Relative clause structure, relative clause perception, and the change from SOV to SVO*

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Abstract

This study presents a view of diachronic change in language, according to which one of the fundamental factors motivating syntactic change is to be found in the conflicting interaction of principles determining the language organization. Specifically, it will be argued that principles of structural nature and principles of perceptual nature are in conflict in languages of the SOV type, because of the relative clause construction. The way in which a relative clause is structured in an SOV language is an obstacle to its effective perceptual processing. It will be argued that this conflict is one of the major factors determining the diachronic change of a language from an OV to a VO typology.

1. Introduction

In this paper we shall direct our attention to what we consider to be one of the fundamental mechanisms of diachronic syntactic change: the conflict between principles that determine language structure and principles on which actual language processing is based. The specific aspect of this conflict to which we shall address ourselves is the one generated by relative clause construction in certain types of language. We shall attempt to show

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that there is a conflict between the way in which a relative clause is structured in an SOV language and the perceptual strategies needed to effectively process a sentence in the same type of language, and that this conflict is one of the major motivations for the shift from an SOV to an SVO (or, better, a VO) typology.

The paper will be organized in the following manner. First, we will examine how the relative clause is structurally organized in language. Second, we will discuss the perceptual strategies that process sentences containing a relative clause. Third, we will derive some diachronic predictions from the interaction of the two preceding factors. Fourth, we will present various kinds of evidence that seem to substantiate the diachronic predictions.

2. The Structure of Relative Clause

For the purposes of the present discussion, we will consider restrictive relative clauses (RC) depending on a full (i.e., non-pronominal) head noun. A restrictive RC has the function of specifying to which individual(s) of the class denoted by the head noun the speaker is referring (see Keenan, 1972). We will assume, in accordance with various proposals (see, for example, Thompson, 1970), that on the semantic level a RC is represented as a sentential structure containing an NP identical to the head NP.[1]

On the surface level, there is a great deal of variability among languages as to the form in which RCs occur. Nonetheless, there are some general features that can be used to characterize them cross-linguistically. First of all, a restrictive RC is a noun-modifier and as such is syntactically part of the same NP containing the head noun. Second, since the RC has a noun identical to the head noun, the surface clause manifesting it will have a missing NP, either deleted or pronominalized. Third, the sequence manifesting a RC will include some characteristics marking it as a non-main clause.

We don't mean to imply that the above three features *define* a RC, in fact we don't think that such a definition can be given in terms of surface characteristics. What we do mean is that they are *typically* associated with the manifestation of a RC, even if in certain languages some types of RC may lack one or another of them.

Let us now consider the position occupied by the RC with respect to the head noun. It is a well known typological fact that in OV languages the RC is usually placed on the left of the head noun, while in VO languages (which

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[1] See below, pp. 10–11.

include SVO, VSO, and VOS languages) it is placed on the right of the head noun. Thus, OV languages like Turkish, Japanese, Burmese, Korean all have the RC on the left of the head noun, while VO languages like Arabic, English, Italian, Yoruba, Tagalog have the RC on the right of the head noun. There are, to be sure, languages that appear to be an exception to such a generalization. For example, although Persian is an OV language, its RC appears on the right of the head noun. But for the moment we will set aside these cases, since they will play a crucial role in the final discussion.

A number of different proposals have been formulated to account for the generalization relating RC position to the basic order typology of a language. Lehmann (1973) has formulated a universal principle relating the position of noun modifiers (adjectives, genitives, relative clauses) and what he calls "verb modifiers" (like negation and causation) to the basic relative order of object complement and verb: modifiers are placed on the opposite side of a basic syntactic element from its primary concomitant. The primary concomitant of a verb (V) is its object (O), and viceversa. Therefore, in languages with a basic VO order, noun modifiers will be placed on the side of the noun opposite to the side where the verb appears. Since V appears on the left of O, noun modifiers will be placed on the right of the noun. Conversely, with a basic OV order, noun modifiers will be placed on the left of the noun. Thus, according to this principle, since RC is a noun modifier, it will appear in postnominal position in VO languages and in prenominal position in OV languages.

Kuno (1974) tries to offer an explanation for the generalization contained in Lehmann's principle. He starts from the well known observation that center-embedding drastically reduces the comprehensibility of sentences. Then he takes into account an SOV language on one side and a VSO language on the other, and considers the effect of placing RC on the right or on the left of the head noun in both types of language.

SOV – Prenominal RC	SOV – Postnominal RC
(1) [RC] S O V	(3) S [RC] O V
(2) S [RC] O V	(4) S O [RC] V
VSO – Prenominal RC	VSO – Postnominal RC
(5) V [RC] S O	(7) V S [RC] O
(6) V S [RC] O	(8) V S O [RC]

In SOV languages prenominal position of RC is better than postnominal position, because it reduces the probabilities of having a center-embedded clause. In fact, while in postnominal construction both subject-modifying (3) and object-modifying (4) RCs are center-embedded, in prenominal construction this happens only to object-modifying RC (2). Conversely, in a

VSO language it is the postnominal position that minimizes the proba-
bilities of center-embedding, as shown by (7—8) *versus* (5—6). Therefore, on
the assumption that language patterns will tend to minimize perceptual
difficulties, the different choice between prenominal and postnominal
position of RC in the two types of languages is accounted for.

It seems to us that both Lehmann's and Kuno's proposals have some in-
ternal weaknesses. Lehmann's principle is descriptively adequate, but, as
Kuno correctly observes, no explanation or justification for it is given.
Why should modifiers be placed on the opposite side of a basic syntactic
element from its primary concomitant, rather than, say, on the same side?
Until this question is answered, Lehmann's principle is not different from an
empirical generalization.

Kuno's proposal, on the other hand, is directed toward the explanatory
question. But we see two major problems with his solution. First of all, it
doesn't account for the pattern found in SVO languages. In these languages
both prenominal and postnominal position of RC give rise to exactly the
same probabilities of center-embedding. Thus, if avoidance of center-
embedding is what determines RC position, one would expect these
languages to freely show either postnominal or prenominal RC. But this is
false, since it is well known that SVO languages have postnominal RC.[2]
A second (and more serious) problem has to do with the nature of the per-
ceptual difficulty in center-embedding. Kuno bases his argument on the
assumption that center-embedding is perceptually bad in any case. But this
is clearly not true. There are no difficulties in processing sentences con-
taining center-embedded clauses, *as long as the degree of center-embedding
is not higher than one.* Now, in the RC case, two degrees of center-embedding
are found only when there is a center-embedded RC one of whose NPs is
in turn modified by a RC. This in itself is such an improbable situation in
actual language use, that it is hard to think that a certain language structure
is motivated by the need to avoid it. In this light, Kuno's hypothesis loses
much of its original appeal.

Venneman (1973) (see also Bartsch, 1972; Bartsch and Vennemann,
1972) makes a quite different proposal. He tries to account for the position
of noun modifiers in terms of a general principle underlying the whole linear
organization of the sentence, rather than in terms of some principle specific
to (noun) modifiers. This is called the Principle of Natural Serialization,
and it accounts in a general way not only for prenominal position of noun
modifiers in OV languages and for their postnominal position in VO

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[2]Actually, if one includes intransitive sentences in the probabilities' count, as Kuno does, then we
would expect SVO languages to have prenominal RCs.

languages, but also for the whole array of features typically present in the two types of languages. This proposal is too long to be summarized here and it will be taken for granted. We basically agree with Vennemann's approach, though not with all the details of his solution. Therefore, we will now formulate another proposal, which, although quite similar to Vennemann's in both its underlying logic and its predictions, makes some additional claims on the structural status of the RC construction that will be essential for our discussion.

Language is a mechanism used to map meaning into sound. In very general terms, we can conceive such a mapping mechanism as a function, whose input is any of an infinite set of meanings and whose output is a uniquely specified sequence of sounds. In order to understand its nature, we have to consider the task this function has to perform. The form of its output is a *linear* sequence of elements, while the form of its input is a *hierarchical* structure. In other words, the form of the output is a series

(9) $a + b + c + \ldots n$

structured in terms of a "precedes" (or "follows") relation; i.e., "a precedes b", "b precedes c", "... precedes n".

