THE GREENBERGIAN WORD ORDER CORRELATIONS

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This paper reports on the results of a detailed empirical study of word order correlations, based on a sample of 625 languages. The primary result is a determination of exactly what pairs of elements correlate in order with the verb and object. Some pairs of elements that have been claimed to correlate in order with the verb and object do not in fact exhibit any correlation. I argue against the Head-Dependent Theory (HDT), according to which the correlations reflect a tendency towards consistent ordering of heads and dependents. I offer an alternative account, the Branching Direction Theory (BDT), based on consistent ordering of phrasal and nonphrasal elements. According to the BDT, the word order correlations reflect a tendency for languages to be consistently right-branching or consistently left-branching.*

1. INTRODUCTION. Since Greenberg 1963, it has been widely known that the order of certain pairs of grammatical elements correlates with the order of verb and object. OV languages, for example, tend to be postpositional, placing adpositions after their objects, while VO languages tend to be prepositional, placing adpositions before their objects. This paper addresses two questions. First, what ARE the pairs of elements whose order correlates with that of the verb and object? And second, why do these correlations exist?

Detailed empirical evidence bearing on the first of these two questions has never been presented. Greenberg 1963 presented data for a number of pairs of elements for a sample of 30 languages, and data for a subset of these pairs for a larger number of languages. However, the former sample is small, and questions about possible areal and genetic bias arise. In addition, Greenberg's goal was to present evidence for a number of exceptionless or close-to-exceptionless statistical universals rather than to show which pairs of elements correlate in order with the verb and object. In fact, although Greenberg was clearly aware that many of his statistical universals reflected an underlying pattern of various pairs of elements correlating in order with the verb and object, it was the later work of Lehmann (1973, 1978) and Vennemann (1973, 1974a, 1974b, 1976) that focused attention on this underlying pattern and made it a central concern of word order typology. Yet neither Lehmann nor Vennemann presented systematic evidence in support of their assumptions about which pairs of elements correlate in order with the verb and object, and, as Hawkins (1980, 1983) shows, even Greenberg's data casts doubt on some of Lehmann's and Vennemann's

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assumptions. The empirical results reported here, based on an examination of the word order properties of 625 languages, support many claims that have been made about word order correlations but also show that many other widely-held assumptions are not supported. These empirical results—regardless of what is the correct explanation for the correlations—are intended as the primary contribution of this paper.

In the rest of §1, I discuss methodological preliminaries and present an outline of the paper. In §§2–4 I present data on various pairs of elements, demonstrating which of them correlate in order with the verb and object and which do not. Much of §§3–4 is also devoted to arguing that the correlations cannot be explained by what I will call the Head-Dependent Theory (HDT), according to which the word order correlations reflect a tendency towards consistent ordering of heads and dependents. In §5 I argue against a variant of the HDT, namely the Head-Complement Theory, according to which the correlations reflect a tendency towards consistent ordering of heads and COMPLEMENTS. In §6 I present an alternative explanation, the Branching Direction Theory (BDT), according to which the correlations reflect a tendency towards consistent left-branching or consistent right-branching. Sec. 7 deals with some pairs of elements that present complications, and in §8 I discuss possible parsing motivation for the BDT.

1.1. DETERMINING CORRELATION PAIRS. Let me introduce some terminology that will be useful throughout this paper. If the order of a pair of elements X and Y exhibits a correlation with the order of verb and object respectively, then I will refer to the ordered pair ⟨X,Y⟩ as a CORRELATION PAIR, and I will call X a VERB PATTERNER and Y an OBJECT PATTERNER with respect to this correlation pair. For example, since OV languages tend to be postpositional and VO languages prepositional, we can say that the ordered pair ⟨adposition, NP⟩ is a correlation pair, and that, with respect to this pair, adpositions are verb patterners and the NPs that they combine with are object patterners. The two questions being addressed in this paper can thus be rephrased: What are the correlation pairs? And what general property characterizes the relationship between verb patterners and object patterners?

In order to determine whether a given pair of elements X and Y is a correlation pair, we must first address the question of what it means to say that the order of X and Y exhibits a correlation with that of verb and object. In the clearest cases, VO languages will overwhelmingly employ XY order while OV languages will overwhelmingly employ YX order. But, as will be seen below, few pairs of elements actually exhibit this property. More often, the evidence available involves differences in numbers of languages, and legitimate questions arise as to whether the differences in numbers necessarily reflect facts about human language rather than historical accident. In general, what we need to do is determine whether the differences are statistically significant. But if we take a large sample of languages, such as those in the appendix of Greenberg 1963, it is not possible to determine directly by standard statistical tests whether a difference is statistically significant, because the relevant statistical tests re-

quire the items in the sample to be independent of each other. This requirement is not satisfied by a sample containing two languages within the same language family when they share a given characteristic due to mutual inheritance.

I argue in Dryer 1989b, however, that even if we construct a sample containing only one language per language family, we have still not adequately addressed the problem of independence, because of the effects of diffusion, which seem to be particularly pervasive in the area of word order. A sample that contains two genetically unrelated languages that share characteristics due to diffusion also fails to satisfy the requirement that the languages in the sample be independent. A further argument in Dryer 1989b is that there is at least circumstantial evidence for weak linguistic areas that are continental in size, and that it may be difficult to construct samples of genetically and areally independent languages that are large enough to provide a basis for satisfactorily testing linguistic hypotheses. In response to these difficulties, I have proposed a different approach to the problem, one that allows the use of large samples of related languages but which manipulates the genetic and areal relationships among these languages in such a way that no requirements on statistical tests are violated.

The method employed here for determining whether two word order parameters correlate is illustrated in Table 1, which provides data supporting the

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&Postp	[15]	[26]	[5]	[17]	[25]	[19]	107
OV&Prep	3	3	0	1	0	0	7
VO&Postp	4	1	0	0	3	4	12
VO&Prep	[16]	[8]	[15]	[6]	[20]	[5]	70

TABLE 1. Adposition type.

Key: The numbers indicate the number of genera containing languages of the given type in the given area. The large of the two numbers for each area and for each order of verb and object is enclosed in a box. Africa includes Semitic languages of southwest Asia; Eurasia = Europe and Asia, except for southeast Asia, as defined immediately; SEAsia&Oc = Southeast Asia (Sino-Tibetan, Thai, and Mon-Khmer) and Oceania (Austronesian); Aus-NewGui = Australia and New Guinea, excluding Austronesian languages of New Guinea; NAmer = North America, including languages of Mexico, as well as Mayan and Aztecan languages in Central America; SAmer = South America, including languages in Central America except Mayan and Aztecan languages.

claim that OV languages tend to be postpositional while VO languages tend to be prepositional. The evidence is based on a database containing 625 languages.[1] The method involves first grouping the languages into genetic groups

[1] Most of the data in this paper is based on a 543-language subset of the database for which I have been able to determine a basic order of verb and object. The remaining 82 languages are ones in which both orders of verb and object are common or ones for which there is insufficient information in the sources consulted to determine whether there is a basic order of verb and object. Each of the tables below is based, in fact, upon the subset of these 543 languages for which I have been able to assign a value to the other word order parameter being examined. For example, Table 1 is based on the 434 languages for which I have data on both order of verb and object and adposition type. There are four reasons why the database might not contain data for a given parameter: (1)

roughly comparable in time depth to the subfamilies of Indo-European. I refer to each of these groups as a GENUS. The counts cited below involve numbers of genera rather than numbers of languages. Counting genera rather than languages controls for the most severe genetic bias.[2] The languages within a genus are generally similar for most of their typological characteristics. These genera are then grouped into six large geographical areas: Africa, Eurasia (excluding southeast Asia), Southeast Asia & Oceania, Australia-New Guinea, North America, and South America.[3] As discussed in Dryer 1989b, this allows us to

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both orders might be common; (2) the sources consulted contain insufficient data; (3) the language may lack the category in question (e.g., some languages do not employ adpositions); or (4) the sources consulted may not have been fully examined yet. The overall magnitude of the numbers in the various tables varies because the database contains more data for certain characteristics than for others.

[2] The groups identified as genera are intended to be maximal groups with a time depth no greater than 4000 years. Because our current knowledge about the time depths of most genetic groups is rather meagre, considerable guesswork has been involved in identifying these genera. My decisions regarding which groups are genera have been made on the basis of published estimates of time depths, informal estimates from experts on particular groups, and my own impressions about the rough genetic distance between groups, based both on descriptions of the languages and on the literature discussing particular classifications. Nichols 1990 employs the term FAMILY in a sense that is similar to my notion of genus, and her guesses as to which groups are families are very similar to the groups I identify as genera. Genera are groups of languages whose similarity is such that their genetic relatedness is uncontroversial. Discussions in the literature debating whether two languages or groups are genetically related point to the conclusion that, whether or not they are related, they must be in separate genera. For the languages of North America, Campbell & Mithun (1979) have provided a list of minimal genetic groups whose validity nobody questions. I assume that any group that contains more than one of these minimal groups must be more remote than a genus. Most of these minimal groups I in fact treat as a genus; I have decided that a few of them contain more than one genus, usually because of estimates of time depths either in the published literature or from experts in those groups. Salish and Uto-Aztecan are examples of groups like these, and I treat their immediate subgroups as genera. But my decisions on the whole remain rather impressionistic and perhaps in some cases somewhat arbitrary. They are subject to dispute and some of them are undoubtedly wrong.

This paper contains an appendix listing the languages in my database by genus and by area. The list differs somewhat from a similar list in Dryer 1989b because the database is larger now and because I have in some cases revised my assumptions about what the genera are. The current version of the database contains languages from 252 genera.

[3] See the key to Table 1 for a more detailed description of the six areas. The choice of areas and where to draw their boundaries is somewhat arbitrary, and in this paper it is in fact slightly different from that proposed in Dryer 1989b, where Southeast Asia & Oceania are treated as part of Eurasia. The use of six areas rather than five makes the test employed in this paper more difficult to satisfy by chance and thus more conservative (since there is only 1 chance in 64 that six areas will be identical by chance, but 1 in 32 if five areas are used). Grouping Australia and New Guinea together may also seem somewhat odd, since there is little evidence of contact between them during the past 8000 years. But no claim is made, in grouping them together, that there has been any influence between them, or that they form a linguistic area. Rather, the goal in deciding on the areas was to have areas that appear roughly comparable in genetic and typological diversity. While Australia does exhibit considerable diversity, it does not appear to exhibit the same amount of diversity as most if not all of the other areas. The crucial question, however, is to what extent the results discussed here would have been different had a different set of areas been chosen. While one cannot know this without trying out different possible sets, the nature of the results cited here

control for large-scale areal phenomena and also allows us to determine whether a difference in numbers of languages reflects a world-wide phenomenon (and thus a general property of language) or whether it is restricted to one or two areas of the world (and is thus perhaps due to chance). To determine whether a difference in frequency between two language types is statistically significant, the number of genera in each area containing each of the two language types is determined. If one type is more frequent than the other in each of the six areas, then the difference is taken to be statistically significant. The underlying logic is that, if we assume the six areas to be essentially independent of each other areally and genetically, then there would be only one chance in 64 that all six areas would exhibit the given property if there were no linguistic preference for the language type that occurs more frequently.

The first line of Table 1 shows the number of genera within each of the six areas that contain OV languages with postpositions. The second line shows the same for OV languages with prepositions. The larger of each pair of figures is enclosed in a box. For example, the 15 in the upper lefthand corner of Table 1 indicates that there are 15 genera in Africa containing languages in my database that are OV&Postpositional. This number is enclosed in a box because it is greater than 3, the number of genera containing languages that are OV&Prepositional. In the righthand column are the total numbers of genera containing languages of each type over the entire world. In Table 1 the difference in these totals (107 vs. 7) is so great that these figures are indicative of the strong preference among OV languages to be postpositional. Our statistical test involves comparing the number of each type in each of the six areas, and indeed the number of genera containing languages that are OV&Postpositional is greater than the number of genera containing languages that are OV&Prepositional within each of the six areas. Hence the preference for postpositions among OV languages is statistically significant. The last two lines give comparable data for VO languages. Here VO&Prep outnumbers VO&Postp in each of the six areas, indicating a statistically significant preference for VO languages to employ prepositions rather than postpositions.[4] We have firm evidence, therefore, that the pair ⟨adposition, NP⟩ is a correlation pair, that adpositions are verb patterners with respect to this pair, and that the NPs they combine with are object patterners.

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is such that there is little reason to believe that they would be significantly different if, say, I had treated Australia and New Guinea as separate areas: since for most of the results cited below all six of the areas assumed here exhibit the same pattern, the worst that might happen if we were to treat Australia and New Guinea as separate areas is that one of them might not have conformed to the otherwise universal pattern.

