the case we assign the subject term narrow scope, that is the reading which says that 'somewhere yesterday there has been an accident in which ten people got killed'. If we assign the subject term wide scope the sentence can be paraphrased as saying that the total number of people killed in all the accidents that took place yesterday is ten. It looks as if we could distinguish between a collective and a distributive reading of 'yesterday' here, in that in the reading in which 'ten people' has narrow scope we consider the set of accidents that took place yesterday. This would also imply that we say that 'yesterday' is a plural expression, for in our framework only plural expressions can be interpreted collectively. This I think is unattractive. It is moreover not difficult to explain the differences in interpretation of 'yesterday'. In the reading in which the subject term has wide scope with respect to 'in a traffic accident' it may also have wider scope than 'yesterday'.

The adverbial 'in a traffic accident' is also a time adverbial but of a different subcategory than 'yesterday'. In order to accomodate phrases like this in MG we introduce an operator T´ that maps accidents to the time of their occurrence. We have

(45) T´ is of type$\langle\langle i,e\rangle,i\rangle$ and $T'(y)^{A,w,i,g}$ is a iff $Accident'(y)^{A,w,a,g}$ is 1.

I will first concentrate on the reading in which the subject term has wider scope than 'in a traffic accident' and 'yesterday'. The translation is as follows:

(46) in a traffic accident⇒ $\lambda P_t \lambda t(\forall y)[Accident'(y) \& t=T'(y) \& {}^{\vee}P_t(t)]$

yesterday´⇒ $\lambda P_t\ (\forall t)[Yesterday'\ (t) \& {}^{\vee}P_t(t)]$

x_0 got killed in a traffic accident yesterday⇒ $(\forall t)[Yesterday'(t) \& (\forall y)[Accident'(t) \& t=T'(y) \& AT[t, Die'\ ({}^{\vee}x_0)]]]$

(44) $(\forall Q)[Ten'(\hat{}People')({}^{\vee}Q) \& Ten'(\hat{}\lambda x_0(\forall t)[Yesterday'(t) \& (\forall y)[Accident'(y) \& t = T'(y) \& AT[t, Die'({}^{\vee}x_0)]]])({}^{\vee}Q)]$

The reading in which 'in a traffic accident' has wider scope than the subject term can now be rendered as follows:

(47) (44) $(\forall t)[Yesterday'(t) \&(\forall y)[Accident'(y)\& T'(y)=t \& (\forall Q)[Ten'(\hat{}People')({}^{\vee}Q)\& Ten'(\hat{}\lambda x_0 AT[t,Die'({}^{\vee}x_0)])({}^{\vee}Q)]]]$

There are several remarks to be made. In the first place, note that according to (47) 'in a traffic accident' has wide scope with respect to the universal quantifier implicit in the translation of 'Ten people'. In the second place, let us note that the operator AT is within the scope of the predicate Ten´. Never-

theless, subformulas of the form "Ten' ( ) (Q)" are still evaluated with respect to the reference point chosen. This then means that we should read such parts as: Q is a set with ten members now, which is as it should be. In the third place we are now in the position to see why the intension of the first argument in formulas of the form "Ten' ( )(Q)" is an essential intension. Compare the translation given in (46). The set Q cannot be said to have ten members before the last victim died. The set is 'built up' so to say in time.[7] That's why I changed the types in the way indicated. This calls for a further explanation however.

Montague in his writings did not introduce a separate index for intervals. Reading through his papers Pragmatics, Pragmatics and Intensional Logic and On the Nature of some philosophical Entities (Pr,PrIl,PE) we see that he sometimes treats the set I as the set of worlds and sometimes as the set of moments. It is remarkable, however, that the intension operator always ranges over the set of possible worlds. If we separate more clearly between worlds and moments (intervals, rather), then we will need two different intension operators. I will represent the temporal intensional operator by a double cap: $\hat{}$. I interpret it as an operator forming functions from the set of intervals to some domain. The definition is

(48) $[\hat{} A]^{A,w,i,g}$ is a function h on the domain D_i such that for all $j \in D_i$: $h(j) = A^{A,w,J,g}$.

