

# "SOME UNIVERSALS OF GRAMMAR WITH PARTICULAR REFERENCE TO THE ORDER OF MEANINGFUL ELEMENTS"

JOSEPH H. GREENBERG

Stanford University

In: Joseph H. Greenberg (ed.). 1963. Universals of Language. London: MIT Press, pp. 73-113.

---

## 1. **Introduction**

2. [The Basic Order Typology](#)

3. [Syntax](#)

4. [Morphology](#)

5. [Conclusion: Some General Principles](#)

Appendix I: [Basic Data on the 30-Language Sample](#)

Appendix II: [Distribution of Basic Order Types](#)

Appendix III: [Universals Restated](#)

Aufgabe 2. Wieweit erfüllt eine Sprache wie Deutsch oder Englisch, die Greenberg als SVO typologisch kennzeichnet, diese Charakterisierung? Überprüfen Sie Universal 1-25 und erläutern Sie mit Beispielen!

## 1. Introduction\*

---

The tentative nature of the conclusions set forth here should be evident to the reader. Without much more complete sampling of the world's languages, the absence of exceptions to most of the universals asserted here cannot be fully assured. As indicated by the title, attention has been concentrated largely, but by no means exclusively, on questions concerning morpheme and word order. The reason for this choice was that previous experience suggested a considerable measure of orderliness in this particular aspect of grammar. In the body of this paper a number of universals are proposed. A large proportion of these are implicational; that is, they take the form, "given x in a particular language, we always find y." When nothing further is said, it is understood that the converse, namely, "given y, we always find x," does not hold. Where the two sets of characteristics are binary, the typical distribution in a tetrachoric table is a zero as one of the four entries.<sup>1</sup> From the point of view of scientific methodology, there is nothing to apologize for in such results, and this is so for two reasons. First, the lowest-level laws as described in manuals of scientific method take precisely this form.<sup>2</sup> Second, what seem to be non-universals about language are in fact tacitly implicational since they are implied by the definitional characteristics of language.<sup>3</sup> Further, to assert the definitional characteristics themselves is obviously tautologous.

It is perhaps worth while to point out that a number of universals of the second type -- that is, those implied by the definitional characteristics of language -- although not usually formally stated in this paper, are in fact involved in the notion of the general comparability of languages in the grammatical sphere which underlies the specific statements found here. For example, a whole series of universals in the usual sense are assumed in such a statement as the following: If a language has verb-subject-object as its basic word order in main declarative clauses, the dependent genitive always follows the governing noun. It is here assumed, among other things, that all languages have subject-

predicate constructions, differentiated word classes, and genitive constructions, to mention but a few. I fully realize that in identifying such phenomena in languages of differing structure, one is basically employing semantic criteria. There are very probably formal similarities which permit us to equate such phenomena in different languages. However, to have concentrated on this task, important in itself, would have, because of its arduousness, prevented me from going forward to those specific hypotheses, based on such investigation, which have empirical import and are of primary interest to the nonlinguist. Moreover, the adequacy of a cross-linguistic definition of 'noun' would, in any case, be tested by reference to its results from the viewpoint of the semantic phenomena it was designed to explicate. If, for example, a formal definition of 'noun' resulted in equating a class containing such glosses as 'boy', 'nose', and 'house' in one language with a class containing such items as 'eat', 'drink', and 'give' in a second language, such a definition would forthwith be rejected and that on semantic grounds. In fact, there was never any real doubt in the languages treated about such matters. There is every reason to believe that such judgments have a high degree of validity. If, for example, someone were to dispute the specific assignment of order type of a genitive construction given in this paper, it is quite clear on what evidence such an assignment would be accepted or rejected.

For many of the statements in this paper, a sample of the following 30 languages has been utilized: Basque, Serbian, Welsh, Norwegian, Modern Greek, Italian, Finnish (European); Yoruba, Nubian, Swahili, Fulani, Masai, Songhai, Berber (African); Turkish, Hebrew, Burushaski, Hindi, Kannada, Japanese, Thai, Burmese, Malay (Asian); Maori, Loritja (Oceanian); Maya Zapotec, Quechua, Chibcha, Guarani (American Indian). This sample was selected largely for convenience. In general, it contains languages with which I had some previous acquaintance or for which a reasonably adequate grammar was available to me. Its biases are obvious, although an attempt was made to obtain as wide a genetic and areal coverage as possible. This sample was utilized for two chief purposes. First, it seemed likely that any statement which held for all of these 30 languages had a fair likelihood of complete or, at least, nearly complete universal validity. Second, less reliably, it serves to give some notion of the relative frequency of association of certain grammatical traits. In this respect, of course, it is not to be taken literally. On some questions I have gone well outside the sample.

The main section of the paper, which follows, is concerned with the establishment of universals on the basis of the empirical linguistic evidence. These are presented with a minimum of theoretical comment. The final section is exploratory, seeking to discover what general principles may exist from which at least some of the generalizations of the earlier sections might be deduced. For convenience of exposition, the universals scattered though the text are repeated for cross reference in Appendix III. The theoretical section is far more speculative and uncertain than the sections devoted to the universals themselves. In a certain sense we would prefer to have as few universals as possible, not as many. That is, we would like to be able to deduce them from as small a number of general principles as possible. However, the establishment of a relatively large number of empirical generalizations must, on the whole, come first. For one thing, it would be embarrassing to deduce a particular universal from what seemed like a valid general principle, only to discover that the generalization was not empirically valid.

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 73-75.

## 2. The Basic Order Typology<sup>\*/4</sup>

---

Linguists are, in general, familiar with the notion that certain languages tend consistently to put modifying or limiting elements before those modified or limited, while others just as consistently do the opposite. Turkish, an example of the former type, puts adjectives before the nouns they modify, places the object of the verb before the verb, the dependent genitive before the governing noun, adverbs before adjectives which they modify, etc. Such languages, moreover, tend to have postpositions for concepts expressed by prepositions in English. A language of the opposite type is Thai, in which adjectives follow the noun, the object follows the verb, the genitive follows the governing noun, and there are prepositions. The majority of languages, as for example English, are not as well marked in this respect. In English, as in Thai, there are prepositions, and the noun object follows the verb. On the other hand, English resembles Turkish in that the adjective precedes the noun. Moreover, in the genitive construction both orders exist: 'John's house' and 'the house of John'.

More detailed consideration of these and other phenomena of order soon reveals that some factors are closely related to each other while others are relatively independent. For reasons which will appear in the course of the exposition, it is convenient to set up a typology involving certain basic factors of word order. This typology will be referred to

as the basic order typology. Three sets of criteria will be employed. The first of these is **the existence of prepositions as against postpositions**. These will be symbolized as Pr and Po, respectively. The second will be **the relative order of subject, verb, and object in declarative sentences** with nominal subject and object. The vast majority of languages have several variant orders but a single dominant one. Logically, there are six possible orders: SVO, SOV, VSO, VOS, OSV, and OVS. Of these six, however, only three normally occur as dominant orders. The three which do not occur at all, or at least are excessively rare, are VOS, OSV, and OVS. These all have in common that the object precedes the subject. This gives us our first universal:

**Universal 1. In declarative sentences with nominal subject and object, the dominant order is almost always one in which the subject precedes the object.**<sup>5</sup>

This leaves us with three common types: VSO, SVO, and SOV. These will be symbolized as I, II, and III, respectively, reflecting the relative position of the verb.

The third basis of classification will be **the position of qualifying adjectives (i.e., those designating qualities) in relation to the noun**. As will be seen later, the position of demonstratives, articles, numerals, and, quantifiers (e.g., 'some', 'all') frequently differs from that of qualifying adjectives. Here again there is sometimes variation, but the vast majority of languages have a dominant order. Dominant order with adjective preceding noun will be symbolized by A and dominant order with noun preceding adjective by N. We thus arrive at a typology involving 2 x 3 x 2, that is, twelve logical possibilities. The 30 languages of the sample are distributed among these twelve classes as shown in Table 1.<sup>6</sup>

TABLE 1

	I	II	III
Po-A	0	1	6
Po-N	0	2	5
Pr-A	0	4	0
Pr-N	6	6	0

The table has been arranged so that the 'extreme' types Po-A and Pr-N are in the first and fourth row, respectively. It is evident that with respect to these extremes, I and III are polar types, the former being strongly correlated with Pr-N and the latter with Po-A. Type II is more strongly correlated with Pr-N than with Po-A. It is also clear that adjective position is less closely related to types I, II, and III than is the Pr/Po contrast. The table is, I believe, a fair representation of the relative frequency of these alternatives on a world-wide basis. Type II is the most frequent; type III almost as common; type I is a definite minority. This means that the nominal subject regularly precedes the verb in a large majority of the world's languages.

Turning for a moment to genitive order, we note that this characteristic might fittingly have been utilized for typological purposes. The reason for not employing it is its extremely high correlation with Pr/Po, a fact generally known to linguists. It would thus virtually have duplicated the latter criterion. It was not chosen because Pr/Po on the whole is slightly more highly correlated with other phenomena. Of the present sample of 30 languages, 14 have postpositions, and in every one of these the genitive order is genitive followed by governing noun. Of the 14 prepositional languages, 13 have the genitive following the governing noun. The only exception is Norwegian, in which the genitive precedes. Thus, 29 of the 30 cases conform to the rule. If anything, 1/30 is an overestimation of the proportion of exceptions on a world-wide basis. We therefore have the following universal:

**Universal 2.** In languages with prepositions, the genitive almost always follows the governing noun, while in languages with postpositions it almost always precedes.

