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A typology of operators
Jan Rijkhoff
University of Amsterdam

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Jan Rijkhoff
Dept. of General Linguistics
University of Amsterdam

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A TYPOLOGY OF OPERATORS:

towards a unified analysis of terms and predications.

0. Introduction¹

In the last few years several studies have discussed linguistic expressions in terms of layered structures which are under the scope of different semantic operators (e.g., Foley and Van Valin 1984, Hengeveld 1988). In none of these studies, however, has this theory of layers and operators been applied to the domain of the term phrase. It will be argued that in this domain too several layers can be distinguished, each having its own set of operators. Additionally it will be shown that similar kinds of operators, having scope over similar kinds of layers, can be recognized in the domain of the underlying predication, suggesting that essentially terms and predications can be described in a similar fashion.

1. On levels and domains

Before turning to the scope (or: semantic range) of operators in the term phrase it may be useful to establish the boundaries of this study. First of all, this article will be restricted to operators and layers in domains at the defining level.

Linguistic structures can be analyzed at two levels: the defining and the discourse level.² At the defining level one investigates the elements of the predication underlying the proposition uttered in a speech act. In itself the underlying predication does not (in fact, cannot) refer to any particular state-of-affairs (henceforth SoA - i.e. an action, process, position, or state; see Dik 1988); it merely defines a certain kind of SoA. Only when the proposition containing this predication is uttered, as in a discourse, has it become a linguistic

¹ Thanks are due to Machtelt Bolkestein, Simon Dik, Kees Hengeveld, and the editors for their helpful comments.

² Or: the representational and the interpersonal level, cf. Hengeveld (1988: 2).

expression through which the speaker can refer to a specific SoA. This is because in a discourse, when the predication is turned into a proposition, two essential aspects are added.

Firstly the speech act provides a spatiotemporal reference point or deictic centre (Comrie 1985: 14), which makes it possible to locate the SoA as defined by the predication contained in the proposition in some spatiotemporal region (henceforth ST region; cf. Vet 1986). The fact that an entity has as its location a certain ST region implies that it exists there and can be identified.³

Secondly, in communicating the proposition the speaker can indicate how the hearer is to evaluate the SoA as defined by the predication contained in the proposition as regards:

- 1a. the degree to which it is considered possible or desirable that the SoA as defined by the underlying predication contained in the proposition obtains (epistemic and deontic modality);
- 1b. the way and the extent to which the speaker commits himself to the truth of the proposition (epistemological modality or evidentiality; cf. Chung and Timberlake 1985, Chafe and Nichols (eds.) 1986, Willett 1988);
2. the speaker's intentions as to the contents of the proposition; whether the hearer is to interpret the contents of the proposition as an assertion, a question, a command, etc.

That is, propositions can be marked for modal (1a-b) and illocutionary (2) values respectively.

Thus it is because of the spatiotemporal reference point provided by the speech situation that a particular SoA can be located in some ST region, which in turn makes this SoA identifiable for the hearer. But as we will see below it may also be the case that the SoA is more or less deprived of its reference point, rendering the SoA in question theoretically 'unlocatable' and hence unidentifiable as regards its temporal location. The remainder of this article will mainly be concerned with domains, layers and operators at the defining level.

³ For the sake of argument I will mainly consider cases in which the reference point coincides with the speech situation, i.e. absolute tense (see Comrie 1985 for the distinction between absolute and relative tense).

1.1 Domains at the defining level

It was indicated above that I will confine myself to domains at the defining level. Here another restriction is made for not every domain at this level will be considered, but only domains with operators, i.e. linguistic expressions employed in referring to first or second order entities: terms and predications.

At the defining level every type of predicate can be associated with a linguistic domain. Since the predicate is the most important element of a domain in that it more than any other element determines the function of that domain it is called the head of that domain. Four domains can be distinguished at this level: the predication, the term phrase, the adjective phrase, and the adverb phrase.

(1)

DISCOURSE LEVEL	
D E F I N I N G L E V E L	

<u>Domain</u>	<u>Head</u>
predication	verb
term phrase	noun
adjective phrase	adjective
adverb phrase	adverb

Terms and predications typically define first and second order entities (spatial and temporal objects respectively; see Lyons 1977: 442 ff.) and are attested in every language. Adverb and adjective phrases, on the other hand, are not attested in every language. Their primary function is to further characterize the entity defined by the simple term or predication without the speaker having to resort to defining other first or second order entities for the characterization or identification of the intended referent.

A simple term is a phrase containing elements that define nothing but the intended referent x_i proper; i.e. there is no material defining any other (first or second order) entity in the simple term, such as an embedded possessor phrase or a restric-

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tive relative clause.⁴ Similarly a simple predication contains nothing but elements defining the SoA e_i proper (as to the e variable, see Vet 1986); i.e. no material defining other SoAs. A simple predication usually consists of a verbal complex and maximally three argument terms. The simple predication may also contain certain other term phrases; just as the adjective phrase is part of the simple term phrase because it specifies a more or less typically inherent property of a first order entity (size, colour, weight, etc.), manner, quality, and instrument phrases are part of the simple predication because they specify some typically inherent property of a second order entity. Then there may be terms defining other participants in the SoA, such as terms with beneficiary or comitative function, and time and place phrases, indicating, for instance, duration or direction.

Both terms and predications can contain embedded domains, defining an entity of the same or a higher order (again I restrict myself to domains at the defining level); such terms and predications will be called complex domains.

(2)	simple domain	->	complex domain
	-----		-----
	term defining x_i		+ embedded term defining x_j
			+ embedded predication defining e_j
	predication defining e_i		+ embedded predication defining e_j

Each of these complex structures is exemplified below, where (3) shows a term embedding another term, (4) a term with a relative clause, and (5) a predication containing a subordinate clause of reason:

(3) We bought the house next to the local pub.

(4) We bought the house that used to be next to the local pub.

(5) We bought the house because it is next to the local pub.

(3)' (past e_i : [buy_v (dm x_i : [+S, -A](x_i))_{AgSub} (dl x_j : house_N(x_j):
 {(dl x_k : pub_N(x_k): local_A(x_k))_{Loc}} (x_j))_{SoOb}] (e_i))

⁴ Attributive pronouns are left out of consideration here.

- (4)' (past e₁: [buy_v (dmx₁: [+S,-A](x₁))_{AgSub} (dlx_j: house_N(x_j):
 (hab.past e_j: [{(dlx_k: pub_N(x_k): local_A(x_k))_{Loc}} (x_j)]
 (e_j))_{Sub}] (e₁))
- (5)' (past e₁: [buy_v (dmx₁: [+S,-A](x₁))_{AgSub}
 (dlx_j: house_N(x_j))_{Sub} (present e_j: [{(dlx_k: pub_N(x_k):
 local_A(x_k))_{Loc}} (x_j)] (e_j))_{Reason}] (e₁))

As to these representations, see sections 2 and 3, which also propose certain modifications.

