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GAPPING AND THE ORDER OF CONSTITUENTS*

There are many examples in the literature of generative grammar which show how greatly the superficial structures of sentences can differ from the abstract structures which underlie them. Deep structures can contain elements or even whole clauses which do not appear in surface structure, and the order in deep structure of elements which appear in both levels of representation may be far different from the surface structure order of the same elements. Furthermore, it seems to be the case that even in apparently simple sentences, the transformational mapping between deep and surface structure is extremely complex — far more so, in fact, than has previously been thought.[1] These facts make it extremely difficult to ascertain the nature of deep structure, and necessitate the use of long chains of inference to this end. This paper, which is devoted to discovering the deep structure order of subject, verb, and object (hereafter S, V, and O), is centered on several such chains of inference.

In his important paper, "Some universals of grammar",[2] Joseph Greenberg divides the languages of the world into three major types, based on the position of the verb in the 'basic' or 'dominant' order of constituents. He does not explain which phenomena he takes as critical in deciding which of the many orders of S, V, and O that can be observed in a language is basic, but some examples of each of his three types will illustrate what he means. Type I languages have the verb in the first position in their basic order — VSO: Arabic is an example. Type II languages, like English, exhibit SVO order, and Type III languages, like Japanese, SOV order.

It now appears doubtful that one of Greenberg's universals — that subject precedes

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[1] Many arguments to this effect will be presented in *The Abstractness of Underlying Structure*, by George Lakoff and John Robert Ross (in preparation).

[2] Cf. pp. 73–113, and especially p. 76, in *Universals of Language*, Joseph Greenberg (ed.), first paperback edition, M.I.T. Press, Cambridge (1966).

object in the basic order — can be maintained: Paul Schachter has informed me that the basic order in Tagalog and related languages is VOS; Ives Goddard that the unmarked order in Algonkian is OVS; and Guy Carden that the basic order in Aleut is OSV. But whether or not all six possible orders must be assumed to exist in deep structure is not my concern here. My aim is the more modest one of providing a way of deciding when a language is Type II or Type III.

With this goal in mind, let us consider the English rule of GAPPING, which converts structures underlying such sentences as those in (1) into those underlying the corresponding sentences in (2).

(1) (a) *I ate fish, Bill ate rice, and Harry ate roast beef*
(b) *Tom has a pistol, and Dick has a sword*
(c) *I want to try to begin to write a novel, and Mary wants to try to begin to write a play*

(2) (a) *I ate fish, Bill rice, and Harry roast beef*
(b) *Tom has a pistol, and Dick a sword*
(c) *I want to try to begin to write a novel, and*

$$\textit{Mary} \left\{ \begin{array}{r} \textit{to try to begin to write a play} \\ \textit{to begin to write a play} \\ \textit{to write a play} \\ \textit{a play} \end{array} \right\}$$

This rule operates to delete indefinitely many occurrences of a repeated main verb in a conjoined structure. The problem of formulating the rule so that it will convert (1c) into any of the sentences in (2c) has not been solved, and seems to require an *ad hoc* abbreviatory convention: I know of no other rules which make use of this convention. There are many other problems that are connected with GAPPING: note, *e.g.*, that the sentences in (3) cannot be converted into those in (4).

(3) (a) *I didn't eat fish, Bill didn't eat rice, and Harry didn't eat roast beef*
(b) *They have been arrested, and we have been being followed*
(c) *I want Bob to shave himself, and Mary wants Bob to wash himself*

(4) (a) **I didn't eat fish, Bill rice, and Harry roast beef*
(b) **They have been arrested, and we (been) being followed*
(c) **I want Bob to shave himself, and Mary to wash himself*

But since an exact formulation of the rule of GAPPING is not my main concern in this paper, I will sidestep these problems here.

Note that GAPPING operates only forward in English — that is, in n conjoined sentences, it is the leftmost occurrence of the identical main verb that causes the n-1 following occurrences to be deleted. In Japanese, an SOV language, exactly the opposite is the case — it is the rightmost verb among n identical verbs that is retained. Thus (5a) becomes (5b).

(5) (a) *watakusi wa sakana o tabe, Biru wa gohan o tabeta*
I (prt) *fish* (prt) *eat, Bill* (prt) *rice* (prt) *ate*
(I ate fish, and Bill ate rice)
(b) *watakusi wa sakana o, Biru wa gohan o tabeta*
I (prt) *fish* (prt), *Bill* (prt) *rice* (prt) *ate*
(I ate fish, and Bill rice)

Schematically, sentences of the form (6a) are converted to sentences of the form (6b), and sentences of the form (7a) are converted to sentences of the form (7b).