The form of the input (meaning) is instead a structure

(10)
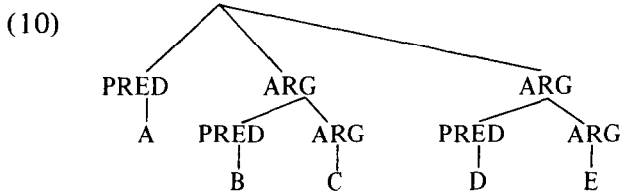
where the defining relation is "E is argument of D", "D is second argument of A", "C is argument of B", "B is first argument of A".[3]

From this point of view, the task of the function we want to define is that of translating in a general and systematic way hierarchical structures like (10) into linear sequences like (9). Let's consider how this task might be accomplished, starting from the simplest case. The minimal semantic structure underlying a sentence is that formed by a predicate with one argument. For example,

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[3] As a representation of meaning, we are here assuming a kind of logical structure, but this is not essential for the proposal we are going to formulate. Any kind of hierarchical representation (for example, "dependency trees") will work in the same way.

(11)

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              /\
        PRED      ARG
         |          |
       CLOSE      DOOR
```
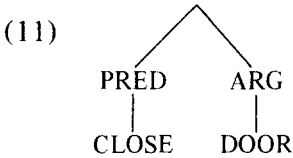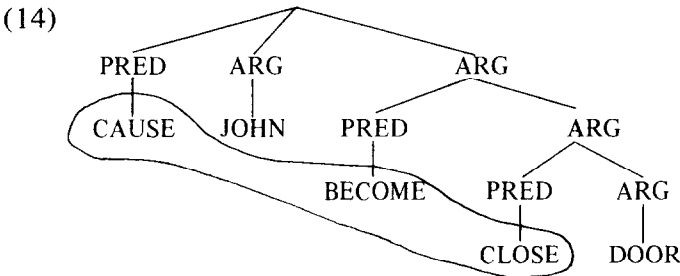
corresponding to *the door is closed*. The lexicon assigns the phonological segment *be closed* to the predicate CLOSE and *door* to DOOR. Once this is done, there are only two possible ways of translating a structure like (11) into a linear sequence. Either the lexical item corresponding to the argument is placed on the right of the one corresponding to the predicate or on the left of it. Thus, corresponding to (11) we have two possible linear sequences;[4]

(12) $V N_O$ "be closed door"
(13) $N_O V$ "door be closed"

We will call (12) "rightward" expanded and (13) "leftward" expanded. Consider now a slightly more expanded semantic structure

(14)

```
        PRED     ARG              ARG
         |         |              /\
      ( CAUSE    JOHN     PRED          ARG
                          |            /\
                       BECOME    PRED      ARG
                                  |         |
                                CLOSE )   DOOR
```

The lexicon determines the following correspondences: the encircled predicates correspond to *close*, JOHN to *John* and DOOR to *door*. Given that the lower part of (14) can be realized as either (12) or (13), the problem is what place will be assigned in the linear sequence to the item *John*. If the mapping mechanism of language were completely free, *John* could appear in six different positions:[5]
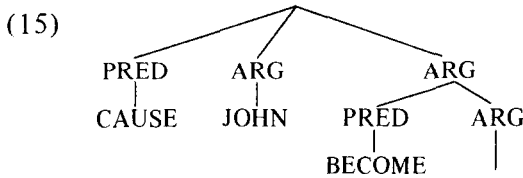
$N_A \; V \; N_O$ $V \; N_A \; N_O$ $V \; N_O \; N_A$
$N_A \; N_O \; V$ $N_O \; N_A \; V$ $N_O \; V \; N_A$

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[4]We designate the nominal argument of (11) as N_O because its semantic role in structures like (11, 14, 18, 23) corresponds to that of a "Deep Object" (in Fillmore's terms). This appears as the surface object in transitive sentences (see 14).
[5]The nominal corresponding to JOHN is designated with N_A, because its semantic role in structures like (14) is that of the "Agent".

But we maintain that the function regulating the mapping mechanism of language is based on the following fundamental principle: to every logical expansion in the semantic structure there corresponds a parallel linear expansion of the surface sequence in a constant direction.[6]

The structure

(15)

```
        PRED      ARG              ARG
         |         |            PRED     ARG
       CAUSE     JOHN            |        |
                              BECOME
```
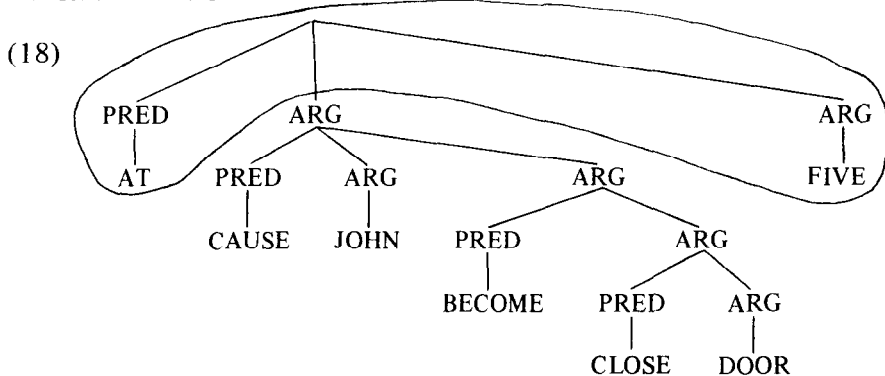
can be considered a logical explansion of the minimal structure (11). In fact, both (11) and (14) underlie a sentence, but (15) doesn't, and (11) is a proper part of (14). Therefore, the principle predicts that any element manifesting (15) will be added to the sequence of elements manifesting (11) following the same direction of linear expansion. Thus, if a language maps (11) by means of (12) (i.e., by adding N_O to the right of V), *John* will be added to the right of sequence (12):

(16)   V N_O N_A "close door John"

If a language maps (11) by means of (13) (i.e., by adding N_O to the left of V), *John* will be added to the left of sequence (13):

(17) N_A N_O V   "John door close"

Consider now a structure like

(18)