2. Layers and operators in the term phrase

Terms are analyzed according to the following general schema (cf. Dik 1988: Ch.7):

- (6) (Ωx₁: φ₁(x₁): φ₂(x₁): ...: φ_n(x₁))

where: -

■ Ω stands for various term operators, which indicate (among other things)

- (i) (in)definiteness, i.e. whether or not the intended referent is considered identifiable for the hearer
 (ii) the number or measure of the intended referent.

■ x₁ is the term variable symbolizing the intended referent.

■ every φ(x₁) is an open predication in x₁. φ is a (nominal, adjectival or verbal) predicate designating a property of x₁, or a relation between x₁ and one or maximally two other referents.

These predicates are called restrictors: they progressively narrow down the set of potential referents of the term. φ₁ is the first restrictor and this is usually the head noun predicate, which designates the most characteristic property of a referent: its name (which may be a proper name like 'Peter' or 'Amsterdam' -referring to a token-, or a type name like 'book' or 'flower'); φ₂ is the second restrictor, e.g. an adjectival predicate designating such properties as colour ('red'), size ('big'), propensity ('jealous') etc. For instance:

- (7) two nice little houses in the country

(7)' (i2x₁: house_N(x₁): little_A(x₁): nice_A(x₁):
{(dlx_j: country_N(x_j))_{Loc}}(x₁))

Here the third restrictor is a term predicate with a semantic function 'Location'.

So far the relative order among operators in the schema has never been motivated. It is my intention to propose an ordering for term operators which is based on the relative scope differences these operators seem to have in the domain of the term phrase. In this respect this article can be regarded as an extension of Hengeveld 1988, which contains a proposal concerning the organization of operators in the predication and higher level domains. On the other hand this article may be viewed an amendment to his proposal since it argues that operators relating to the quantity of a referent x_i or e_i have their own scope.

2.1 The qualitative term operator

Recently Dik has proposed regarding the numeral classifier as a particular type of term operator, whose function it would be "[...] to individuate the head noun referent [...]" (Dik 1987: 18). It is assumed in that article that in (numeral) classifier languages nominals in themselves are not subcategorized as count (or mass) nouns in the lexicon. One could say that such nominal predicates, which Dik calls 'ensemble nouns (as opposed to count and mass nouns), designate first order (physical / spatial) entities that are conceived of as undifferentiated, homogeneous objects, entities that are as yet not restricted by any spatial boundaries. But because an ensemble noun designates an undifferentiated object it cannot as such be used in a term phrase containing a cardinal numeral. In those cases there appears a numeral classifier, which affects the nominal predicate so as to make it applicable to discrete first order entities; only discrete physical objects can have cardinality. Since the numeral classifier relates to the quality of the nominal predicate ('quality' in the sense of an essential or distinguishing characteristic), the numeral classifier can be called a quality

operator. The following examples are from Thai (Allan 1977: 286); the representations are according to Dik (1987: 18):

- (8) khru· lâ·j khon
 teacher three person
 'three teachers'
 (8)' (i3 khon x_i: khru·_N(x_i))
 (9) ma· s· tua
 dog four body
 'four dogs'
 (9)' (i4 tua x_i: ma·_N(x_i))

But since the scope of the numeral classifier is restricted to the nominal predicate these constructions should rather be analyzed as (Ω_i = numeral classifier):

- (10) (Ωx_i : $\Omega_i \Phi_N(x_i)$: ...: $\Phi_n(x_i)$)
 (8)'' (i3x_i: khon khru·_N(x_i)) 'three teachers'
 (9)'' (i4x_i: tua ma·_N(x_i)) 'four dogs'

It must be added that this representation would reflect the ideal situation, in which the numeral classifier is a fully grammatical element. In practice this is not always the case, as in many languages the numeral classifier, which commonly arises from a noun, can also serve as an anaphoric element. In construction with a numeral the numeral classifier forms what has been called a classifier phrase, of which Greenberg (1975: 41) noted: "Essentially, the classifier expression is in origin a quantifying phrase which serves as comment to the head noun functioning as topic." Evidence for this special relation between the classifier phrase and the head noun was found in the occurrence of a pause in between the noun and classifier phrase (ibid.) and in certain syntactic properties of the classifier phrase (ibid.; p. 40). If in some language the numeral classifier is still in its early stages of development, then obviously it will still bear many nominal features and cannot be regarded as an operator. Although I will not go into this problem here, one possible solution may be to treat the classifier phrase as one of two coreferential subdomains in one complex domain and under the scope of the same

operator (here Ω_2 - see below).⁵ In such cases the representation would rather be:

(11) ($\Omega_2 x_1: (N_0(x_1): \Phi_2(x_1): \dots \Phi_n(x_1))$, ($\Omega_2 x_1: N_{clr}(x_1)$))

(11)' ($i x_1: (khru \cdot N_0(x_1))$, ($3 x_1: khon_{N_{clr}}(x_1)$)) 'three teachers'

in which Ω_2 and Ω_2 indicate (in)definiteness and number (see below), and where N_0 and N_{clr} stand for 'general' (= non-count) noun and 'classifier noun' respectively.

2.2 The quantitative term operator

In the term phrase a quantity operator indicates the absolute or relative quantity of an entity and this is formally expressed by a cardinal numeral or a quantifier and/or number marking. Since the expression of this operator does not affect constituents in the embedded domain, this operator seems to have scope only over the elements of a simple domain, defining the intended referent proper. For instance, as examples 12a-d below indicate, the number variable of each domain in a complex term phrase may vary independently, the only restriction being due to physical laws, as in e.g. 'The chair in the rooms'; one entity cannot be in two places at the same time (Ω_2 = quantity operator).

(12) ($\Omega_n \Omega_2 x_1: \Omega_1 \Phi_1(x_1): \Phi_2(x_1): \dots : \Phi_n(x_1)$)

(13)a. The child in front of the house. (sg-sg)

a'. ($dlx_1: child_N(x_1): \{(dlx_j: house_N(x_j))_{Loc}\}(x_1)$)

b. The children in front of the house. (pl-sg)

b'. ($dmx_1: child_N(x_1): \{(dlx_j: house_N(x_j))_{Loc}\}(x_1)$)

c. The child in front of the houses. (sg-pl)

c'. ($dlx_1: child_N(x_1): \{(dmx_j: house_N(x_j))_{Loc}\}(x_1)$)

d. The children in front of the houses. (pl-pl)

d'. ($dmx_1: child_N(x_1): \{(dmx_j: house_N(x_j))_{Loc}\}(x_1)$)

⁵ In the light of Foley and Van Valin 1985 this would probably be a case of 'co-subordination' (see also Hengeveld 1988: 29-32).