There will be more to be said on this score but I will just mention two points: one of the things to worry about is the interaction of these two intensional operators. That this is so can be seen from PE and the relation discussed there between instantaneous generic events and individual events: the former are intensional whereas the latter are not. Such a difference would moreover return if we worked out the semantics of CNs like 'accident'. I will not try to pursue this here. I ignore possible worlds just as Bennett and Dowty, amongst others, have proposed (although I do not agree with their reasons for doing so). So, my intensions will all be temporal intensions. I do not use the double cap symbol, for purely typographical reasons.

Second, note that taking the temporal extension ($\check{}$) of a temporal individual concept would yield what Carlson has called stages. Compare Carlson (1978) for the notion 'stage'. Carlson had trouble in identifying stages with extensions because what he called 'stages of kinds' cannot be so represented. I am not ready to acknowledge stages of kinds, so the problem does not arise. Again, I have used throughout this paper the single cup for the temporal extensional operator.

2.3. We are now in a position to begin the discussion about the plurality of adverbials like 'regelmatig' ('regularly'). The function of these adverbials is to pluralize the verb phrase, or, in our terminology, the Reference Period of the sentence.

SJAAK DE MEY

Let me first indicate roughly what I mean by pluralizing the RP of a sentence. For this purpose it is good to take as example a sentence with a rather complicated time structure, although I will not propose a translation for this sentence.
(49) Yesterday, three trains arrived one right after the other.
The reference period is a period belonging to yesterday and in which there are three arrivals of one train. That is, there is one event which can be subdivided into three 'subevents' that are temporally related. Now if we add the adverbial 'regularly' to this sentence, we get
(50) Three trains arrived regularly one right after the other yesterday.
It is evident that now there are many such events, each of which can be subdivided into three 'subevents'.

Let us now take a sentence of a less complicated structure.
(51) Yesterday, John fell regularly.
It translates as follows:
(52) $(\forall Q)[\text{Many}'(\hat{}\lambda t\, \text{Past}'(t) \,\&\, \text{Yesterday}'(t) \,\&\, \text{AT}[t, \text{Fall}'(j')])(^{\vee}Q)]$
I used the following partial translations in this:
(53) Past⇒ $\lambda t[\text{Past}'(t) \,\&\, \text{AT}[t,\text{Fall}'(j')]]$
Yesterday⇒ $\lambda P_t \lambda t[\text{Yesterday}'(t) \,\&\, {}^{\vee}P_t(t)]$
Regularly⇒ $\lambda P_t (\forall Q_t)[\text{Many}'(P_t)(^{\vee}Q_t)]$
The variable 't' here represents the event period. 'Regularly' translates here as a many-membered set of intervals.

Before we can go on, we must make a remark on the semantics of time expressions in general. In Dowty's grammar there are two rules, F_{36} and F_{39}, of which the former is a rule that takes both a time adverbial and a sentence and maps these to a tensed sentence with a time adverbial. The latter rule maps a sentence to a tensed sentence. We could analyze F_{36} into two separate rules such that one rule inserts a time adverbial and another rule inserts a past tense. However, this results into a grammar having two different rules for the past tense-insertion:
(54) Past⇒ $\lambda t[\text{Past}'(t) \,\&\, \text{AT}[t,\varphi]]$
Past⇒ $(\forall t)[\text{Past}'(t) \,\&\, \text{AT}[t,\varphi]]$
In my opinion it would be better to introduce a formative Finite which translates as
(55) Finite⇒ $\lambda P_t (\forall t)[{}^{\vee}P_t(t)]$
That is, tenses map sentences (expressions of type t) to expressions of type $\langle s,\langle i,t\rangle\rangle$ (which is the type of the variable P_t). Time adverbials map P_t-typed expressions to P_t-typed expressions. After the last time adverbial has been inserted the formative Finite maps the resulting P_t-typed expression to a tensed sentence. I think it will be best to change the Derived Verb phrase rule in such a way that it applies to untensed sentences only. Note that we still can quantify in terms after having formed a tensed sentence. In this way we can account