[4] Note that the number of genera in South America containing VO&Prep languages is only one more than the number of genera containing VO&Postp languages. This means that if the next language from South America to be added to my database were a VO&Postp language not in any of the genera currently containing such languages, then the number of genera for VO&Prep and VO&Postp in South America would become equal, and the number of genera containing VO&Prep languages would not be higher in all six areas, and the preference for prepositions among VO languages would fall short of statistical significance. However, even in that situation adpositions would still be verb patterners by the revised definition to be discussed shortly.

Adposition type illustrates a particularly clear case in which the order of two elements correlates with the order of verb and object. Many other cases are less clear. Consider the data given in Table 2 for the relationship between the order of verb and object and the order of noun and relative clause.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&RelN	5	[11]	2	2	3	3	26
OV&NRel	[9]	5	2	[6]	[12]	3	37
VO&RelN	0	0	1	0	0	0	1
VO&NRel	[21]	[8]	[12]	[3]	[11]	[5]	60

TABLE 2. Order of noun and relative clause.

If we restrict attention to the figures for OV languages in Table 2, we find little reason to posit a correlation: in only one of the six areas are prenominal relative clauses (RelN) more common among OV languages, and in the totals in the rightmost column, NRel order is actually somewhat more common. By contrast, when we look at the figures for VO languages we see evidence of a very strong tendency for VO languages to be NRel: RelN order is found in only one genus (Chinese), while NRel order is found in 60 other genera. In all six areas, VO&NRel clearly outnumbers VO&RelN. While we do not have a correlation here in the same sense as with adposition type, we do still have a correlation in the sense that RelN order is more common among OV languages than it is among VO languages, and conversely for NRel order. This notion is captured by standard statistical tests for association or correlation, like the Chi-Square test. The basic idea behind such tests can be achieved in the present instance by comparing the PROPORTION OF GENERA containing OV languages that are RelN with the proportion of genera containing VO languages that are RelN. These proportions, directly computed from the data in Table 2, are given in Table 3. For example, Table 2 shows that there are 5 genera in Africa containing OV&RelN languages and 9 genera containing OV&NRel languages. Thus the proportion of genera in Africa containing OV&RelN languages among genera containing OV languages for which I have data on the order of noun and relative clause is 5 out of 5 + 9 = 14 or .36.[5]

[5] More precisely, the PROPORTION OF GENERA is defined as follows. Given two parameters A and B, the proportion of genera is defined as the number of genera containing languages that are A&B as a proportion of the sum of the number of genera containing languages that are A&B and the number of genera containing languages that are A&~B. In general, this sum will be identical to the number of genera containing languages that are A for which I have data on whether they are B or ~B, but not always, because a genus might contain languages of type A&B as well as languages of type A&~B. For example, among the Eastern Cushitic languages some are OV&NRel (Somali, Oromo) while at least one (Afar) is OV&RelN. This genus, therefore, is included both among the 5 genera in Africa that contain languages which are OV&RelN and among the 9 genera that contain languages which are OV&NRel. The number of genera in Africa which contain OV languages and for which I have data on the order of relative clause and noun is thus 13, but the sum of the number of genera containing languages which are OV&RelN and the number of genera containing languages which are OV&NRel is 14. I define the proportion of genera in this way so that the sum of the proportion of genera that are A&B and the proportion that are A&~B will be 1.00.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	.36	.69	.50	.25	.20	.50	.42
VO	.00	.00	.08	.00	.00	.00	.01

TABLE 3. Proportions of genera containing RelN languages as opposed to NRel.

Table 3 shows that in all six areas the proportion of genera containing RelN languages is higher among OV languages than it is among VO languages. We can say that there is a correlation between the order of noun and relative clause and the order of verb and object in the sense that RelN order is significantly more common among OV languages than it is among VO languages. In general, I will test for correlations by comparing proportions as in Table 3. Only in cases where the raw numbers of genera are so overwhelming, as in the case of adposition type, will I forego this step. Nevertheless, in 1 I refine the definitions of verb patterner and object patterner to incorporate this idea.

(1) If a pair of elements X and Y is such that X tends to precede Y significantly more often in VO languages than in OV languages, then ⟨X, Y⟩ is a CORRELATION PAIR, and X is a VERB PATTERNER and Y an OBJECT PATTERNER with respect to this pair.

By the definition in 1, the evidence in Table 3 shows that the pair of noun and relative clause is a correlation pair, and that nouns are verb patterners and relative clauses object patterners with respect to this pair of elements.

Throughout this paper I assume that the word order correlations can be discussed in terms of a contrast between VO languages and OV languages. This assumes that SVO languages pattern like verb-initial languages, an assumption that characterizes the work of Lehmann and Vennemann. This assumption has been challenged by a number of people in recent years (Hawkins 1980:199, 1983:30; Comrie 1981:90, 94–95, 1989:96, 100–101; Mallinson & Blake 1981:379; Siewierska 1988:18–19), who argue that SVO languages are actually intermediate between verb-initial and verb-final languages. However, I demonstrate in detail in Dryer 1991 that, except for a small number of characteristics, SVO languages exhibit properties very much like those of verb-initial languages, so that it is appropriate to discuss the word order correlations in terms of a contrast between VO and OV languages.

1.2. EXPLAINING THE CORRELATIONS. Many different kinds of explanation have been offered for the word order correlations (cf. Lehmann 1973; Vennemann 1973, 1974a, 1974b, 1976; Vennemann & Harlow 1977; Kuno 1974; Givón 1975, 1984; Keenan 1979; Frazier 1979, 1985; Maxwell 1984; Hawkins 1983, 1984, 1990). But it seems fair to say that the most popular view is that they reflect a tendency to order grammatical heads consistently with respect to their dependents. This view is stated more explicitly in 2.

(2) THE HEAD-DEPENDENT THEORY (HDT): Verb patterners are heads and object patterners are dependents. That is, a pair of elements X and Y will employ the order XY significantly more often among VO languages than among OV languages if and only if X is a head and Y is a dependent.

According to the HDT, languages tend towards one of two ideals: head-initial languages, in which heads consistently PRECEDE their dependents, and head-final languages, in which heads consistently FOLLOW their dependents. One of the goals of this paper is to present evidence against the HDT. It is not clear whether anybody has ever made a claim in the primary literature that is exactly equivalent to the HDT. Greenberg comes close, referring (1963:100) to 'a general tendency to put modified before modifier' in reference to consistent verb-initial languages, noting that consistent verb-final languages exhibit opposite properties. Lehmann (1978:19–20) claims that 'nominal modifiers precede nouns in OV languages and follow them in VO languages', but claims the opposite pattern for verbal modifiers: 'verbal modifiers follow verbs in OV languages and precede them in VO languages' The data cited below shows that neither of these claims is true. Vennemann (1973, 1974a, 1974b) does not characterize the pattern in terms of heads and dependents, but in terms of what he calls OPERANDS and OPERATORS; however, the elements he calls operands are generally elements that would be analyzed as heads, and the elements he calls operators are generally elements that would be analyzed as dependents. And he himself notes (1974b:9) that his 'definition coincides with Trubetzkoy's conception of the relationship between the determinant and the determiné.' Vennemann revises his views in subsequent work (Vennemann 1976, Vennemann & Harlow 1977), explicitly formulating an account in terms of the heads and specifiers (using the latter term in a way that is apparently equivalent to the notion of dependent and not to be confused with the uses of that term in generative grammar). Hawkins (1983) does not employ an approach whereby various pairs of elements are viewed as correlating in order with the verb and object; but his principle of Cross-Category Harmony is formulated in terms of heads and dependents, and it specifies that the most frequent type of verb-initial languages will be those that are consistently head-initial and that the most frequent type of verb-final languages will be those that are consistently head-final.[6]

Evaluation of the HDT in 2 is hampered by the fact that its predictions depend on one's assumptions about what is a head. While there is widespread agreement across different theoretical approaches as to what is a head and what is a dependent, there are few pairs of elements on which there is universal agree-

[6] Positions resembling the HDT have been widely assumed in generative grammar, both in Extended Standard Theory (cf. Jackendoff 1977:85, Lightfoot 1982) and in Government-Binding Theory (cf. Stowell 1981; Koopman 1984; Travis 1984, 1989; Chomsky 1988:69), where reference is often made to a distinction between head-final and head-initial languages. But questions arise as to exactly what predictions, if any, the theoretical claims of such approaches make regarding the relative frequency of language types classified on the basis of surface word order. Furthermore, insofar as a distinction is made in the generative literature between head-final and head-initial languages, the claims are often made about the ordering of heads with respect to COMPLEMENTS, rather than with respect to all types of dependents. I discuss a variant of the HDT based on the notion of complement in §5. Some of the literature cited above (e.g., the works of Koopman and Travis) contains proposals for describing languages with inconsistent word order, but the nature of these proposals is such that it is unclear why such languages are less frequent than languages with consistent word order. But it is precisely this phenomenon that I wish to explain here.

ment. Even the pair of adjective and noun, which might seem to be a prototypical example of modifying dependent and head, has been analyzed the opposite way, as head + dependent, at least for English (cf. Anderson 1976, Abney 1987). I will take the liberty of distinguishing cases like these, where there is general agreement in the field, including traditional grammar, from instances where both alternatives have been seriously considered. An example of the latter type would be complementizers. While traditional grammar treats the combination of complementizer plus clause as an exocentric structure, in which neither element is a head, earlier forms of generative grammar, in which the Comp combined with S to form an S′, treated the S as head in the sense that the S′ was a projection of the S.[7] And more recently Stowell 1981 and Chomsky 1986 treat the complementizer as head, a view that is also proposed, from different theoretical perspectives, by Vennemann & Harlow 1977 and Hudson 1984. Clearly the predictions of the HDT depend, in cases like these, on what assumptions one makes as to which element—if either—is head. In evaluating the HDT, it will be necessary for me to consider the implications for different sets of assumptions.

While the primary purpose of this paper is to present the empirical evidence about which pairs of elements are correlation pairs and to evaluate the HDT in light of this evidence, I will propose in §6 the following alternative to the HDT.

(3) THE BRANCHING DIRECTION THEORY (BDT): Verb patterners are nonphrasal (nonbranching, lexical) categories and object patterners are phrasal (branching) categories. That is, a pair of elements X and Y will employ the order XY significantly more often among VO languages than among OV languages if and only if X is a nonphrasal category and Y is a phrasal category.

According to the BDT, languages tend towards one of two ideals: right-branching languages, in which phrasal categories FOLLOW nonphrasal categories, and left-branching, languages in which phrasal categories PRECEDE nonphrasal categories. The idea that OV and VO languages differ in their branching direction is hardly novel. But it often seems to be assumed that the HDT and the BDT are equivalent—that a head-initial language will be right-branching, and vice versa. In many cases, this is true. But I will show below that the two theories are not equivalent, and that where they make different predictions it is the BDT which is correct.

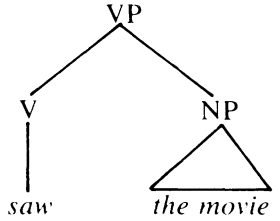
The two theories can be briefly illustrated at this point by the two correlation pairs discussed above, as well as by the pair of verb and object, which is a correlation pair by definition. The structures typical of VO languages are given schematically in 4.[8] The three structures in 4 conform to the HDT: in all three

[7] The notion of 'head' is sometimes applied only to lexical heads. I use the term here to include phrasal elements which are heads in the sense that the mother of the phrasal element is viewed as the projection of the phrasal element.

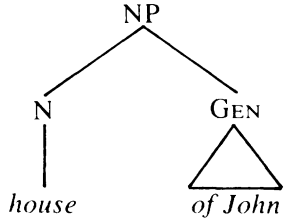
[8] The structure in 4c is schematic in a number of ways, ignoring the role of articles and the fact that 'REL' is not a grammatical category. My arguments do not depend on these matters of detail.

cases the first element, the verb patterner, is the grammatical head and the second element, the object patterner, is a dependent. These structures also conform to the BDT, since they are all right-branching: the first element is a single word belonging to a nonphrasal (nonbranching) category and the second element involves a phrasal (branching) category.

(4) a.



b.



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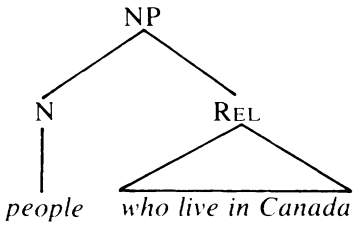


In §§2–4, I will present the empirical evidence bearing on the question of which pairs of elements are correlation pairs, discussing the implications of this evidence for the HDT. I will distinguish three sets of pairs of elements: pairs of elements that exhibit correlations which the HDT correctly predicts (§2); NONCORRELATION PAIRS, i.e. pairs of elements which do not exhibit a correlation but which the HDT incorrectly predicts ought to exhibit a correlation (§3); and CONTROVERSIAL PAIRS, i.e. pairs of elements which are correlation pairs but which have been analyzed in different ways as to which element of the pair (if either) is a head (§4). For the third type I will show that the HDT makes the correct prediction under certain assumptions as to what is head, but that under alternative assumptions it either fails to predict a correlation or predicts the opposite correlation from what we in fact find.[9]

2. PAIRS OF ELEMENTS THAT THE HDT ACCOUNTS FOR. While I will ultimately show that the HDT (stated in 2) is inadequate, it does correctly account for a number of correlation pairs—including, for instance, adposition and NP, and noun and relative clause, at least under the assumption that adpositions are heads, a point I return to in §4. In this section I will discuss the evidence regarding the pairs of elements in Table 4. In each of these cases the verb patterner is head and the object patterner is dependent, as claimed by the HDT.