```
   PRED            ARG                               ARG
    |           PRED     ARG              ARG         |
    AT         CAUSE    JOHN           PRED          FIVE
                                        |
                                      BECOME    PRED     ARG
                                                 |        |
                                               CLOSE    DOOR
```

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[6]The following presentation will be highly informal and simplified. We will give only a general idea of how the principle works, limited to those cases that are relevant to our discussion. Several problems requiring detailed justification will be deliberately ignored. For a full treatment, see Antinucci (1977a).

underlying a sentence like *John closed the door at five.* Again, the encircled structure is a logical expansion of structure (14). Therefore, the principle predicts that its manifestation will be added to the sequence manifesting (14) in the same direction. Denoting *at five* with ADV (Adverbial), we will have, accordingly

(19) $V \ N_O \ N_A \ ADV$

in languages showing (16) and (12), and

(20) $ADV \ N_A \ N_O \ V$

in languages showing (17) and (13). However, ADV consists of two lexical items: how is their relative order determined? In both sequence (12) and (13) corresponding to the minimal structure (11), we can say that the predicate "precedes" its argument, since (12) grows from left to right and (13) from right to left. Therefore, also in (19) and (20) the predicate of ADV will "precede" its argument in the linear sequence. Thus, we will have

(21) $V \ N_O \ N_A \ A \ N$ "close door John at five"
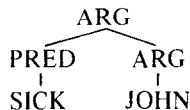(22) $N \ A \ N_A \ N_O \ V$ "five at John door close"
    (where A (adposition) is the predicate of ADV and N its argument).

Finally, consider a structure like

(23)
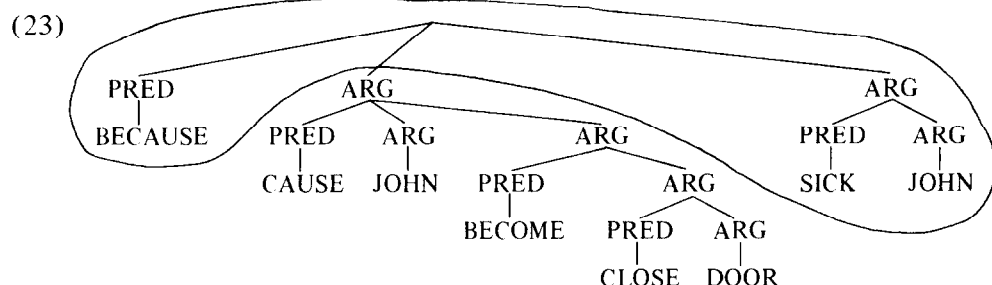
underlying a sentence like *John closed the door because he was sick.* Again, the encircled structure is a logical expansion of (14). It is formed by a predicate BECAUSE and its argument   ARG   . If we denote the first with

PRED   ARG
SICK   JOHN

C (Conjunction) and the second with S (Sentence), the corresponding linearizations determined by the principle will be

(24) $V \ N_O \ N_A \ C \ S$
(25) $S \ C \ N_A \ N_O \ V$

The order internal to S will be obviously determined by a recursive application of the principle, giving rise to

(26) $\quad\quad\quad\quad$ V N_O N_A C V N_O $\quad\quad\quad$ "closed door John because
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ was sick John"

(27) N_O V C N_A N_O V $\quad\quad\quad\quad$ "John was sick because John
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ door closed"

Even from this very rough presentation, it is easy to see how the principle of expansion correctly predicts the characteristic array of features found in the basic language types. If we disregard the behavior of the so-called Subject,[7] the principle correctly predicts the existence of two types of language. Those whose linear sequence is built from left to right (rightward expanding) and those whose linear sequence is built from right to left (leftward expanding). In the first type, the nominal constituents of a sentence (excluding the Subject) will follow the main verb, as in (12) and (16). Adpositions will appear as prepositions, since they will be placed on the left of their argument, as in (21). Adverbials will appear in clause final position, as in (19). Adverbially subordinated clauses will follow the main clause, as in (24). Conjunctions will appear at the beginning of the subordinate clause, as in (26).[8]

On the other hand, in the second type the nominal constituents of a sentence will precede the main verb, as in (13) and (17). Adpositions will appear as postpositions (or case-markers), since they will be placed on the right of their argument, as in (22). Adverbials will appear in clause initial position, as in (20). Adverbially subordinated clauses will precede the main clause, as in (25). Subordinating conjunctions will come at the end of the subordinate clause, as in (27). In short, the principle correctly predicts the characteristics of the so-called VO and OV language-types.[9]

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[7]The position and behavior of the so-called Subject is determined by a totally distinct principle (Topical Movement), whose basis is not the logical structure of sentence meaning, but rather aspects of meaning related to the distinction between Given and New information. This matter will not be pursued at all here (see Antinucci, 1977a).

[8]Since we are disregarding subject position, this type includes SVO, VSO, and VOS languages. It is, in fact, well known that apart from subject position these languages share the same syntactic characteristics.

[9]Notice that the English glosses of our leftward expanding formulas correspond to the typical sentence structure of an SOV language. On the other hand, if we move an NP internal to each clause at the beginning of its clause, the glosses of our rightward expanding formulas correspond to the typical sentence structure of an SVO language (which is *not* characterized by having the verb in *medial* position, but by having the verb in *second* position, while all the remaining sentence constituents are placed after it). As said before, this movement is accomplished by a different principle (Topical Movement).

The motivation for the existence of a principle like that of expansion should be obvious: it offers a general solution to the basic problem faced by the mapping mechanism of language. It can translate univocally any of an infinite set of logical structures representing meaning into the appropriate linear sequence, and viceversa.

Let's now consider noun modifiers. The (simplified) structures corresponding to sentences
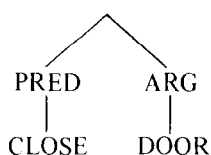
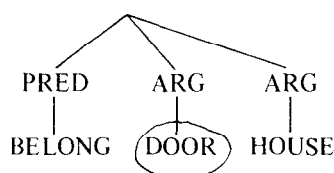(28)   The door of the house was closed
(29)   The young boy left
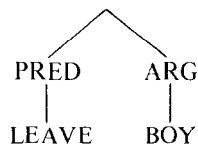(30)   The boy who met the girl left

are, respectively,

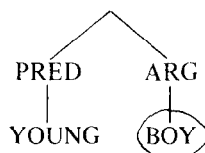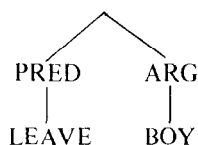(31) (a)   (b)

         PRED   ARG   PRED   ARG   ARG
          | | | | |
        CLOSE   DOOR   BELONG   (DOOR)   HOUSE

(32) (a)   (b)

         PRED   ARG   PRED   ARG
          | | | |
        LEAVE   BOY   YOUNG   (BOY)

(33) (a)   (b)

         PRED   ARG   PRED   ARG   ARG
          | | | | |
        LEAVE   BOY   MEET   GIRL   (BOY)
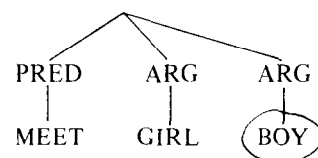
As we said at the beginning, noun modifiers can be considered as sentential structures containing a noun identical to the head noun (the encircled argument in (31–33)), associated to the main sentence structure. From this point of view, they can be considered as logical expansions of the main-clause structure, and, more specifically, as logical expansions of one of the main-clause arguments (the argument DOOR in (31a), and BOY in (32a–33a)).[10] On this basis, the principle of expansion will determine also their position in the linear sequence. As any other expansion, they will "follow" the element (or sequence of elements) manifesting the structure of which

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[10]Intuitively this is clear enough. But it requires a refinement of the formal definition of logical expansion, given the kind of meaning-representation used here.

they are an expansion. Since they are an expansion of the argument appearing as the head noun (HN), they will "follow" it in the sequence. Thus, in rightward expanding languages they will be placed on the right of the head noun

(34)   HN MOD

In leftward expanding languages they will be placed on the left of the head noun

(35)   MOD HN

Notice that the principle will also determine the order internal to the modifier itself, when this is formed by more than one lexical item. Remember, in fact, that a lexical item corresponding to a predicate always "precedes" that corresponding to its argument. Thus, for (31) we will have

(36)   HN A N   "door of house"
(37)   N A HN   "house of door"

In both cases the adposition manifesting the predicate of (31b) (genitive marker, in this case) will come between the head and the specifying noun (N). Finally, (33) will be realized as

(38)   HN V N   "boy [met girl] "
(39)   N V HN   "[girl met] boy"

Therefore, RCs will be placed on the right of the head noun in VO languages, and on the left side of it in OV languages.

To return to our problem, we must notice that both our proposal and the one by Vennemann make a specific claim concerning the position of RC. That is, such a position is *not* an independent variable in the syntactic organization of a language, it is instead inherently tied to the organization of the whole linear sequence. In other words, the "rule" that specifies the position of RC is *not* an independent rule in the grammar of a language. The placement of RC to the right or to the left of the head noun is determined by the same universal principle determining the position of verb, noun phrases, adposition, conjunctions, subordinate clause, etc. In this sense we will speak of *structural* factors (i.e., connected to the universal principle underlying the language mapping mechanism) affecting the RC.

This does not mean that it is empirically impossible to find a language where the position of RC (or of any other constituent, for that matter) is inconsistent with, say, the relative position of NPs and verb. What our hypothesis implies is: (a) that the sequential organization of such a language cannot be imputed to structural factors only; (b) that the language will be under the pressure of structural factors to reorganize itself.

At first this statement could appear to be vacuous. Shoudn't we consider the existence of "inconsistent" languages as a disproval of the universal principle that we set up? We don't think that this conclusion follows necessarily, given a correct understanding of the logic of scientific inquiry.