(6) (a) SVO + SVO + SVO + ... + SVO ⇒
(b) SVO + SO + SO + ... + SO

(7) (a) SOV + SOV + SOV + ... + SOV ⇒
(b) SO + SO + ... + SO + SOV

Given these facts, an obvious hypothesis suggests itself:

(8) The order in which GAPPING operates depends on the order of elements at the time that the rule applies; if the identical elements are on left branches, GAPPING operates forward; if they are on right branches, it operates backward.

This hypothesis finds further support in a language like Russian, where word order is freer than it is in English or Japanese, and where sentences both of form (6a) and of form (7a) occur.

(9) (a) *ja pil vodu, i Anna pila vodku*
(I drank water, and Anna drank vodka
(b) *ja vodu pil, i Anna vodku pila*
I water drank, and Anna vodka drank
(I drank water, and Anna drank vodka)

As the hypothesis predicts, (9a), which is of form (6a), can be gapped forward to produce (10a); and (9b), which is of form (7a), can be gapped backward to produce (10b).

(10) (a) *ja pil vodu, i Anna vodku*
(I drank water, and Anna vodka)
(b) *ja vodu, i Anna vodku pila*
I water, and Anna vodka drank
(I drank water, and Anna vodka)

Leaving aside, for the time being, the problem of whether Russian has SVO or SOV order in deep structure, it is clear that these Russian facts of gapping can be accounted for if the rule of GAPPING follows SCRAMBLING, the rule which optionally permutes

major elements of a clause, subject to various conditions which need not concern us here. That is, the two rules must be ordered as shown in (11)

(11) SCRAMBLING OPTIONAL
GAPPING OPTIONAL

But there is a third sentence, of a type not found in English or Japanese, which can be derived from the deep structure underlying the sentences in (9).

(12) *ja vodu pil, i Anna vodku*
I water drank, and Anna vodka
(I drank water, and Anna vodka)

This sentence is of the schematic form shown in (13):

(13) SOV + SO + SO + ... + SO

At least superficially, (12) provides counterevidence for the hypothesis stated in (8), for GAPPING has operated forward, despite the fact that the verb is on the right branch of the first conjunct. Must the hypothesis then be abandoned?

I think not, for the Russian facts can be explained in another way. And if (8) is abandoned entirely, how can it be explained that, to my knowledge, no language in the world has sentences of the schematic form shown in (14)?

(14) *SO + SO + ... + SO + SVO

Below, I will provide an explanation for the universal impossibility of sentences of this form — an explanation which makes crucial use of (8).

Let us now return to the problem of accounting for the Russian sentence in (12). If we assume that Russian has the deep structure order SVO, and that GAPPING is an 'anywhere rule' — *i.e.*, a rule that can apply at any point in a derivation[8] — then

[8] There is independent evidence that this convention of rule application is necessary, regardless of how the problems posed by sentences involving GAPPING are dealt with. In his "Deep and Surface Grammar" (unpublished Harvard mimeograph, 1967), George Lakoff argues that such sentences as

Mary is said to be tall, but I don't believe it

require that the rule of S DELETION, which deletes under identity a sentence immediately dominated by an NP whose head noun is the pronoun *it*, must apply pre-cyclically to the whole tree before the cyclically ordered rules of IT REPLACEMENT and PASSIVE can apply. If this same rule of S DELETION is to produce also such sentences as

John condescended to kiss the bishop's foot, but I wouldn't agree to it

it can be seen that S DELETION will have to follow the cyclic rule of EQUI NP DELETION, the rule which deletes the subject of the clausal objects of *condescend to* and *agree to* in the above sentence, for prior to the application of this rule, these embedded clauses are not identical, and S DELETION will not apply. Since S DELETION thus must sometimes apply pre-cyclically, and sometimes after the application of a cyclic rule, Lakoff has proposed that it be allowed to apply at any point in a derivation. So far, no countercases due to this extremely strong hypothesis have been found. I will thus assume that GAPPING can be another such 'anywhere rule'.