[9] In this paper I consider only correlations with the order of verb and object that involve the order of two elements. There are a variety of other typological characteristics that appear to correlate with the order of verb and object, such as the use of case marking to distinguish subjects and objects, apparently more common in OV languages. I assume that these other correlations are to be explained by principles distinct from those that explain the correlations between pairs of elements.

VERB PATTERNER	OBJECT PATTERNER	EXAMPLE
noun	genitive	*father + of John*
adjective	standard of comparison	*taller + than Bob*
verb	PP	*slept + on the floor*
verb	manner adverb	*ran + slowly*
copula verb	predicate	*is + a teacher*
'want'	VP	*wants + to see Mary*

TABLE 4. Correlation pairs accounted for by the Head-Dependent Theory.

2.1. NOUN AND GENITIVE. Table 5 gives the data on the order of noun and genitive. It shows that, while there is an overwhelming preference for GenN order among OV languages, the preference for NGen order among VO languages is much weaker: in fact, in two areas GenN order is more common among VO languages. In order to determine whether there is a correlation here,

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&GenN	[17]	[21]	[5]	[16]	[30]	[23]	112
OV&NGen	6	3	1	2	0	0	12
VO&GenN	5	4	4	[6]	6	[5]	30
VO&NGen	[22]	[5]	[12]	0	[21]	3	63

TABLE 5. Order of noun and genitive.

we must compare proportions, as we did with relative clauses. Table 6 gives the proportions of genera containing GenN languages in OV and VO languages. The data in this table still falls short of demonstrating a statistically significant correlation between the order of verb and object and the order of noun and genitive, because there is one area, Australia-New Guinea, in which GenN order is more common among VO languages. Since the difference in proportions is small in this one area, while the differences in proportions are considerably larger for the other five areas and the difference in the average of proportions is also fairly large (.89 vs. .45), I will assume that noun and genitive form a correlation pair.[10]

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.74]	[.88]	[.83]	.89	[1.00]	[1.00]	.89
VO	.19	.44	.25	[1.00]	.22	.63	.45

TABLE 6. Proportions of genera containing GenN languages as opposed to NGen.

2.2. ADJECTIVE AND STANDARD. Greenberg's 1963 30-language sample shows a strong correlation between VO order and adjective-marker-standard order in comparative structures (e.g. *taller than John*) and between OV order and stan-

[10] I show in Dryer 1991 that the large number of VO&GenN languages is due to the fact that both orders of genitive and noun are common in SVO languages, as opposed to V-initial languages: although SVO languages generally pattern like V-initial languages, the order of noun and genitive is one characteristic for which SVO languages are intermediate between V-initial and V-final languages. The fact that there is a larger difference between V-initial and OV languages with respect to the order of noun and genitive provides further reason to conclude that noun and genitive form a correlation pair.

dard-marker-adjective order. I ignore the position of the marker here, restricting attention to the order of adjective and standard. Table 7 shows evidence similar to Greenberg's.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&StAdj	3	15	3	0	5	3	29
OV&AdjSt	2	1	0	0	1	3	7
VO&StAdj	0	0	1	0	0	0	1
VO&AdjSt	5	7	8	0	7	4	31

TABLE 7. Order of adjective and standard in comparative construction.

The totals for OV languages in Table 7 show a clear preference for StAdj order among OV languages, though the figures fall short of statistical significance for OV languages because I have no data for this characteristic for Australia-New Guinea and because the numbers for the two types are equal for South America. Table 7 shows a particularly clear preference for AdjSt order among VO languages, with only one case of a VO&StAdj genus (Chinese). When we compare proportions, as shown in Table 8, we find that the proportion for StAdj order is considerably higher for OV languages in all five areas for which I have data. I will assume that, where this situation obtains, we can conclude we have a correlation pair.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	.60	.94	1.00	—	.83	.50	.77
VO	.00	.00	.11	—	.00	.00	.02

TABLE 8. Proportions of genera containing StAdj languages as opposed to AdjSt.

2.3. VERB AND ADPOSITIONAL PHRASE. The next three characteristics have rarely been discussed in the word order literature. Table 9 shows evidence of a strong correlation between the order of verb and object and the order of verb and adpositional phrase.[11] In fact, this pair of elements exhibits the strongest correlation of any pair considered in this paper. Table 9 shows that adpositional phrases more often precede the verb in OV languages in all six areas, and that they more often follow the verb in VO languages in all six areas. The correlation is so strong here that it is unnecessary to compare proportions.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&PP-V	8	14	3	10	17	11	63
OV&V-PP	5	0	0	0	0	4	9
VO&PP-V	0	0	1	0	0	0	1
VO&V-PP	17	7	13	4	14	4	59

TABLE 9. Order of verb and adpositional phrase.

The fact that the order of verb and adpositional phrase correlates so strongly with the order of verb and object may seem almost tautological, since adpo-

[11] Throughout this paper I use 'PP' as an abbreviation for 'adpositional phrase', i.e. prepositional or postpositional phrase.

sitional phrases are so similar to objects and are even considered by some to be a kind of object, in that they involve nominal dependents of the verb. Nevertheless, the existence of languages in which adpositional phrases occur on the opposite side of the verb from objects shows that this correlation is by no means tautological. It is possible that the correlation has an independent explanation, in terms of the strong similarity between objects and adpositional phrases. It should be stressed, however, that the fact that they are both dependents of the same element is not enough to explain the correlation, since various other elements that are widely assumed to be dependents of the verb do not exhibit the same correlation—either not exhibiting a correlation at all, as is the case with negative particles (cf. §3.4), or exhibiting the opposite correlation, as is the case with question particles (cf. §4.4).

2.4. VERB AND MANNER ADVERB. Although manner adverbs and other adverbs often pattern similarly, I consider only manner adverbs here, because many other kinds of adverbs are interpretable as sentence adverbs and exhibit greater flexibility of word order in many languages. Table 10 shows that manner adverbs overwhelmingly precede the verb in OV languages and generally follow the verb in VO languages.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&AdvV	[5]	[18]	[3]	[13]	[13]	[12]	64
OV&VAdv	1	1	1	0	0	3	6
VO&AdvV	0	2	4	2	[6]	0	14
VO&VAdv	[16]	[5]	[10]	[4]	5	[4]	44

TABLE 10. Order of verb and manner adverb.

Because there is one area in which manner adverbs precede the verb more often in VO languages, it is necessary to compare proportions of genera. Table 11 shows that manner adverbs precede the verb more often among OV languages than among VO languages for all six areas.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.83]	[.95]	[.75]	[1.00]	[1.00]	[.80]	.89
VO	.00	.29	.29	.33	.55	.00	.24

TABLE 11. Proportions of genera containing AdvV languages as opposed to VAdv.

2.5. COPULA AND PREDICATE. By 'copula' I mean a word that is used with nominals, adjectives, or locatives when they are used predicatively. In most languages the word in question is a verb, analogous to English *be*, but in a few languages it is a nonverbal particle. Table 12 shows that the preferred order of copula and predicate is PredCop in OV languages and CopPred in VO lan-

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&PredCop	[9]	[19]	[2]	[8]	[11]	[15]	64
OV&CopPred	4	0	1	1	1	1	8
VO&PredCop	2	1	0	[1]	6	2	12
VO&CopPred	[17]	[6]	[10]	0	[8]	2	43

TABLE 12. Order of copula and predicate.

guages, though the preference for CopPred order in VO languages is found in only four of the six areas.

When we compare proportions, as shown in Table 13, we find that the proportion for PredCop order is higher for OV languages in five areas. However, the one deviant area is Australia-New Guinea, and the high proportion for PredCop order among VO languages in this area is partly due to the fact that I have data on the order of predicate and copula for only one VO language in the area—Wembawemba, a VOS Australian language that exhibits a number of characteristics atypical of VO languages. Since the proportion for PredCop order is considerably higher among OV languages than among VO languages in each of the other five areas, I will consider copula and predicate to be a correlation pair, where the copula is the verb patterner and the predicate is the object patterner.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.69]	[1.00]	[.67]	.89	[.92]	[.94]	.85
VO	.11	.14	.00	[1.00]	.43	.50	.36

TABLE 13. Proportions of genera containing PredCop languages as opposed to CopPred.

As with the order of verb and adpositional phrase, the fact that copulas are verb patterners and predicates object patterners may seem almost tautological, since the predicate is a complement of the copula in much the same way that an object is a complement of the verb. Again, however, the existence of languages in which the order of verb and object differs from the order of copula and predicate shows that the correlation is not tautological.

2.6 ORDER OF 'WANT' AND SUBORDINATE VERB. Table 14 provides data on the order of a verb meaning 'want' and the subordinate verb with which it is associated. The direction of the numbers in Table 14 suggests that this pair of

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&VWant	2	[7]	[2]	[6]	[5]	[7]	29
OV&WantV	2	2	1	2	1	2	10
VO&VWant	0	0	0	1	1	2	4
VO&WantV	[13]	[6]	[10]	1	[9]	[3]	42

TABLE 14. Order of 'want' + verb.

elements forms a correlation pair, and the comparison of proportions in Table 15 establishes this conclusion: the proportion of VWant is higher among OV languages in all six areas. The HDT accounts for the order of the word meaning 'want' with respect to the other verb under the assumption that the word meaning 'want' is the head.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.50]	[.86]	[.67]	[.75]	[.83]	[.78]	.72
VO	.00	.00	.00	.50	.10	.40	.17

TABLE 15. Proportions of genera containing VWant languages as opposed to Want V.

3. NONCORRELATION PAIRS. Each pair of elements discussed in this section involves a head and a dependent, but none of them is a correlation pair. These pairs of elements, which I will refer to as noncorrelation pairs, are listed in Table 16. Although some of these pairs have been thought to be correlation pairs, the evidence I will present here demonstrates that they do not correlate in order with the verb and object. They thus provide a problem for the HDT, which predicts that the head in each pair ought to be a verb patterner and the dependent an object patterner.

DEPENDENT	HEAD	EXAMPLE
adjective	noun	*tall + man*
demonstrative	noun	*that + man*
intensifier	adjective	*very + tall*
negative particle	verb	*not + go*
tense/aspect particle	verb	cf. examples in 6 in §3.5

TABLE 16. Noncorrelation pairs: Head-dependent pairs that are not correlation pairs.

3.1. NOUN AND ADJECTIVE. It is widely believed that the order of noun and adjective correlates with the order of verb and object, that adjectives modifying nouns are object patterners. Lehmann 1973 and Vennemann 1974b both imply that VO languages tend to be NAdj, while OV languages tend to be AdjN. I have shown in Dryer 1988a, however, that there is no evidence of any such correlation. Table 17, which presents the evidence in the format employed in this paper, shows no evidence of any tendency for OV languages to be AdjN. To the contrary, in five of the six areas the more common order among OV languages is NAdj.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&AdjN	7	[24]	2	4	10	8	55
OV&NAdj	[18]	4	[5]	[15]	[18]	[14]	74
VO&AdjN	3	[6]	4	[5]	[19]	3	40
VO&NAdj	[25]	3	[12]	2	8	[5]	55

TABLE 17. Order of noun and adjective.

Nor do VO languages tend to be NAdj: the totals in the righthand column show more genera with VO&NAdj than VO&AdjN, but this order is more common in only three of the six areas. The comparison of proportions in Table 18 provides the crucial test, and shows no evidence of any correlation. While there are three areas in which the adjective precedes the noun more often in OV languages than in VO languages, the other three areas exhibit the opposite pattern. Furthermore, the averages of the proportions, given in the righthand column, show that the average for AdjN order is actually higher among VO languages. Hence, insofar as there is a trend, it is in the opposite direction

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.28]	[.86]	[.29]	.21	.36	.36	.39
VO	.11	.67	.25	[.71]	[.70]	[.38]	.47

TABLE 18. Proportions of genera containing AdjN languages as opposed to NAdj.

from that predicted by the HDT. This difference is small, however, and well within the range of random variation. I conclude that ⟨noun, adjective⟩ is not a correlation pair.[12]

3.2. NOUN AND DEMONSTRATIVE. Tables 19 and 20 show a similar lack of evidence for any correlation between the order of noun and demonstrative and the order of verb and object. Table 19 shows that DemN order is more common among OV languages in five of the six areas, but this apparently reflects no more than a general preference for DemN order: in four areas this order is preferred among VO languages as well. The totals might suggest that NDem is more common in VO languages, but a majority of the genera containing VO&NDem languages are in Africa. When we compare proportions in Table 20, we find no evidence of a correlation; in fact, the averages of the proportions over areas are almost identical for OV and VO languages.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&DemN	10	[20]	[4]	[10]	[22]	[13]	79
OV&NDem	[11]	1	2	9	5	4	32
VO&DemN	4	[8]	7	[5]	[20]	[9]	53
VO&NDem	[23]	1	[11]	0	7	1	43

TABLE 19. Order of demonstrative and noun.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.48]	[.95]	[.67]	.53	[.81]	.76	.70
VO	.15	.89	.39	[1.00]	.74	.90	.68

TABLE 20. Proportions of genera containing DemN languages as opposed to NDem.