We use a certain empirical basis, the relative positions of sentence constituents in a large number of languages, to build a hypothesis concerning the universal basis of the language mapping mechanism. If, at this point, we find some cases that do not conform to the prediction made by the hypothesis, there are at least two ways open to us. The first is to accept such cases as a disproval of the hypothesis, and try to formulate a new one that will include also the "deviant" cases. However, one has to remember that a scientific hypothesis *is not* equivalent to a generalization of empirical facts, and therefore will not be *ipso facto* falsified by the existence of apparent counterexamples. (The law of gravity is not *ipso facto* falsifed if we find some bodies that do not fall to the ground according to the parameters specified by it). The second way is to try to explain away such cases by enriching the model with additional hypotheses. And this can be legitimately done if we can show that these additional hypotheses are independently needed, and that they enable us to derive predictions that go beyond the explanation of the "deviant" cases. In this way, we will try to show that claims (a) and (b) derived from our hypothesis are correct.

3. The Perception of Relative Clauses

Let's now pass to our second point and consider the relative clause in relation to the perceptual mechanism that has to process it. First of all, we have to stress a general point. Psycholinguistic research carried out in the past few years has shown that the mechanisms of actual language processing are not isomorphic to the mechanisms postulated in the grammar of a language to relate underlying and surface forms (see Fodor, 1971; Bever, 1974). Although this has been demonstrated to be true with respect to forms of grammar based on transformational operations, the same conclusion could be easily drawn for models like the one proposed above.[11]

Notice, however, that this conclusion by no means implies that the grammar of a language isolated by a linguist is just a conventional and arbitrary systematization of empirical regularities. The grammar models a real

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[11]Notice that a processing model isomorphic to the structural model we have proposed would imply the absurd claim that actual language perception in an SOV language proceeds from right to left, starting from the end of the sentence.

mental capacity, namely the speaker's knowledge of the complex and systematic relations existing between meanings and sounds in his language (mirrored, for example, in his intuitions about the relations between sentences in his language), and the universal principles underlying grammar model the ways in which such knowledge is organized in the human mind. What we are saying is that this system of the mind is different from the one(s) that effect(s) the actual processing of language in real time.

In addition to the negative findings, a consistent body of knowledge has been accumulated in the past years in the field of language perception. The common view held is that the perceptual mechanism for language operates on the basis of *strategies* of segmentation that directly map surface sequences into underlying semantic representations.[12]

From this point of view, RCs present two basic problems to the perceptual mechanism:

1) the segmentation of the appropriate sequence constituting the subordinate clause from the main clause;

2) the recovery of the missing NP and its function within the RC itself. We will now argue that the performance of both these tasks presents much more severe problems in an OV than in a VO language.

A number of different experiments (reported in Bever, 1974) show that in English the fundamental perceptual strategy applied to the processing of a sentence is one that segments together the first N . . V . . (N) sequence as the main independent clause of the sentence, unless there is some kind of subordination marking. Bever found that this strategy is so strong that, when confronted with a sentence like

(40)   *The editor authors the newspaper* hired liked laughed

subjects cannot avoid interpreting the sequence in italics as a clause, even when they are given explicit instructions that this interpretation is incorrect. "The NVN sequence — writes Bever — is so compelling that it may be described as a 'linguistic illusion" which training cannot readily overcome".

The ground for the existence of such a strategy is obvious: it exploits in the most efficient possible way the information about the basic word order of a language. Though the formulated strategy is clearly language-particular, we will assume here that the basic principle underlying this strategy, the exploitation of basic word order to segment a clause, has a universal basis in the perceptual mechanism for language. Leaving aside, for the moment, the question of markers that can block its operation, let's consider the

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[12]For obvious reasons of space, we will deal here only with those strategies that are relevant to our problems. A complete and detailed account can be found in Bever (1974).

potential interaction of this strategy (henceforth, B(asic) S(trategy)) with the structure of sentences containing a RC.

Taking into account for the moment only RCs depending on subject and object NPs, in an SVO language we have the following four cases

(41) $N_S [N_S V] V N_O$
(42) $N_S [V N_O] V N_O$
(43) $N_S V N_O [N_S V]$
(44) $N_S V N_O [V N_O]$

With respect to our first problem, the correct segmentation of the sequence forming the RC from the main clause, sentences of type (41) create no difficulties. BS is blocked because the first sequence met is NNV. Type (42) instead creates a problem. The first sequence is NVN, and therefore potentially open to the operation of BS, thus producing an incorrect segmentation. Type (43) again poses no problem. The first NVN sequence is correctly identified as the main clause by BS. In type (44) the head noun followed by the RC constitutes a NVN sequence, but since it comes after the initial NVN and has been correctly segmented as the main clause, it does not create problems.

Therefore in an SVO language only one type of sentence out of four has a potentially dangerous structure with respect to BS. The situation in an SOV language is quite different. Here the four corresponding cases are

(45) $[N_S V] N_S N_O V$
(46) $[N_O V] N_S N_O V$
(47) $N_S [N_S V] N_O V$
(48) $N_S [N_O V] N_O V$

First of all notice that all the four sentence types contain an initial sequence that is a potential candidate for a BS segmenting the first N. . .(N). . .V sequence as the main clause. In the absence of any other clue the strategy would be to assign a main clause status to the RC of (46) and (45), and, even worse, segment together the first NNV sequence in (47) and (48) that don't even correspond to a clause. Therefore in an SOV language, four out of four sentences containing a RC have a structure whose initial sequence matches that of a main clause without being one.

However, we have to consider that OV languages, as observed in section 2, tend to have a system of case-marking on the noun. Since nouns marked by case will appear also in a main clause, one can reasonably hypothesize that a BS in these languages will be sensitive also to this feature. Let's consider some concrete cases where this happens. In Japanese sentences corresponding to types (45–48) will appear as

(49) inu-ga   kande-iru kodomo-ga neko-o   nadete-iru
      dog-nom   biting-is   child-nom cat-acc   patting-is
      "The child whom the dog is biting is patting the cat"

(50) ringo-o   tabete-iru kodomo-ga inu-o   nadete-iru
      apple-acc eating-is   child-nom dog-acc   patting-is
      "The child who is eating the apple is patting the dog"

(51) kodomo-ga inu-ga   tabete-iru ringo-o   motte-iru
      child-nom dog-nom   eating-is apple-acc holding-is
      "The child is holding the apple that the dog is eating"

(52) inu-ga   ringo-o   tabete-iru kodomo-o   kande-iru
      dog-nom   apple-acc eating-is child-acc biting-is
      "The dog is biting the child who is eating the apple"

If we take into account case-marking, it seems that sentence types (46) and
(47) are no longer a problem for BS. (46) begins with a noun marked as
object (by the particle -*o*) and in (47) the second noun is marked by the
subject particle -*ga* and not by the object particle. Types (45) and (48)
instead will still present an initial sequence subject to the operation of BS.[13]
Thus, even taking into account case marking in Japanese, the possibilities
that BS will incorrectly segment sentences containing a RC are still two out
of four. Furthermore, it may be the case that this gain is only apparent.
In fact, an initial sequence N-*o* V, like the one in type (46), *can* in Japanese
form a main clause by itself. This happens because Japanese can have zero-
subject pronominalization (and also zero-object pronominalization). Kuno
(1973) remarks that a sentence like

(53) Mary-ga   kita   toki ai   ni kita
                came   when see to came

"can mean either 'When Mary came, (I) came to see (her)' or 'When Mary
came, (she) came to see (me)' ". Furthermore, also a sequence like N-*ga*
N-*ga* V, like the one found at the beginning of type (47), can form a main
clause. There is in fact, in Japanese, a class of verbs that require exactly an
N-*ga* N-*ga* V construction (see Kuno, 1973; p. 81).[14]

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[13]Notice that the interpretation of the initial sequence of (49) as a main clause will not be blocked by
the fact that the verb is transitive and is not preceded by an object NP. Japanese, in fact, allows zero-
object pronominalization; see example (53).

