Floating Quantifiers and Georgian Distributivity

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The term floating quantifier was introduced into generative grammar to account for various sentential positions occupied by quantifiers such as each or all, and for their relationship to the noun phrase (NP) they appear to quantify. In this sense, the underlined quantifier in (1) is floated in (2):

(1) Each of the children received a balloon
    All of the children received a balloon
   (non-floated quantifier)
(2) The children each received a balloon
    The children all received a balloon
   (floated quantifier)

Although syntacticians usually assume a close connection between constraints on scope and constraints on movement, the movement analyses of either the quantifier (as in Postal, 1974) or its quantified NP (as in Sportiche, 1988) so far has had little to say about differences in interpretation linked to each particular position of the quantifier in the sentence. Furthermore, most analyses exclude or separately account for (3), the so-called shifted quantifier construction:

(3) The children received a balloon each
    (shifted quantifier)

The goal of this paper is to show that in French, as well as in English, the surface-structure position of the quantifier crucially contributes to interpretative differences of the sentences in the three constructions above. My analysis of these facts is that the position of the quantifier guides the semantic interpretation by defining the domain of a distributive function applying at the level of conceptual structure. Such an approach predicts some uniformity across languages in the interpretive component of the grammar. This prediction will be shown to be borne out in Georgian, a language where distributivity is expressed by reduplication.

1. Some evidence for interpreting the position of the Quantifier:

1.1. A Floated Quantifier forces the distribution of the event:

Compare the non-floated construction of quantifier chacun/each in (4) with its floated counterpart in (5).

(4) Chacun des enfants prit l'autobus en même temps
    Each of the children took the bus at the same time

(5) ???Les enfants prirent chacun l'autobus en même temps
    ???The children each took the bus at the same time

In both (4) and (5), the expression en même temps/ at the same time induces an interpretation where the event of taking the bus is not only simultaneous but also probably the same event for all children. The oddness of (5) seems to result from the position of the quantifier. In (4) the interpretation is such that each individual encompassed in the denotation of the plural definite NP the children is related to an
event of taking the bus, denoted by the verb phrase (VP). That this event happens at the same time and that it is the same event does not matter as long as each child is mapped with a bus-taking event. In (5), however, the fact that the event happens at the same time and is probably the same event poses a problem. It seems that it is the event denoted by the VP which distributes over the individuals denoted by the subject NP: a bus taking event is mapped with each child. In other words, when the distribution of the (bus-taking) event is blocked, sentence (5), containing a floated quantifier is odd.

In contrast, when we force the distribution of the event with an expression like l’un après l’autre (one after the other) a sentence such as (6) containing the non-floated quantifier is odd, whereas sentence (7) containing a floated quantifier is fine:

(6) ??Chacun des enfants téléphona à sa mère l’un après l’autre
???Each of the children called his mother one after the other
(7) Les enfants téléphonerent chacun à leur mère l’un après l’autre
The children each called their mother one after the other

A similar but weaker contrast obtains with non-floated and floated quantifier tous, all exemplified in (8) and (9):

(8) ??Tous les gens découvrirent la grotte l’un après l’autre
??All the people discovered the cave one after the other
(9) Les gens découvrirent tous la grotte l’un après l’autre
The people all discovered the cave one after the other

These facts show that there is a difference in compositionality between floated and non-floated quantifiers. This supports Dowty and Brodie's (1984) idea that the order in which the arguments are combined is not the same in the two constructions. The syntactic structure I will assume for the non-floated quantifier is given in (10), with the quantifier phrase (QP) taking a complement. (10a) illustrates chacun/each and (10b) tous/all.

(10) a. [IP [QP Chacun [PP des [DP l'un [NP enfants]]]] [I' reçut le ballon]]
   [IP [QP Each [PP of [DP the [NP children]]]] [I' Infl [VP received the balloon]]]
   b. [IP [QP Tous [DP les [NP enfants]]] [I' reçurent le ballon]]
   [IP [QP All [PP of [DP the [NP children]]] [I' Infl [VP received the balloon]]]

For the floated quantifier construction, I will assume (11) with the quantifier forming a QP left-adjointed to VP. (11a) illustrates chacun/each and (11b) tous/all.

(11) a. [IP Les enfants [I' reçurent [VP [QP chacun] [VP [V' TV [NP ple ballon]]]]]]
   [IP The children [I' Infl [VP [QP each] [VP received [NP the balloon]]]]]
   b. [IP Les enfants [I' reçurent [VP [QP tous] [VP [V' TV [NP ple ballon]]]]]]
   [IP The children [I' Infl [VP [QP all] [VP received [NP the balloon]]]]]
When the quantifier is adjacent to the VP, it forces the distribution of the event. Compare now (12) with (13). Coordinated subject NPs do not tolerate quantifiers. But the sentences are fine with a floated quantifier.