Hence the difference reflected in the totals in Table 19 simply reflects the large number of genera in Africa containing VO&NDem languages. This illustrates the danger of using overall totals without attending to the areal distri-

[12] The fact that adjectives are not object patterners may seem surprising in light of the fact that relative clauses are object patterners, as shown in §1.1. As discussed in Dryer 1988b, there are many languages in which what I call adjectives are really verbs, and 'adjectives' modifying nouns are really just a kind of relative clause. Because of this, we might expect to find a correlation between the order of noun and relative clause and the order of noun and adjective, and we do. To an anonymous referee, this seems puzzling: if the order of verb and object correlates with the order of noun and relative clause, and if the order of noun and relative clause correlates with the order of noun and adjective, shouldn't the order of verb and object correlate with the order of noun and adjective as well? The answer is simply that 'correlate with' is not a transitive relation: as is well known in statistics, if X correlates with Y and Y with Z, it does not follow that X correlates with Z. In fact, Prior 1985 argues for the existence of chains of word order correlations, which each pair of pairs of elements that are adjacent in the chain correlate in order, but where the first pair in the chain exhibits an INVERSE correlation with the last pair in the chain. The absence of a correlation in the case of noun and adjective despite the correlation in the case of noun and relative clause can be partly understood in terms of the large number of languages, like English, in which the adjective precedes the noun and the relative clause follows it. In fact, AN&NRel outnumbers AN&RelN in my database by 32 genera to 25.

bution. We can conclude that ⟨noun, demonstrative⟩ does not form a correlation pair.[13]

3.3. ADJECTIVE AND INTENSIFIER. By INTENSIFIER I intend words that, like *very* and *more* in English, modify adjectives, indicating the degree to which the state denoted by the adjective is true. These words are traditionally called 'adverbs' and are also known as 'degree words'. Tables 21 and 22 show no evidence of a correlation. Table 21 shows that, for both OV languages and VO languages, there are three areas in which IntensAdj order is more common and two areas in which AdjIntens order is more common. While there is a small difference in the average of proportions, shown in the righthand column of Table 22, this difference is entirely attributable to one area, Africa.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&IntensAdj	[4]	[14]	2	4	[8]	7	39
OV&AdjIntens	2	0	2	[9]	4	[8]	25
VO&IntensAdj	0	[7]	5	1	[10]	[4]	27
VO&AdjIntens	[8]	1	[9]	1	3	3	25

TABLE 21. Order of intensifier and adjective.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.67]	[1.00]	[.50]	.31	.67	.47	.60
VO	.00	.88	.36	[.50]	[.77]	[.57]	.51

TABLE 22. Proportions of genera containing IntensAdj languages as opposed to AdjIntens.

3.4. VERB AND NEGATIVE PARTICLE. Negative morphemes in the languages of the world can be classified into three types (cf. Dahl 1979). In some languages negation is expressed by an affix on the verb, as in 5 (from Ashton 1947:338):

(5) Swahili: *mtoto ha-ku-lia.*
child NEG-PAST-cry
'The child did not cry.'

In other languages negation is expressed by a separate word. Among such negative words we can distinguish those which are verbs (illustrated in 7 below) and those which are not verbs, like *not* in English, which I will refer to as negative particles. In this section I will present data for nonverbal particles; verbal negatives are considered in §4.2. I exclude from consideration, both here and in §4.2, languages with little or no verb morphology, since for such languages it is difficult to determine, at least on the basis of superficial evidence,

[13] There are a couple of complications associated with demonstratives. First, while ⟨noun, demonstrative⟩ is not a correlation pair, ⟨article, noun⟩ is, as shown below in §4.6. This presents a problem for any theory of the word order correlations, since the relationship of demonstrative to noun and that of article to noun are generally assumed to be analogous. Second, it is sometimes proposed that articles are heads of noun phrases (see §4.6); such proposals are generally formulated to refer to 'determiners' and are intended to apply to demonstratives as well. If one assumes that demonstratives are heads, then the HDT makes the opposite prediction from that assumed here. But that prediction also fails, since there is no correlation. I return to these issues in §7.2.

whether the negative should be considered a verb or not. Table 23 shows that both OV and VO languages exhibit a tendency to place the negative particle before the verb.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&VNeg	2	1	0	2	2	[4]	11
OV&NegV	[5]	[6]	[1]	[11]	[5]	3	31
VO&VNeg	6	0	1	0	0	0	7
VO&NegV	[7]	[5]	[7]	[3]	[17]	[4]	43

TABLE 23. Order of verb and negative particle.

Table 24 shows that, when we compare proportions, VNeg tends to be more common in OV languages; but this tendency falls short of statistical significance, since VNeg is more common in only four areas. I will assume, therefore, that ⟨verb, negative particle⟩ is not a correlation pair. If we follow the usual assumption that negative particles are modifiers of verbs, then the HDT predicts not only that verb and negative particle ought to be a correlation pair but also that we ought to find a correlation in the OPPOSITE direction from the trend that we actually find.[14]

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	.29	[.14]	.00	[.15]	[.29]	[.57]	.24
VO	[.46]	.00	[.13]	.00	.00	.00	.10

TABLE 24. Proportions of genera containing VNeg languages as opposed to NegV.

3.5. TENSE/ASPECT PARTICLE AND VERB. Languages employ three kinds of tense/aspect morphemes, parallel to the three kinds of negative morphemes just discussed, namely, affixes, particles, and verbal auxiliaries. The examples in 6 illustrate tense/aspect particles; the presence of inflections on the verb and the absence of inflections on the tense/aspect particles provides evidence that these particles are not (auxiliary) verbs.

(6) a. Yapese: *gamow raa guy-eem.*
IPL.EXCL FUT see-2SG
'We will see you.' (Jensen 1977:194)

b. Kiowa: *hègɔ́ páy mîn yî·-yà.*
now sun about.to disappear-IMPF
'The sun is about to set.' (Watkins 1984:218)

I will discuss auxiliary verbs indicating tense/aspect in §4.1 below. And, just

[14] The conclusions regarding negatives in this paper are rather different from those in Dryer 1988b. The primary difference stems from the fact that in the earlier paper I did not distinguish the three kinds of negative morphemes distinguished here. Overall, negative morphemes behave as verb patterners, but this turns out to be due to the fact that verbal negatives and negative affixes behave as verb patterners; the data in this paper shows that negative particles lack this property. (Dahl 1979 previously reported this difference between negative particles and the other two types of negatives.) The theoretical discussion in Dryer 1988b was based on the assumption that negative particles are verb patterners. Since that assumption is not supported, much of the theoretical discussion in that paper is now obsolete.

as I exclude from consideration negative words in languages lacking verbal inflections (since it is generally not clear whether these words are verbs), I also exclude tense/aspect words from the same languages. Table 25 shows that tense/aspect particles tend to precede the verb in both OV and VO languages.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&V-T/A	1	0	0	0	[4]	1	6
OV&T/A-V	[6]	[1]	[1]	[4]	3	[3]	18
VO&V-T/A	1	0	1	0	1	1	4
VO&T/A-V	[3]	[1]	[5]	0	[13]	[3]	25

TABLE 25. Order of verb and tense/aspect particle.

Table 26 shows that, when we compare proportions, we still find little difference between OV and VO languages: V-T/A order is more common in VO languages in two areas and more common in OV languages in only one area, and the averages of proportions are about the same.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	.14	.00	.00	.00	[.57]	.25	.16
VO	[.25]	.00	[.17]	—	.07	.25	.15

TABLE 26. Proportions of genera containing V-T/A languages as opposed to T/A-V.

Hence this too is apparently not an instance of a correlation pair. It is not entirely obvious how tense/aspect particles should be treated in terms of head-dependent relations. In English the category to which they bear the strongest resemblance is that of the negative particle *not*. By analogy to traditional approaches to the English negative, this argues for treating such particles as modifiers of the verb. What distinguishes tense/aspect particles from auxiliary verbs is that the latter typically bear all or some of the verbal inflections associated with the clause. It is this property, in fact, that provides the clearest argument for treating auxiliary verbs as heads (cf. Zwicky 1985). But the same considerations provide an argument for treating the verbs with which tense/aspect particles occur as heads, and hence for treating the tense/aspect particles as modifiers of the verb. Under these assumptions, the HDT predicts that such particles ought to be object patterners. The fact that they are not thus provides further evidence against the HDT.[15]

4. CONTROVERSIAL PAIRS. For the pairs of elements discussed in §§2–3 there is widespread agreement as to which element is head. For many pairs of elements, however, there is a widespread lack of agreement as to which member, if either, is the head. As we have seen, even for some of the pairs of elements

[15] It should be noted that a possible way of treating such particles in Government-Binding Theory would be as instances of INFL. But since INFL is assumed to be the head of the sentence in that theory, tense/aspect particles would be heads, not dependents, under that assumption. The HDT would then predict that such particles should be verb-patterners. But the fact that they are not, that they tend to precede the verb in both OV and VO languages, means that that prediction is not borne out.

discussed above one can find proposals that are at odds with the assumptions I have made. Consider also, for example, Dik's framework of Functional Grammar, which treats adpositions not as heads but rather as RELATION MARKERS (Dik 1983, Limburg 1983), while other approaches generally treat adpositions as heads. The HDT correctly accounts for this correlation only under the assumption that the adposition is head.

For the pairs of elements discussed in this section there are also conflicting mainstream proposals as to which element, if either, is head. All eight pairs considered here are correlation pairs. Thus for each of these pairs the HDT makes the correct prediction only if one assumes that the element shown here to be a verb patterner is the head. These pairs, listed in Table 27, therefore provide a problem for the HDT only under an assumption that one or more of these verb patterners is not the head. I will refer to these pairs of elements as the CONTROVERSIAL PAIRS.

VERB PATTERNER	OBJECT PATTERNER	EXAMPLE
tense/aspect auxiliary verb	VP	*has + eaten dinner*
negative auxiliary	VP	cf. 7 in §4.2
complementizer	S	*that + John is sick*
question particle	S	cf. 8 in §4.4
adverbial subordinator	S	*because + Bob has left*
article	N′	*the + tall man*
plural word	N′	cf. 9 in §4.7
verb	subject	*(there) entered + a tall man*

TABLE 27. Controversial pairs: Correlation pairs whose head-dependent status is controversial.

4.1. CONTENT VERB AND TENSE/ASPECT AUXILIARY VERBS. This section deals only with auxiliary verbs whose stem conveys tense or aspect. Applied to English, this includes *will, have*, and progressive *be*, but excludes the passive auxiliary *be* and modal auxiliaries like *can* and *should*. I also consider only tense/aspect words that are specifically verbal, in contrast to nonverbal tense/aspect particles like those discussed in §3.5. The verb with which the auxiliary verb combines is traditionally called the 'main verb', but this usage is confusing, since according to one view the auxiliary verb is the head—which implies that it is in one sense the main verb, while the other verb is a subordinate verb. For lack of a better neutral term, I will refer to the other verb as the content verb, as opposed to the auxiliary verb, which is a function word. Table 28 shows that auxiliary verbs tend to follow the content verb in OV languages and to precede it in VO languages.

The predictions of the HDT depend on one's assumptions about which verb is the head in constructions involving an auxiliary verb and a content verb.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&VAux	[5]	[12]	[2]	[8]	[1]	[8]	36
OV&AuxV	3	0	0	0	0	0	3
VO&VAux	1	1	0	[1]	0	1	4
VO&AuxV	[15]	[5]	[3]	0	[4]	1	28

TABLE 28. Order of content verb and auxiliary verb.

One view in generative grammar has been that the content verb is the head, the auxiliary being a specifier (and hence dependent) of the verb (cf. Chomsky 1970:52, Akmajian et al. 1979, Lightfoot 1982:60–61). Under this assumption, the HDT predicts exactly the opposite correlation from what we find. An alternative view (Vennemann 1973:43, Pullum & Wilson 1977, Schachter 1983, Gazdar et al. 1982) is that the auxiliary verb is the head, i.e. that it is simply a verb subcategorized for a VP complement. Only under this assumption does the HDT correctly predict the correlation that we find.