[14]The fact that in most sentences of this type the first NP is marked by -*wa* rather than by -*ga*, as in

      Boku-wa   Mary-ga   kowai
      I   am-afraid-of

is irrelevant, since the first NP of a sentence like (51) is also likely to appear with -*wa*. (For the alter-
nation between -*wa* and -*ga*, see Kuno, 1973; pp. 37–78).

(54) (a)   dare-ga eiga-ga suki   desu ka?
           who   movie   fond-of   is?
           "Who likes movies?"

(b)   Watakusi-ga eiga-ga suki   desu
      I   movie   fond-of am
      "I like movies"

If BS in Japanese is flexible enough to be sensitive to sentences like (53–54), then sentence types (46) and (47) will again cause perceptual problems.

With some minor differences, the same situation holds in Korean. In Turkish there is instead a different system. Sentences of type (45–48) appear as

(55)   köpeg-in ısırdığı çocuk   kedi-y-i oksuyor
       dog-gen   bite   child   cat-acc   pats
       "The child whom the dog bites is patting the cat"

(56)   kedi-y-i ısırmış köpek elma-y-ı   yiyor
       cat-acc   bit   dog   apple-acc eats
       "The dog who bit the cat is eating the apple"

(57)   çocuk   köpeğ-in yediği elma-y-ı   tutuyor
       child   dog-gen   eat   apple-acc holds
       "The child is holding the apple that the dog eats"

(58)   kedi elma-y-ı   yiyen çocuğ-u   ısırıyor
       cat   apple-acc   eat   child-acc   bites
       "The cat is biting the child who is eating the apple"

When the relativized noun is the object of the RC verb, as in (55) and (57), the RC subject appears with a genitive case marker. Therefore the initial sequences of (55) and (57) are not subject to BS any more. On the other hand, the initial sequence of (56) is marked by the object inflection -*i*, which would again block the operation of BS. The initial sequence of (58) instead remains subject to the operation of BS, causing a wrong segmentation. Thus, it seems that case marking in Turkish reduces the possibilities of wrong segmentation to one out of four.

However, it should be noted that the object inflection in Turkish is applied only to definite NPs. Indefinite NPs show no inflection: in these cases the noun appears unmarked as in subject NPs. Consequently, sentences of type (46) can also appear as

(59) kedi ısırmış köpek elma yiyor
      cat   bit   dog   apple eats
      "The dog who bit a cat is eating an apple"

Since in this case the object noun shows up in the same form of a subject noun, the initial sequence can again trigger BS.

In conclusion, even if we take into account case-marking, the interaction of sentence structures containing a RC with BS is still more problematic in OV languages than in VO languages. Furthermore, to this purely quantitative difference in the number of potentially dangerous sequences in the two types of language, should be added the effect of a qualitative difference. In VO languages the only problematic structure is (42). The application of BS to (42) interprets the initial $N_S [V \, N_O]$ sequence as a clause and assigns a main-clause status to it. However, since in (42) the subject head noun is also semantically the subject of the RC, the interpretation derived by BS will be wrong only in assigning a main-clause status to this sequence. On the contrary, the application of BS to sentences like (48), which, as we saw, is always a problematic case in OV languages (even on the assumption of a perfectly consistent system of case-marking), causes much wider negative effects. First of all, the correct interpretation of a RC of the kind that appears in (48) is in itself a perceptual task more difficult than that of (42). This is due to the so-called "double-function" of the head noun in (48). In this case, the head noun has the function of object in the main clause and subject in the RC. This factor has been demonstrated to increase perceptual complexity (see Bever, 1974; p. 1212). A recent experiment by Cook (1975) designed to test the relative difficulty in processing different types of RC, shows that subjects' performance is significantly lower when the head noun has a double function. 76% of all the errors were made in processing RCs whose head noun had a double function.[15] Furthermore, the application of BS to (48) interprets the initial $N_S [N_O \, V]$ as a clause. Now, contrary to what happens in (42), the first noun in this sequence, which is interpreted as the subject of the embedded verb, has no relation at all with that verb. While the semantic interpretation of the clause resulting in (42) corresponds at least to that of the RC, the one in (48) doesn't correspond to any clause of (48). This means that the analysis of (48) derived by the initial application of BS has to be entirely discarded and redone.

Up to this point we have not considered the fact that BS may be blocked by the presence of some kind of marker indicating the subordinate status of the RC.

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[15] These results are based on our analysis of Cook's data.

A survey of VO languages (see the relevant data in Schwartz, 1971) shows that they typically have some kind of marker situated between the head noun and the beginning of the RC. This marker is either an invariable particle (Ewe, Hebrew, Italian) or a pronoun (Latin, Greek, Russian). The effect of this marker on perceptual strategies is obvious: it blocks the operation of BS immediately after the head noun and tells the hearer that what comes next is a new, subordinate, clause. Therefore, if we assume that in sentence types (41–44) above such a marker is present, there will be no more danger of incorrect segmentation by BS. In particular, in type (42), whose initial $N_S[V\ N_O]$ sequence is the only potential problematic case for an SVO language, BS will be correctly blocked right after the first N.

It is worth noting that English, which is fairly atypical in that it sometimes allows the deletion of the initial marker, never does so in sentences like (42) and (44), i.e., in those sentences where such deletion would leave a NVN sequence. Furthermore, Middle English allowed the deletion of the marker even in (44) but not in (42), which, as we said, is the real potential problem for BS (on this point, see Bever and Langendoen, 1971).

On the other hand, OV languages do not have any marker at the beginning of the RC. They tend to mark the subordinate status of the RC at the very end of it, i.e., after the verb. In Turkish, the RC verb takes one of a number of suffixes turning it into a participial form. Furthermore, when the relativized noun is the object, a possessive pronoun agreeing with the subject is added to the participial form

(60)   adam-ın   bekle-diğ-i   misafir
        man-gen   await-prt-his   guest
        "The guest whom the man is awaiting"

(61)   yaz-dığ-ım   mektup
        write-prt-my   letter
        "The letter which I wrote"

However, when the relativized noun is the RC subject, some of the participial forms (the past *-miş* and the future *-ecek*) are identical to finite verb forms

(62)   gel-ecek   haber
        come-prt   news
        "The news which will come"

(63)   haber gel-ecek
        "The news will come"

(64) hazirlan-miş   plan
      prepared-prt   plan
      "The plan which has been prepared"

(65) plan hazirlan-miş
      "I gather that the plan has been prepared"[16]

In Japanese, instead, the same verb form appears in relative and main clauses, as (49) and (52) show. There is, therefore, no marker of subordination in RCs. Only the verb *to be* in the present tense has a special form for RCs

(66) kinben   na hito
      diligent is person
      "A person who is diligent"

Like Turkish, Korean has a set of suffixes turning the verb into a participial form

(67) chayk-lïl   ssï-ess-nïn   salam
      book-acc   write-prt   man
      "The man who wrote the book"

The suffix-*nïn* marks the verb as subordinate.

Lahu shows an invariable particle *ve*, which is identical to the genitive marker, at the end of the RC (see Matisoff, 1973)

(68) và?=ó-qō thà?   cɔ̂ tā   ve   yâ-mî=ma lɛ̀   qhâ?-šɛ=ma   yò
      pig's-head acc   boiled gen woman   head man's   wife
      "The woman who boiled the pig's head is the headman's wife

(69) qha?-šɛ=ma   cɔ̂ tā   ve   và?=óćō   mè jā
      headman's wife   boiled gen pig's-head   yummy
      "The pig's head that the headman's wife boiled is yummy"

From these facts it could be argued that most of the problems deriving from the interaction of BS with the structure of sentences containing a RC in OV languages are in fact solved. There are still some problematic cases, like those of Japanese, where there is no special marking of the RC verb, and Turkish, where some verb suffixes do not univocally mark the subordinate status of the verb. But at least in many cases we do have a final marker univocally identifying the preceding clause as a subordinate clause.

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[16] As a finite verb-form, the past -*miş* is used inferentially.

Therefore, it could be argued that the status of RC with respect to BS in OV languages is not very much worse than in VO languages. However, it should be remembered that perceptual strategies process speech in real time: their operation takes place simultaneously with the temporal development of the sound sequence. In other words, they tend to segment and interpret the language input as soon as possible. From this point of view *it is one thing to have a signal at the beginning of the sequence to be processed and quite another to have it at the end.*

What we are claiming here is that from the perceptual point of view the relative efficiency of a marker signalling the subordinate status of a sequence is much higher if this marker precedes rather than follows the sequence. Consider what happens in a VO language like English when the RC marker of a sequence like

(70) ... the pen *that* fell on the table ...