2.3 The locative/ID term operator

The last term operators to be discussed here are definiteness and indefiniteness. Research into the meaning(s) of these two notions has a long history and there are still many aspects that remain unclear. Because of its problematic character relatively much attention will be devoted to (in)definiteness (and their counterparts in predication; see 3.3 below).

Generally speaking (in)definiteness indicates for the hearer whether or not an intended referent can be Identified, i.e. whether or not its location at a particular ST region can be accounted for. Identifiability is marked in various ways across the languages of the world (constituent order, agreement, tone, article, etc.), but what is it that makes a referent identifiable? With respect to SoAs it was said above that if a SoA is located in some ST region (relative to the ST region of the speech situation), this SoA is identifiable for the hearer. Basically the same appears to hold for a first order entity in that the hearer must be able to account for its location at a particular ST region before it can be identified, but there is a major difference. Every (newly introduced) SoA can be identified the moment it has been given its location relative to the deictic centre because there cannot exist two identical actions, positions, processes, or states simultaneously at the same place involving the same participants. Every tensed SoA referred to is unique and can therefore be introduced as an identifiable entity, provided of course that the hearer is also able to identify the participants in that SoA that are defined in definite term phrases.

A first order entity on the other hand is not unique in that it can and often will be involved in different SoAs: in different relations with varying participants at various times and places. Precisely because of its non-uniqueness every time a new first order entity is introduced it will usually not be immediately identifiable, and if it has been introduced before and is referred to again (anaphorically) the hearer must be able to determine which of the 'old', already existing entities is being referred to again. It is for this reason that we may assume that

first order entities are identified by different strategies than second order entities, although both need some kind of referential anchor on the basis of which their location (and hence: existence) can be determined. Just as a second order entity needs a spatiotemporal reference point relative to which it is given its location, a first order entity needs an identifying entity (IDE) to give it its location so as to make identification possible (see Rijkhoff forthc.).

Apart from deictic references, in the most obvious case a referent is identifiable because it has been referred to before. This means that this referent already exists as a participant in some previously defined SoA, so that the hearer only has to recognize that the intended referent is identical with a referent that already exists in his mental referent file (cf. Heim 1982). This will lead to the conclusion that the intended referent already exists, which results in the identification of the intended referent (as being one of the referents established earlier).

- (14) Last month I bought AN EXPENSIVE BOOK. It was only yesterday I found out that THE BOOK was badly damaged: several pages were illegible.

So here it is AN EXPENSIVE BOOK, a previously established referent, that functions as the IDE of THE BOOK. If the intended referent has been referred to a short time before and there is little or no chance of ambiguity, the speaker will commonly use a pronominal element in such cases.

A referent may also be identifiable because the existence (in the hearer's mental referent file) of referent A in some ST region entails the existence of discourse referent B in that ST region (cf. Hannay 1985). For instance, if in a discourse a certain book is established as a referent, then by implication one or more other referents are established as potentially identifiable discourse referents as well. For if there is a book, there will usually also be a cover, an author, etc., namely the cover and the author of the book in question. In the following example too BOOK is the IDE, the entity that makes it possible to explain the existence of COVER:

(15) Yesterday I bought A BEAUTIFUL BOOK, but when I got home I noticed that THE COVER was badly damaged.

In this case one could argue that the referent whose existence in a certain ST region - and hence its identifiability - is implied (here: COVER), is 'located at' the book.⁶

There are several other conditions under which intended referents can be presented as identifiable, but here I will confine myself to definite complex terms. This allows me to demonstrate that the scope of (in)definiteness extends to embedded domains in the complex term phrase.⁷

2.3.1 Restrictive and non-restrictive embeddings

At this point the term can be represented by the following general schema (see (12) above):

(16) $(\Omega_n \Omega_2 x_1: \Omega_1 \Phi_1(x_1): \Phi_2(x_1): \dots: \Phi_n(x_1))$

where every $\Phi(x_1)$ is an open predication in x_1 and successively narrows down the class of potential referents. Thus these predicates function as restrictors in that with every new property or relation predicated about x_1 by Φ_n the set of potential referents is defined in greater detail. This holds for both definite and indefinite terms. However, certain open predications in x_1 , notably embedded domains, seem to function differently with respect to restrictiveness in definite and indefinite terms. In definite terms, whose referents are supposed to be identifiable, embedded domains are generally restrictive since they are required to help identify the intended referent, whereas in in-

⁶ Similarities between possessive, locative and existential constructions have been noted by several authors (see e.g. Lyons 1967; Christie 1970; Clark 1978; Bugenhagen 1986).

⁷ The uses of the definite article mentioned here are also known as direct anaphoric reference, indirect anaphoric reference, and cataphoric reference respectively; cf. Quirk et al. (1985: ch. 5.26).

definite terms, whose referents are not expected to be identifiable, they are not restrictive. This will be discussed in more detail below.

3.2.1.1 Complex definite terms

A referent that in itself is not identifiable can still be identified if the term phrase defining that referent contains an embedded domain (e.g. locative phrase or relative clause) defining or containing an identifiable referent. As opposed to adjectives embedded domains do not characterize an intended referent with respect to its inherent, more or less (literally) typical properties. Embedded domains locate the intended referent set as a whole in time and/or space, in relation with one or more other referent sets. In other words, whereas adjectives (and nominals) specify set membership of each individual member with respect to their typical properties, embedded domains can be seen as set localizers, specifying some non-typical, external property or relation of the intended referent.

(17)a. * We went to THE BAR. (what bar?)

b. We went to THE BAR next to MY HOUSE.

(18)a. * They have arrested THE MAN. (what man?)

b. They have arrested THE MAN who stole MY CAR last week.

Although the hearer may not have known before about the bar or man in question, this does not make any difference with respect to the identifiability of these referents, since the hearer does not feel inclined to ask what bar or man the speaker is referring to. This is because the location (and hence: existence) of the intended referent proper (bar, man) can be inferred on the basis of its semantic relation with the entity that is defined in the embedded domain and that is identifiable (MY HOUSE, MY CAR). Apparently the rationale behind this phenomenon is: if A exists in ST region P, and B has a location relative to referent A (as in 17b), or B participates in the same SoA as A (as in 18b), then

B must exist there too, which makes B (bar, man) an identifiable referent.

Thus in an 'unmarked' (i.e. non-contrastive, non-generic) definite term the embedded domain serves to provide an identifiable referent whose function it is to explain the existence of the intended referent so that the speaker can present the intended referent as an identifiable entity too. This embedded domain is restrictive for it cannot be omitted without affecting the identifiability of the intended referent (cf. 17a and 18a).

It was mentioned above that the (restrictive) embedded domain of a definite term must contain an identifiable referent. Consider:

(19) * We went to THE BAR next to A HOUSE.

(20) * They have arrested THE MAN who stole A CAR.