4.2. NEGATIVE AUXILIARY AND CONTENT VERB. I demonstrated in §3.4 that nonverbal negative particles and the verb do not form a correlation pair. In some languages, however, negative words exhibit verbal properties, as in 7 (from Langdon 1970:183):

(7) Diegueño: *ʔ-u·ya·w-x ʔ-əma·w-x.*
1-know-FUT 1-not-FUT
'I won't know.'

And just as tense/aspect words are verb patterners when they exhibit verbal properties, so are negative auxiliaries, as observed by Dahl 1979. The data in my database showing this falls short of statistical significance, but this may simply reflect the fact that there are two areas for which my database does not contain any OV languages with negative auxiliaries and two others for which my database does not contain any VO languages with negative auxiliaries. The trend is sufficiently strong that I will assume that it is real. Table 29 shows that such negative auxiliaries more commonly follow the content verb in OV languages and more often precede it in VO languages.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&VNeg	0	3	[1]	[1]	[2]	[1]	8
OV&NegV	0	3	0	0	0	0	3
VO&VNeg	1	0	0	0	0	0	1
VO&NegV	[4]	0	[5]	0	[3]	[1]	13

TABLE 29. Order of content verb and negative auxiliary verb.

The grammatical status of negative auxiliaries is presumably similar to that of the tense/aspect auxiliaries discussed in §4.1. In other words, an approach that treats tense/aspect auxiliary verbs as dependents would likely do the same for negative auxiliaries, and an approach that treats tense/aspect auxiliary verbs as heads would likely do the same for negative auxiliaries. Hence the discussion in the preceding section applies here as well.

4.3. COMPLEMENTIZER AND S. I will not cite data on the order of complementizer and S of the sort presented for other pairs of elements in this paper,[16] but there seems to be little question that this is a correlation pair. While both

[16] I have collected data on the position of complementizers for some of the languages in my database, but there is not enough of it to be worth citing. The data collected to date does not contain any VO&SComp languages.

initial and final complementizers are found in OV languages (cf. Dryer 1980, Hawkins 1990:225), complementizers in VO languages seem invariably to be initial; in fact, it may be an exceptionless universal that final complementizers are found only in OV languages. If so, then final complementizers are clearly more common in OV languages than they are in VO languages, and complementizers are therefore verb patterners, while the Ss they combine with are object patterners.

There are two traditional views on the relationship between complementizer and S. One is that the two form an exocentric structure (in which neither element is head); the other is that the S is the head (as labeling the category of the combination 'S-bar' implies). But the HDT would not predict the complementizer to be a verb patterner under either of these assumptions. Under the assumption that the structure is an exocentric one, the HDT does not predict any correlation; under the assumption that the S is the head, the HDT predicts that the complementizer should be an object patterner, the opposite of what we actually find. In a departure from traditional assumptions, Vennemann & Harlow (1977:247), Stowell (1981:388–95), Hudson (1984:107), and Chomsky (1986:3) take the position that the complementizer is head. Under that assumption the HDT predicts the correlation that we find.

4.4. QUESTION PARTICLE AND SENTENCE. Many languages employ particles to indicate that a sentence is being used as a question, typically a yes/no question, as in 8 (from Harrison & Albert 1976:311).

(8) Mokilese (Austronesian): *a koah sihkei?*
Q you well
'Are you well?'

Such question particles appear in a variety of positions in different languages—sentence-initial position, sentence-final position, some fixed position relative to the verb, sentence-second position, and variable position. Table 30 includes only languages in which question particles normally occur in a sentence-peripheral position.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&SQ	[4]	[6]	[3]	[9]	[5]	[5]	32
OV&QS	1	2	0	3	4	3	13
VO&SQ	[9]	0	[7]	1	2	0	19
VO&QS	6	[5]	3	[2]	[10]	[2]	28

TABLE 30. Order of question particle and sentence.

While Table 30 shows SQ being more common among OV languages in all six areas, the figures are much closer for VO languages: QS is more common in only four areas, and both types are common. As in other cases with such a pattern, it is necessary to compare proportions, as in Table 31. This table shows that the proportion for sentence-final complementizers (SQ) is higher among OV languages in all six areas, so we can conclude that question particles (or at least sentence-peripheral ones) are verb patterners.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.80]	[.75]	[1.00]	[.75]	[.56]	[.63]	.75
VO	.60	.00	.70	.33	.17	.00	.30

TABLE 31. Proportions of genera containing SQ languages as opposed to QS.

Under traditional assumptions, question particles might be viewed as modifiers of the verb, a view that is taken by Lehmann 1978. But then the HDT makes precisely the wrong prediction. A plausible alternative view would be that question particles (or at least some clause-peripheral ones) are a type of complementizer. Such a position is plausible in light of the fact that the English complementizer *whether* serves a function with respect to a subordinate clause that is similar to the function of a question particle with respect to a main clause. Thus question particles may pattern like complementizers. If one assumes that question particles are complementizers and complementizers are heads, then the HDT would make the correct prediction. But unless one assumes that question particles are heads, the HDT fails to predict that they are verb patterners.

4.5. ADVERBIAL SUBORDINATORS AND S. By 'adverbial subordinator' I mean words that, like *although* and *when* in English, are called 'subordinate conjunctions' in traditional grammar, and that mark adverbial subordinate clauses for their semantic relationship to the main clause. Table 32 shows that adverbial subordinators are somewhat more commonly clause-final in OV languages but overwhelmingly clause-initial in VO languages, indicating that they are verb patterners.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&SSub	4	[8]	[2]	[5]	[9]	[10]	38
OV&SubS	[6]	7	1	1	2	0	17
VO&SSub	0	0	0	0	0	1	1
VO&SubS	[16]	[8]	[11]	[3]	[17]	[4]	59

TABLE 32. Order of adverbial subordinator and clause.

As with complementizers, traditional grammar treats such words as combining with clauses in a structure which is exocentric or in which the clause is head. Under these assumptions the HDT predicts either no correlation or the opposite correlation from what we in fact find. An alternative view (Klima 1965, Jackendoff 1977) is that English adverbial subordinators are prepositions that subcategorize for S. If one assumes that adverbial subordinators are in general adpositions, then they are heads, and the HDT correctly predicts the correlation.

4.6. NOUN AND ARTICLE. I demonstrate in Dryer 1989a that articles are verb patterners, while the nouns they combine with are object patterners. This correlation is not as strong as most of those we have examined here. Table 33 shows that ArtN order is more common among OV languages in only two areas, and it is more common among VO languages in five areas; and Table 34 shows

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&NArt	[5]	2	[2]	[4]	4	2	19
OV&ArtN	1	[3]	0	2	4	[3]	13
VO&NArt	[9]	0	3	0	3	0	15
VO&ArtN	2	[6]	[7]	[1]	[17]	[4]	37

TABLE 33. Order of article and noun.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.83]	[.40]	[1.00]	[.67]	[.50]	[.40]	.63
VO	.82	.00	.30	.00	.15	.00	.21

TABLE 34. Proportions of genera containing NArt languages as opposed to ArtN.

that the proportion of NArt is higher among OV languages than it is among VO languages in all six areas.

The standard view of articles is that they are a type of modifier of the noun: this is the assumption of traditional grammar, of most work in generative grammar, and of most descriptions of languages that employ articles. But under this assumption, the HDT predicts exactly the opposite correlation from the one we find. Table 34 shows that articles FOLLOW nouns significantly more often in OV languages than in VO languages. Significantly, there have been proposals from a number of perspectives in recent years (cf. Vennemann & Harlow 1977:246, Hudson 1984:90–91, Abney 1987) that treat articles as the heads of what have traditionally been called noun phrases (but which can be called determiner phrases on this analysis), and that treat what is called an N′ in X′-syntax (e.g. *tall man* in *the tall man*) as a complement of the article. Only under this assumption does the HDT make the right prediction regarding articles.

4.7. NOUNS AND PLURAL WORDS. The next pair of elements involves a category found in only a small minority of the world's languages, namely, PLURAL WORDS, which are described in greater detail in Dryer 1989c and illustrated in 9.

(9) a. Gbeya: *ó tú wí-ré*
PLURAL black person
'black people' (Samarin 1966:81)

b. Gurung: *cá pxra-báe mxi jaga*
that walk-ADJ person PLURAL
'those walking people' (Glover 1974:97)

These words perform the same function as plural affixes in other languages, but they are separate words, not affixes. Table 35 shows that plural words invariably follow the noun in the OV languages in my sample, but they more

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&NPl	[2]	0	[3]	[5]	0	[6]	16
OV&PlN	0	0	0	0	0	0	0
VO&NPl	[5]	0	3	0	0	0	8
VO&PlN	2	0	[7]	[1]	[3]	[2]	15

TABLE 35. Order of plural word and noun.

often precede the noun in VO languages. Plural words are thus clearly verb patterners.

The most natural approach is to treat plural words as modifiers of the noun: that is generally how they are described in grammatical descriptions of languages employing them. However, under that assumption the HDT again predicts the opposite correlation from what we find. Since plural words resemble articles in some ways (like articles, they code grammatical features of the noun phrase), it is conceivable that the proposals for treating articles as heads of noun phrases might be extended to plural words as well. Otherwise plural words present a problem for the HDT.

4.8. VERB AND SUBJECT. At first blush, it might not seem that the order of verb and subject should correlate with the order of verb and object. After all, SVO order is very common, in fact the second most frequent order of subject, object, and verb (cf. Dryer 1989b, Tomlin 1986). Tables 36 and 37 show, however, that subjects are object patterners: the proportion of genera containing SV languages is higher among OV languages than it is among VO languages, largely because of the extreme rarity of OVS languages.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&SV	[23]	[27]	[5]	[20]	[30]	[27]	132
OV&VS	1	0	0	0	0	2	3
VO&SV	[23]	[6]	[13]	[6]	9	5	62
VO&VS	6	1	6	2	[25]	5	45

TABLE 36. Order of verb and subject.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.96]	[1.00]	[1.00]	[1.00]	[1.00]	[.93]	.98
VO	.79	.86	.68	.75	.26	.50	.64

TABLE 37. Proportions of genera containing SV languages as opposed to VS.

Hence, subjects satisfy the definition of object patterners. The HDT accounts for this, at least under the assumption that subjects are dependents of the verb. Whether subjects are dependents of the verb corresponds to the question of whether the S or the VP is the maximal projection of the verb. If the S is the maximal projection of the verb (cf. Jackendoff 1977, inter alia)—in other words, if the verb is the head of S, not just of VP—then the subject is a dependent of the verb. But if the VP is the maximal projection of the verb, then the subject is not a dependent of the verb. On the traditional view in generative grammar, the S is an exocentric (headless) construction consisting of the subject NP and the VP. On this view, the HDT fails to predict that subjects should be object patterners. The order of subject and verb is discussed further in §7.4 below.

5. ALTERNATIVES TO THE HDT: THE HEAD-COMPLEMENT THEORY. The evidence presented in §§3–4 provides convincing reason to reject the HDT as an account of the word order correlations. The HDT predicts that the noncorrelation pairs in Table 16 should be correlation pairs; and unless one's theory claims that the verb patterners in the controversial pairs in Table 27 are heads

with respect to their object patterners, these pairs also present a problem for the HDT. The 'best case' scenario for the HDT, therefore, is under a theory in which all of the verb patterners in the controversial pairs in Table 27 are analyzed as heads. Let us therefore explore the possibility that some variant of the HDT might survive the evidence I have presented here, if we were to assume that each of the verb patterners in the controversial pairs in Table 27 is a head. Under this assumption, the only pairs that present a problem for the HDT are the noncorrelation pairs in Table 16. An examination of the class of dependents in these noncorrelation pairs suggests that we might be able to reformulate the HDT in a way that restricts it to a proper subclass of the class of dependents. Strikingly, none of the dependents in these pairs is a complement: all of them—adjectives, demonstratives, intensifiers, negative particles, and tense/aspect particles—are attributes or adjuncts. We could thus propose the following variant on the HDT:

(10) THE HEAD-COMPLEMENT THEORY (HCT): Verb patterners are heads and object patterners are complements. That is, a pair of elements X and Y will employ the order XY significantly more often among VO languages than among OV languages if and only if X is a head and Y is a complement.

Unfortunately, there is some variation in linguists' use of the term 'complement', and the predictions of the HCT vary with the particular interpretation. Consider first a notion of complement defined as 'subcategorized dependent'. Since none of the noncorrelation pairs in Table 16 involve complements, the HCT correctly predicts that they are not correlation pairs. Conversely, a number of the pairs of elements that exhibit a correlation do involve complements. This is certainly true for the pairs verb and object, copula verb and predicate, and 'want' plus complement. Furthermore, if the object patterner in each of the controversial pairs in Table 27 is a dependent, it is certainly specifically a complement rather than an adjunct. For example, if complementizers are heads, they certainly subcategorize for an S, so the S they combine with would be a complement. Similarly, if articles are heads, they subcategorize for an N′, which is therefore a complement of the article.