Various problems involving the ordering of syntactic transformational rules will be examined in detail in George Lakoff and John Robert Ross, *The Transformational Component* (in preparation).

sentences like (10a), (10b), and (12) will be derivable from the deep structure underlying the sentences in (9), but no sentence of the form (14) will be. For if GAPPING is an anywhere rule, it will be able to apply before and after SCRAMBLING, as shown in (15), and the derivations of (10a), (10b) and (12) will proceed as shown in (16).

(15) GAPPING OPTIONAL
SCRAMBLING OPTIONAL
GAPPING OPTIONAL

(16) (a) Base: SVO + SVO $\overset{\textit{Forward Gapping}}{\Rightarrow}$ SVO + SO [=(10a)]

(b) Base: SVO + SVO $\overset{\textit{Scrambling}}{\Rightarrow}$ SOV + SOV $\overset{\textit{Backward Gapping}}{\Rightarrow}$ SO + SOV [=(10b)]

(c) Base: SVO + SVO $\overset{\textit{Forward Gapping}}{\Rightarrow}$ SVO + SO $\overset{\textit{Scrambling}}{\Rightarrow}$ SOV + SO [=(12)]

It should be evident that (14) cannot be derived by the rule ordering shown in (15), if the deep structure order of constituents is SVO. For in (14), GAPPING has operated backwards, which is only possible, on hypothesis (8), if all conjuncts have the order SOV. But if the basic order was SVO, the order SOV can only have resulted through SCRAMBLING. But then, if backward gapping occurs after SCRAMBLING, the last conjunct will remain in the SOV order of sentence (10b), not the SVO of (14), for SCRAMBLING has been passed in the ordering, and cannot reapply.

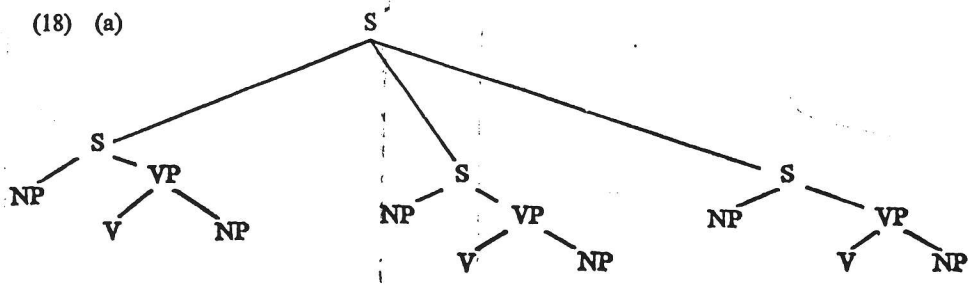
However, if the basic order were SOV, rules ordered as in (15) could derive (14), as the derivation in (17) shows.

(17) Base: SOV + SOV $\overset{\textit{Backward Gapping}}{\Rightarrow}$ SO + SOV $\overset{\textit{Scrambling}}{\Rightarrow}$ *SO + SVO [=(14)]

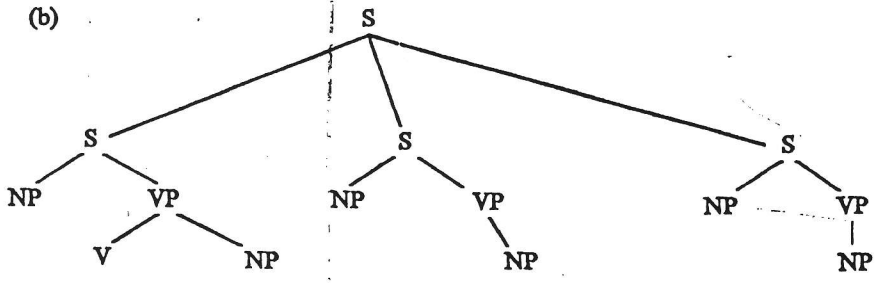
Thus we can see that one long chain of inference is necessary to establish that Russian has the deep structure order SVO, and not SOV. More inferences of the same sort will follow.