for the difference between a plural subject and a plural time expression. (For reasons of exposition I will assume for the remainder of the paper that the subject term has wider scope than any other term for which the verb is strictly subcategorized.) In a sentence with a plural subject we have a semantic structure as depicted in (41): there is a RP for each member of the subject set, but these RPs are simultaneous. In a sentence with a plural time adverbial, like 'regularly' we have a sequence of RPs, as discussed in connection with (51). This can be seen more clearly in our translation for the sentence

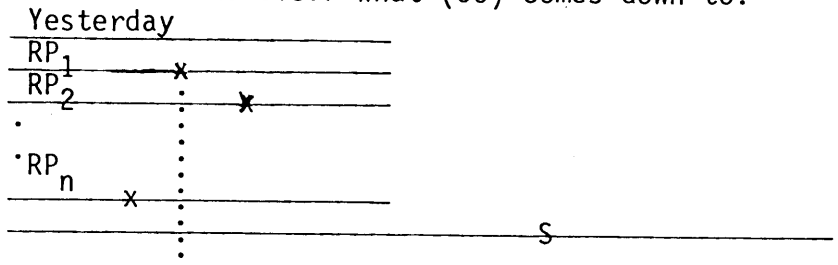
(56) Many people got killed yesterday:

(57) x_0 got killed yesterday⇒ $(Vt)[\hat{Y}(t) \& AT[t, Die'(^{\vee}x_0)]]$

(56) $(VQ)[Many'(\hat{}Person')(^{\vee}Q) \& Many'(\hat{}\lambda x_0(Vt)[\hat{Y}(t) \& AT[t, Die'(^{\vee}x_0)]])(^{\vee}Q)]$

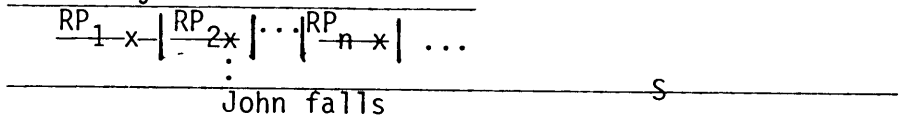
The different RPs all belong to the past and to yesterday. In this sense we can say that they are simultaneous. This does not mean that all people died simultaneously. We use the following picture to make clear what (56) comes down to:

(58)



A picture of (51) would have to look like this:

(59)



Let us now go back to (40). I give a representation for the distributive-collective reading and for the distributive-distributive reading:

(60) $(VQ)[Three'(\hat{}Boy')(^{\vee}Q) \& Three'(\hat{}\lambda x(Vt)[Past'(t) \& (VQ')[Two'(\hat{}Unicorn')(^{\vee}Q') \& AT[t, Find'(^{\vee}c'(^{\vee}Q'))(^{\vee}x)]]])(^{\vee}Q)]$

(61) $(VQ)[Three'(\hat{}Boy')(^{\vee}Q) \& Three'(\hat{}\lambda x(VQ')[Two'(\hat{}Unicorn')(^{\vee}Q') \& Two'(\hat{}\lambda y(Vt)[Past'(t) \& AT[t, Find'(^{\vee}y)(^{\vee}x)]])(^{\vee}Q')])(^{\vee}Q)]$

The difference between these readings, as is apparent from the translations, is that in (60) there are three subevents of finding a set of two unicorns, whereas all the subevents in (61) are findings of just one unicorn.