Although the HCT succeeds in accounting for the fact that the noncorrelation pairs in Table 16 are not correlation pairs, the pairs in Table 38, which the HDT accounted for straightforwardly, present potential problems for the HCT. The first pair in Table 38, verb and manner adverb, seems quite clearly to involve an adjunct rather than a complement. PP modifiers of verbs are similar:

VERB PATTERNER	OBJECT PATTERNER	EXAMPLE
verb	manner adverb	*ran + slowly*
verb	PP	*slept + on the floor*
adjective	standard of comparison	*taller + than Bob*
noun	genitive	*father + of John*
noun	relative clause	*movies + that we saw*

TABLE 38. Correlation pairs which do not (or may not) involve complements.

they are generally not subcategorized by the verb. The same is true for standards of comparison. One might argue that in English the comparative form of an adjective subcategorizes for a standard of comparison; however, most languages in my database lack comparative forms, the typical construction being one like 11 (Buechel 1939:95), in which the marker plus standard combine with just the adjective:

(11) Lakota: *hokšíla kį atkúku kį isám háska.*
boy the father the than tall
'The boy is taller than the father.'

Thus the marker of comparison in most languages should probably be glossed 'more than', not just 'than'.

The situation with genitives is more complex. Inalienable possessors are plausibly subcategorized for; thus, *John* is plausibly a complement in *John's father*, since *father* is an inherently relational predicate. While we can say *Bill is a father*, what this really means is 'Bill is someone's father'. But it is much more difficult to argue that an alienably possessed genitive, e.g. *John* in *John's dog*, is a complement, since *dog* does not subcategorize for a possessor: *Fido is a dog* does not mean 'Fido is someone's dog' The relative clause, the final object patterner in Table 38, is clearly not a complement, so the HCT fails to account for it.

There is one property that genitives, adpositional phrase modifiers of verbs, and standards of comparison share, and that is that they are all nominal, in the sense of being either NPs or PPs. And the term 'complement' is often used in a looser sense that seems equivalent to 'nominal dependent'. On this usage, the object and any PP dependents of the verb are complements, regardless of whether the PP is subcategorized for by the verb. Thus the broadest sense of complement, to apply to any nominal dependent, would cover these cases. But while a version of the HCT based on such a notion of complement would account for the fact that these nominal dependents are object patterners, many object patterners are not nominal. Some are of the category N′ (with articles and plural words), some are Ss (with complementizers, question particles, and adverbial subordinators), some are VPs (with tense/aspect auxiliary verbs, negative auxiliaries, and verbs meaning 'want'), and at least one is or can be an adjective phrase (with copulas). Finally, the HCT fails to account for the fact that relative clauses are object patterners on either notion of complement: relative clauses are clearly not subcategorized for by nouns, nor are they nominal dependents of the noun. The HCT therefore fares no better than the HDT: although the noncorrelation pairs all involve adjuncts rather than complements, not all object patterners are complements, on either of the two notions of complement discussed here.

The contrast between adjectives and relative clauses is instructive. Both are adjunct dependents of the noun. But relative clauses are object patterners, while adjectives are not. The same is true for intensifiers and standards of comparison. Both are adjuncts of the adjective, but only standards of com-

parison are object patterners. And while negative particles are like PPs in being adjuncts of verbs, only PPs are object patterners. What distinguishes each of these contrasting pairs is that the elements which are object patterners are all PHRASAL, while the dependents which are not are NONPHRASAL. This leads us to an alternative to the HDT (and the HCT) which is based, not on the distinction between heads and dependents (or some subclass of dependents), but on the distinction between phrasal and nonphrasal elements.

6. THE BRANCHING DIRECTION THEORY. Tables 39 and 40 summarize the results of §§1–4. Table 39 is a complete list of the correlation pairs discussed in this paper; Table 40 repeats (from Table 16) the list of noncorrelation pairs, which do not exhibit any correlation in order with the verb and object.

VERB PATTERNER	OBJECT PATTERNER	EXAMPLE
verb	object	*ate + the sandwich*
verb	subject	*(there) entered + a tall man*
adposition	NP	*on + the table*
copula verb	predicate	*is + a teacher*
'want'	VP	*wants + to see Mary*
tense/aspect auxiliary verb	VP	*has + eaten dinner*
negative auxiliary	VP	cf. 7 in §4.2
complementizer	S	*that + John is sick*
question particle	S	cf. 8 in §4.4.
adverbial subordinator	S	*because + Bob has left*
article	N′	*the + tall man*
plural word	N′	cf. 9 in §4.7
noun	genitive	*father + of John*
noun	relative clause	*movies + that we saw*
adjective	standard of comparison	*taller + than Bob*
verb	PP	*slept + on the floor*
verb	manner adverb	*ran + slowly*

TABLE 39. Complete list of correlation pairs.

DEPENDENT	HEAD	EXAMPLE
adjective	noun	*tall+ man*
demonstrative	noun	*that + man*
intensifier	adjective	*very + tall*
negative particle	verb	*not + go*
tense/aspect particle	verb	cf. examples in 6 in §3.5

TABLE 40. Noncorrelation pairs.

Building on the observation given at the end of §5, we can see that, subject to some complications to be discussed below, each of the correlation pairs in Table 39 involves a nonphrasal verb patterner and a phrasal object patterner. By contrast, in each of the noncorrelation pairs in Table 40, both elements are nonphrasal. This leads to the formulation of the Branching Direction Theory (BDT) as an alternative to the HDT and the HCT. The BDT was stated in 3 and is repeated as 12:

(12) THE BRANCHING DIRECTION THEORY (BDT): Verb patterners are nonphrasal (nonbranching, lexical) categories and object patterners are phrasal (branching) categories. That is, a pair of elements X and Y will employ the order XY significantly more often among VO languages than among OV languages if and only if X is a nonphrasal category and Y is a phrasal category.

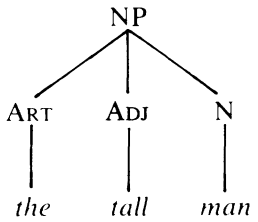
According to the BDT, languages tend towards one of two ideals: right-branching languages, in which phrasal categories FOLLOW nonphrasal categories, and left-branching languages, in which phrasal categories PRECEDE nonphrasal categories.[17] I will discuss some necessary revisions to the BDT below. For now, we can observe that what distinguishes adjectives from relative clauses is the fact that the former are single words while the latter are phrases. Precisely the same difference holds between intensifiers and standards of comparison (both adjuncts of adjectives) and between negative particles and PPs (both adjuncts of verbs). Furthermore, the same difference holds for the controversial pairs of elements in Table 27—for which there is lack of agreement as to which element (if either) is the head—regardless of one's assumptions about which member of the pair is head. Thus, for example, regardless of whether one considers a complementizer as a head, or the S it combines with as a head, or neither as a head, the complementizer is a nonphrasal element and the S that it combines with is phrasal. Similarly, regardless of whether one considers articles to be heads, articles are nonphrasal elements combining with a phrasal N′. The BDT thus accounts for these pairs of elements regardless of their head-dependent structure.

Just as the predictions of the HDT depend on one's assumptions about which elements are heads, the predictions of the BDT depend on one's assumptions about constituent structure. In fact, although I have argued that

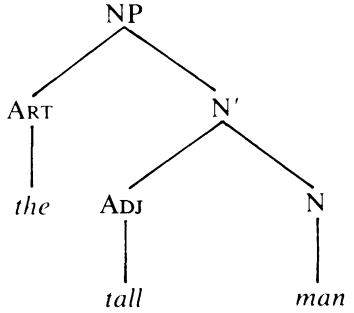
[17] Note that, while the BDT claims that for each correlation pair the order of verb patterner and object patterner is more likely to be harmonic with the order of verb and object in a given language, it does not claim that most languages will be completely consistent; nor does it make any claim about how frequent completely consistent languages are. Because of the nature of my database, in which there are gaps for the majority of languages, I am not able to answer this question. But for a hint about a possible answer, consider the following data for languages in my database that are consistent with respect to the order of object and verb, subject and verb, adposition type, genitive and noun, and relative clause and noun. Among OV languages, there are 21 genera containing languages that are consistent with respect to this set of characteristics and 30 genera containing languages that involve at least one inconsistency. Hence the completely consistent type represents a minority. However, for 22 of these 30 genera the inconsistent languages are inconsistent only in being NRel. With respect to the other pairs of elements, the consistent type represents a majority. Similarly, for VO languages there are 18 genera containing languages that are completely consistent with respect to the above set of pairs of elements and 40 genera that contain languages that are inconsistent in at least one way. But again, 26 of these 40 genera are inconsistent only in the order of subject and verb; SVO languages are all inconsistent, since subjects are object patterners. The general conclusion is that completely consistent types represent a minority, but that the majority of inconsistencies among inconsistent languages can be attributed to a small number of pairs of elements for which there is a skewed distribution, such as the general preferences for NRel order and SV order.

the HDT fails under ANY existing set of assumptions regarding head-dependent structure, I obviously cannot argue that the BDT succeeds under ANY set of assumptions regarding constituent structure. For example, unless one assumes the existence of an N′ constituent in NPs like *the tall man*, the article will not be combining with a phrasal category, and the BDT will not account for the fact that articles are verb patterners. But pregenerative and early generative approaches did not recognize N′ constituents, assuming instead that articles combine with the other elements of the noun phrase in a flat structure like 13a, rather than as in 13b.

(13) a.



b.



The existence of different points of view in cases like these makes it difficult to offer a solid set of arguments for the BDT. The remainder of §6 and all of §7 will be devoted to a consideration of some of these complications. Secs. 6.1–6.2 address two problems arising from my claim that the combination of adjective and noun involves two nonphrasal categories; both problems, as we will see, lead to revisions of the BDT.

6.1. ADJECTIVE PHRASES AND FULLY RECURSIVE PHRASAL CATEGORIES. The claim that adjectives are nonphrasal is subject to the objection that it is not adjectives that combine with nouns but adjective PHRASES. Just as *water* is a noun phrase as well as a noun in *John likes water*, so too *cold* is an adjective phrase as well as an adjective in a noun phrase like *cold water*. Furthermore, there are clear cases of adjective phrases, e.g. *very tall* and *taller than John*. But if adjectives are really adjective phrases, and hence phrasal, then the BDT, as stated in 12, would seem to predict that they should be object patterners. But we have seen that they are not.

It is useful to distinguish three classes of AdjPs in English that consist of more than just an adjective. The first class involves AdjPs like *very tall* and *much more interesting*, comprising a modifier followed by the adjective; the modifier is an intensifier or perhaps even an intensifier phrase (like *much more*). The form of such AdjPs is very limited. They are nonrecursive: they can only be formed by adding one of a limited set of words and expressions. As a result, there is only a finite number of AdjPs of this sort.[18]

[18] In one marginal way there is an infinite number of AdjPs of this sort, namely, by the addition of intensifier phrases of the form *very very*, *very very very*, and so on. If one assumes that these are grammatical without upper bound, then we do have a kind of recursion within these AdjPs. It

The second type of AdjP involves the conjunction of two or more AdjPs, each of which is a simple adjective or an AdjP of the first type (as in *tall and rather thin*), or is itself also a conjoined AdjP of this second type (as in *tall and thin but rather slow*, which involves conjoining an AdjP of the second type, *tall and thin*, with an AdjP of the first type, *rather slow*). AdjPs of this second sort are clearly formed by a recursive mechanism, and there is an infinite number of AdjPs of this sort. Nevertheless, the type of recursion that is involved in coördination is of a rather degenerate sort, particularly when contrasted with the type of recursion exhibited by the object patterner phrasal categories in Table 39. Namely, AdjPs of this second sort can never dominate OTHER major phrasal categories, such as NP, PP, or S. Noun phrases functioning as objects of verbs, for example, can contain PPs or Ss, and hence any other phrasal category. But AdjPs of the second sort cannot contain anything but other AdjPs. The rules for forming such AdjPs do not 'feed into' other phrase-structure rules the way the rules for forming these other phrasal categories do.

The third type of AdjP in English does contain other major phrasal categories, as in *bigger than houses* or *eager to help others*. The modifiers in these AdjPs follow the adjective and the AdjP itself follows the noun (in contrast to AdjPs of the first two types, which precede the noun). For instance, in *trees bigger than houses* and *a man eager to help others* the adjective is followed by an adjunct or complement phrase. Such AdjPs are fully recursive in the sense that they are formed by rules that feed into the rest of the grammar. I will define a FULLY RECURSIVE PHRASAL CATEGORY as one that can dominate other major phrasal categories. Many languages, however, do not appear to allow fully recursive AdjPs, at least as modifiers of nouns. It is fairly unusual for grammatical descriptions of languages to mention AdjPs of this sort, and often, where specific rules are given for forming AdjPs, they are limited to ones of the first and second types. Tryon (1968), for example, gives relatively explicit phrase-structure rules for Dehu, an Austronesian language; his rules for adjective phrases allow them to expand with an intensifier (p. 63), and he mentions the possibility of conjoining adjectives (p. 64), but he makes no mention of fully recursive adjective phrases. Similarly, AdjPs modifying nouns in Hausa cannot be fully recursive (Mahamane L. Abdoulaye, personal communication, 1990). In some languages the meanings of such AdjPs must be expressed by means of a relative clause; in other languages it is difficult to distinguish AdjPs from relative clauses.