Turning once more to the data of Table 1, we find striking evidence of lawful relationships among the variables in that of the 12 possibilities 5, or almost half, are not exemplified in the sample. All of these types are either rare or nonexistent.<sup>7</sup> For type I, we see that all 6 languages of the sample are Pr/N. This holds with extremely few exceptions on a world-wide basis. There are, however, a few valid examples of I/Pr/A, the mirror image, so to speak, of the fairly frequent III/Po/N. On the other hand, there are, as far as I know, no examples of either I/Po/A or I/Po/N. Hence we may formulate the following universal:

**Universal 3.** Languages with dominant VSO order are always prepositional.

Languages of type III are, as has been seen, the polar opposites of type I. Just as there are no postpositional languages in type I, we expect that there will be no prepositional languages in type III. This is overwhelmingly true, but I am aware of several exceptions.<sup>8</sup> Since, as has been seen, genitive position correlates highly with Pr/Po, we will expect that languages of type III normally have GN order. To this there are some few exceptions. However, whenever genitive order deviates, so does adjective order, whereas the corresponding statement does not hold for Pr/Po.<sup>9</sup> We therefore have the following universals:

**Universal 4.** With overwhelmingly greater than chance frequency, languages with normal SOV order are postpositional.

**Universal 5.** If a language has dominant SOV order and the genitive follows the governing noun, then the adjective likewise follows the noun.

An important difference may be noted between languages of types I and III. In regard to verb-modifying adverbs and phrases as well as sentence adverbs, languages of type I show no reluctance in placing them before the verb so that the verb does not necessarily begin the sentence. Further, all VSO languages apparently have alternative basic orders among which SVO always figures. On the other hand, in a substantial proportion, possibly a majority, of type III languages, the verb follows all of its modifiers, and if any other basic order is allowed, it is OSV. Thus the verb, except possibly for a few sentence modifiers (e.g., interrogative particles), is always at the end in verbal sentences. It is not logically required, of course, that languages all of whose basic orders involve the verb in

the third position should also require all verb modifiers to precede the verb, but this seems to hold empirically. Thus, languages in which the verb is always at the end may be called the "rigid" subtype of III. In the present sample, Burushaski, Kannada, Japanese, Turkish, Hindi, and Burmese belong to this group, while Nubian, Quechua, Basque, Loritja, and Chibcha do not.<sup>10</sup> These considerations permit us to state the following as universals:

**Universal 6.** All languages with dominant VSO order have SVO as an alternative or as the only alternative basic order.

**Universal 7.** If in a language with dominant SOV order, there is no alternative basic order, or only OSV as the alternative, then all adverbial modifiers of the verb likewise precede the verb. (This is the rigid subtype of III.)

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 76-80.

### 3. Syntax\*

---

Having defined the basic order typology and stated some of the universals that can be most immediately derived from the consideration of its defining properties, we turn to a number of syntactic universals, many but not all of which are associated with this typology. One set of criteria employed in this typology was the order of nominal subject, nominal object, and verb in declarative sentences. One reason for stating the criteria in this manner was that interrogative sentences tend to exhibit certain characteristic differences as compared to declarative statements. There are two main categories of questions, those of the yes-no variety and those involving specific question words. A common method of differentiating yes-no questions from the corresponding statement is by a difference of intonational pattern, as in English. Our knowledge of these patterns still leaves much to be desired. However, the following statement seems to be sufficiently documented:

***Universal 8.*** When a yes-no question is differentiated from the corresponding assertion by an intonational pattern, the distinctive intonational features of each of these patterns are reckoned from the end of the sentence rather than from the beginning.

For example, in English a yes-no question is marked by a rise in pitch in the last stressed syllable of the sentence and the corresponding statement by falling pitch. The reckoning of distinctive patterns from the end of the sentence may well hold for all intonational patterns.

Yes-no questions may likewise be signaled by a question particle or affix. Some languages use both this method and intonation as alternatives. The position of such question markers is fixed by either reference to some specific word, most frequently the verb, or the emphasized word of the question, or it may be fixed by position in the sentence as a whole. In languages of the rigid subtype III, it is of course impossible to distinguish between position after the verb and position at the end of the sentence. In the present sample, there are 12 languages with such initial or final particles. With reference to the basic order typology, these 12 examples are distributed as shown in Table 2.<sup>11</sup>

TABLE 2

	I	II	III
Initial particle	5	0	0
Final particle	0	2	5

The two examples of a final particle in group II are prepositional languages (Thai and Yoruba). The table includes only cases where there is a single such particle or affix in the language, or there are several following the same rule. In two of the languages in the samples, there is more than one such element, each with differing rules. Zapotec (I/Pr) has either an initial particle alone or this same particle in conjunction with a final particle. Songhai (II/Po) has three such particles, two of them an initial and one a final particle. These complications as well as the fact that at least one language outside of the sample belonging to (II/Po), namely, Lithuanian, has an initial particle suggest the following rather cautious statement:

**Universal 9.** With well more than chance frequency, when question particles or affixes are specified in position by reference to the sentence as a whole, if initial, such elements are found in prepositional languages, and, if final, in postpositional.

Where specification depends on some particular word, the particle almost always follows. Such particles are found in 13 languages of the present sample.<sup>12</sup> Examples of the rigid subtype III are counted in both this and the previous category. Of these 13, 12 are suffixed. They include both prepositional and postpositional languages, but none is group I. The following, therefore, probably, holds:

**Universal 10.** Question particles or affixes, when specified in position by reference to a particular word in the sentence, almost always follow that word. Such particles do not occur in languages with dominant order VSO.

The other basic kind of question, that involving an interrogative word, likewise shows a definite relationship to the basic order typology. In such sentences, many languages have a different word order than that of the corresponding declarative sentence.

Characteristically, the question word comes first, except for the possible retention of normal order within smaller units (e.g., phrases). This holds in English, for example, where the question word is first in 'What did he eat?' as against the statement, 'He ate meat'. The second point is illustrated by 'With whom did he go?' as against 'He went with Henry', where the question phrase comes first but the order within the phrase itself is not disturbed. Many languages which put interrogatives first likewise invert the order of verb and subject (e.g., German 'Wen sah er?'). Such languages sometimes invert for yes-no questions, (e.g., 'Kommt er?'). It appears that only languages with interrogatives always initially invert, and only languages which invert in interrogative word questions invert for yes-no questions.<sup>13</sup>

In the present sample, 16 languages put the interrogative word or phrase first. They are distributed as shown in Table 3.

TABLE 3

	I	II	III
Question word first	6	10	0
Question and statement order identical	0	3	11

  

	Pr	Po



Question word first	14	2
Question and statement order identical	2	12

A definite relationship thus appears, and we have the following universals:

**Universal 11.** Inversion of statement order so that verb precedes subject occurs only in languages where the question word or phrase is normally initial. This same inversion occurs in yes-no questions only if it also occurs in interrogative word questions.

**Universal 12.** If a language has dominant order VSO in declarative sentences, it always puts interrogative words or phrases first in interrogative word questions; if it has dominant order SOV in declarative sentences, there is never such an invariant rule.

Verbal subordination to verb will be considered next. Semantically, the concepts to be considered here include time, cause, purpose, and condition. Formally, we have one or more of the following: introductory words (i.e., "conjunctions"); and verbal inflections, whether finite, involving categories of person and number (e.g., subjunctives) or nonfinite forms such as verbal nouns and gerundives. It seems probable that conjunctions are more frequent in prepositional languages, nonfinite verb forms in postpositional languages, and that finite verb forms are found in both, but this point was not investigated. In accordance with the over-all emphasis of the paper, attention was directed to the question of the relative order of subordinate and main verbal forms. Since the subordinate verb qualifies the main verb, we would expect it to precede the main verb in all languages of the rigid subtype of III. Since this subtype was defined merely in terms of the invariable precedence of noun object, the question remains for empirical verification. In fact, this turns out to be true for all the languages of this subtype in the sample and, no doubt, holds generally.<sup>14</sup> In languages of other types certain characteristics of individual constructions appear. The normal order everywhere is for the protasis of conditional constructions to precede the apodosis, that is, for the condition to precede the conclusion. This is true for all 30 languages of the sample. In languages of the rigid subtype of III the protasis never follows, but in other languages it will do so occasionally.

On the other hand, in expressions of purpose and volition the normal order is for these to follow the main verb except in languages of the rigid subtype of III. Here again there are no exceptions in the sample. We have therefore the following universals:

**Universal 13.** If the nominal object always precedes the verb, then verb forms subordinate to the main verb also precede it.

**Universal 14.** In conditional statements, the conditional clause precedes the conclusion as the normal order in all languages.

**Universal 15.** In expressions of volition and purpose, a subordinate verbal form always follows the main verb as the normal order except in those languages in which the nominal object always precedes the verb.