(12) *Chacune de la bicyclette, la trousse à outils et la cuisinière se sont vendues pour $10  
*Each of the bicycle, the tool kit, and the oven sold for $10
(13) La bicyclette, la trousse à outils et la cuisinière se sont vendues chacune à $10  
The bicycle, the tool kit, and the oven each sold for $10
(English examples from Roberts, 1987)

In (13) the event can be mapped to each individual denoted by the coordinated subject NPs. The same applies to Proper Nouns; compare (14) and (15):

(14) *Tous de Robespierre, Marat et Charlotte Corday participèrent activement à la révolution de 1789.  
*All of Robespierre, Marat and Charlotte Corday took an active part in the French revolution of 1789.
(15) Robespierre, Marat et Charlotte Corday participèrent tous activement à la révolution de 1789.  
Robespierre, Marat and Charlotte Corday all took an active part in the French revolution of 1789.

These facts show that sentences with a floated quantifier differ in compositionality from sentences with a non-floated quantifier. Constituents do not combine for interpretation in the same fashion in the two constructions. We have seen that blocking the distribution of the event ruins the floated construction, while forcing it ruins the non-floated construction. We described these constraints by saying that a floated quantifier forces the distribution of the event. In a floated quantifier construction, a series of different token events are mapped onto each individual denoted by the subject NP. The interpretation is constrained by the configurational position of the quantifier at S-structure.

In the next section we will see that the S-structure position of the quantifier similarly constrains the interpretation in the shifted quantifier construction.

1.2. Shifted each and the distribution of the object:

1.2.1. The shifted quantifier construction in (16) has been treated apart in most analyses. Safir and Stowell (1986) and Choe (1987), investigating the syntactic constraints of this particular construction, suggested that the quantifier each be adjoined to the right of the object NP. The syntactic representation I will assume is given in (17), with the quantifier forming a quantifier phrase (QP) right-adjoined to the object NP.

(16) Les enfants reçurent un ballon chacun  
The children received a balloon each
(17) [IP[Les enfants [I reçurent [VP [V t [[NP un ballon] [QP chacun] ]]])  
[IP[The children [I Infl [VP [V received [[NP a balloon] [QP each]]]]]]]
The only interpretation of (16) is that there is one balloon per child. The denotation of the object balloon is mapped onto individual children until there is one balloon per child.

1.2.2. Shifted each and entailment (\(--\rightarrow\)) vs Floated each and implicature (\(--\rightarrow\)):

If one compares (16), the shifted each construction repeated below, with (18), a construction containing a floated each and an indefinite object, the two sentences seem synonymous, meaning that there is one different balloon per child.

(16) Les enfants reçurent un ballon chacun
The children received a balloon each
\(--\rightarrow\) one different balloon per child

(18) Les enfants reçurent chacun un ballon
The children each received a balloon
\(--\rightarrow\) one different balloon per child

However, in (16) this interpretation is an entailment (\(--\rightarrow\)), whereas in (18), it is an implicature (\(--\rightarrow\)). Only in (18), the sentence with a floated quantifier, can we cancel the implicature that there is a different balloon per child, as shown in (19).

(19) Les enfants reçurent chacun un ballon mais c'était le même
The children each received a balloon but it was the same

In (16), the sentence with shifted each, the multiplicity of balloons is an entailment. An entailment cannot be cancelled, so (20) is ruled out:

(20) *Les enfants reçurent un ballon chacun mais c'était le même
*The children received a balloon each but it was the same

Why is there such entailment in (16)? It cannot be due to the indefinite, since (16) and (18) are synonymous. I propose that the position of the quantifier is responsible for these differences. In the shifted each construction the quantifier forces the distribution of the NP to which it is attached. It entails a series of token balloons, which are mapped with each individual denoted by the subject NP. In the floated construction, the fact that the quantifier is attached to the VP (recall (11)) always makes the event interpretation available. This event interpretation is not available when the quantifier is attached to the object NP. Compare now (21a) with (21b):

(21) a. Ils reçurent le même ballon chacun
They received the same balloon each
\(--\rightarrow\) same type balloon

b. Ils reçurent chacun le même ballon
They each received the same balloon
\(--\rightarrow\) same type or same token balloon
(21a), the shifted each construction, is felicitous with only one interpretation: when balloon has a type interpretation, that is a balloon of the same type per child. Each child still needs to be associated with a different token balloon. In (21b), however, balloon can have a token interpretation, that there is only one balloon for the group, and it is the event which is distributed.