is perceived. On the one hand, it immediately blocks the perceptual routine that is analyzing the clause where the preceding head noun occurs; on the other hand it makes the perceiver process a new clause and simultaneously assigns a subordinate status to it.

Consider now a case like (48) in an OV language:

(71)   kedi   elma-y-ı   yi-y-en   çocuğ-u   ısırıyor
        cat   apple-acc   eat-prt   child-acc   bite
        "The cat is biting the child who is eating the apple"

When the perceiver arrives at the verb *yi-* he has already received a sequence formed by a noun in the (unmarked) nominative case and a noun with the accusative inflection. This creates the expectation that the coming verb will fill the missing slot and complete a main clause relating the two NPs. On reaching the verb this analysis goes into effect and is disconfirmed only by the final *-en*. The perceiver at this point has to look ahead to the coming NP, process it, and then reanalyze the whole sentence. Obviously, this analysis puts a much heavier load on the perceptual mechanism than a sequence like (70)[17]. Cook's experiment on RC, quoted above, offers direct experimental evidence of the dramatic effect of presence vs. absence of an initial RC marker. In this experiment, there were three sentences of type (41), i.e., all sharing the form $N_S[N_SV]$ V N_O. In one of them there was no

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[17]The analysis might also be disconfirmed by the semantic nature of the verb, when this does not represent a plausible semantic relation between the first two NPs. But this fact does not change the nature of the problem, since the expectation derived from the initial sequence has already built a possible main-clause schema. This must be erased and the analysis of the whole sequence redone.

marker between the head noun and the RC; in the second there was a *that*, and in the third a *what*:

(A) N_S N_S V V N_O
(B) N_S *that* N_S V V N_O
(C) N_S *what* N_S V V N_O

The comprehension task involved was the same for the three sentences, and furthermore, sentences (A) and (B) were built with exactly the same lexical material. The percentages of incorrect performances for each sentence were the following:[18]

(A)   46%
(B)   24%
(C)   30%

Performance on (A), where there is no marker, is nearly *twice* as bad as performance on (B), where *that* is present. Notice that even performance on (C) is better than performance on (A). Although (C) is an ungrammatical sentence, it has some kind of signal at the beginning of the RC.

Since (A) and (B) are identical and they both contain an initial NNV sequence which is not subject to incorrect analysis by BS, these results are extremely important because they isolate and show the importance of an explicit "signal of interruption" at the beginning of the RC. This finding is confirmed by the results on the ungrammatical sentence containing *what*.[19]

In conclusion, we have examined the first problem posed by the processing of RC to the perceptual mechanism: the segmentation of the appropriate sequence corresponding to the RC and the recognition of its subordinate status. We have argued that, for a variety of reasons, the types of structures generated by the universal principle underlying grammar for sentences containing a RC (i.e., the position of RC, the order of consitituents in clauses, the type and position of subordination markers)[20] make this task much more difficult in OV than in VO languages.

In view of the quantity of linguistic discussions on this topic, the nature of this difficulty is to be stressed. We are *not* claiming that the relative clause is difficult because it causes actual ambiguities and misunderstandings as a

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[18]This is again our analysis of Cook's data.
[19]Results do not change if we compare performances on all the types of sentences containing a RC used in the experiment:
errors when no marker is present: 44%
errors when *what* is present: 32%
errors when *that* is present: 23%
[20]The "structural" status of this last feature will be discussed below.

result of the structure of OV languages. Although this may sometimes happen (and, apparently, does happen, as a Japanese speaker has informed us), real language use is redundant enough to minimize such inconveniences. What we are claiming is that processing a RC in an OV language constantly places a burden on the perceptual analyzer, which is much heavier than in a VO language. In other words, the trouble is not actual ambiguity but systematic processing inefficiency.

Let us now examine the second problem posed by RCs: the recovery of the missing NP. In VO languages we find typically one of the following two systems: (a) the RC is marked at the beginning by an invariable particle; the missing NP is either deleted or represented by a pronoun. Usually, it is deleted in the direct cases and pronominalized in the oblique cases. The reason for this distribution is clear: the NP is retained in a pronominal form in those instances where its deletion would cause the loss of its function within the RC.[21] (b) There is a special pronoun (a "relative" pronoun), placed at the beginning of the RC, which can also carry the grammatical function of the missing NP.

Both these systems present no problem for perceptual analysis. In (a) subjects process the relative clause and when they reach a pronoun or a gap, recover immediately both the content of the missing NP (since it is identical to the head noun which has already been processed), and its function. In (b) the marker that also signals the beginning of the RC allows the hearer to recover content and function of the missing NP.

OV languages, on the other hand, always tend to delete the coreferential NP in the RC. In fact, most OV languages do not tolerate pronominalization of the missing NP (with the exception of a very few cases). In Lahu "no relative clause may contain an NP which is coreferential with the head noun" (Matisoff, 1973; p. 473). The same holds for Turkish and Japanese. Kuno (1973; p. 237) describes the following sentence, where the coreferential NP is pronominalized, as awkward, and our informant was very reluctant to accept it:

(72)   watakusi-ga so-no   namae-o   wasurete-simatta okyaku-san
       I-nom   that-of name-acc have-forgotten   guest
       "a guest whose name I have forgotten"

This restriction is likely to create problems in the recovery of the missing NP. When the NP is in an oblique case, its deletion causes also the loss of

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[21]If the language allows function markers to be left stranded (as in English), then deletion may occur in every case.

its accompanying functional marker, which in turn makes the recovery of the NP's grammatical function more difficult. Thus in Turkish

(73)   gel-dig-im   tren
       come-prt-my   train

can mean both "the train *to which* I came" and "the train *on which* I came". The intended interpretation must be derived from the context.

In Japanese, a sentence like (Kuno, 1973, p. 244)

(74)   tegami-ga   takusan kita   tomodati-ga oozei   ita
       letters-nom many   came   friend-nom many   were

can mean both "there were many friends *from whom* many letters came" and "there were many friends *to whom* many letters came". Again, the intended meaning must be gathered from the context. Thus, a discourse like the following

(75)   Tokyo ya Osaka kara   oozei-no daihyoo-ga   kita.
                and   from   many   representative   came

       Daihyoo-ga   hitori mo   konakatta tosi-wa Hiroshima   to
       representative   one-person   came-not   city   and

       Fukuoka   dake da.
                 only is

is interpreted as "Many representatives came from Tokyo and Osaka. Cities *from which* no representatives came are only Hiroshima and Fukuoka". The first sentence makes clear that the deleted NP in the RC of the second sentence must be interpreted as *from which*.

Therefore, owing to the obligatory deletion of the missing NP, its grammatical function in the RC cannot be marked. This conclusion raises an interesting problem. If, as we saw, deletion of the coreferential NP makes the recovery of its function more difficult, then why do OV languages not pronominalize the missing NP (at least in the oblique cases) as VO languages do? The answer is again to be looked for in the conflict between structural and processing factors. In discussing constraints on the behavior of pronouns, Bever writes: "Such a complex system appears at first to be an example of a "pure" linguistic law. However, there is an intuitively clear general principle of all experience which could underlie such complex linguistic constraints. First, for one object to 'stand for' another, like a pronoun for a noun, a connection must already be established between them. For example, a picture of a leaf cannot be used to represent a tree unless the

viewer already knows the connection. Analogously, in *He spoke to George, he* cannot refer to *George* since the listener does not yet know who *he* is. The constraint which allows a superordinate clause noun to govern the pronominalization of a subordinate clause noun may also be interpreted as a linguistic reflection of an obvious regularity of experience: presentation of a whole includes a presentation of its subordinate part but not viceversa. For example, a picture of a tree also presents a leaf since it includes a leaf, but a picture of a leaf does not present a tree (without prior knowledge of the connection, as above). Analogously, a pronoun can appear, even preceding its governing noun, if it is explicitly marked as in the subordinate part of the sentence. Since every sentence has at least one main clause, the listener can predict that a pronoun in a subordinate clause *will* be governed by a main-clause noun. But a pronoun in an initial main clause does not necessarily have a following subordinate-clause governing noun since there may be no subordinate clause at all [...]. To put it another way, the general perceptual principle is: A symbol S1 can stand for S2 if (a) the prior connection is known or (b) there is an indication that a connection is about to be established." (Bever, 1974; p. 1195).[22] Now, since, for structural reasons, the relative clause has to precede the head noun in OV languages, we always have to have *backward pronominalization* in order to have a pronoun in the RC. But given the way RCs are marked in these languages, the pronoun occurs in the sequence at a point where the hearer does not yet know that the clause under processing is a subordinate one. If in processing the sequence the hearer were to hit on a pronoun, he would immediately search for an antecedent in the preceding context, and in this way miss the correct interpretation of the sentence. On the other hand, if he does not find any pronominal element to interpret, he may proceed until the end of the clause and find the head noun. Therefore, in these structures pronominalization would be *worse* than deletion.