Another relation of verb to verb is that of inflected auxiliary to main verb. For present purposes, such a construction will be defined as one in which a closed class of verbs (the auxiliaries) inflected for both person and number is in construction with an open class of verbs not inflected for both person and number. For example, in English 'is going' is such a construction. This definition, of course, excludes the possibility of such a construction

in languages in which the verb has no category of person and number (e.g., Japanese). In the sample of 30 languages, 19 have such inflected auxiliaries. They are distributed among the order types as shown in Table 4.<sup>15</sup>

TABLE 4

	I	II	III
Auxiliary precedes verb	3	7	0
Auxiliary follows verb	0	1	8

	Pr	Po
Auxiliary precedes verb	9	1
Auxiliary follows verb	0	9

These data suggest the following universal:

**Universal 16.** In languages with dominant order VSO, an inflected auxiliary always precedes the main verb. In languages with dominant order SOV, an inflected auxiliary always follows the main verb.

Uninflected auxiliaries will be considered later in connection with verb inflections.

In nominal phrases, the position of attributive adjectives in relation to the noun modified is a key factor. The position of the qualifying adjective shows a definite though only statistical relation to the two other bases of the typology. A summary of these data for the languages of the sample is given in Table 5.

TABLE 5

	I	II	III
NA	6	8	5
AN	0	5	6

	Pr	Po
NA	12	7
AN	4	7

In general, then, the tendency is for adjectives to follow the noun in prepositional languages, and most strongly so in languages of type I, which are always prepositional as has been noted. There are a few rare exceptions, not in the sample, of languages of type I with adjective before the noun, as was noted earlier. Hence, we have the following *near* universal:

**Universal 17.** With overwhelmingly more than chance frequency, languages with dominant order VSO have the adjective after the noun.

From the data of Table 5, it will also be noticed that there are 19 languages with adjective after the noun, as against 11 with the adjective before the noun. This is representative of a general tendency which very nearly overrides the opposite rule to be expected in languages of type III.

The position of demonstratives and numerals is related to that of descriptive adjectives in individual languages. However, these items show a marked tendency to precede even when the descriptive adjective follows. On the other hand, when the descriptive adjective precedes, then the demonstratives and numerals virtually always precede the noun likewise. The data from the sample languages are given in Table 6.

TABLE 6

	NA	AN
Dem. - Noun	12	7
Noun - Dem.	11	0
Num. - Noun	8	10
Noun - Num.	11	0

In one language, Guarani, numbers may either precede or follow the noun, and this case was not included in the table. In Guarani, the adjective follows the noun, as would be expected. In the case of numbers, it should be noted that for languages with numeral classifiers, it was the position of the numeral in relation to the classifier which was taken into account.<sup>16</sup> There seems to be no relation between the position of the numeral and the demonstrative outside of that mediated by adjective position. Languages in which the adjective follows the noun may have numeral preceding while demonstrative does not, demonstrative preceding while numeral does not, both preceding or neither preceding. Outside of the sample, however, there are a small number of instances (e.g., Efik) in which the demonstrative follows while the adjective precedes. It may be noted that other quantifiers (e.g., 'some', 'all') and interrogative and possessive adjectives show this same tendency to precede the noun, as evidenced, for example, in the Romance languages, but those cases were not studied. We have then the following universal:

**Universal 18.** When the descriptive adjective precedes the noun, the demonstrative and the numeral, with overwhelmingly more than chance frequency, do likewise.

An additional related observation may be noted:

**Universal 19.** When the general rule is that the descriptive adjective follows, there may be a minority of adjectives which usually precede, but when the general rule is that descriptive adjectives precede, there are no exceptions.

This last universal is illustrated by Welsh and Italian in the present sample.

The order within the noun phrase is subject to powerful constraints. When any or all of the three types of qualifiers precede the noun, the order among them is always the same: demonstrative, numeral, and adjective, as in English, 'these five houses'.

When any or all follow, the favorite order is the exact opposite: noun, adjective, numeral, demonstrative. A less popular alternative is the same order as that just given for the instances in which these elements precede the noun. An example of the latter is Kikuyu, a Bantu language of East Africa, with the order, 'houses these five large', instead of the more popular 'houses large five these'. We have, then, a universal:

**Universal 20.** When any or all of the items (demonstrative, numeral, and descriptive adjective) precede the noun, they are always found in that order. If they follow, the order is either the same or its exact opposite.

The order of adverbial qualifiers of adjectives in relation to the adjective will now be considered. This order also shows a definite relation to that between the descriptive adjective and the noun, as shown by Table 7. In the third row are cases in which certain adverbs precede and others follow.<sup>17</sup>

TABLE 7

	AN	NA
Adverb - Adjective	11	5
Adjective- Adverb	0	8
Adj. - Adv. and Adv. - Adj.	0	2

From Table 7 it can be seen that there is a tendency for the adverb to precede the adjective, which can be overridden only in some cases when the adjective follows the noun. The situation thus far is similar to that obtaining with regard to demonstratives and numerals. However, if we look further, we note that all of those languages in which some or all adverbs follow the adjective not only have the noun followed by the adjective, but also are all of types I and II. Thus we have a universal:

**Universal 21.** If some or all adverbs follow the adjective they modify, then the language is one in which the qualifying adjective follows the noun and the verb precedes its nominal object as the dominant order.

One other topic concerning the adjective to be considered is that of comparisons, specifically that of superiority as expressed, for example in English, by sentences of the type 'X is larger than Y'. A minority of the world's languages have, like English, an inflected comparative form of the adjective. More frequently a separate word modifies the adjective, as in English, 'X is more beautiful than Y', but in many languages this is optional or does not exist at all. On the other hand, there is always some element which expresses the comparison as such, whether word or affix, corresponding to English 'than', and obviously both the adjective and the item with which comparison is made must be expressed. We thus have three elements whose order can be considered, as in English *larg(er) than Y*. These will be called adjective, marker of comparison, and standard of comparison. The two common orders are: **adjective, marker, standard** (as in English); or the opposite order: **standard, marker, adjective**. These two alternatives are related to the basic order typology, as shown by Table 8.<sup>18</sup> A number of languages are not entered in

this table because they utilize a verb with general meaning 'to surpass'. This is particularly common in Africa (e.g., Yoruba): 'X is large, surpasses Y'. Loritja, an Australian language which has 'X is large, Y is small', is likewise not entered.

TABLE 8

	I	II	III
Adjective- Marker-Standard	5	9	0
Standard - Marker-Adjective	0	1	9
Both	0	1	0

	Pr	Po
Adjective- Marker-Standard	13	1
Standard - Marker-Adjective	0	10
Both	0	1

Universal 22. **If in comparisons of superiority the only order, or one of the alternative orders, is standard-marker-adjective, then the language is postpositional. With overwhelmingly more than chance frequency if the only order is adjective-marker-standard, the language is prepositional.**

A clear relation to the basic order typology is likewise found in constructions of nominal apposition, particularly those involving a common along with a proper noun. A number of semantic and formal subtypes are involved (e.g., titles of address, 'Mr. X,' as against appellations 'Avenue X'). The latter type is, in certain cases, assimilation to the genitive, and may therefore be expected to show a similar order (e.g., 'the city of Philadelphia'). English is somewhat ambivalent, doubtless because of adjective-noun order, as can be seen from '42nd Street' versus 'Avenue A', or 'Long Lake' versus 'Lake Michigan'. Most languages, however, have a single order (e.g., French, 'Place Vendôme', 'Lac Genève', 'Boulevard Michelet'). My data here are incomplete because grammars often make no statement on the subject, and I was dependent on text examples.<sup>19</sup>

In Table 9, contrary to usual practice, the genitive construction is used instead of Pr/Po since it gives more clear-cut results.

TABLE 9

	I	II	III
Common Noun - Proper Noun	2	7	0
Proper Noun - Common Noun	0	2	6

	GN	NG
Common Noun - Proper Noun	8	1
Proper Noun - Common Noun	0	8

Universal 23. **If in apposition the proper noun usually precedes the common noun, then the language is one in which the governing noun precedes its dependent genitive. With much better than chance frequency, if the common noun usually precedes the proper noun, the dependent genitive precedes its governing noun.**

As the concluding item in the discussion of nominal construction, we take the relative clause which modifies a noun (e.g., English, 'I saw the man who came', 'I saw the student who failed the examination'). Here again there is considerable diversity of formal means from language to language. All that will be considered here is the order as between nominal antecedent and the verb of the relative clause (e.g., 'man' and 'came' in the first sentence).

Once more the distribution of the rules of order, as set forth in Table 10, shows a clear relation to the categories of the basic order typology.<sup>20</sup>

TABLE 10

	I	II	III
Relational expression precedes noun	0	0	7
Noun precedes relational expression	6	12	2
Both constructions	0	1	1

	Pr	Po
Relational expression precedes noun	0	7
Noun precedes relational expression	16	4
Both constructions	0	2

From Table 10 it is clear that if the relational expression precedes the noun either as the only construction or as alternate construction, the language is postpositional. However, outside of the sample there is at least one exception, Chinese, a prepositional language in which the relational expression precedes the noun. It is plausible to explain this deviation as connected with the fact that in Chinese the adjective precedes the noun. As with adjective-noun order there is a pronounced general tendency for the relative expression to follow the noun it qualifies. This tendency is sometimes overcome but only if (1) the language is prepositional or (2) if the qualifying adjective precedes the noun.

**Universal 24.** If the relative expression precedes the noun either as the only construction or as an alternate construction, either the language is postpositional, or the adjective precedes the noun or both.