Let us revise the BDT so that it claims that object patterners are fully recursive phrasal categories and that verb patterners are either nonphrasal categories or phrasal categories that are not fully recursive. (This revision is incorporated into the statement of the BDT given below in 16, after we examine the need for further revision.) The BDT now predicts that, among languages

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is a limited type of recursion, however, analogous to the recursion found in the second type of AdjP to be discussed immediately below, and unlike the type of recursion found in the third type of AdjP.

in which AdjPs cannot be fully recursive (and this seems to be common if not typical), the order of adjective and noun will not correlate with the order of verb and object. If such languages are typical, then the revised BDT will account for the overall lack of a correlation. The BDT does predict that, among languages in which AdjPs are a (fully recursive) phrasal category, the order of the noun with respect to such AdjPs should correlate with the order of verb and object. What this means is that the BDT predicts that, in languages in which AdjPs are fully recursive, the AdjP should tend to follow the noun if the language is VO and to precede the noun if the language is OV—or at least that fully recursive AdjPs should do so. English conforms to this prediction since, although simple AdjPs precede the noun, fully recursive ones follow it. While the few languages I have found relevant information for are consistent with this prediction, further research is required to test it.[19]

6.2. MAJOR CONSTITUENTS. There is another objection that might be leveled against my claim that, in a combination of adjective plus noun, neither element is a phrasal category. Namely, even if one concedes that the adjective (or AdjP) is not in general a fully recursive phrasal category, one might still argue that, at least in English, the element which the adjective COMBINES WITH is in general a phrasal category. An English NP like *a good picture of John* is often analyzed as having a hierarchical structure like 14.[20]

In 14 the adjective *good* combines with an N′ constituent which, by the definition above, is a fully recursive phrasal category, since it can contain major phrasal categories like PP. However, the N′ constituent with which the adjective combines is distinct in a crucial way from the phrasal categories discussed

[19] In many languages, 'adjectives'—i.e. words that express adjectival meanings—are really verbs, so that, as modifiers of nouns they are really relative clauses. As relative clauses they are instances of a fully recursive phrasal category, and thus the BDT predicts that they too should tend to follow the noun in VO languages and precede it in OV languages. I assume that this prediction is correct: since they are relative clauses, they should exhibit the same pattern as relative clauses, preceding the noun more often in OV languages than in VO languages, though often following the noun in OV languages, just as relative clauses do.

[20] There is some question about the extent to which similar noun phrases in other languages have a structure similar to 14. In languages in which noun complements occur on the same side of the noun, it is very common for the adjective to occur between the genitive and the noun, as in the Korean example in (i)a; the reverse order, shown in (i)b, is judged odd.

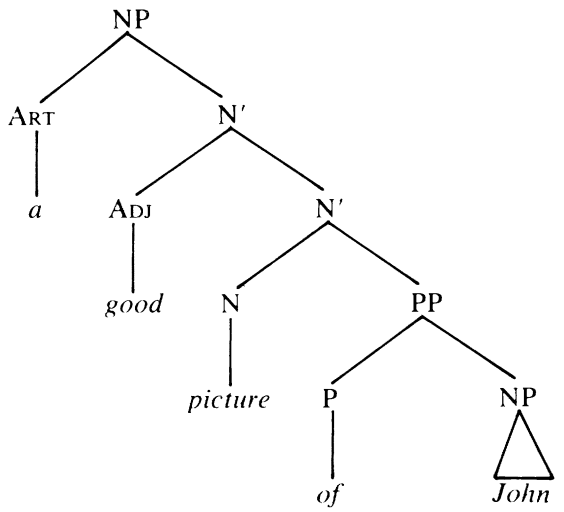
(i) a. *John-uy yəs sacin* b. *??yəs John-uy sacin*
John-GEN old picture old John-GEN picture
'an old picture of John' 'an old picture of John'

Similarly, in Hausa, when the adjective and complement both follow the noun, the adjective must occur between the noun and the complement, as in (ii)a; the reverse order, shown in (ii)b, is unacceptable.

(ii) a. *foto tsoho na John* b. **foto na John tsoho*
picture old of John picture of John old
'old picture of John' 'old picture of John'

There is no evidence that the adjective combines with a phrasal element in Korean and Hausa, and these languages may even be typical in this respect. See Gil 1987 for arguments that NPs have a flat structure in many languages.

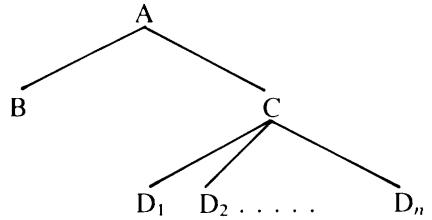
(14)



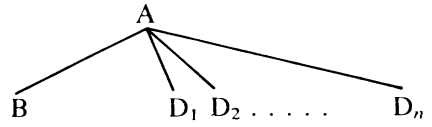
above that act as object patterners: the category of the combination of Adj + N′ is also N′. In this and some other cases in which the BDT as currently formulated makes incorrect predictions, the source of the incorrect prediction can be traced to phrasal constituents that are of the same category as their dominating node and that serve as head of that node. I will assume, then, that such phrasal constituents do not count as constituents for the purposes of the BDT, and I will refer to them as MINOR CONSTITUENTS. Constituents that are not minor constituents I will refer to as MAJOR CONSTITUENTS. I will assume that only major constituents count for the purposes of the BDT.

This idea can be made more precise as follows. Given a structure of the form 15a (or an equivalent left-branching structure), where A and C are of the same category and where C is the head of A, ignore constituent C. In other words, treat a structure of the form in 15a as if it had the structure in 15b, where the node C is removed and the daughters of C are attached as daughters of A.

(15) a.



b.



We can refer to the resulting structures as MAJOR CONSTITUENT TREES. In saying that constituents like C do not count for the purposes of the BDT, I mean that the BDT applies to the major constituent tree. Applying this to *a good picture of John*, we see that the adjective is not combining with a phrasal

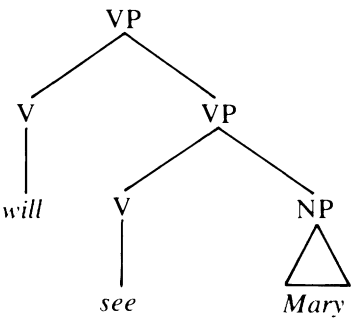
category but rather with a nonphrasal noun. The BDT can be reformulated as in 16 to capture the revisions proposed in this section and §6.1.

(16) BRANCHING DIRECTION THEORY (revised version): Verb patterners are nonphrasal categories or phrasal categories that are not fully recursive, and object patterners are fully recursive phrasal categories in the major constituent tree. That is, a pair of elements X and Y will employ the order XY significantly more often among VO languages than among OV languages if and only if X is not a fully recursive phrasal category in the major constituent tree and Y is a fully recursive phrasal category in the major constituent tree.

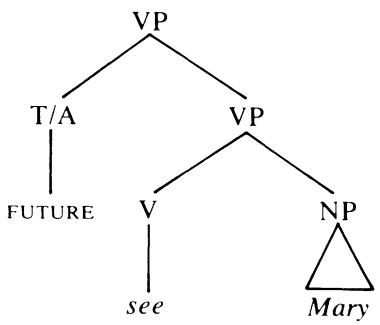
It is worth contrasting adjectives with articles, since both can be viewed as combining with an N′ constituent. The important difference is that the category that results from combining an adjective with an N′ is another N′, while the category that results from combining an article with an N′ is a distinct category, NP (or N″) on the traditional view, or D[eterminer] P[hrase] if the article is viewed as head of the NP. Either way, the article combines with a fully recursive phrasal category that is not a minor constituent, while the adjective does not. The BDT thus accounts for the fact that articles are verb patterners, while adjectives are not.

The assumption that minor constituents do not count for the purposes of the BDT solves a number of problems. If one adopts the standard view in X′-syntax that adjuncts combine with X′-phrases, then we account not only for the fact that nonphrasal adjuncts, like adjectives, are not verb patterners, but also for the fact that phrasal adjuncts of verbs, like PP, ARE object patterners. For example, if one analyzes the PP *in the kitchen* in *John kissed Mary in the kitchen* as combining with a VP *kissed Mary*, then, without the assumption that the BDT ignores minor constituents, the BDT would fail to account for the fact that PPs are object patterners: if PPs always combine with a phrasal category, the BDT would predict that verb and PP should not be a correlation pair. But if we assume that minor constituents do not count, this problem does not arise, since the phrasal constituent with which the PP combines is a minor constituent.

(17) a.



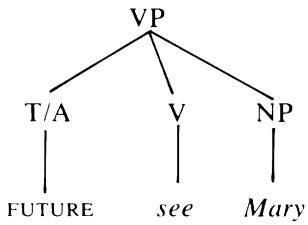
b.



This assumption also captures nicely the difference between tense/aspect particles and verbal auxiliaries. Consider the two schematic trees in 17 illustrating each of these elements. I use the notation 'T/A' as an ad-hoc label for

the category of a nonverbal tense/aspect particle with future meaning. We saw in §4.1 and §3.5 that verbal auxiliaries, like *will* in 17a, are verb patterners, but that nonverbal tense/aspect particles, as in 17b, do not exhibit any correlation. Unless we exclude minor constituents from consideration, the structures in 17 would suggest that the BDT predicts that both should be verb patterners, since both combine with fully recursive phrasal categories in 17. However, while both the verbal auxiliary in 17a and the nonverbal future particle in 17b combine with VPs that are themselves dominated by VP, the VP *see Mary* is a minor constituent in 17b but not in 17a. The reason for this difference rests on the fact that minor constituents are defined not only as constituents immediately dominated by a node of the same category but also as the HEADS of the higher node. The lower VP in 17b satisfies this property: since the future particle is a modifier of the lower VP, that lower VP is the head of the higher VP. Since the lower VP in 17b is a minor constituent, it doesn't count as a constituent for the purposes of the BDT, so that, for these purposes, it is as if the structure of 17b were 18. Since the future particle and the verb are both nonphrasal in the major constituent tree in 18, the BDT predicts (correctly) that there should be no ordering correlation between these two elements.

(18)



The lower VP in 17a, by contrast, is not a minor constituent. Although it is of the same category as the immediately dominating node, it is not the head of the higher VP. Rather, the structure with one VP dominating another arises only because the auxiliary verb is a verb that is subcategorized to take a VP complement. Hence the auxiliary in 17a combines with a phrasal category in the major constituent tree, and the revised BDT as stated in 16 predicts (correctly) that verbal auxiliaries will be verb patterners.[21]

6.3. AN ALTERNATE VERSION OF THE BDT. The version of the BDT that emerges from the discussion in §§6.1–6.2 accounts for the fact that the controversial pairs of elements in Table 27 are correlation pairs, regardless of one's assumptions as to which element, if either, is the head. While I take no stand in this paper as to whether these assumptions are right, it is worth noting that if one takes the position that the verb patterner in each of these pairs of elements IS a head—i.e. auxiliary verbs, complementizers, question particles, adverbial

[21] This argument assumes that the verbal auxiliary is head. On the view that verbal auxiliaries are specifiers of the VP (Chomsky 1970), the auxiliary would be combining with a V′ to form a V″, so *see Mary* would be a major constituent, since its category would be different from that of the higher node. Hence the same contrast can be accounted for under this alternative assumption.

subordinators, articles, and plural words—then it is possible to formulate an alternate version of the BDT which makes no reference to the distinction between minor and major constituents. This alternate version is given in 19.

(19) THE BRANCHING DIRECTION THEORY (alternate version): Verb patterners are heads and object patterners are fully recursive phrasal dependents. I.e., a pair of elements X and Y will employ the order XY significantly more often among VO languages than among OV languages if and only if X is a head and Y is a phrasal dependent of X.

This is essentially the theory that the discussion at the end of §5 led to. We saw there that the best we could do to rescue the HDT was to adopt the position that the verb patterners in the controversial pairs in Table 27 are heads, and to recognize that the crucial difference between those dependents that do not behave as object patterners and those that do is that the former are nonphrasal while the latter are phrasal. The alternate version in 19 is more elegant than the version of the BDT stated in 16, which I will refer to as the BASIC version of the BDT, because it is unnecessary to make reference in the alternate version to the distinction between minor and major constituents. Although adjectives may combine with fully recursive phrasal categories, the alternate version of the BDT claims that they are not verb patterners because they are not the heads of the N′-phrases they combine with. The contrast between articles and adjectives results, on this view, from the fact that articles are heads but adjectives are not. Similarly, the contrast between verbal auxiliaries and tense/aspect particles results from the fact that the former are heads but the latter are not.