The above sentences make no sense (at least not in a non-contrastive reading) because you cannot identify a referent on the basis of something that is itself unidentifiable. Some apparent counterexamples involve embedded possessor phrases, but here it can be argued that it is not a token but a type that is identified:^o

(21) From our room we could see THE TOP of A FAMOUS MOUNTAIN.

Cf. Dutch:

(22) Vanuit onze kamer konden we DE TOP van EEN BERG zien.
From our room could we THE TOP of A MOUNTAIN see

Which is equivalent to:

(23) Vanuit onze kamer konden we EEN BERGTOP zien.
From our room could we A MOUNTAINTOP see.

^o Cf. also Lübner (1986: 302), who states that "[...] the overall reference [of such terms] is not determined". Yet he claims: "The scope of the definite article [...] is just the noun it precedes" (ibid.: p. 320).

2.3.1.2 Complex indefinite terms

It was indicated above that adjectives specify inherent, more or less typical properties of the intended referent and that embedded domains primarily serve to locate the intended referent in time and/or space so as to make this referent identifiable. From this point of view it is difficult to see how embedded domains can function restrictively in a complex indefinite term: why use an identification strategy for something that is unidentifiable in the first place? Notice that in the examples below the identifiability of the intended referent remains the same with and without the embedding, which can be omitted without any serious consequences.

- (24) We went to A BAR (next to A/MY HOUSE).
- (25) They have arrested A MAN (who stole A/MY CAR last week).

On the basis of the observation that in the unmarked case definite terms require restrictive embeddings (containing an identifiable referent) whereas indefinite terms normally incorporate non-restrictive embedded domains we may conclude that the scope of (in)definiteness extends to the whole domain of the term phrase.

2.4 The scope of term operators

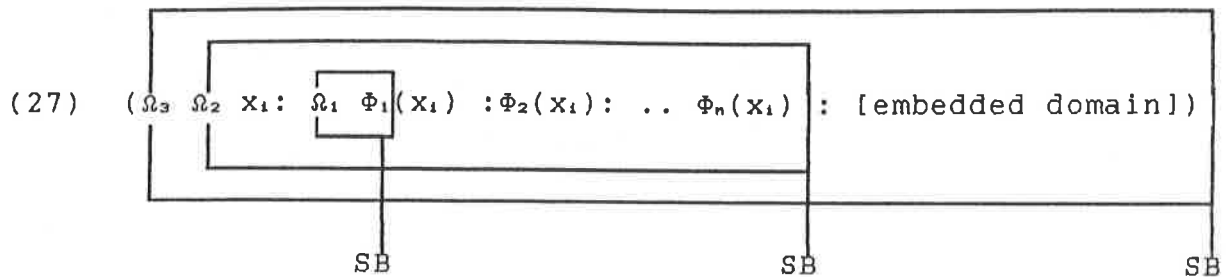
On the basis of the previous discussion we can make the following table:

(26)

T E R M P H R A S E	
o p e r a t o r	l a y e r

location/ID operator	complex term
quantity operator	simple term
quality operator	predicate N

Thus in the domain of the term phrase three layers can be distinguished, each with its own set of operators. Taken together the whole structure could be represented as follows (SB = scope boundary; see below):



where Ω_3 , Ω_2 , and Ω_1 stand for location (or: identifiability), quantity, and quality operators respectively.

One may wonder what x_1 stands for in the representation given above. Basically it is the term variable, but this variable has received different interpretations. In Dik 1988 x_1 stands for an individual set member (which itself is also a set with cardinality one) whereas in Brown 1985 it symbolizes the full referent set. I would like to argue for an alternative interpretation of x_1 , in which x_1 acquires both its lexical properties and its grammatical specifications in a dynamic way.

2.4.1 An alternative interpretation of x_1

As Mackenzie (1987: 10) stated, a term has a twofold function in discourse: a referring and a predicating function. This is more or less reflected in the term schema, in which the part to the left of the colon can be associated with the referring function and the part to the right of the colon with the predicating function. Now, let us for the sake of argument accept the following views. In the predicative part of the term schema in (27)

- x_1 starts out either as a number of discrete entities in the case of 1a) a count noun; 1b) a non-count noun under the scope of a numeral classifier; or 2) a spatially unbounded entity in the case of a non-count noun. Mass nouns will be left out of con-

sideration here.

- from left to right in the predicative part of the structure (after the colon) x_i successively acquires its lexical and grammatical specifications so that after the last open predication (x_i) is identical with the x_i in the referring part (before the colon), including its operators.

- whenever x_i occurs outside the scope of an operator it has a certain value for that operator.

- once a primary μ -operator value has been assigned to a referent set (see Dik 1988: ch. 14), this value remains constant throughout the structure.⁹ This is to avoid that in the case of relativized partitives we end up with a set that is smaller than the set referred to (see (29) below).¹⁰

- when the intended referent is defined by nominal and adjectival predicates it acquires its typical, more or less intrinsic properties, which have no direct spatiotemporal relevance.

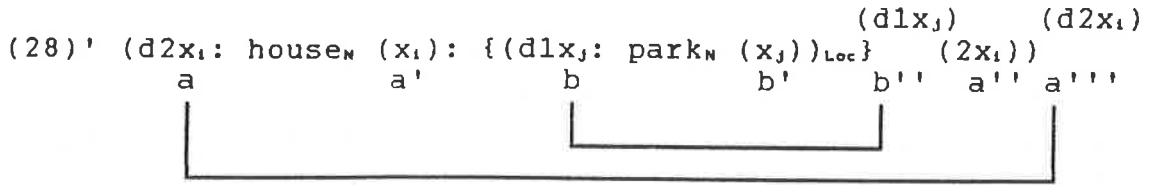
- when the intended referent is also defined by a term predicate or is part of some other embedded domain it is a quantified set (see below) which is located in time and/or space, possibly in relation with other referent sets.

⁹ I consider Ω_3 , Ω_2 and Ω_1 as primary μ -operators (operators present in the underlying term structure), and anaphoric and relative operators as contextual μ -operators (operators used "[...] to capture the fact that the operation of an expression rule may be sensitive to features which do not locally operate on the operandum, but are to be found in the wider context in which the operandum occurs" (Dik 1988: ch. 14.6.2)). Whenever x_i occurs on its own in a predication (no operators or restrictors) there will appear a contextual anaphoric operator, which has to take care of, for instance, agreement (see also Mackenzie 1987: 11); when a 'bare' x_i is predicated about in a relative clause there will appear a relative operator.

¹⁰ Another potential advantage of this approach is that not only primary μ -operators are introduced in the correct order (Ω_1 - Ω_2 - Ω_3 , i.e. from inside out), but also that possible auxiliary and contextual μ -operators can be triggered and formally expressed at the scope boundaries of primary μ -operators.