Thus far nothing has been said about pronouns. In general, pronouns exhibit differences regarding order when compared with nouns. This was the reason for specifying nominal subject and nominal object in the definitions of the basic typology. One peculiarity of pronominal order is illustrated by French where we have, 'Je vois l'homme' but 'Je le vois'; that is, the pronominal object precedes, whereas the nominal object follows. Similar examples are found in a number of languages of the sample. In Italian, Greek, Guarani, and Swahili, the rule holds that the pronominal object always precedes the verb, whereas the nominal object follows. In Italian and Greek, however, the pronoun follows just as does the nominal object with imperatives. In Berber the pronoun objects, direct or indirect, precede the verb when the verb is accompanied by the negative or future particle. In Loritja, the pronominal object may be an enclitic added to the first word of the sentence. In Nubian, the usual nominal order is SOV, but the alternative SVO is fairly frequent. For pronominal object, this alternative never occurs. In other words, the pronominal object always precedes the verb, whereas the nominal object may either precede or follow. In Welsh, in an alternative order with emphasis on the pronoun subject, the pronoun subject comes first in the sentence. In such sentences the pronominal object precedes the verb, but the nominal object follows. Finally, in Masai, whereas normal order for nominal object is VSO, a pronominal object precedes a nominal subject and immediately follows the verb.

No contrary instances occur in the sample of a pronominal object regularly following the verb while a nominal object precedes. We may therefore state the following universal:

**Universal 25.** If the pronominal object follows the verb, so does the nominal object.

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 80-91.

#### 4. Morphology<sup>\*</sup>

---

Before proceeding to the question of inflectional categories, which will be the chief topic of this section, certain general considerations relating to morphology will be discussed. Morphemes within the word are conventionally divided into root, derivational and inflectional. As elsewhere in this paper, no attempt at definition of categories will be attempted. Derivational and inflectional elements are usually grouped together as affixes. On the basis of their order relation to the root, they may be classified into a number of categories. By far the most frequent are prefixes and suffixes. Infixing, by which a derivational or inflectional element is both preceded and followed by parts of the root morpheme, may be grouped with other methods involving discontinuity. Examples of such other methods are intercalation, as in Semitic, and what might be called ambifixing, where an affix has two parts, one of which precedes the entire root, while the other follows. All such discontinuous methods are relatively infrequent, and some languages do not employ any of them. The following universal on this topic is probably valid:

**Universal 26.** If a language has discontinuous affixes, it always has either prefixing or suffixing or both.

As between prefixing and suffixing, there is a general predominance of suffixing. Exclusively suffixing languages are fairly common, while exclusively prefixing languages are quite rare. In the present sample, only Thai seems to be exclusively prefixing. Here again a relationship with the basic order typology appears.<sup>21</sup>

TABLE 11

	I	II	III
Exclusively prefixing	0	1	0
Exclusively suffixing	0	2	10
Both	6	10	1



	Pr	Po
Exclusively prefixing	1	0
Exclusively suffixing	0	12
Both	15	2

**Universal 27.** If a language is exclusively suffixing, it is postpositional; if it is exclusively prefixing, it is prepositional.

Where both derivational and inflectional elements are found together, the derivational element is more intimately connected with the root. The following generalization appears plausible:

**Universal 28.** If both the derivation and inflection follow the root, or they both precede the root, the derivation is always between the root and the inflection.

There are probably no languages without either compounding, affixing, or both. In other words, there are probably no purely isolating languages. There are a considerable number of languages without inflections, perhaps none without compounding and derivation. The following probably holds:

**Universal 29.** If a language has inflection, it always has derivation.

Turning now to verb inflectional categories, we can state that since there are languages without inflection, there will obviously be languages in which the verb has no inflectional categories. In the far more frequent cases in which the verb has inflectional categories, a partial implicational hierarchy exists.

**Universal 30.** If the verb has categories of person-number or if it has categories of gender, it always has tense-mode categories.

The greater externality of gender categories in the verb can be seen from the following generalization:

**Universal 31.** If either the subject or object noun agrees with the verb in gender, then the adjective always agrees with the noun in gender.

Gender agreement between noun (usually noun subject) and verb is far less frequent than agreement in person and number; yet examples of the former without the latter do occur (e.g., in some Daghestan languages of the Caucasus). However, where such gender categories appear, they always seem to be associated with number also. Therefore we have the following:

**Universal 32.** Whenever the verb agrees with a nominal subject or nominal object in gender, it also agrees in number.

A further observation about noun-verb agreement in number may be made. There are cases in which this agreement is regularly suspended. In all such cases, if order is involved, the following seems to hold:<sup>22</sup>

**Universal 33.** When number agreement between the noun and verb is suspended and the rule is based on order, the case is always one in which the verb precedes and the verb is in the singular.

Such phenomena as the suspension of agreement are analogous to that of neutralization in phonemics. The category which does not appear in the position of neutralization, in this case the plural, may be called the marked category (as in classical Prague School phonemic theory). Similar phenomena will be encountered in the subsequent discussion.

The three most common nominal inflectional categories are number, gender, and case. Among systems of number, there is a definite hierarchy which can be stated in the following terms:

**Universal 34.** No language has a trial number unless it has a dual. No language has a dual unless it has a plural.

Nonsingular number categories are marked categories in relation to the singular, as indicated in the following universal:

**Universal 35.** There is no language in which the plural does not have some nonzero allomorphs, whereas there are languages in which the singular is expressed only by zero. The dual and the trial are almost never expressed only by zero.

The marked character of the nonsingular numbers as against the singular can also be seen when number occurs along with gender. The interrelations of these two sets of categories are stated in the following universals:

**Universal 36.** If a language has the category of gender, it always has the category of number.

**Universal 37.** A language never has more gender categories in nonsingular numbers than in the singular.

This latter statement may be illustrated from Hausa, which has a masculine and feminine gender distinction in the singular but not in the plural. The opposite phenomenon, to my knowledge, never occurs.

Case systems may occur with or without gender systems and with or without the category of number. The unmarked categories of case systems are the subject case in nonergative systems and the case which expresses the subject of intransitive and the object of transitive verbs in ergative systems. Hence we have the following universal:

**Universal 38.** Where there is a case system, the only case which ever has only zero allomorphs is the one which includes among its meanings that of the subject of the intransitive verb.

As between number and case, where there is a distinct morpheme boundary, the following relation almost always holds:

**Universal 39.** Where morphemes of both number and case are present and both follow or both precede the noun base, the expression of number almost always comes between the noun base and the expression of case.

The following general statement may be made about agreement between adjectives and nouns:

**Universal 40.** When the adjective follows the noun, the adjective expresses all the inflectional categories of the noun. In such cases the noun may lack overt expression of one or all of these categories.

For example, in Basque, where the adjective follows the noun, the last member of the noun phrase contains overt expressions of the categories of case and number and it alone has them.

Case systems are particularly frequent in postpositional languages, particularly those of type III. In the present sample, all the languages of this type have case systems. There are a few marginal cases or possible exceptions.

**Universal 41.** If in a language the verb follows both the nominal subject and nominal object as the dominant order, the language almost always has a case system.

Finally, pronominal categories may be briefly considered. In general, pronominal categories tend to be more differentiated than those of the noun, but almost any specific statement in this regard will have some exceptions. As a general statement we have the following universals:

**Universal 42.** All languages have pronominal categories involving at least three persons and two numbers.

**Universal 43.** If a language has gender categories in the noun, it has gender categories in the pronoun.

Gender categories show certain relations to categories of person in pronouns, as might be expected.

**Universal 44.** If a language has gender distinctions in the first person, it always has gender distinctions in the second or third person, or in both.

There is likewise a relation to the category of number.

**Universal 45.** If there are any gender distinctions in the plural of the pronoun, there are some gender distinctions in the singular also.

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 92-96.

## 5. Conclusion: Some General Principles<sup>\*</sup>

---

No attempt is made here to account for all of the universals described in the preceding sections and repeated in Appendix III. Some general principles, however, are proposed which seem to underlie a number of different universals and from which they may be deduced. Attention is first directed to those universals which are most closely connected with the basic order typology and the closely associated genitive construction. Two basic notions, that of the dominance of a particular order over its alternative and that of harmonic and disharmonic relations among distinct rules of order, are introduced. This latter concept is very obviously connected with the psychological concept of generalization.

We may illustrate the reasoning involved by reference to Universal 25, according to which, if the pronominal object follows the verb, the nominal object does so likewise. In other words, in the tetrachoric table resulting from the alternative for each of the combinations there is a single blank. Since the nominal object may follow the verb whether the pronoun object precedes or follows, while the nominal object may precede the verb only if the pronoun precedes, we will say that VO is dominant over OV since OV only occurs under specified conditions, namely when the pronominal object likewise precedes, while VO is not subject to such limitations. Further, the order noun object-verb is harmonic with pronoun object-verb but is disharmonic with verb-pronoun object since it does not occur with it. Likewise verb-noun object order is harmonic with verb-pronoun object and disharmonic with pronoun object-verb. We may restate our rule, then, in terms of these concepts as follows:

A dominant order may always occur, but its opposite, the recessive, occurs only when a harmonic construction is likewise present.