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[22] Notice that the whole range of pronominalization phenomena cannot be accounted for on perceptual grouns only (as Bever seems to imply). There are other factors involved, the most important of which seems to be the relative degree of "topicality" of the NPs involved (see Kuno, 1972). The interplay of these different factors in determining the behavior of pronominalization is investigated in Antinucci (1977b). However, perceptual factors will in any case prevent inter-clause backward pronominalization (which is the relevant point to our argument), if the clause containing the pronoun can be interpreted as a complete main clause.

4. Diachronic Change

The general conclusion that we can derive from the preceding discussion is that a variety of factors concur in making the perceptual processing of RC in OV languages problematic.

Therefore, languages of the OV type will be under pressure from the perceptual mechanism to reorganize the structure of RC in such a way as to eliminate these inconveniences. One could easily imagine a solution: the first group of problems is solved by having markers of subordination at the beginning of the RC, rather than at the end of it. The difficulties connected to the recovery of the missing NP would, in this case, also be solved, since pronominalization could work backwards.

However, this solution is unavailable, as is shown by the fact that there are extremely few (if any) OV languages that adopt an initial RC marker. The reason is that this construction is impossible from the structural point of view. As we said in section 2 above, the fundamental principle underlying the mapping of meaning into a linear sequence (be it Vennemann's "natural serialization" or what we called "principle of expansion") univocally determines that the RC "follows" its head noun, since the former is a logical expansion of the latter. If this order is realized in a language that builds its linear sequence from left to right (as VO languages do) the RC will be placed on the right of the head noun, while if the linear sequence is built from right to left (as in OV languages) the RC will be placed on the left of the head noun. Therefore, in both cases the starting point of the RC is, from the structural point of view, enclosed between the head noun and the sequence corresponding to the RC; i.e., on the immediate right of the head noun when the RC is on the right of it, and on the immediate left of the head noun when the RC is on the left of it. Now, in VO languages the "temporal" beginning of the RC in the sound sequence coincides with its "structural" beginning, but in OV languages the temporal beginning of the RC has no structural status. This explains why in OV languages, if some marker is found, it comes at the temporal ending (i.e., structural beginning) of the RC.

The same conclusion can be reached for those languages that treat their RC essentially as a genitive construction. For example, in Lahu the RC marker *ve* is the genitive marker found in nominal construction (Matisoff, 1973; p. 141)

(76)   Cà-lɔ̄   ve   á-thɔ
        Jalaw   of   knife
        "Jalaw's knife"

The order determined by the structural principle for OV languages is *Speci-*

fying noun – Genitive – Head noun and *Head noun – Genitive – Specifying noun* for VO languages (see (36–37) above). Since there can be no **Genitive – Specifying noun – Head noun* order, it follows that the genitive marking the subordinate status of the RC can never be placed at the temporal beginning of the RC when this precedes the head noun.

Thus, we are left with only one way to solve the problems posed by the perceptual analysis of RCs in OV languages. This is to remove the RC from its position on the left of the head noun and place it to the right of it. If this happens, then the structural beginning of the RC will coincide with its temporal beginning.[23] But such a change implies a change in the direction of expansion of the linear sequence. This is constructed from right to left, and instead would have to be constructed from left to right in order to generate RCs following the head noun. But once this change occurs, the whole linear organization of the language will be inconsistent with the new building direction, and therefore it will tend to change in order to reestablish consistency. This change takes place along the time dimension and will determine the diachronic evolution of an original OV language into a VO language.

To sum up, our hypothesis is that one of the main causes of the shift from an OV to a VO organization is the pressure that the processing mechanism exerts on the structure constituted by prenominal RC towards a reorganization leading to a perceptually more favorable postnominal position. But since RC position is not an independent variable in the organization of language, a change to postnominal position triggers a structural pressure to reorganize the whole linear sequence, which will push the language towards a VO construction.

From this hypothesis we can derive some predictions which are subject to empirical verification. If the hypothesis is correct, then we would expect that in languages showing a drift from OV to VO, RC position (being one of the causes of such a change) will be diachronically one of the *first* features to change. Therefore, the change from prenominal to postnominal position of RC would have to come *before* most other changes connected to the general change in type; for example, before the change of object NP, indirect object NP and other complement NPs from preverbal to postverbal position.

On the other hand, the processing difficulties connected with prenominal position of RC will *delay* the unavoidable change from postnominal to pre-

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[23]Notice that this solution is not "impossible" in the same sense in which we said it is impossible to have initial marking of preposed RC. The latter would radically contradict the universal principle of logical expansion. As we said before, a sequence like **Gen   Specifying noun   Head noun* cannot be generated in *any* type of language. On the other hand, a sequence like *Head noun – Gen - Specifying noun* (which would result from the shift of modifiers to the right of the Head noun) can be generated and is inconsistent only with the *direction* of expansion of an OV language.

nominal position in a language that is undergoing a change from the VO to the OV type.[24] Therefore, in the opposite drift from VO to OV we would expect RC position to be one of the *last* features to change; for example, we would expect it to occur after the shift of NPs from postverbal to preverbal position.

This claim can be verified in both a direct and an indirect way. The direct way is to show that for those languages whose history is recorded the sequence of changes in features is actually the one predicted. We will offer below some evidence that this in fact is the case. But since there are not many languages whose history is recorded over the wide time span needed to verify our prediction, and furthermore the data available from remote periods of the history of a language are often very limited in size and/or type and difficult to interpret, we will also rely on indirect evidence.

In fact, a very strong synchronic claim can be derived from our hypothesis. Logically, there are four possible combinations of language type and RC positions:

(A)   OV – Prenominal RC
(B)   OV – Postnominal RC
(C)   VO – Prenominal RC
(D)   VO – Postnominal RC

As we said in section 2, (A) and (D) are the combinations determined by the structural principle. Now, if our hypothesis is correct, it follows that (B) will also be found among the languages of the world, but (C) won't. In fact, according to our hypothesis, if a language is undergoing a change from OV to VO, RC will move to postnominal position *before* the change of NPs to postverbal position has been established. Therefore, such a language will show, synchronically, a predominant OV order of sentence constituents and postnominal RC (B). On the other hand, if a language is undergoing a change from VO to OV, the shift of NPs to preverbal position will occur *before* RC moves to prenominal position. Thus, such a language will also show synchronically a predominant OV order of sentence constituents and postnominal RC.

A first check on this prediction can be done by looking at Greenberg's (1963) 30-language sample. In this sample all the languages classified as VO

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[24]Of course, such a change is not motivated by the RC structure. Notice that our hypothesis does not imply that VO languages are in general "simpler" than OV languages and consequently that there is a constant general drift from OV to VO. There are several respects in which VO languages are more problematic than OV languages, specifically in the interaction between the construction of the linear sequence determined by the principle of logical expansion and the distribution of Given and New information (see n.7). In Antinucci (1977a), it is argued that this conflicting interaction is one of the main factors motivating the shift from a VO to an OV typology.