For instance, the following term can be analyzed as follows:

(28) the two houses in the park



At position a in the structure x_i is the identifiable referent set referred to, consisting of two members; this is also the set we want to have after the last open predication in x_i , after x_i occurs outside the scope of the outermost operator in the predicating part; to avoid redundancy this can be left out of the schema; here it is included at its proper position, but one line higher.

At position a' in the structure x_i is an unspecified number of discrete entities of the type 'house'; the fact that they are discrete entities is a consequence of 'house' being a count noun which designates discrete entities. The number of these discrete entities is irrelevant at this point; the predicate 'house' applies to an unspecified number of set members. In numeral classifier languages the nominal predicate may have been operated upon by the classifier so as to make it applicable to discrete entities.

At position a'' in the structure x_i symbolizes everything it stands for at position a', but in addition the number of set members is now specified, since x_i occurs outside the scope of Ω_2 . This quantified set serves as an argument of the term predicate $\{(d1x_j: park_N(x_j))_{Loc}\}$, expressed as 'in the park'. The term that served as the input of the predicate formation rule refers to an identifiable set: 'the park' (see below). Notice that the semantic relation in the embedded domain holds between two sets.

At position a''' in the structure x_i symbolizes everything it

stands for 'at position a'', but in addition its pragmatic status in terms of identifiability is now specified, since it occurs outside the scope of Ω_2 . At this point x_1 is identical with the x_1 in the referring part of the representation.

As far as x_j is concerned, at b' x_j is the identifiable referent set referred to, consisting of one member. At position b' x_j is an unspecified number of discrete entities of the type 'park'; the fact that they are discrete entities is the result of 'park' being a count noun which designates discrete entities. The number of these discrete entities is irrelevant at this point. At b'' x_j appears after all scope boundaries which means its quantity and pragmatic status must have been specified. At this point x_j is identical with the set referred to at the left side of the colon.

Notice that this representation can account for the fact that in relativized partitives another Ω_2 operator has a fully quantified set in its scope, as in the following example:

(29) The three books of which one was damaged have disappeared.

(29)' (present perf e_1 : [disappear_v (d3 x_1 :book_N(x_1): (past e_j : [damaged_A (1/3 x_1)_o] (e_j)))_{Proc}] (e_1))

3. Layers and operators in the predication

Predications can be represented by this schema:

(30) (π e_1 : [Φ_v (t_1)_{er} (t_2)_{er} ..] (e_1) : [emb. predic.] (e_1))

where π stands for predication operators, e_i symbolizes some SoA, and (t_n) some term phrase with a semantic function. For instance:

(31) He gave the car to a friend before he left.

(31)' (past e_1 : [give_v (x_1)_{AgSub} (d1 x_j : car_N(x_j))_{oob} (il x_k : friend_N(x_k))_{Rec}] (e_1) : [(past e_j : [leave_v (x_1)_{AgSub}] (e_j))_{Time}] (e_1))

Following Vet (1986: 2) the embedded predication of time is

treated as a restrictor of the SoA variable e_i . Notice that, in a sense, this restrictor can also be seen as a set localizer, but less so than its counterpart in the term phrase, since the SoA is already located in time. The SoA designated by the embedded predication makes it possible to locate the SoA designated by the matrix predication more precisely.

In this section I will attempt to demonstrate that the kind of operators that can be distinguished in the domain of the term phrase can also be recognized in the domain of the predication, and that the scope of these operators extends to similar layers as in the term phrase.

3.1 The qualitative predication operator

With respect to spatial entities, which are defined by nominal predicates, we saw that the numeral classifier can be viewed as the formal expression of a term operator that turns a non-count noun into one that applies to discrete, countable first order entities. A similar operator appears to be relevant as regards verbal predicates designating temporally unbounded SoAs. This operator relates to aspect, which characterizes the internal structure of a second order entity (a SoA) in terms of discreteness in the temporal dimension.¹¹

Similarities between first and second order entities or between nouns and verbs in terms of count versus mass and perfective versus imperfective have been discussed before (most recently in Langacker 1987; see also for references Mourelatos 1981, note 27), but the type of noun employed in numeral classifier languages justifies the comparison even better.

In terms of temporal discreteness four aspects can be distinguished:

¹¹ As in Comrie (1976: 7) 'aspect' is used only to refer to grammatical expressions of aspectual distinctions, although the English paraphrases will necessarily involve lexical or periphrastic expressions.

- (32) SoA-time imperfective (unbounded)
 SoA-time > ingressive
 SoA-time < egressive
 SoA-time > < perfective

The imperfective characterizes a SoA as having neither a beginning nor an ending; the SoA designated is presented as lacking any discrete points in time. Ingressive and egressive aspect emphasize the beginning or the end of a SoA respectively, and perfective aspect indicates that a SoA has both a beginning and an end.

The perfective will commonly indicate a momentary or punctual situation, but it may also indicate a longer period. Sometimes the ingressive and the egressive aspect are taken together with the perfective aspect (the three of them referred to as the perfective aspects), so that all grammatical expressions positively indicating temporal discreteness are opposed to the imperfective aspect.

It will be evident that the quality operator in the predication has scope over the verbal predicate only, which means it serves as a predicate operator in the domain of the predication (π_1 is the predicate operator; see also Hengeveld 1988: 6).

- (33) (πe_1 : [$\pi_1 \Phi_v (t_1)_{\text{or}} (t_2)_{\text{or}} \dots$] (e_1) : [...] (e_1))

Compare in this respect also Bybee (1985: 21), who remarks that "[...] it might be said that aspect is the category that is most directly and exclusively relevant to the verb".

3.2 The quantitative predication operator

Just as first order entities can occur in different quantities, so second order entities may obtain any number of times. Absolute or relative quantity can be indicated in relation to both first and second order entities. Whereas absolute number of first order entities is expressed by a cardinal numeral, this is indicated by 'once', 'twice', or '... times' in the case of second order entities.

Many relative quantifiers can be applied to both first and second order entities, or have some equivalent in the other domain. For instance:

(34)	<u>first order</u>	<u>second order</u>
	all	always, all the time
	every/each	every/each time
	many	often
	some	sometimes
	few	occasionally
	hardly any	hardly ever
	no	never, not

However, quantifiers in the predication are usually lexical elements (adverbs), as opposed to quantifiers in the term, indicating that they function as satellites rather than operators.

In some languages the fact that a SoA obtains repeatedly is expressed inflectionally, which is called iterative (or: repetitive, frequentative) aspect and if there is an inflectional element indicating that a SoA obtained only once this is called semelfactive aspect, although aspect might not be the appropriate name if one prefers to reserve this name for phenomena discussed in the previous section. I will refer to these inflectional elements as quantitative predication operators. As with the quantitative term operator it appears that the quantitative predication operator has scope over the simple domain only: each SoA defined in a complex predication can have its own number of instances, as these paraphrases demonstrate (but see (50)):

(35) She called the police repeatedly after he had threatened her (once).