We can also handle sentences like

(62) Many people get killed in traffic accidents

now; the distributive-distributive reading will be rendered as:

(63) in traffic accidents⇒ $\lambda P_t(VQ_t)[Pl'(\hat{}\lambda t(Vy)[Accident'(y) \& t = T'(y)])(^{\vee}Q_t) \& Pl'(P_t)(^{\vee}Q_t)]$/ distributive

in traffic accidents⇒ $\lambda P_t(VQ_t)[Pl'(\hat{}\lambda t(Vy)[Accident'(y) \&$

$t = T^{\vee}(y)]$)($^{\vee}Q_t$)& $^{\vee}P_t$($^{\vee}c^{\vee}$($^{\vee}Q_t$)] /collective

(62) ⇒ (VQ)[Many$^{\vee}$($\hat{}$Person$^{\vee}$)($^{\vee}$Q) & Many$^{\vee}$($\hat{}\lambda x$(VQ$^{\vee}_t$)[Pl$^{\vee}$($\hat{}\lambda t$ (Vy) [Accident$^{\vee}$(y) & t = T$^{\vee}$(y)])($^{\vee}$Q$^{\vee}_t$)& Pl$^{\vee}$($\hat{}\lambda t$ Past$^{\vee}$(t) & AT[t, Die$^{\vee}$($^{\vee}$x)])($^{\vee}$Q$^{\vee}_t$)])($^{\vee}$Q)] /distributive-distributive

Now, a distributive-distributive reading may not be the most probable reading for this sentence, although it would be for

(64) Many people get involved in traffic accidents

(62) is better read dependently. The translation will be

(65) (VQ)[Many$^{\vee}$($\hat{}$Person$^{\vee}$)($^{\vee}$Q) & (VQ$^{\vee}_t$)[Pl$^{\vee}$($\hat{}\lambda t$(Vy)[Accident$^{\vee}$(y) & t = T$^{\vee}$(y)])($^{\vee}$Q$^{\vee}_t$) & AT[$^{\vee}c^{\vee}$($^{\vee}$Q$^{\vee}_t$), Die$^{\vee}$($^{\vee}c^{\vee}$($^{\vee}$Q)])]]

This is the collective-collective reading. May-be this reading makes sense as it stands. The dependent reading, however, needs a meaning rule spelling out what it means to say that AT[$^{\vee}c^{\vee}$($^{\vee}$Q$^{\vee}_t$)), Die$^{\vee}$($^{\vee}c^{\vee}$($^{\vee}$Q))]. This meaning rule must stipulate that there is for each person belonging to the subject set an interval t such that he or she dies at t. The traffic accidents are not necessarily simultaneous.

Finally, let us turn to our original sentence (1). We have the following translations for the non-dependent and the dependent reading; the non-dependent reading is a distributive-collective reading:

(66) (1)⇒ (VQ$_t$)[Many$^{\vee}$($\hat{}\lambda t$(VQ$^{\vee}$) [Pl$^{\vee}$($\hat{}$Train$^{\vee}$)($^{\vee}$Q$^{\vee}$) & & AT [t,Leave$^{\vee}$($^{\vee}c^{\vee}$($^{\vee}$Q))]])($^{\vee}$Q$_t$)]

(1)⇒ (VQ$_t$)[Many$^{\vee}$(Q$_t$)($^{\vee}$Q$_t$) & (VQ$^{\vee}$)[Pl$^{\vee}$($\hat{}$Train$^{\vee}$)($^{\vee}$Q$^{\vee}$) & & AT [$^{\vee}c^{\vee}$($^{\vee}$Q$_t$),Leave$^{\vee}$($^{\vee}c^{\vee}$($^{\vee}$Q$^{\vee}$))]]]

As the dependent reading is a collective-collective reading we need a collective rendering of 'regularly', which is as follows:

(67) regularly ⇒λP_t(VQ$_t$)[Many$^{\vee}$(Q$_t$)($^{\vee}$Q$_t$) & $^{\vee}P_t$($^{\vee}c^{\vee}$($^{\vee}$Q$_t$)]