1.2.3. Shifted each does not licence discourse anaphora:

Another striking difference between the shifted quantifier and the other constructions is discourse anaphora. Compare (22a) with (22b-c). In the shifted each construction (22a), the indefinite object may not serve as antecedent for subsequent anaphora in discourse, whereas in the other constructions (22b-c), the object NP, even if indefinite, may do so.

(22) a. Les enfants reçurent un ballon chacun. #Il était rose et dégonflé
    The children received a balloon each. #It was pink and deflated
b. Les enfants reçurent chacun un ballon. Il était rose et dégonflé
    The children each received a balloon. It was pink and deflated
c. Chacun des enfants reçut un ballon. Il était rose et dégonflé
    Each of the children received a balloon. It was pink and deflated

Note that with anaphora, the different balloon per child reading of (22b), can be cancelled and readjusted to a reading where there is just one balloon. The reading of (22c) can similarly be readjusted so that each child is mapped with a receiving event, and there is just one balloon for the group. Such a readjustment is not possible with shifted each.

We have given evidence that shifted each forces the distribution of the NP it is attached to. The quantifier position entails that the object NP denotes a series of different token things which are mapped onto each individual denoted by the subject NP. Again, the S-structure position of the quantifier constrains the interpretation. We will now turn to an analysis of distributivity.

2. The analysis:

I take distributivity to be not just the property of an NP. We have seen that it applies to events. Distributivity has a wider range than is generally assumed by Generalized Quantifiers approaches which are only working with sets of individuals or sets of sets of individuals.

At the conceptual level distributivity consists of establishing a relation between ontological categories in the sense of Jackendoff (1983): things, events, times, places, paths, manners, amounts... More precisely, it is a function mapping each element of its domain with an element of its range.

At the syntactic level, distributivity consists of computing phrasal components of the sentence, in a certain order and in a certain way. I have shown in the last section that this order appears to be marked by the position of the quantifiers in the sentence. I propose that the quantifier is a distributive operator (D) whose position marks the domain of the distributive function.

(23) Interpretive component of the grammar:
    D: Distributive Operator:
FD: Distributive function,
FD: domain (X) --> range (Y)
FD: V x, x ∈ X, ∃ y ∈ Y, FD (x) = y

The distributive function is parasitic on the function-argument structure of
the sentence, but the existence of the shifted each construction shows that we
cannot rely solely on function-argument mapping to explain distributivity.
I will adopt a simplified notation, shown in (24), with the distributive
operator D, the two syntactic constituents X and Y and an ordered relation <:>
X defines the domain and Y the range of the distributive function. My proposal can
be summarized as follows: the distributive operator D, realized in French and
English as a lexical quantifier (Q), is configurationally attached to a constituent X
defining the domain of distributivity. The range Y is given by predication:

(24) Syntactic representation of distributivity:
D: a distributive operator
X, Y : Two syntactic constituents
< >: an ordered relation
D < X, Y>
- where D is configurationally attached to X at S-structure.
- where Y is given by predication.

(24) yields the following representations of the different quantifier
positions. This is illustrated in (25) with English each:

(25) a. Non-floated quantifier:
[Each of [NP the children]] [VP received a balloon]
Q < NP, VP> Each <child, receiving event>
(Q < NP, [VP V [NP]]>) (Each <child, balloon>)
b. Floated quantifier:
[NP The children] [VP each received a balloon]
Q < VP, NP> Each <receiving event, child>
(Q < [VP V [NP]], NP>) (Each <balloon, child>)
c. Shifted quantifier:
[NP The children] received [[NP a balloon] each]
Q < NP, NP> Each <balloon, child>

In the non-floated position, (25a), the quantifier takes its NP complement as
its first argument and the VP as its second argument. The canonical interpretation is
that each child is mapped with a receiving event.

In the floated position, (25b), the quantifier takes the VP to which it is
adjoined as its first argument and the subject NP as its second argument. The
canonical interpretation is that there is a receiving event per child.

In the shifted position, (25c), the quantifier takes the object NP to which it
is attached as its first argument and the subject NP as its second argument. The
canonical interpretation is that there is a balloon per child.

If this view of distributivity, where a distributive operator defines the
domain of the distributive function by its position at S-structure, is on the right
track, it should apply to other languages as well. Let us now turn to Georgian.

Georgian is a language which expresses distributivity in a very different way, by reduplicating a numeral adjective or a verb. It does not have overt determiners and does not obligatorily mark definiteness. Gil (1987) studies the following cases:

3.1. Reduplication of the subject NP’s numeral:
When the numeral adjective of the subject NP is reduplicated, two distributive readings are available, as shown in (26).