(36) She called the police (once) after he had threatened her repeatedly.

Repetitive aspect can be indicated as follows (π_2 is the quantity operator):

(37) ($\pi_n \pi_2 e_1$: [$\pi_1 \Phi_v (t_1)_{st} \dots$] (e_1) : [...] ($\pi_2 e_1$))

(38) ($\pi_n 1e_1$: [$\pi_1 \Phi_v (t_1)_{st} \dots$] (e_1) : [...] ($1e_1$)) (semelfactive)

(39) ($\pi_n me_1$: [$\pi_1 \Phi_v (t_1)_{st} \dots$] (e_1) : [...] (me_1)) (repetitive)

(35)' (past me_i: [call_v (x_i)_{AgSub} (dmx_j: police_N(x_j))_{GoOb}] (e_i) :
 [(past perf le_j: [threaten_v (x_k)_{AgSub} (x_i)_{GoOb}] (e_j))_{Time}]
 (me_i))

(36)' (past le_i: [call_v (x_i)_{AgSub} (dmx_j: police_N(x_j))_{GoOb}] (e_i) :
 [(past perf me_j: [threaten_v (x_k)_{AgSub} (x_i)_{GoOb}] (e_j))_{Time}]
 (le_i))

If necessary, the predicate operator π_i in this domain may apply to the verbal predicate, of course; just as first order entities must be discrete in space before they can appear in a certain number or measure, so second order entities must be discrete in the temporal dimension before they can be repeated. Notice that here too the variable gets a value for an operator if it occurs outside the scope of that particular operator.

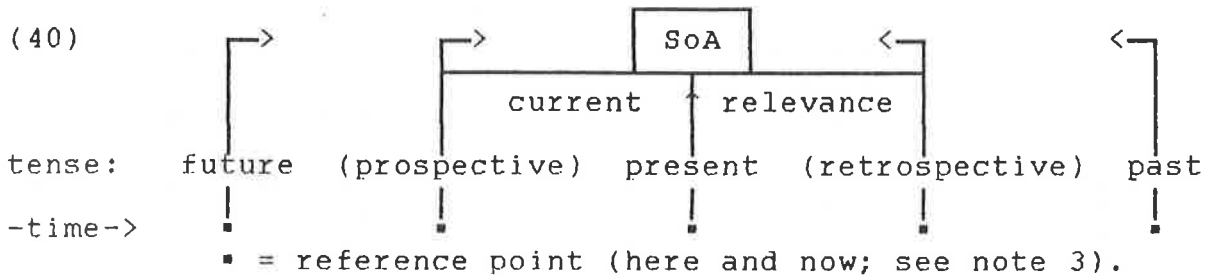
3.3 The locative/ID predication operator

Definiteness and tense have a comparable function in that both indicate identifiability, albeit with respect to different kinds of entities (see also Vet 1986). In general definiteness indicates that a first order entity can be identified because there is an IDE through which its existence in some ST region can be explained; conversely, indefiniteness indicates that a first order entity cannot be identified since there is nothing (no IDE) that explains its existence in some ST region. Tense indicates that a SoA, a second order entity, can be identified (and where in the temporal dimension) because there is a reference point (the speech situation) relative to which this SoA is located in time.

Since this is an attempt to determine to what extent it is possible to analyze terms and predications in a unified fashion, the obvious question is: does indefiniteness in the term also have its counterpart in the domain of the predication? It will be argued below that this is indeed the case.

A SoA can precede (past tense), follow (future tense), or coincide with (present tense) the reference point. If it precedes or follows it may or may not be the case that this SoA is felt to have current relevance. If it has this is indicated by the

prospective aspect in case of a future situation and by the retrospective aspect (or: perfect) in case of a past situation, although again (see above) one could doubt whether these should be regarded as purely aspectual distinctions.



We already observed that first order entities need another entity, an IDE, to explain their existence in some ST region so that they can be identified. Often, however, as when a first order entity is newly introduced as a discourse referent, there will not be an IDE, and the term phrase defining that referent will be indefinite, indicating that the intended referent cannot be identified. Similarly second order entities also need a referential anchor to make them identifiable, namely a reference point in the real world, but the difference is that this referential anchor is always available in the form of the speech situation.

If a reference point in the real world is needed to be able to locate a SoA in a certain ST region, then the obvious way to refer to an unlocatable and hence unidentifiable SoA is to deprive this SoA of its reference point, so that there is nothing relative to which the location (and hence: existence) of that SoA can be established. Evidently this must be indicated verbally, since the reference point itself, the speech situation, cannot be taken away. So if tense is defined as "[...] grammaticalised expression of location in time" (Comrie 1985: 9), then not using tense would seem the way to indicate that a SoA does not have a location in time, as in the case with all sorts of unrealized SoAs (hopes, desires, wishes, etc.). Surprisingly it seems that here too tensed forms are used, but evidently we cannot really speak of 'tense' in such cases, for this would make Comrie's definition vacuous. Compare these Dutch examples (and their

English translations):

<u>- reference point (- tense)</u>	<u>+ reference point (+ tense)</u>
(41)a. Piet zou gisteren komen. Piet would yesterday come 'Piet was to come yesterday'	b. Piet kwam gisteren. Piet came yesterday 'Piet came yesterday'
(42)a. Piet zou vandaag komen. Piet would today come 'Piet was to come today'	b. Piet komt vandaag. Piet comes today 'Piet is coming today'
(43)a. Piet zou morgen komen. Piet would tomorrow come 'Piet was to come tomorrow'	b. Piet zal morgen komen. Piet will tomorrow come 'Piet will come tomorrow'

The fact that the same form (*zou* = past future) can be used to refer to a situation in the past, the present, and the future shows that actually there is no tense here, at least not in the sense of tense as a grammatical device to locate a SoA in time.

Note that this is not to say that by not using tense the existence of a particular SoA is denied. It is only to indicate that the location/existence of some particular SoA is left undetermined, which does not necessarily imply that this SoA does not exist.¹²

Often a future 'tense' is used to mark a SoA as being unrealized, and this is not surprising in view of the fact that strictly speaking future SoAs are (as yet) unrealized situations, although one could argue that by using the future tense the speaker predicts that a SoA will obtain. Interestingly Bybee (1985: 157) mentions a dialect of Yanomama as having an "expected future" and a "desired future". The status of the future as a real tense has often been questioned.¹³ Besides the future the

¹² Also, it seems to me that as a rule the scope of negation does not extend beyond the simple domain (here: the simple predication), the layer of the quantity operator. Some confirmation for this view can be found in Nunggubuyu, which has negative *harmony*: verbs, nouns and demonstratives within the scope of a negative word are all morphologically affected. The only cases in which the negator has scope over two or more predications involve juxtaposed constructions designating identical or otherwise closely associated SoAs (cf. Heath 1984:528).