The phrase Many$^{\vee}$(Q$_t$)($^{\vee}$Q$_t$)(Q$_t$ is a many-membered subset of itself) means, of course, that Q$_t$ has many members. May-be the collective-collective reading makes sense as it stands (I am not sure though, that 'regularly' has indeed a collective reading), but the dependent reading needs, again, a meaning rule which spells out what it means to say that a collective of trains is leaving at a collective of moments of departure. Note that all the moments of departure must be strictly ordered such that all the trains are leaving one after the other. Such is the meaning of 'regularly'. This has to be part of the meaning rule too.

It is, however, much more difficult in this case to give the relevant meaning rule than it was in the case of 'father'. The rule for 'father' was based on the lexical content of the word. Here, however, a dependent reading can be justified only on the basis of pragmatic knowledge. The best thing to say, then, is that in all cases in which we have a formula or part of it, of the form P(x)(y), in which both x and y denote collectives we can interpret this as saying that there are two sets: not only is there a relation between these sets expressed by the predicate, but also are the members of these two sets related to each other; the latter relationship can

be just any of all possible relations which members of two sets can bear to each other. Which relation is the most probable for the case at hand can be determined on the basis of lexical or pragmatic information only.

FOOTNOTES

[1]I am grateful to Barbara Partee for the help she gave me at an earlier stage of the preparation of the text of this paper.

[2]A convention of MG requires lambda-bound variables to be intensions, that is expressions of a type of the form $<s,a>$, a an arbitrary type. The reason for this convention has nothing to do with predicates like temperature' or price', but can be found in PrIl. In the language called Pragmatics operators are intensional, that is require an intensional argument, but predicates are extensional. In IL, however, the difference between operators and predicates has been abolished, leaving only predicates, or functions rather. That's why all arguments to functions are intensionalized, as can be seen from the rule associating categories to types of IL. Consequently we must distinguish between essential and non-essential intensions, the latter being neutralized by an extension operator. The arguments to what would be operators in a Pragmatics-like language are essential intensions whereas arguments to what would be predicates in a Pragmatics-like language are non-essential intensions.

If a function is written as a lambda-expression its argument is an intension, in accordance with the convention just explained, and as the type of the variable bound by the lambda-operator has to be in accordance with the argument, it has to be an intension too. If such a variable is used as a predicate in the lambda-expression (as for instance in the translation of the proper name John: $\lambda P\ {}^{\vee}P(\hat{}j')$)the intension is non-essential and consequently all lambda-bound variables used as a predicate are extensionalized. If such a lambda-bound variable is used as an argument, however, it may but need not be extensionalized, depending on the nature of the predicate to which it is an argument. It should be observed that similar considerations hold of variables bound by a quantifier, as quantifiers are defined symbols.

In formulas of the form $Pl'(P)({}^{\vee}Q)$ the intension of the first variable is essential, but of the second non-essential. Why the first argument is an essential intension will be explained in section 2.2.

[3]There are two patterns according to which transitive verbs are translated in MG, the two being related by meaning postulate number 4 in PTQ. We could however translate all the transitive verbs at which the meaning postulate is applicable in the same way as Montague translates 'be'. This is the trans-

lation used here. Note that this forces us to translate constants as lambda-expressions, because the difference between the two modes of translating transitives cannot be brought out otherwise. The translation of 'seek' is consequently not just 'seek´', but $\lambda P\, \lambda x\, \text{Seek´}(P)(^{\vee}x)$.

Translating all constants as lambda-expressions has some advantages and no other disadvantages beyond being less elegant. One of the advantages is that it makes the substar-operator superfluous, and consequently also the meaning postulates 2 and 3. Boy would translate as $\lambda x\, \text{Boy´}\, (^{\vee}x)$.