(i.e., Greenberg's SVO and VSO) have postnominal RC. On the other hand, of all the languages classified as SOV, seven have prenominal RC, but two have postnominal RC. Two languages are said to have both prenominal and postnominal RC. One of these, Nubian, is classified as SOV and therefore is still consistent with our hypothesis. The second, Finnish, is instead classified as SVO. However, a closer examination of RC formation in Finnish (see Karlsson, 1972) shows that the predominant pattern is undoubtedly the postnominal one. Prenominal formation is limited to a few instances for which there are in any case corresponding postnominal constructions. Thus, our prediction seems to be confirmed.

A second check was done by extending the language sample. However, instead of making a random selection, we deliberately chose languages whose combination of typological features offered maximum probabilities of falsifying our hypothesis. Greenberg's Appendix II offers an extended list of languages classified into 24 groups according to all possible combinations of four features: basic order of S, V, and O; presence of prepositions vs. postpositions; relative position of head noun and genitive; relative position of head noun and adjective (3 × 2 × 2 × 2 = 24). Since the crucial prediction of our hypothesis is the absence of VO languages with prenominal RC, we looked at languages showing an SVO order accompanied by some features inconsistent with the VO type; i.e., at languages classified in Greenberg's groups 10–16. Since these languages have one or more of the three remaining features which are consistent with an OV construction, the probabilities of also finding prenominal RCs in them are in principle higher than in consistent VO languages. The results can be summarized as follows. Among the languages in group 10, where the inconsistent feature is prenominal adjective position, German, Dutch, and all the Slavic languages have postnominal RC. The three languages classified in group 11, Norwegian, Swedish and Danish, showing both prenominal adjective and prenominal genitive, all have postnominal RC. Group 12 includes only Arapesh for which we did not find data concerning RC position. Group 13 is empty. Group 14, where inconsistent features consist in the presence of postpositions and prenominal adjective positions, includes Rutulian and other Daghestan languages. Along these languages, Rutulian, Batsbi, Dido, Xwarši, all have postnominal RC (Vinogradov, 1966). On the other hand, Avar and Tabasaran have prenominal RC but their order is rigidly SOV. Among the languages of group 15, showing postposition, prenominal adjective and prenominal genitive, Finnish has already been discussed, Estonian has postnominal RC, Chinese instead has a prenominal RC construction. Finally, among languages of group 16 (postpositions and prenominal genitive), Twi, Ewe, Songhai and Guarani all have postnominal RC.

In conclusion, the entire group of languages checked confirmed our prediction with the only exception of Chinese.[25] On the other hand, the list of OV languages having postnominal RC can be easily extended. In addition to those in Greenberg's sample, they include, for example, Persian, Galla, Sumerian and Yaqui.

The limited amount of direct diachronic evidence available seems also to confirm our hypothesis. Lehmann (1974) has argued that Proto-Indo-European was OV in structure but was developing into a VO language at the time of the early dialects. He has further argued convincingly that PIE had prenominal RC without a marker, in accordance with the general OV pattern. The point relevant to our discussion is whether the establishment of postnominal RC preceded that of postverbal constituent order. Even a cursory examination of the relevant data suggests that this is, in fact, what happened. Ancient Greek has a well established postnominal RC construction, while still showing a predominant SOV order (see Dover, 1960). Even the most archaic phases of Latin, where SOV order is by far the most predominant (see Marouzeau, 1922), have a postnominal RC introduced by a relative pronoun. Hittite, which in the earliest records shows even some unmarked prenominal RCs, develops a postnominal RC introduced by a form of the pronoun *kuis* while its pattern of sentence construction is still SOV.

Some direct evidence can also be gathered in favor of our second prediction; namely, that in a language changing from VO to OV the RC will move to prenominal position *after* the shift of NPs to preverbal position. The case in question seems to be that of Hindi and some related Indo-Aryan languages. Today Hindi is a quite rigid SOV language. However, Bloch (1934), in his history of Indo-Aryan, dealing with the verb-final pattern, says that in the modern Indo-Aryan languages we find "la fixation d'un ordre qui n'était d'abord qu'habituel" (p. 306). This is shown by the fact that in Old Indo-Aryan (Asoka inscriptions) "les compléments indiquant la destination (infinitif, substantif au datif) se rejettent volontiers après le verbe", while these postverbal constructions are impossible today. Thus, it can be argued that the Modern Indo-Aryan languages have been drifting toward a more rigid SOV construction. This is confirmed by the history of another relevant

[25]Contrary to the Finnish case, where prenominal RC construction appears to be a more or less "frozen" relic of an older stage, the Chinese case looks like a real exception. At present, we are unable to offer any explanation for it; notice, however, that the question of main clause word-order in Chinese, both diachronically and synchronically, is a fairly complex and controversal one (see Li and Thompson, 1974; Tai, 1973; 1976). Since Chinese is one of the languages whose history is well attested to, a careful diachronic study of the relationship between NP and clause constituent-order should be conducted, before we can definitely assert its exceptionality.

feature. In Old Indo-Aryan there were prepositions. According to Chatterji (1926) they fell into gradual disuse and lost their separate status from Late Indo-Aryan. In Middle Indo-Aryan their number is very restricted. On the other hand, "the Indo-Aryan speech began to employ the accusative, dative, ablative or locative form of some suitable noun (with the sense of location, vicinity, direction, connexion, purpose or power) along with the principal noun which retained its original inflexion. Classical Sanskrit, following the Pakrit vernaculars, took up this device. This sort of auxiliary and post-positional use was later extended to some verbal formations" (p. 766). In other words, the Indo-Aryan languages lost prepositions and formed new postpositions deriving them from original nouns and verbs. This is another typical sign of evolution toward an OV pattern. Now, if we look at the RC, we find that these languages still today allow a postnominal RC introduced by a relative pronoun.

Again, our prediction seems to be confirmed. The Indo-Aryan languages have been undergoing a change toward an OV construction, as testified by the increasingly rigid verb-final order and by the loss of prepositions and formation of a system of postpositions, but they have not yet eliminated postnominal RCs.

A final case in favour of our hypothesis comes from Givon's (1975) reconstruction of the sequence of changes that Amharic has been undergoing in its shift form a VSO to an SOV organization. Here is his argument: "In this language the definite article is a noun suffix, but if a modifying adjective precedes the noun, the definite article is suffixed to that adjective:

måkina-w
car-the
"the car"

tɨlɨg-u makina
big-the car
"the big car"

In Ge'ez, the closest attestation to the VSO pre-Amharic, one finds the modifying adjective — with the definite suffix — *following* the noun. One may thus conclude, as is indeed attested in Ge'ez, that the definite article -*u* was an NP-final morpheme. In time it became *bound*, and when the older N-ADJ order changed to ADJ-N, the definite article moved with the adjective to which it was bound. Now here is the rub — in Amharic the definite article appears as a *verb suffix* when a noun is modified by a (preceding) relative clause:

mäkina yä-gazzä-w   säw
car   that-bought-the man
"the man who bought a car"

Since we know that the definitizer -*u*/-*w* was an NP-suffix in pre-Amharic, the only way of explaining its verb-suffix position in relative clauses is by assuming that there existed a stage in Amharic in which N-MOD was still the prevailing order within the noun phrase, but the VP syntax has already changed to SOV, so that in relative clauses the verb was positioned clause-final, and therefore also NP-final" (p. 93).

Thus, also in Amharic we find the sequence of changes predicted by our hypothesis: the shift of NPs to preverbal position *preceded* the shift of RC to prenominal position.

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Résumé

On propose ici une interprétation d'un changement diachronique dans le langage. Selon le point de vue adopté un des facteurs majeurs qui motive un changement de la syntaxe est dû à une interaction conflictuelle entre des principes déterminant l'organisation du langage. Plus spécifiquement on avance que la construction des propositions relatives rend conflictuels les principes d'origine structurelle et ceux d'origine perceptuelle dans les langues de type SOV. La manière dont une proposition relative est structurée dans un langage SOV est un obstacle à son calcul perceptuel. Ce conflit serait un des facteurs majeurs à l'origine du changement diachronique d'un langage d'une typologie OV à un langage d'une typologie VO.