¹³ See e.g. Lyons 1977:677, 816; Ultan 1978; Comrie 1985:21; Chung and Timberlake 1985:243; Palmer 1986:216 ff.

past tense form may also be used to refer to unreal, hypothetical SoAs (cf. Palmer 1986: ch. 6.). The fact that tense-like forms are used with intentions, desires, obligations, etc. is generally known but it remains a question as to why this is so (see e.g. Lyons 1977: 682 and Palmer 1986: ch. 6). Possibly this is so because a nonfinite predication, such as a participial construction, tends to 'inherit' its tense from the context. What may be the case then is that some finite form is used only to prevent the predication from receiving tense from the context. But since this finite form may not locate the SoA in time, a form is selected (e.g. future, past, future in the past; except in the case of generic or gnomic predications the present 'tense' seems to be avoided generally) that does not match the temporal setting of the SoAs with which it forms a coherent discourse, signalling that the opposite is meant: non-location in time.

The fact that non-tensedness of such predications is not usually recognized as a grammatical category in itself (as opposed to indefiniteness) is probably not only due to the (tense-like) form that expresses it, but also to the fact that it always seems to combine with or is subsumed under a modal or illocutionary value.¹⁴ For instance, "in their strictly temporal sense [tense affixes] do not occur in the imperative/optative mood [...]" in West Greenlandic (Fortescue 1984: 275). In Tamil "a good proportion" of the modal auxiliaries are not marked for tense (Asher 1982: 165), and in Kobon "the tense distinctions between simple past, remote past, present, and future are made only in the indicative mood [...]" (Davies 1981: 168).

This is all to suggest that the definiteness/indefiniteness opposition in the domain of the term phrase has its counterpart in the domain of the predication in the form of the tense/non-tense opposition. So as to show that a comparison between 'non-tensedness' (marking the fact that the location/existence of a

¹⁴ Or as Chung and Timberlake (1985: 241) put it: "Whereas there is basically one way for an event to be actual, there are numerous ways that an event can be less than completely actual." To this one might add: Whereas there is basically one way for a first order entity to be unidentifiable, there are numerous ways for a first order entity to be identifiable; see e.g. Quirk et al. (1985: 265ff.).

SoA cannot be determined because there is no reference point) and indefiniteness (marking the fact that a first order entity cannot be identified because there is nothing that accounts for its existence, no IDE) may not be as far-fetched as it seems, witness the examples below from Jacaltec, where both the exhortative mood and non-specificity (admittedly not indefiniteness) are expressed in the form of the same suffix: *-OJ*, "[...] the general suffix of irrealis [...]" (Craig 1977: 93).

(44) way- oj ab naj
 sleep-OJ exh cl/he
 'would that he sleep!'

(45) x- Ø -'oc heb ix say- a hun-uj munlabel
 asp-A3-start plural woman look for-fut a -OJ pot!
 'the women started looking for a pot'

(exh = exhortative; cl = classifier; A3 = absolutive 3; asp = aspect; fut = future)

In the first sentence *-OJ* is suffixed to the intransitive verb in the exhortative mood, in the other sentence it marks the referent of the term phrase as non-specific.

Let us finally turn to the scope of tense. The best examples to show that tense has scope over an embedded predication involve matrix predications with 'verbs of perception' such as 'to see', 'to hear', etc. These predications can have an embedded predication in an argument position and the tense of the embedding must be the same as the tense specified for the matrix predication; the temporal settings of these SoAs necessarily have to coincide (π_2 is the location/ID operator):

(46) $(\pi_2 \pi_2 e_1 : [\pi_1 \Phi_V (t_1)_{\text{tr}} ([\text{SoA}]_{\text{tr}} \dots] (e_1) : [\dots] (\pi_2 e_1))$

(47) We saw that she closed the door.

(47)' $(\text{past } 1e_1 : [\text{see}_V (x_1)_{\text{ExpSub}} (\text{past } 1e_j : [\text{close}_V (x_j)_{\text{AgSub}} (1lx_k : \text{door}_N(x_k))_{\text{OODb}}] (e_j))_{\text{OODb}}] (e_1))$

(48) * We saw that she closes/will close the door.

Compared to embeddings in the term phrase, however, the scope of the location/ID operator in the predication is a little more difficult to demonstrate. This is at least partly due to the fact that embeddings in the predication serve a different purpose than

embeddings in a term phrase. In a term phrase (restrictive) embeddings serve to help identify the intended referent. Obviously this cannot be the function of embedded domains in the predication, as (tensed) SoAs are immediately identifiable. One might say that embedded domains in the predication generally provide background information in relation the SoA referred to in the matrix predication.

Nevertheless, the occurrence of 'sequence of tenses' (see Comrie 1985: 104f.) also shows that tense has scope over embeddings. In a sequence of tenses the tense of the embedded predication is determined (or: 'neutralized') by the tense of the matrix predication. This is for instance the case in Bahinemo, where "[...] tense is marked overtly only on the first verb in a sequence of verbs with like time reference" (ibid.: 103).

3.4 The scope of predication operators

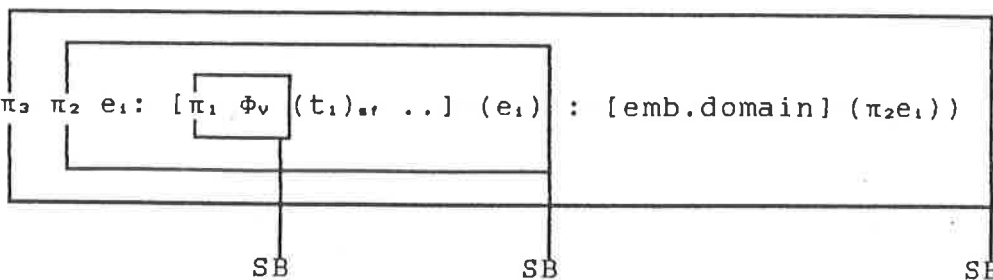
On the basis of the previous discussion we can make the following table:

(49)

P R E D I C A T I O N	
o p e r a t o r	l a y e r
location/ID operator	complex predication
quantity operator	simple predication
quality operator	predicate V

Thus in the domain of the predication too three layers can be distinguished, each with its own set of operators. Taken together the whole structure could be represented as follows:

(50) $(\pi_3 \pi_2 e_1 : [\pi_1 \phi_v (t_1)_{st} \dots] (e_1) : [\text{emb.domain}] (\pi_2 e_1))$



where π_3 , π_2 , and π_1 stand for location/ID, quantity, and quality operators respectively. Notice that when the embedded domain is

an argument of the main predicate ϕ_v (as is the case with sentential complements of verbs of perception), it is also under the scope of the quantity operator of the matrix predication, which seems to square with the facts, since e_j , the SoA referred to in the embedded predication, must have the same number of instances as e_i , the SoA referred to in the main predication (supposing the repetition in (50) can also be expressed inflectionally):

(51) We repeatedly saw that she closed the door.