It might be objected that it is wrong to collapse the two rules which effect what I have called forward gapping and backward gapping, on the grounds that they perform different operations on trees. Thus while it seems intuitively reasonable to claim that SVO input structures are gapped by merely deleting the last *n-1* instances of the verb, as in the conversion of (18a) into (18b),

(18) (a)

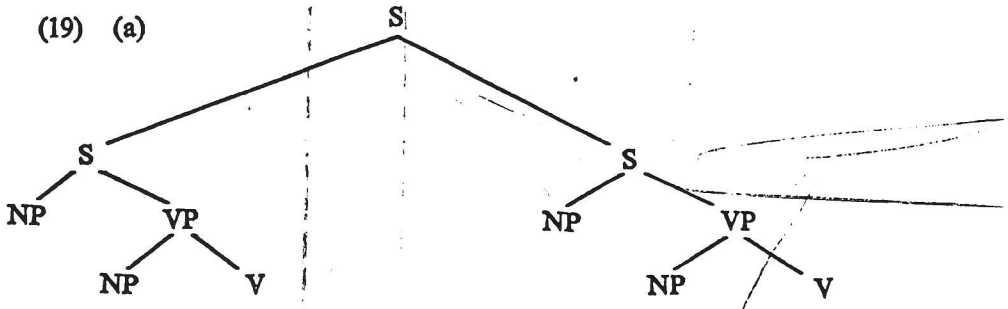


(b)

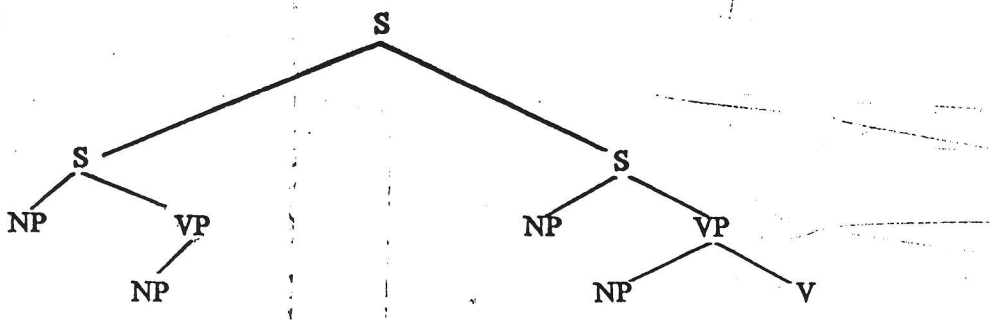


it may seem wrong to merely delete the first *n-1* occurrences of the verb in backward gapping, as shown in the conversion of (19a) into (19b).

(19) (a)



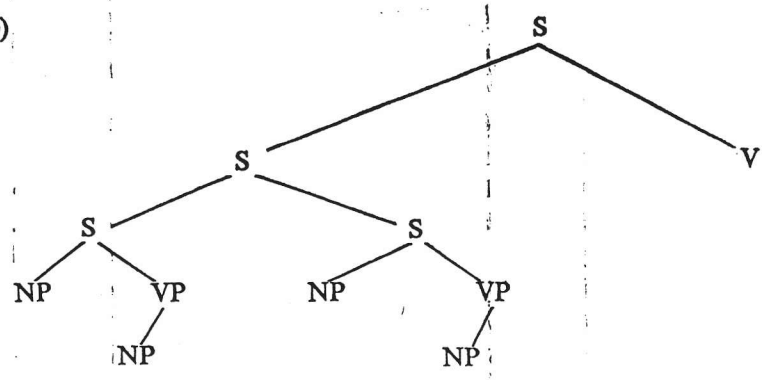
(b)



For some speakers feel that the largest constituent break in sentences in which Gapping has proceeded backward, such as (5b) or (10b), should be directly before the verb, a fact which (19b) does not reflect. For these speakers, a more reasonable derived

constituent structure, after (19a) has been gapped, would be that shown in (20).

(20)



Speakers of different languages disagree about the constituency of sentences which result from backward gapping, but if structures like (20) are ever necessary, there is an independently necessary rule of conjunction reduction which could convert (19a) into (20).[4] Nonetheless, despite the fact that the formal operations involved in converting (18a) into (18b) are quite different from those which would be involved in changing (19a) into (20) I still feel that the rules which effect these changes should be collapsed. For note that in (10b), in which backward gapping has occurred, the verb *pila* 'drank' has the feminine ending *-a*, agreeing with the gender of the subject NP, *Anna*, of the right conjunct of (9b). Thus it is the rightmost verb that has been kept in backward gapping, even if it has been raised out of its VP to become a sister to the conjoined S-node as in (20). I believe this similarity to outweigh the dissimilarity of the operations involved, and I will therefore continue to speak of two varieties of gapping, and to consider that GAPPING is an anywhere rule. This may be a wrong decision on my part, but I do not believe it will affect the argument below one way or the other.