(26) **Or-orma k’acma sami canta c’aigo**
Two-dist-erg man-erg three-abs suitcase-abs carried-3sg
‘Each of the two men carried three suitcases’ (reading A)
‘Two men at a time carried three suitcases’ (reading B)

For each reading he proposes the following analysis:

(27) Reading A: the subject NP Or-orma k’acma distributes over the object NP sami canta. (There are two men per suitcase)
Reading B: the subject NP Or-orma k’acma distributes over a set of events (the verb c’aigo). (There are two men per carrying event)

3.2. Reduplication of the object NP’s numeral:
When reduplication applies to the numeral of the object NP as in (29), the following readings obtain:

(29) **Orma k’acma sam-sami canta c’aigo**
two-erg man-erg three-dist-abs suitcase-abs carried-3sg
‘two men carried three suitcases each’ (reading C)
‘two men carried suitcases three at a time’ (reading D)

For each reading Gil proposes the following analysis:

(30) Reading C: the object NP sam-sami canta distributes over the subject NP Orma k’acma. (There are three suitcases per man)
Reading D: the object NP sam-sami canta distributes over a set of events (the verb c’aigo). (There are three suitcases per carrying event)

3.3. Reduplication of the verb:
Georgian also has the possibility of reduplicating the verb, as in (31):

(31) **adamianebi gamagld-gamagldnen**
men-abs became-dist-3pl tall
‘The men each became tall’ (reading E)

(31) is analysed by Gil as in (32):

(32) Reading E: the verb gamagld-gamagldnen distributes over its subject NP adamianebi. (There is an event per man)
3.4. Reduplication as a distributive operator:

If we take reduplication to be a two-place distributive operator (R), readings A, B, C, D and E, can be rewritten as in (33):

(33) a. Reduplication of the Subject NP's numeral:
   Reading A:
   R < NP, NP> R <two men, suitcase>
   Reading B:
   R < NP, VP> R <two men, carrying event>

b. Reduplication of the Object NP's numeral:
   Reading C:
   R < NP, NP> R <three suitcases, man>
   Reading D:
   R < NP, VP> R <three suitcases, carrying event>

c. Reduplication of the Verb:
   Reading E:
   R < VP, NP> R <event, man>

When it is the subject's numeral that is reduplicated, (33a), the distributive operator R takes as its first argument the subject NP and as its second argument, the object NP or the VP, with the interpretation that there are two men per suitcase or per carrying event.

When it is the object's numeral that is reduplicated, (33b), the distributive operator R takes as its first argument the object NP and as its second argument the subject NP or the VP, with the interpretations that there are three suitcases per man or per carrying event.

When it is the verb that is reduplicated, (33c), the distributive operator takes as its first argument the VP and as its second argument the subject NP, with the interpretation that there is an event per man.

The distributive operator in Georgian is the process of reduplication. This operator points to a particular syntactic constituent: the subject NP for readings A, B, the object NP for readings D, E, and the verb for reading E. This syntactic constituent always constitutes the domain of the distributive function. In Georgian as well as in French and in English, distributivity can be seen as a function whose domain is marked by the position of a distributive operator at S-structure: reduplication in the former, quantification in the latter.

Conclusion:

The interesting parallelism between Georgian on the one hand, and French and English on the other hand, is that the syntactic position of the distributive operator at S-structure plays a role in guiding the semantic interpretation. We have given evidence that in French and in English, sentences (1-3) with non-floated, floated and shifted quantifiers, are not always synonymous. Different structures yield different interpretations. This supports a configurational theory of interpretation. In a configurational theory, the compositionality requirement is met through the precise properties of the structure of the language itself. In this paper, I have focussed on the role of the position of the quantifier. Further attention could be paid to the specific configuration of lexical quantifiers and to the possibility of marking definiteness in the language. The question remains open as to how we
should constrain our theories of grammar. Increasing the complexity of structural representations will prove adequate only if we keep seeking a very tight relationship between syntax and semantics.

1 See Barwise and Cooper (1981).
2 Gil (1987) claims that there is a third reading, which he calls 'NP-internal distributivity' and where the men are arranged in groups of two, acting collectively. This reading seems to me to be a plural. I therefore leave it aside.

Research for this paper was supported by doctoral fellowship # 452-89-0288 of the Social Sciences and Humanities Research Council of Canada. I wish to thank all the people both at U Mass and U of O who at some stage or other gave me comments on earlier versions of this work. I am especially indebted to Barbara Partee for initial guidance and to Marc Authier for last-minute help.

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