(51)' (past me_i : [see_v (x_i)_{ExpSub} (past me_j : [close_v (x_j)_{AgSub} (dlx_k: door_N(x_k))_{CoOb}] (e_j))_{CoOb}] (e_i))

4. Quality, quantity, and location/ID operators in the term phrase and in the predication

It will be clear by now that there is considerable evidence that similar layers and operators can be distinguished both in the domain of the term phrase and in the domain of the predication:

(52) Operator	Layer	Term phrase	Predication
<u>Location/ID</u> ± identifiability	complex domain	complex term phrase	complex predication
<u>Quantity</u> number of items or instances	simple domain	simple term phrase	simple predication
<u>Quality</u> ± spatial/temporal discreteness	predicate	predicate N	predicate V

The quality operator relates to the notion 'discreteness' in time or space, the quantity operator concerns the number of items or instances of the intended referent (x_i or e_i), and the location /ID operator indicates whether or not an entity can be located in a certain ST region, whether or not its location can be accounted

for. If so, the entity in question can be identified.¹⁵

With the specific operators included the discussion above can be summarized in the following table:

DISCOURSE LEVEL		
<u>Domain</u>	<u>Layer</u>	<u>Operator</u>
speech act		$\Sigma 1, \Sigma 2, \dots$
proposition		$\Gamma 1, \Gamma 2, \dots$
DEFINING LEVEL		
<u>Domain</u>	<u>Layer</u>	<u>Operator</u>
predication	complex predication	<u>Locative/ID</u> $\pi 3$: \pm tense
	simple predication	<u>Quantitative</u> $\pi 2$: quantitative aspect
	predicate V	<u>Qualitative</u> $\pi 1$: imperfective, ingressive, egressive, perfective aspect
term phrase	complex term phrase	<u>Locative/ID</u> $\Omega 3$: \pm definiteness
	simple term phrase	<u>Quantitative</u> $\Omega 2$: number
	predicate N	<u>Qualitative</u> $\Omega 1$: numeral classifier

This listing of term and predication operators is not exhaustive, so that it remains to be seen whether operators for e.g. genericity or specificity can also be classified under one of the three types proposed for both domains.

As to the predication, there is considerable evidence that the ordering of operator types in the underlying structure is directly reflected in the actual linguistic expression. In her 1985 study on morphology Bybee investigated the ordering of inflectional morphemes relative to the verbal predicate in a

¹⁵ As a matter of fact this typology of operators was more or less inspired by Aristotle's discussion of movement or change (Physics, V. II): "[...] movement [...] pertain[s] exclusively to quality, quantity, and locality, each of which embraces contrasts" (see also Rijksbaron 1988).

representative sample of fifty languages. She found that "[...] aspect occurs closest to the stem, followed by tense, and then by mood. The only exception to this ordering found in the 50-language sample is in Ojibwa, where the Dubitative suffix precedes the Preterite suffix" (Bybee 1985: 196).

This does not tell us where the quantitative predication operator occurs. In her sample Bybee found only one language in which iterative aspect is expressed by an inflectional morpheme, which is also used for habitual meanings (*ibid.*: 150). Hengeveld (1988: 12) gives an example from Hidatsa, a Siouan language described in Matthews 1964, where the quantitative predication operator occurs after the qualitative predication operator (both following the verb):

- (53) Wí i hírawe ki ksa c
 woman she sleep Ingr Iter Mood
 'The woman fell asleep again and again'

To my knowledge a study of this scale concerning the ordering of term operators has never been undertaken, but here Greenberg and Hawkins may shed some light. Greenberg (1966) investigated a variety of ordering phenomena in thirty randomly selected languages, which resulted in the formulation of a great number of universals of grammar. More recently Hawkins proposed a revision of Greenberg's Universal 20 (Hawkins 1983: 119-120):

Universal 20'. When any or all of the items (demonstrative, numeral, and descriptive adjective) precede the noun, they (i.e., those that do precede) are always found in that order. For those that follow, no predictions are made, though the most frequent order is the mirror-image of the order for preceding modifiers. [...]

Since demonstratives also indicate definiteness, this universal indicates that the quantitative term operator most commonly occurs in between the locative/ID term operator and the noun.

Similarly, little is known about the position of the qualitative term operator (the numeral classifier) relative to other term elements. What is known is that it concatenates with the numeral, forming "[...] a nexus that cannot be interrupted by the noun which it qualifies" (Allan 1977: 288), so that only the

following sequences occur (q = quantifier, c = classifier, N = noun):

- | | | |
|------|-------|---------------------------------------------------------------------------|
| (54) | q c N | Amerindian languages, Bengali, Chinese,
Semitic languages, Vietnamese. |
| | N q c | Burmese, Japanese, Thai. |
| | c q N | Kiriwina (Oceanic). |
| | N c q | Louisiade Archipelago (Oceanic). |

Allan (*ibid.*) adds that the order in which the various combinations are given here approximates to the relative frequency with which these sequences occur. This would imply that the most popular order is one in which the qualitative operator occurs closest to the predicate, which would reflect the underlying structure suggested here.

Together these data suggest that there is a general ordering principle, which can be formulated as follows (cf. also Hengeveld 1988: 17f.):

(55) The Principle of Scope:

The relative order of operators in a domain is determined by the scope the operators have in that domain.

Hengeveld (*ibid.*) put forward some general rules for operators that seem to hold in the domain of the term phrase as well. One says that, diachronically, operators develop from an inner to an outer layer, and another that operators at an outer layer may impose restrictions on the selection of operators at an inner layer.

As to the first rule it has been suggested by Greenberg (1978: 78) that classifiers may turn into demonstratives or articles, i.e. an operator at an inner layer may become an operator at an outer layer.¹⁶ As far as the second rule is concerned, it is obvious that definiteness, indicating identifiability of the intended referent, also implies knowledge about the number of entities involved. And in the case of one or more discrete entities the head noun must be a count noun or (if the language has no count nouns) there must appear a numeral

¹⁶ See also Nguyen-Dinh Hoa (1957:131), footnote 9.

classifier. Thus identifiability of the intended referent(s) implies knowledge about the number of entities involved, which in turn implies countability, i.e. identifiability of referent set > identifiability of number of constituting members in that set > discreteness (see also section 2.2).

5. Conclusion

In summary it seems that the theory of layers and operators applies in the domain of the term phrase too and that the kind of layers and operators distinguished in the term phrase can also be recognized in the predication. This finding leads to greater conceptual and descriptive coherence in the representation of linguistic structures.

Additionally the status of the variable x_i (and e_i) in the general schema was discussed. An alternative interpretation of the variable was suggested, which involves the specification of an operator value on the variable in the predicating part of the structure if the variable occurs outside the scope of that operator.

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