In (21), I have put into one list all the four logically possible outputs of GAPPING. There are, of course, many more outputs if other orders than just SVO and SOV, to which this study is restricted, are taken into consideration.

(21) A. SVO + SO + SO + ... + SO } *Forward Gapping*
B. SOV + SO + SO + ... + SO }

C. SO + SO + ... + SO + SOV } *Backward Gapping*
D. *SO + SO + ... + SO + SVO }

Type *A* is the same as (6b), type *B* the same as (13), type *C* the same as (7b), and type *D* is the same as the impossible (14). As I showed above, Russian exhibits all of the three possible output structures, Japanese only type *C*, and English only type *A*. In (22), I have taken all eight logically possible subsets of these first three output types and listed them at the heads of columns. The names of languages under them

[4] This rule will be discussed in detail in Lakoff and Ross, *The Transformational Component*.

exhibit just those output types at the top of the column. If a column heading is starred, it means that I know of no language which exhibits all and only the output types it lists.

(22)

**None*	*Only A*	**Only B*	*Only C*
	English		Japanese
	French		Siouan
	German (main clauses)		
**Only AB*	**Only AC*	*BC*	*ABC*
		Hindi	Russian
		Turkish	Latin
		German	
		(subordinate clauses)	

How can the strange distribution of facts in (22), and the fact that no language exhibits outputs of type *D*, be accounted for? As far as I can see at present, they can be accounted for only if hypothesis (8) — that the direction in which GAPPING operates is universally determined by the input phrase structure configuration — is assumed to be correct and added to the theory of language. The strongest indications that (8) must be correct come from the predicted nonexistence of languages exhibiting type *D* outputs, and from the nonexistence of languages exhibiting only outputs of type *B*. Inspection of (22) reveals that every language exhibiting type *B* also exhibits type *C*. I will attempt an explanation of this fact presently: here it is sufficient to note that hypothesis (8) correctly allows for the existence of such languages as English and Japanese, whose grammars do not contain the rule of SCRAMBLING, and which gap only forward or only backward, respectively, while excluding SOV languages which gap only forward, and languages which exhibit type D outputs.

I know of no language which exhibits no gapping behavior of any kind [hence the asterisk before *None* in (22)], but even if such languages should prove to exist, hypothesis (8) would not be refuted! If it is assumed that GAPPING must be an anywhere rule in any language in whose grammar it occurs, the nonexistence of languages exhibiting only output types *AB* or *AC* can be explained. A language would exhibit only types *A* and *B* if it had underlying SVO order and could gap before SCRAMBLING but not after, and a language would exhibit only types *A* and *C* if it could gap only after SCRAMBLING. I must emphasize, however, that even if languages exhibiting only *AB* or only *AC* can be found, hypothesis (8) can be maintained: it is only the claim that forward and backward gapping are effected by one anywhere rule that would have to be abandoned.

Now let us return to the question of languages which exhibit only the output types *B* and *C*. With the exception of German, to which I will return below, these languages would be classified as SOV languages by Greenberg. What then differentiates *BC* languages, like Hindi, from *C* languages, like Japanese, which were both classified as SOV languages by Greenberg (*cf.* op. cit. p. 107)?

The answer to this question that I propose is the following: *C* languages, which gap only backward, have SOV order in deep structure, whereas *BC* languages, which gap in both directions, have underlying SVO order. In other words, despite the fact that verbs appear only clause-finally in both Japanese and Hindi, I would argue that in Hindi, verbs start out before their objects, and then, after GAPPING has had a chance to apply forward, they are obligatorily moved to the end of their VP, where backward gapping will subsequently also be able to apply. That is, despite the superficial similarity of *BC* languages to *C* languages, I would analyze the former as being deeply similar to *ABC* languages, where an obligatory rule has prevented *A* type outputs from appearing.

There is one other piece of evidence which separates *C* languages from *BC* languages: the former languages appear not to have rules of the form shown in (23), while *BC* languages always have such rules.

(23) ... A ... X
1 2 ⇒ 0 2 + 1

In other words, while the grammars of *BC* languages in particular, and in general of all languages whose deep structure order is SVO, can contain rules which permute elements rightward around a variable, the grammars of *C* languages cannot contain such rules.

An English example of a rule of the form of (23) is the rule of EXTRAPOSITION FROM NP, which I have stated in following:

(24) *Extraposition from NP*
X — [NP — S]$_{NP}$ — Y
1 2 3 4 ⇒
1 2 0 4 + 3

This rule converts the structures underlying such sentences as those in (25) to the structures underlying the corresponding sentences in (26).