My practice in this paper is to extensionalize all the arguments to verbs but not the arguments to common nouns and some other predicates. I write Pl´(^Boy´)($^{\vee}$Q) for"Pl´ ($\hat{}\lambda x$ Boy´($^{\vee}$x))($^{\vee}$Q)" and so on for other common nouns.

[4]Already in the standard variants of MG there is little clarity as to what the differences are between the representations for terms like one boy and the boy and for terms like a boy, one boy, some boy and some boys. Problems of a similar nature will arise when we compare the possible representations of terms like all the boys, boys and some boys. For instance, we might be inclined to represent the term some boys as
(i) $\lambda P(\forall Q)[\text{Pl´}(\hat{}\text{Boy´})(^{\vee}Q)\ \&\ (\forall Q´)[\text{Pl´}(Q)(^{\vee}Q)\ \&\ \text{Pl´}(P)(^{\vee}Q´)]]$
There would however virtually be no difference between this formula and the one that is used in translating all the boys in (21), unless Q stands for the predicate set of Boy´.

We will not attempt to solve such problems here. The differences that exist between those terms cannot be expressed by using this kind of symbolism only. For instance, there can be several reasons why it is legitimate to use a definite determiner in some context. A the-NP may refer back to an NP used earlier, or it may implicitly refer to a definition (the truth) or to the bearer of a function (the king of France), etc. An analysis of the semantics of such NPs can be undertaken in a much richer framework only.

[5]I will use 'classical quantifiers' in rendering singulars and operators like Pl´ in rendering plurals. It is evident however that a rendering of Each boy as
(i) $\lambda P(\forall Q)[\text{Pl´}(\hat{}\text{Boy´})(^{\vee}Q)\ \&\ (\forall Q´)[\text{One´}(Q)(^{\vee}Q´)\ \&\ \text{One´}(P)(^{\vee}Q´)]]$
is equivalent to the one given in (25). Such equivalences are not harmful to our grammar, because the difference between plurals and singulars is to be sought not in the kind of symbols used, but in the possibility of being interpreted collectively.

[6]The c´-operator is introduced here mainly in order to evade a formal problem. We could not translate all the boys as
(i) $\lambda P(\forall Q)[\text{Pl´}(\hat{}\text{Boy´})(^{\vee}Q)\ \&\ ^{\vee}P(Q)]$

because it is not well-formed. Maybe we should look for an alternative in which the verb phrase is pluralized in case the subject is a plural. Such an alternative would be more in agreement with what is the case in a natural language like Dutch.

[7]This reasoning applies in particular to the dependent reading of (1). We wondered why a plural can be used in what seems to be a singular meaning. The answer is that the set of trains leaving within the period covered by 'regularly' is a plural set. What leaves at particular moments however are single trains, not sets of trains. This plural set of trains is consequently also 'built up in time'.

REFERENCES

G.N. Carlson (1978) : Reference to Kinds in English, distributed by the Indiana University Linguistics Club.

N. Chomsky (1975) : Questions of Form and Interpretation, in: Linguistic Analysis 1, nr 1, p. 75-109.

D.Dowty(1979) : Word Meaning and Montague Grammaer, Dordrecht.

R. Kempson & A. Cormack (unpubl) : Ambiguity and Quantification.

E. Klein (unpubl) : Determiners and the Category Q (dated February 1980)

D.T.Langendoen (1978): The Logic of Reciprocity, in:Linguistic Inquiry 9,nr2, p. 177-197.

R.Scha (forthcoming) : Distributive, Collective and Cumulative Quantification, to be published in the Proceedings of the Third Amsterdam Colloquium on Formal Methods in Linguistics, Amsterdam, March 25-28, 1980.

I. Sag (1976) : Deletion and Logical Form, PhD Thesis MIT.

R. Thomason (1974) : Formal Philosophy, Selected Papers of Richard Montague, New Haven & London.

Z. Vendler : Linguistics in Philosophy, Ithaca.