Note that the notion of dominance is not based on its more frequent occurrence but on the logical factor of a zero in the tetrachoric table. It is not difficult to construct an example in which one of the recessive alternatives is more frequent than the dominant. Dominance and harmonic relations can be derived quite mechanically from such a table with a single

zero. The entry with zero is always the recessive one for each construction, and the two constructions involved are disharmonic with each other.

Harmonic and disharmonic relations, as noted earlier, are examples of generalization. In similar constructions, the corresponding members tend to be in the same order. The basis for the correspondence in the present instance is obvious, in that pronoun and noun are both objects of the verb, and the other pair verb-verb is identical. In regard to harmonic and disharmonic relations, a fair amount of freedom will be exercised based on transformational and other relations among constructions, not merely the occurrence of a zero in a tetrachoric table.

Proceeding on this basis, we now consider Universal 3. It will be noted that this universal amounts to an assertion of the nonexistence of postpositional languages of type I. Since in all of the types, I, II and III, S precedes O, this is irrelevant for the present context. This leads to the following conclusions:

Prepositions are dominant over postpositions, and SV order is dominant over VS order. Further, prepositions are harmonic with VS and disharmonic with SV, while postpositions are harmonic with SV and disharmonic with VS. What distinguishes type II from type III is that in type II the object follows the verb, a characteristic shared with type I. On the other hand, type III has the object before the verb. From Universal 4, which states that with overwhelmingly more than chance frequency SOV is associated with postpositions, the conclusion is drawn that OV is harmonic with postpositions while VO is harmonic with prepositions. The constructional analogies which support this are discussed later with reference to the closely associated genitive constructions. For the moment it may be noted that the relations between types I, II, and III and Pr/Po may now be recapitulated in these terms: Type I has VS which is harmonic with prepositions, and SO which is likewise harmonic with prepositions. Further, prepositions are dominant. All languages of type I, in fact, are prepositional. Type II has SV which is harmonic with postpositions and VO which is harmonic with prepositions, and prepositions are dominant. In fact, a definite majority of languages of type II have prepositions. Type III has SV and OV, both of which are harmonic with postpositions. However, prepositions are dominant. In fact, the preponderant majority of languages which have type III have postpositions, with but a handful of exceptions.

From the overwhelming association of prepositions with governing noun-genitive order and of postpositions with genitive-governing noun order but with a small number of exceptions of both types, the conclusion is drawn that prepositions are harmonic with NG and postpositions with GN.

The close connection between genitive order and Pr/Po is a simple instance of generalization. The relation of possession is assimilated to other relational notions, for example, spatial relations. In English, 'of' which marks possession is a preposition with the same order properties as 'under', 'above', etc. Further, such spatial and temporal relations are often expressed by nouns or nounlike words, for example, English 'in back

of'. In many languages 'behind' = 'the back + genitive'; hence: 'X's back' = 'in back of X' parallels 'X's house'; and 'back of X' = 'in back of X' parallels 'house of X'.

The connection between these genitives and the analogous prepositional or postpositional phrases on the one hand, and subject-verb and object-verb constructions on the other, is via the so-called subjective and objective genitive. Note that in English 'Brutus' killing of Caesar started a civil war' has the same truth value as 'The fact that Brutus killed Caesar started a civil war'. The order of elements is likewise similar. In other words, in such transformations, the noun subject or object corresponds to the genitive, and the verb to the governing noun. In fact, there are languages in which the subject or the object of the verb is in the genitive. For example, in Berber *argaz* 'man' is the general form of the noun, and *urgaz* is either the dependent genitive or the subject of the verb, provided it follows immediately. Thus *iffer urgaz*, 'went out the man', exactly parallels *axam urgaz*, 'the house of the man'. Berber, it will be noted, is a language of type I, and the genitive follows the noun. It likewise has prepositions rather than postpositions.

A further relationship among the variables of the basic order typology may be posited, that between genitive order and adjective order. Both the genitive and qualifying adjectives limit the meaning of the noun. There are further facts to support this. There are languages like Persian, in which both adjective and genitive dependence are marked by exactly the same formal means. Where pronominal possession is involved, some languages use a derived adjective, while others use a genitive of the pronoun. There are even instances where adjectives are used in the first and second person, while a genitive is used in the third person (e.g., Norwegian).

We may summarize these results by stating that all of the following are directly or indirectly harmonic with each other: prepositions, NG, VS, VO, NA. We have here a general tendency to put modified before modifier, and the most highly "polarized" languages in this direction are those of type I with NG and NA, a considerable group of languages. The opposite type is based on harmonic relations among postpositions, ON, SV, OV, and AN. This is also a very widespread type, as exemplified by Turkish and others in the present sample. On the other hand, the general dominance of NA order tends to make languages of the Basque type (i.e., III/Po/NA with GN order) very nearly as common as the Turkish type. It should also be pointed out that languages being highly complex structures, there are other factors at work in individual cases not included among the five factors cited at this point. One of them, demonstrative-noun order, has already been mentioned.

It is more difficult to account for the dominances than for the harmonic relations, to explain, for example, why the adjective tends to follow the noun. It may be suggested, however, that noun-adjective predominance arises from the same factor as that which makes subject-verb the dominant order. In Hockett's terminology, there is a general tendency for comment to follow topic. There is some evidence that noun-adjective does parallel subject-verb in this way. In many languages all adjectival notions are treated as intransitive verbs. The qualifying adjective is then a relative or participle of the verb. The tendency of relative clauses, it has been seen, is even stronger than that of adjectives to

follow the noun. In some languages such as Arapesh in New Guinea, 'The good man came' would be literally translated 'The man is-good that-one he came'. Adjective-noun order, then, is somewhat ambivalent since analogies with other constructions involving modifiers make it indirectly harmonic with VS while the factor of topic-comment order makes it analogous with SV.

All this is far from a complete theory. Nevertheless, it does suggest that one should examine instances in which, contrary to the prevailing rules, the genitive construction is disharmonic with Pr/Po. One would reason that in such cases the genitive construction is, as it were, being attracted by the adjective-noun construction which, as has been seen, has sources of determination that are to some extent outside of the general framework of harmonic relations connected with the order of modifier and modified. For example, if, in spite of the general rule, we find genitive-governing noun order with prepositions, the reason might be the opposing pull of order adjective-noun which is harmonic with genitive-governing noun. Otherwise stated, the genitive construction should only be disharmonic with Pr/Po when Pr/Po is disharmonic with the adjective-noun order. One may include here cases in which a language has two genitive orders, indicating a probable change of type since one must, in all likelihood, be older than the other. One may further conjecture that if there are exceptions, they will be in type II, which, having both SV and VO which are disharmonic, can provide an anchor in either case for deviant genitive order.

It will be noted that Universal 5, insofar as it refers to postpositional languages of type III (the vast majority), gives a particular instance of this hypothesis; for this statement asserts that a language of type III if it has NG will also have NA. If such a language is postpositional, then NG will be disharmonic with postpositions but harmonic with NA. If we include languages with both genitive orders, then there are at least six cases, all favorable (i.e., with NA rather than AN). These are Somali and Maba with both genitive orders, and Kanuri, Galla, Teda, and Sumerian which have SOV, postpositions, NG, and NA .

This hypothesis will, however, produce some further predictions. For prepositional languages of type III, the hypothesis will be that with varying genitive order or with GN, which is disharmonic with prepositions, the adjective-noun order will be AN. I know of only two cases, Tigrinya with both genitive orders, and Amharic with GN. Both have AN in accordance with our hypothesis. For languages of type II which are prepositional and which have GN, and should therefore have AN, we have Danish, Norwegian and Swedish (possibly a single case), and English with two genitive orders. Both fulfill the hypothesis in that they have AN. Among postpositional languages of type II, we have the Moru-Madi group in the Sudan and the fairly distantly related Mangbetu, both of which, with alternative genitive orders, have the predicted NA. We now encounter the only exceptions of which I am aware, Araucanian in Chile, with both genitive orders; and a group of Daghestan languages in the Caucasus, including some like Rutulian with NG, and others like Tabassaran with both genitive orders. Apparently all those languages of the Daghestan group which are of type III have only GN harmonising with both postpositions and AN. If so, this is an important indication of the general validity of our

hypothesis. Finally, since all languages of type I are prepositional, we have only a single case to consider, prepositional languages with GN. I know of only one example, the Milpa Alta dialect of Nahuatl described by Whorf. It has AN as expected.

Another type of relation than those that have just been considered is illustrated by Universals 20 and 29. These may be called proximity hierarchies. What we have is a rule that certain elements must be closer to some central element than some other satellite. The central element may be the root morpheme or base of a word or the head-word of an endocentric construction. Such a proximity hierarchy is likely to be related to an implicational hierarchy in the instance of inflectional categories. Just as the category of number is almost always closer to the base than expressions of case, so there are many languages with the category of number but without the category of case, and very few with case but without number. Since, by the proximity hierarchy, number is closer, it is more likely to become amalgamated with the base and so become an inflection. These hierarchies are presumably related to degrees of logical and psychological remoteness from the center, but no analysis is attempted here.

These phenomena are likewise related to those of neutralization. The more proximate category, or the implied category, tends to be more elaborate, and it is the less proximate or the implying categories which tend to be neutralized in its presence. Universals 36 and 37 are related in this manner. Number is the implied category. Gender categories are often neutralized in the marked number (i.e. nonsingular). It is much rarer for number to be neutralized in some particular gender (e.g., the neuter in Dravidian languages). With regard to number and case, number is, as has been seen, more proximate and generally present when case is present, while the opposite relation holds far more rarely. It is likewise common for certain case distinctions to be neutralized in number, while the opposite phenomenon perhaps never occurs.