(25) (a) A woman who was wearing a fur coat came in
(b) I gave a pistol which I had found in my soup to the inspector

(26) (a) A woman came in who was wearing a fur coat
(b) I gave a pistol to the inspector which I had found in my soup

That the grammar of German, which exhibits only SOV order in subordinate clauses, must also contain rule (24) can be seen from the fact that both the sentences of (27) are grammatical.

(27) (a) *Wir gafften, weil eine Frau, die einen Pelzmantel trug, herein-*
We gawked because a woman, who a fur coat was wearing in
gekommen war
come had

(We gawked, because a woman who was wearing a fur coat had come in)

(b) *Wir gafften, weil eine Frau hereingekommen war, die einen Pelzmantel trug*
(We gawked, because a woman had come in who was wearing a fur coat)

Neil Smith has informed me that Hindi also appears to have some rule of extraposition, of the form shown in (23), although it appears to be much more limited than the German and English rules. And Greenberg (*op. cit.*, fn. 10) points out that in Turkish, a dative or locative noun phrase can follow the verb. Both these languages, although Greenberg classifies them as SOV languages, gap in both directions, and are therefore *BC* languages.

As far as I know, a language will gap only backwards, if and only if its grammar contains no rules of the form shown in (23). I propose that it is just these languages which should be analyzed as having SOV order in deep structure, and that principle (28) be added to the theory of grammar.

(28) If a language has SOV order in deep structure, it is a VERB-FINAL LANGUAGE: its grammar can contain no rule which moves verbs to the left, nor any rule of the form of (23).

If this principle is right, it will occasion a sweeping revision of the analyses of Hindi and Turkish, which must be analyzed as being SVO, and not SOV, languages. And similarly, German, which exhibits SVO order in main clauses, but SOV order in subordinate clauses, cannot be derived from deep structures manifesting SOV order, as has been assumed in previous generative analyses.[5] Both the fact that German contains rules of the form of (23), as can be seen from the grammaticality of (27b), and the fact that GAPPING can operate in either direction in subordinate clauses [thus (29) can be converted into (30a) or (30b)] indicate that German should be considered to be an SVO language in deep structure.

(29) *Weil ich das Fleisch aufass, und meine Mutter den Salat aufass, wurden*
Because I the meat up ate, and my mother the salad up ate, became
wir beide krank
we both sick
(Because I ate up the meat, and my mother ate up the salad, we both got sick)

(30) (a) *Weil ich das Fleisch, und meine Mutter den Salat aufass, wurden wir beide krank*

(b) *Weil ich das Fleisch aufass, und meine Mutter den Salat, wurden wir beide krank*

If my proposed analysis of German and Hindi as SVO languages is correct, it will have deep consequences for the comparative syntax of Indo-European, for it will mean that Proto-Indo-European was an SVO language also. For all other non-free

[5] Cf. e.g. Manfred Bierwisch, *Grammatik des Deutschen Verbs*, (*Studia Grammatica*, II) Akademie Verlag, Berlin, 1963.

word-order languages which descended from it seem clearly to be SVO languages, except for these two and Dutch, which is closely related to German.

To recapitulate briefly, I have attempted to account for the nonexistence of sentence structures of the form shown in (14), and for the distribution of facts in (22), by the following set of four hypotheses:

(31) (a) Hypothesis (8) — the direction of GAPPING depends on the input phrase-structure configuration.

(b) Hypothesis (28) — Languages whose deep structure order is SOV always have the verb in clause-final position.

(c) GAPPING is an anywhere rule in any language in whose grammar it appears.

(d) GAPPING is a universal rule: it is to be stated in its most general form in the theory of language, and by convention, every grammar will be able to make use of it in some form. (It is of course to be expected that some grammars may impose language-particular conditions on this rule.)

If the facts are as I have asserted in (22), I know of no simpler explanation for them than this set of hypotheses.

In conclusion, note that although hypothesis (8) and principle (28) are fairly abstract hypotheses, it is easy to prove them wrong. If further research on syntax confirms them, however, their use in the above discussions about what the deep structure order of subject, verb, and object is, in languages like Russian, Japanese, and German, provides a good example of the complexity of arguments which often must be brought to bear in trying to increase our knowledge of deep structure.