Another principle is evident from Universal 34. We do not have such systems as the following: a particular grammatical category for the trial, while another embraces the dual and all numbers larger than three. In other words, disjunctiveness or lack of continuity in this respect is never tolerated.

Universals 14 and 15 possibly illustrate the same principle. The order of elements in language parallels that in physical experience or the order of knowledge. In the instance of conditionals, although the truth relations involved are timeless, logicians have always symbolized in the order implying, implied exactly as in spoken language. If *modus ponens* used in proof, then we have a pragmatic example which follows the order of reasoning. No one thinks to write a proof backwards.

Universals 7, 8, and 40, although superficially very different, seem to be examples of the same general tendency to mark the end of units rather than the beginning. For example, in rigid subtype III, the verb marks the end of the sentence. When the inflections occur only with the final member of the noun phrase, this marks the end of the phrase. This is probably related to the fact that we always know when someone has just begun speaking,



but it is our sad experience that without some marker we don't know when the speaker will finish.

The existence of a rigid subtype III, whereas there are no examples of a rigid subtype of I, is probably related to still another factor. In general the initial position is the emphatic one, and while there are other methods of emphasis (e.g., stress), the initial position always seems to be left free so that an element to which attention is directed may come first. Here Universal 12 is an example. It seems probable that in all languages expressions of time and place may appear in the initial positions in the sentence.

The discontinuity of the predicate, which commonly appears in such instances (e.g., German, 'Gestern ist mein Vater nach Berlin gefahren'), illustrates a further principle. On the whole, the higher the construction in an immediate constituent hierarchy, the freer the order of the constituent elements. It has been seen that practically all languages have some freedom of order regarding subject and predicate as a whole; whereas only a small minority have variant order in genitive constructions, and then almost always along with other differences, not merely a difference of order. Within morphological constructions, order is the most fixed of all. On the whole, then, discontinuous constituents are far less frequent than continuous ones.

As indicated in the initial section of this paper, the principles described in this section are to be viewed as no more than suggestive. It is hoped that some of them at least will prove useful for further investigation.

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 96-104.

## 5. Conclusion: Some General Principles\*

---

No attempt is made here to account for all of the universals described in the preceding sections and repeated in Appendix III. Some general principles, however, are proposed which seem to underlie a number of different universals and from which they may be deduced. Attention is first directed to those universals which are most closely connected with the basic order typology and the closely associated genitive construction. Two basic notions, that of the dominance of a particular order over its alternative and that of harmonic and disharmonic relations among distinct rules of order, are introduced. This latter concept is very obviously connected with the psychological concept of generalization.

We may illustrate the reasoning involved by reference to Universal 25, according to which, if the pronominal object follows the verb, the nominal object does so likewise. In other words, in the tetrachoric table resulting from the alternative for each of the combinations there is a single blank. Since the nominal object may follow the verb whether the pronoun object precedes or follows, while the nominal object may precede the verb only if the pronoun precedes, we will say that VO is dominant over OV since OV only occurs under specified conditions, namely when the pronominal object likewise precedes, while VO is not subject to such limitations. Further, the order noun object-verb is harmonic with pronoun object-verb but is disharmonic with verb-pronoun object since it does not occur with it. Likewise verb-noun object order is harmonic with verb-pronoun object and disharmonic with pronoun object-verb. We may restate our rule, then, in terms of these concepts as follows:

A dominant order may always occur, but its opposite, the recessive, occurs only when a harmonic construction is likewise present.

Note that the notion of dominance is not based on its more frequent occurrence but on the logical factor of a zero in the tetrachoric table. It is not difficult to construct an example in which one of the recessive alternatives is more frequent than the dominant. Dominance and harmonic relations can be derived quite mechanically from such a table with a single zero. The entry with zero is always the recessive one for each construction, and the two constructions involved are disharmonic with each other.

Harmonic and disharmonic relations, as noted earlier, are examples of generalization. In similar constructions, the corresponding members tend to be in the same order. The basis for the correspondence in the present instance is obvious, in that pronoun and noun are both objects of the verb, and the other pair verb-verb is identical. In regard to harmonic and disharmonic relations, a fair amount of freedom will be exercised based on transformational and other relations among constructions, not merely the occurrence of a zero in a tetrachoric table.

Proceeding on this basis, we now consider Universal 3. It will be noted that this universal amounts to an assertion of the nonexistence of postpositional languages of type I. Since in all of the types, I, II and III, S precedes O, this is irrelevant for the present context. This leads to the following conclusions:

Prepositions are dominant over postpositions, and SV order is dominant over VS order. Further, prepositions are harmonic with VS and disharmonic with SV, while postpositions are harmonic with SV and disharmonic with VS.

What distinguishes type II from type III is that in type II the object follows the verb, a characteristic shared with type I. On the other hand, type III has the object before the verb. From Universal 4, which states that with overwhelmingly more than chance frequency SOV is associated with postpositions, the conclusion is drawn that OV is harmonic with postpositions while VO is harmonic with prepositions. The constructional analogies which support this are discussed later with reference to the closely associated genitive constructions. For the moment it may be noted that the relations between types I, II, and III and Pr/Po may now be recapitulated in these terms: Type I has VS which is harmonic with prepositions, and SO which is likewise harmonic with prepositions. Further, prepositions are dominant. All languages of type I, in fact, are prepositional. Type II has SV which is harmonic with postpositions and VO which is harmonic with prepositions, and prepositions are dominant. In fact, a definite majority of languages of type II have prepositions. Type III has SV and OV, both of which are harmonic with postpositions. However, prepositions are dominant. In fact, the preponderant majority of languages which have type III have postpositions, with but a handful of exceptions.

From the overwhelming association of prepositions with governing noun-genitive order and of postpositions with genitive-governing noun order but with a small number of exceptions of both types, the conclusion is drawn that prepositions are harmonic with NG and postpositions with GN.

The close connection between genitive order and Pr/Po is a simple instance of generalization. The relation of possession is assimilated to other relational notions, for

example, spatial relations. In English, 'of' which marks possession is a preposition with the same order properties as 'under', 'above', etc. Further, such spatial and temporal relations are often expressed by nouns or nounlike words, for example, English 'in back of'. In many languages 'behind' = 'the back + genitive'; hence: 'X's back' = 'in back of X' parallels 'X's house'; and 'back of X' = 'in back of X' parallels 'house of X'.

The connection between these genitives and the analogous prepositional or postpositional phrases on the one hand, and subject-verb and object-verb constructions on the other, is via the so-called subjective and objective genitive. Note that in English 'Brutus' killing of Caesar started a civil war' has the same truth value as 'The fact that Brutus killed Caesar started a civil war'. The order of elements is likewise similar. In other words, in such transformations, the noun subject or object corresponds to the genitive, and the verb to the governing noun. In fact, there are languages in which the subject or the object of the verb is in the genitive. For example, in Berber *argaz* 'man' is the general form of the noun, and *urgaz* is either the dependent genitive or the subject of the verb, provided it follows immediately. Thus *iffer urgaz*, 'went out the man', exactly parallels *axam urgaz*, 'the house of the man'. Berber, it will be noted, is a language of type I, and the genitive follows the noun. It likewise has prepositions rather than postpositions.

A further relationship among the variables of the basic order typology may be posited, that between genitive order and adjective order. Both the genitive and qualifying adjectives limit the meaning of the noun. There are further facts to support this. There are languages like Persian, in which both adjective and genitive dependence are marked by exactly the same formal means. Where pronominal possession is involved, some languages use a derived adjective, while others use a genitive of the pronoun. There are even instances where adjectives are used in the first and second person, while a genitive is used in the third person (e.g., Norwegian).

We may summarize these results by stating that all of the following are directly or indirectly harmonic with each other: prepositions, NG, VS, VO, NA. We have here a general tendency to put modified before modifier, and the most highly "polarized" languages in this direction are those of type I with NG and NA, a considerable group of languages. The opposite type is based on harmonic relations among postpositions, ON, SV, OV, and AN. This is also a very widespread type, as exemplified by Turkish and others in the present sample. On the other hand, the general dominance of NA order tends to make languages of the Basque type (i.e., III/Po/NA with GN order) very nearly as common as the Turkish type. It should also be pointed out that languages being highly complex structures, there are other factors at work in individual cases not included among the five factors cited at this point. One of them, demonstrative-noun order, has already been mentioned.

It is more difficult to account for the dominances than for the harmonic relations, to explain, for example, why the adjective tends to follow the noun. It may be suggested, however, that noun-adjective predominance arises from the same factor as that which makes subject-verb the dominant order. In Hockett's terminology, there is a general tendency for comment to follow topic. There is some evidence that noun-adjective does

parallel subject-verb in this way. In many languages all adjectival notions are treated as intransitive verbs. The qualifying adjective is then a relative or participle of the verb. The tendency of relative clauses, it has been seen, is even stronger than that of adjectives to follow the noun. In some languages such as Arapesh in New Guinea, 'The good man came' would be literally translated 'The man is-good that-one he came'. Adjective-noun order, then, is somewhat ambivalent since analogies with other constructions involving modifiers make it indirectly harmonic with VS while the factor of topic-comment order makes it analogous with SV.

All this is far from a complete theory. Nevertheless, it does suggest that one should examine instances in which, contrary to the prevailing rules, the genitive construction is disharmonic with Pr/Po. One would reason that in such cases the genitive construction is, as it were, being attracted by the adjective-noun construction which, as has been seen, has sources of determination that are to some extent outside of the general framework of harmonic relations connected with the order of modifier and modified. For example, if, in spite of the general rule, we find genitive-governing noun order with prepositions, the reason might be the opposing pull of order adjective-noun which is harmonic with genitive-governing noun. Otherwise stated, the genitive construction should only be disharmonic with Pr/Po when Pr/Po is disharmonic with the adjective-noun order. One may include here cases in which a language has two genitive orders, indicating a probable change of type since one must, in all likelihood, be older than the other. One may further conjecture that if there are exceptions, they will be in type II, which, having both SV and VO which are disharmonic, can provide an anchor in either case for deviant genitive order.

It will be noted that Universal 5, insofar as it refers to postpositional languages of type III (the vast majority), gives a particular instance of this hypothesis; for this statement asserts that a language of type III if it has NG will also have NA. If such a language is postpositional, then NG will be disharmonic with postpositions but harmonic with NA. If we include languages with both genitive orders, then there are at least six cases, all favorable (i.e., with NA rather than AN). These are Somali and Maba with both genitive orders, and Kanuri, Galla, Teda, and Sumerian which have SOV, postpositions, NG, and NA .

This hypothesis will, however, produce some further predictions. For prepositional languages of type III, the hypothesis will be that with varying genitive order or with GN, which is disharmonic with prepositions, the adjective-noun order will be AN. I know of only two cases, Tigrinya with both genitive orders, and Amharic with GN. Both have AN in accordance with our hypothesis. For languages of type II which are prepositional and which have GN, and should therefore have AN, we have Danish, Norwegian and Swedish (possibly a single case), and English with two genitive orders. Both fulfill the hypothesis in that they have AN. Among postpositional languages of type II, we have the Moru-Madi group in the Sudan and the fairly distantly related Mangbetu, both of which, with alternative genitive orders, have the predicted NA. We now encounter the only exceptions of which I am aware, Araucanian in Chile, with both genitive orders; and a group of Daghestan languages in the Caucasus, including some like Rutulian with NG,

and others like Tabassaran with both genitive orders. Apparently all those languages of the Daghestan group which are of type III have only GN harmonising with both postpositions and AN. If so, this is an important indication of the general validity of our hypothesis. Finally, since all languages of type I are prepositional, we have only a single case to consider, prepositional languages with GN. I know of only one example, the Milpa Alta dialect of Nahuatl described by Whorf. It has AN as expected.

Another type of relation than those that have just been considered is illustrated by Universals 20 and 29. These may be called proximity hierarchies. What we have is a rule that certain elements must be closer to some central element than some other satellite. The central element may be the root morpheme or base of a word or the head-word of an endocentric construction. Such a proximity hierarchy is likely to be related to an implicational hierarchy in the instance of inflectional categories. Just as the category of number is almost always closer to the base than expressions of case, so there are many languages with the category of number but without the category of case, and very few with case but without number. Since, by the proximity hierarchy, number is closer, it is more likely to become amalgamated with the base and so become an inflection. These hierarchies are presumably related to degrees of logical and psychological remoteness from the center, but no analysis is attempted here.

These phenomena are likewise related to those of neutralization. The more proximate category, or the implied category, tends to be more elaborate, and it is the less proximate or the implying categories which tend to be neutralized in its presence. Universals 36 and 37 are related in this manner. Number is the implied category. Gender categories are often neutralized in the marked number (i.e. nonsingular). It is much rarer for number to be neutralized in some particular gender (e.g., the neuter in Dravidian languages). With regard to number and case, number is, as has been seen, more proximate and generally present when case is present, while the opposite relation holds far more rarely. It is likewise common for certain case distinctions to be neutralized in number, while the opposite phenomenon perhaps never occurs.

Another principle is evident from Universal 34. We do not have such systems as the following: a particular grammatical category for the trial, while another embraces the dual and all numbers larger than three. In other words, disjunctiveness or lack of continuity in this respect is never tolerated.

Universals 14 and 15 possibly illustrate the same principle. The order of elements in language parallels that in physical experience or the order of knowledge. In the instance of conditionals, although the truth relations involved are timeless, logicians have always symbolized in the order implying, implied exactly as in spoken language. If *modus ponens* used in proof, then we have a pragmatic example which follows the order of reasoning. No one thinks to write a proof backwards.

Universals 7, 8, and 40, although superficially very different, seem to be examples of the same general tendency to mark the end of units rather than the beginning. For example, in rigid subtype III, the verb marks the end of the sentence. When the inflections occur only

with the final member of the noun phrase, this marks the end of the phrase. This is probably related to the fact that we always know when someone has just begun speaking, but it is our sad experience that without some marker we don't know when the speaker will finish.

The existence of a rigid subtype III, whereas there are no examples of a rigid subtype of I, is probably related to still another factor. In general the initial position is the emphatic one, and while there are other methods of emphasis (e.g., stress), the initial position always seems to be left free so that an element to which attention is directed may come first. Here Universal 12 is an example. It seems probable that in all languages expressions of time and place may appear in the initial positions in the sentence.

The discontinuity of the predicate, which commonly appears in such instances (e.g., German, 'Gestern ist mein Vater nach Berlin gefahren'), illustrates a further principle. On the whole, the higher the construction in an immediate constituent hierarchy, the freer the order of the constituent elements. It has been seen that practically all languages have some freedom of order regarding subject and predicate as a whole; whereas only a small minority have variant order in genitive constructions, and then almost always along with other differences, not merely a difference of order. Within morphological constructions, order is the most fixed of all. On the whole, then, discontinuous constituents are far less frequent than continuous ones.

As indicated in the initial section of this paper, the principles described in this section are to be viewed as no more than suggestive. It is hoped that some of them at least will prove useful for further investigation.

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 96-104.

Appendix I\*  
Basic Data on the 30-Language Sample

	VSO	Pr	NA	ND	N Num
Basque	III	-	x	x	-
Berber	I	x	x	x	-
Burmese	III	-	x <sup>1</sup>	-	<u>2</u>
Burushaski	III	-	-	-	-
Chibcha	III	-	x	-	x
Finnish	II	-	-	-	-
Fulani	II	x	x	x	x
Greek	II	x	-	-	-
Guarani	II	-	x	-	0
Hebrew	I	x	x	x	-
Hindi	III	-	-	-	-
Italian	II	x	x <sup>3</sup>	-	-
Kannada	III	-	-	-	-
Japanese	III	-	-	-	<u>2</u>
Loritja	III	-	x	x	x



Malay	II	x	x	x	<u>2</u>
Maori	I	x	x	-	-
Masai	I	x	x	-	x
Maya	II	x	-	-	<u>2</u>
Norwegian	II	x	-	-	-
Nubian	III	-	x	-	x
Quechua	III	-	-	-	-
Serbian	II	x	-	-	-
Songhai	II	-	x	x	x
Swahili	II	x	x	x	x
Thai	II	x	x	x	<u>2</u>
Turkish	III	-	-	-	-
Welsh	I	x	x <sup>3</sup>	x	-
Yoruba	II	x	x	x	x
Zapotec	I	x	x	x	-

In the first column, I indicates that normal word order is verb-subject-object, II indicates subject-verb-object, and III subject-object-verb. In the second column, x indicates that the language has prepositions, and - that it has postpositions. In the third column, x indicates that the noun precedes its modifying adjective, and - that it follows. In the fourth column, x indicates that the noun precedes its modifying demonstrative, and - that it follows. In the fifth column, x indicates that the noun precedes its modifying numeral, and - that it follows. In any column, 0 means that both orders are found.

#### *Notes to Appendix I*

1. Participle of adjective-verb, however, precedes and is probably as common as adjective following.
2. Numeral classifiers following numerals in each case. The construction numeral + classifier precedes in Burmese and Maya, follows in Japanese and Thai, and either precedes or follows in Malay.
3. In Welsh and Italian a small number of adjectives usually precede.

#### Appendix II\*

---

Distribution of Basic Order Types:

1. **I/Pr/NG/NA.** Celtic languages; Hebrew, Aramaic, Arabic, Ancient Egyptian, Berber; Nandi, Masai, Lotuko, Turkana, Didinga; Polynesian languages and probably other Austronesian languages; Chinook, Tsimshian; Zapotec, Chinantec, Mixtec, and probably other Oto-Mangue languages.
2. **I/Pr/NG/AN.** Tagabili and probably other Philippine Austronesian languages; Kwakiutl, Quileute, Xinca.
3. **I/Pr/GN/AN.** Milpa Alta Nahuatl.
4. **I/Pr/GN/NA.** No examples.
5. **I/Po/NG/NA.** No examples.
6. **I/Po/NG/AN.** No examples.
7. **I/Po/GN/AN.** No examples.
8. **I/Po/GN/NA.** No examples.
9. **II/Pr/NG/NA.** Romance languages, Albanian, Modern Greek; West Atlantic languages, Yoruba, Edo group, most languages of Benue-Congo group including all Bantu languages; Shilluk, Acholi, Bari, most languages of Chad group of Hamito-Semitic but not Hausa; Neo-Syriac, Khasi, Nicobarese, Khmer, Vietnamese, all Thai languages except Khamti; many Austronesian languages including Malay; Subtiaba.
10. **II/Pr/NG/AN.** **German**, Dutch, Icelandic, Slavonic, Efik, Kredj, Maya, Papiamento.
11. **II/Pr/GN/AN.** Norwegian, Swedish, Danish.
12. **II/Pr/GN/NA.** Arapesh (New Guinea).
13. **II/Po/NG/NA.** No examples.
14. **II/Po/NG/AN.** Rutulian and other Daghestan languages in the Caucasus.
15. **II/Po/GN/AN.** Finnish, Estonian, Ijo, **Chinese**, Algonquian (probably), Zoque.
16. **II/Po/GN/NA.** Most Mandingo and Voltaic languages, Kru, Twi, Gã, Guang, Ewe, Nupe, Songhai, Tonkawa, Guarani.
17. **III/Pr/NG/NA.** Persian, Iraqw (Cushitic), Khamti (Thai), Akkadian.
18. **III/Pr/NG/AN.** No examples.
19. **III/Pr/GN/AN.** Amharic.
20. **III/Pr/GN/NA.** No examples.
21. **III/Po/NG/NA.** Sumerian, Elamite, Galla, Kanuri, Teda, Kamilaroi and other southeastern Australian languages.
22. **III/Po/NG/AN.** No examples.
23. **III/Po/GN/AN.** Hindi, Bengali, and other Aryan languages of India; Modern Armenian, Finno-Ugric except Finnish group; Altaic, Yukaghir, Paleo-Siberian, **Korean**, Ainu, **Japanese**, Gafat, Harari, Sidamo, Chamir, Bedauye, Nama Hottentot; Khinalug, Abkhaz and other Caucasian languages; Burushaski, Dravidian; Newari and other Sino-Tibetan languages; Marind-Anim, Navaho, Maidu, Quechua.
24. **III/Po/GN/NA.** Basque, Hurrian, Urartian, Nubian, Kunama, Fur, Sandawe, Burmese, Lushei, Classical Tibetan, Makasai, Bunak (Timor), Kate (New Guinea), most Australian languages, Haida, Tlingit, Zuni, Chitimacha, Tunica, Lenca, Matagalpa, Cuna, Chibcha, Warrau.

Languages Object before Subject:

Coeur d'Alene: VOS/Pr/NG/NA.  
Siuslaw, Coos: VOS and OVS/Po/GN/AN/

Languages with Variant Constructions:

Geez, Bontoc Igorot 1, 2; Tagalog 1, 2, 3, 4; Sango 9, 10; **English** 10, 11; Lithuanian 11, 15 (prepositions more numerous), Maligbctu, Araucanian 12, 13; Takelma 12, 16 (prepositions more frequent); Moru-Madi 13, 16; Tabassaran 14, 15; Luiseno 15, 16; Tigre 17, 18, 19, 20; Tigrinya 18, 19; Somali, Maba 21, 24; Afar, Ekari 23, 24.

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 108-110.

## Appendix III\*

### Universals Restated

---

***Universal 1.*** In declarative sentences with nominal subject and object, the dominant order is almost always one in which the subject precedes the object.

Universal 2. In languages with prepositions, the genitive almost always follows the governing noun, while in languages with postpositions it almost always precedes.

Universal 3. Languages with dominant VSO order are always prepositional.

Universal 4. With overwhelmingly greater than chance frequency, languages with normal SOV order are postpositional.

Universal 5. If a language has dominant SOV order and the genitive follows the governing noun, then the adjective likewise follows the noun.

Universal 6. All languages with dominant VSO order have SVO as an alternative or as the only alternative basic order.

Universal 7. If in a language with dominant SOV order, there is no alternative basic order, or only OSV as the alternative, then all adverbial modifiers of the verb likewise precede the verb. (This is the "rigid" subtype of III.)

Universal 8. When a yes-no question is differentiated from the corresponding assertion by an intonational pattern, the distinctive intonational features of each of these patterns are reckoned from the end of the sentence rather than from the beginning.

Universal 9. With well more than chance frequency, when question particles or affixes are specified in position by reference to the sentence as a whole, if initial, such elements are found in prepositional languages, and, if final, in postpositional.

**Universal 10. Question particles or affixes, when specified in position by reference to a particular word in the sentence, almost always follow that word. Such particles do not occur in languages with dominant order VSO.**

**Universal 11. Inversion of statement order so that verb precedes subject occurs only in languages where the question word or phrase is normally initial. This same inversion occurs in yes-no questions only if it also occurs in interrogative word questions.**

**Universal 12. If a language has dominant order VSO in declarative sentences, it always puts interrogative words or phrases first in interrogative word questions; if it has dominant order SOV in declarative sentences, there is never such an invariant rule.**

**Universal 13. If the nominal object always precedes the verb, then verb forms subordinate to the main verb also precede it.**

**Universal 14. In conditional statements, the conditional clause precedes the conclusion as the normal order in all languages.**

**Universal 15. In expressions of volition and purpose, a subordinate verbal form always follows the main verb as the normal order except in those languages in which the nominal object always precedes the verb.**

**Universal 16. In languages with dominant order VSO, an inflected auxiliary always precedes the main verb. In languages with dominant order SOV, an inflected auxiliary always follows the main verb.**

**Universal 17. With overwhelmingly more than chance frequency, languages with dominant order VSO have the adjective after the noun.**

**Universal 18. When the descriptive adjective precedes the noun, the demonstrative and the numeral, with overwhelmingly more than chance frequency, do likewise.**

**Universal 19. When the general rule is that the descriptive adjective follows, there may be a minority of adjectives which usually precede, but when the general rule is that descriptive adjectives precede, there are no exceptions.**

**Universal 20. When any or all of the items (demonstrative, numeral, and descriptive adjective) precede the noun, they are always found in that order. If they follow, the order is either the same or its exact opposite.**

**Universal 21. If some or all adverbs follow the adjective they modify, then the language is one in which the qualifying adjective follows the noun and the verb precedes its nominal object as the dominant order.**

Universal 22. **If in comparisons of superiority the only order, or one of the alternative orders, is standard-marker-adjective, then the language is postpositional. With overwhelmingly more than chance frequency if the only order is adjective-marker-standard, the language is prepositional.**

Universal 23. **If in apposition the proper noun usually precedes the common noun, then the language is one in which the governing noun precedes its dependent genitive. With much better than chance frequency, if the common noun usually precedes the proper noun, the dependent genitive precedes its governing noun.**

Universal 24. **If the relative expression precedes the noun either as the only construction or as an alternate construction, either the language is postpositional, or the adjective precedes the noun or both.**

Universal 25. **If the pronominal object follows the verb, so does the nominal object.**

Universal 26. **If a language has discontinuous affixes, it always has either prefixing or suffixing or both.**

Universal 27. **If a language is exclusively suffixing, it is postpositional; if it is exclusively prefixing, it is prepositional.**

Universal 28. **If both the derivation and inflection follow the root, or they both precede the root, the derivation is always between the root and the inflection.**

Universal 29. **If a language has inflection, it always has derivation.**

Universal 30. **If the verb has categories of person-number or if it has categories of gender, it always has tense-mode categories.**

Universal 31. **If either the subject or object noun agrees with the verb in gender, then the adjective always agrees with the noun in gender.**

Universal 32. **Whenever the verb agrees with a nominal subject or nominal object in gender, it also agrees in number.**

Universal 33. **When number agreement between the noun and verb is suspended and the rule is based on order, the case is always one in which the verb precedes and the verb is in the singular.**

Universal 34. **No language has a trial number unless it has a dual. No language has a dual unless it has a plural.**

Universal 35. **There is no language in which the plural does not have some nonzero allomorphs, whereas there are languages in which the singular is expressed only by zero. The dual and the trial are almost never expressed only by zero.**

**Universal 36. If a language has the category of gender, it always has the category of number.**

**Universal 37. A language never has more gender categories in nonsingular numbers than in the singular.**

**Universal 38. Where there is a case system, the only case which ever has only zero allomorphs is the one which includes among its meanings that of the subject of the intransitive verb.**

**Universal 39. Where morphemes of both number and case are present and both follow or both precede the noun base, the expression of number almost always comes between the noun base and the expression of case.**

**Universal 40. When the adjective follows the noun, the adjective expresses all the inflectional categories of the noun. In such cases the noun may lack overt expression of one or all of these categories.**

**Universal 41. If in a language the verb follows both the nominal subject and nominal object as the dominant order, the language almost always has a case system.**

**Universal 42. All languages have pronominal categories involving at least three persons and two numbers.**

**Universal 43. If a language has gender categories in the noun, it has gender categories in the pronoun.**

**Universal 44. If a language has gender distinctions in the first person, it always has gender distinctions in the second or third person, or in both.**

**Universal 45. If there are any gender distinctions in the plural of the pronoun, there are some gender distinctions in the singular also.**

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 110-113.

---

\*Joseph H. Greenberg, "Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements", In: Joseph H. Greenberg (ed.). *Universals of Language*. London: MIT Press, pp. 107-108.