I will not take a stand here on which of these two versions of the BDT is correct. The basic version stated in 16 has the advantage that it does not depend on the assumption that the verb patterners in the controversial pairs in Table 27 are heads; the alternate version stated in 19 has the advantage of being more elegant. There is, however, a further possible advantage of the basic version, since it makes predictions not only about the ordering of heads with respect to dependents but also about the ordering of multiple dependents with respect to each other. If we assume, for example, that an N′ consisting of an adjective, a noun, and a relative clause has a flat structure in the major constituent tree—i.e. that these three elements are sisters to each other—then the basic version predicts not only that the noun and relative clause are a correlation pair, but also that the adjective and relative clause should be a correlation pair, because the former is a nonphrasal category and the latter is a fully recursive phrasal category. Hawkins (1990:241) cites evidence from C. Lehmann (1984:201) on the triplet of noun, adjective, and relative clause that conforms to this prediction: among languages in which the adjective and relative clause occur on the same side of the noun, only N-Adj-Rel and Rel-Adj-N are attested; N-Rel-Adj and Adj-Rel-N are not attested. My own database contains data on this question for only 17 languages that place the adjective and relative clause on the same side of the noun. This data is consistent with Lehmann's: 11 of these languages are N-Adj-Rel and 6 are Rel-Adj-N; neither N-Rel-Adj nor Adj-Rel-N is attested.

If further crosslinguistic investigations provide evidence for a general pattern whereby the basic version of the BDT (16) correctly predicts the ordering of dependents with respect to each other, then we will have evidence in favor of the basic version over the alternate version. In other words, even if the assumption of the alternate version—that the verb patterners in the controversial pairs in Table 27 are heads—is correct, and even if that version is observationally adequate in correctly accounting for the pairs of elements involving a head and a dependent, it will fail at the level of explanatory adequacy, since it does not capture the fact that these correlations with head-dependent pairs can be explained by a principle that makes no reference to heads and dependents and that also explains correlations involving pairs of dependents. The choice between the two versions of the BDT thus depends on empirical predictions that have not yet been adequately tested.

6.4. CONFIGURATIONALITY. The BDT seems to assume a fairly high degree of hierarchical constituent structure. While this structure may be motivated for so-called configurational languages, the question arises as to whether the theory can account for the properties of nonconfigurational languages. To begin with, it is important to point out that there are two kinds of languages that have been designated as nonconfigurational. On the one hand, there are languages that are claimed to lack constituents altogether, such as Warlpiri (Hale 1983) and Nunggubuyu (Heath 1986). If the BDT is correct, we would not expect such languages to conform to the word order correlations. But since part of the nonconfigurationality of such languages is their extremely flexible word order, that expectation is trivially borne out: such languages do not provide exceptions to the word order correlations but rather are simply irrelevant to them. After all, the data cited in this paper is based entirely on languages that can be assigned a basic order for verb and object.

On the other hand, there are nonconfigurational languages which, like Japanese, appear to possess certain types of constituents, e.g. clauses, NPs, and PPs, but which appear to lack VPs. Since a number of the object patterners are classified here as VPs—including the complements of tense/aspect auxiliary verbs and of verbs meaning 'want'—it might not be immediately clear what the BDT predicts about such languages. But in an SOV or VSO language lacking a VP constituent, a tense/aspect auxiliary verb can just as easily be seen as combining with the entire clause rather than with a VP. This is less plausible, however, for verbs meaning 'want', as in the Yagua example in 20 (from Payne 1990:61):

(20) Yagua: *sa-vąąta jibye-eda Rospíta-níí quiivą́.*
3SG-want eat-INF Rospita-3SG fish
'Rospita wants to eat fish.'

From a semantic point of view, the complement of *savąąta* 'want' in 20 is the discontinuous sequence *jibye-eda ... quiivą́* 'eat ... fish'. But unless we posit a discontinuous constituent, we cannot say that the verb meaning 'want' combines with a phrasal constituent, at least at the superficial level. Nevertheless, I assume that at some level the verb meaning 'want' in such cases combines

with a phrasal dependent, though I leave unresolved exactly how this is achieved, since it is theory-dependent. This example does illustrate, however, that the level at which the conditions of the BDT are tested may not be the most superficial one.

Otherwise, nonconfigurational languages of this sort present little problem for the BDT for many pairs of elements, since such languages generally do appear to possess NP, PP, and clausal constituents. Still, for many languages it is not obvious that articles combine with N′ constituents or that question particles combine with clauses (rather than being just one of many constituents of the clause). It must be conceded that the BDT makes a number of crosslinguistic assumptions about constituent structure for which there is currently little supporting evidence.

7. REMAINING COMPLICATIONS. This section concerns a number of pairs of elements that present complications, with potential implications for the BDT. In §7.1 I consider the order of numeral and noun, which may or may not be a correlation pair. In §7.2 I discuss the fact that, as mentioned earlier, demonstrative and noun do not form a correlation pair, while article and noun do. The remaining subsections deal with three correlation pairs that the BDT does not seem to account for: the order of manner adverb and verb (§7.3), the order of subject and verb (§7.4), and the order of affix and stem (§7.5).

7.1. NUMERALS. The pair numeral and noun is one discussed by Greenberg 1963 and Hawkins 1983 that I have not yet presented data for. The reason is that it is not clear whether to interpret the data as demonstrating that it is a correlation pair, so it is difficult to use this pair of elements to test the various theories considered here. Table 41 shows that the two orders of numeral and noun are equally common among OV languages.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&NumN	6	[18]	1	5	12	[10]	52
OV&NNum	[13]	0	[4]	[17]	12	6	52
VO&NumN	2	[9]	[11]	[5]	[19]	[7]	53
VO&NNum	[21]	0	5	0	0	0	26

TABLE 41. Order of numeral and noun.

The data for VO languages is rather surprising. Outside of Africa, VO languages exhibit a strong tendency to be NumN: in four areas I have no examples of VO&NNum languages. But in Africa there is a very strong tendency in the opposite direction, for the numeral to follow the noun in VO languages: out of 23 genera, only 2 contain NumN languages. Table 42 shows that when we compare proportions the proportion of NumN is higher among VO languages

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.32]	1.00	.20	.23	.50	.63	.48
VO	.09	1.00	[.69]	[1.00]	[1.00]	[1.00]	.80

TABLE 42. Proportions of genera containing NumN languages as opposed to NNum.

than it is among OV languages in only four areas, short of statistical significance.

The data in Table 42 does show a clear tendency for NumN order to be more common among VO languages than it is among OV languages. Not only is the proportion for NumN higher among VO languages in four areas, but the margin of difference in these four areas is fairly large, and the average of the proportions is noticeably higher for VO languages (.80 vs. .48). If we were to ignore Africa, it would be tempting to say that we have a correlation pair here and that numerals are verb patterners. But the fact that an area as large as Africa does not conform to this, since the VO languages there exhibit a radically different pattern from that found elsewhere in the world, is a good reason to hesitate before describing this as a correlation pair. But the fact that the distribution in Table 41 is anything but random is an equally good reason not to say merely that this pair of elements is not a correlation pair. For this reason, I leave this pair unclassified.

It should be noted that, whether or not the trend in Table 42 is treated as a real one, the direction of the trend is precisely the opposite of what the HDT predicts under the traditional assumption that numerals are dependents of nouns. Under that assumption, we would expect numerals to precede the noun more often among OV languages than among VO languages. But only in Africa do we find that. It is conceivable that the proposal that articles are heads might be extended to numerals, though the most difficult cases are those involving both an article and a numeral, as in the English phrase *the four books*. If an account of such cases can be provided, the HDT would account for the trend in Tables 41 and 42.

The case of numerals, however, is one for which there is good reason to believe that languages vary with respect to whether the numeral is head or not. Even if numerals are not heads in English, there are languages in which there are stronger arguments that they are heads. In languages with classifiers, it is reasonable to suppose that the numeral plus classifier is head and that the noun is a complement of this head, as in the Burmese example in 21 (from Okell 1969:76):

(21) Burmese: *hpaya hna-hsu*
pagoda two-sacred.object
'two pagodas'

A translation 'two sacred objects of pagoda' might more clearly suggest that the classifier *hsu* 'sacred object' is the head. Since the numeral modifies the classifier, the numeral and the noun *hpaya* are not really in a head-dependent relation at all, although the numeral is part of the head of which the noun is a dependent. Thus, although the numeral follows the noun in 21, the structure is plausibly one in which dependents precede their heads. Thus, while the NNum order of Burmese at first seems to be an instance of a dependent following its head, closer examination suggests that it involves a dependent preceding its head. Since Burmese is OV, this means that the position of numerals with respect to the noun is as the HDT predicts.

The fact that languages can differ in terms of whether the noun is head is brought out even more clearly by arguments in Babby 1987 that Russian has undergone a change from Old Russian, in which numerals were heads, to Modern Russian, in which numerals are not heads, though many fossilized signs of the earlier status of numerals as heads remain (cf. also Mel'čuk 1985 and Corbett 1991). Since the position of numerals with respect to the noun has not changed, their position in Modern Russian (NumN) might be best explained in terms of their earlier status as heads.

There is an important general moral to be drawn from the example of numerals. The standard practice in word order typology since Greenberg 1963 has been to identify different categories largely on the basis of semantic criteria. Underlying this practice is an implicit assumption either that semantic categories like 'numeral' and 'demonstrative' correspond to universal grammatical categories or that any differences in the way in which these semantic categories are realized in particular grammars are somehow irrelevant to the correlations. But I have shown previously in this paper that it is necessary to distinguish two subclasses of the semantic categories of negative words and tense/aspect words, those that exhibit verbal characteristics and those that do not: the former are verb patterners, while the latter are neither verb patterners nor object patterners. In at least some cases, then, failure to consider more specific grammatical properties in particular languages would obscure what is going on with the correlations. It is not unlikely that attending to certain differences in the grammatical role numerals play in particular languages would reveal patterns that are obscured by the way the data for numerals is presented in this paper. And if it is the case that languages differ as to whether numerals are heads, then it is difficult to determine the implications, either for the HDT or for the BDT, of data that ignores such distinctions. The most we can say with respect to the HDT is that, if numerals are dependents in most languages, the HDT predicts the opposite pattern from the trend we find. And the trend is accounted for under the BDT only if we assume that in many languages numerals, like articles, combine with N′ constituents to form NP constituents.[22]

7.2. DEMONSTRATIVES. It was shown in §4.6 that articles are verb patterners—that they tend to precede the noun more often in VO languages than in OV languages. But we saw in §3.2 that demonstratives are not verb patterners—that the order of demonstrative and noun does not correlate with the

[22] Gil 1987 argues that languages also differ in terms of the configurationality of NPs—that while some languages have stacked hierarchical NPs, other languages have flat NPs. Gil discusses a number of contrasts between these two types of languages, many of which suggest that numerals are modifiers of nouns in languages with flat NPs, even if they are heads in at least some languages with configurational NPs. But even apart from questions about whether the numeral is the head, the BDT makes different predictions for the two kinds of languages, because in a language in which the numeral is a kind of determiner, combining with a phrasal N′ to form an NP, the numeral should behave as a verb patterner, while in a language in which the NP is flat the numeral will just be combining with the noun, and the numeral should not behave as a verb patterner. Again, this illustrates the general methodological point: to understand the word order patterns of numerals we need to know more about their grammatical properties in each language.

order of verb and object. This presents something of a puzzle under the standard view that articles and demonstratives are both instances of a more general category 'determiner'.

The solution to this puzzle starts with the observation that there are many languages, probably a majority of the world's languages, in which there is no category 'determiner' that includes both articles and demonstratives. Among the languages lacking such a category there are two sorts, languages that lack articles and languages in which there are articles but they do not belong to the same category as demonstratives. Languages lacking articles (e.g. Latin and Japanese) are well known and may themselves constitute a majority of the languages of the world. Languages in which articles and demonstratives are categorially distinct are far less well known. It is often assumed (cf. Schachter 1985:40) that in languages with articles the articles usually belong to the same category as demonstratives, but in fact languages in which articles and demonstratives belong to different categories appear to be about as common as languages like English, in which they belong to the same category.

Languages in which the article and demonstrative occur on opposite sides of the noun provide particularly clear evidence that these two words belong to separate categories. For example, in both Welsh and Dehu (an Austronesian language) the article precedes the noun and the demonstrative follows it:

(22) a. Welsh: *y ty 'ma*
the house this
'this house' (Jones & Thomas 1977:167)

b. Dehu: *la tusi čelæ*
the book this
'this book' (Tryon 1968:57)

In other languages the article and demonstrative occur on the same side of the noun, but they co-occur, suggesting that they belong to different categories. Further support for this conclusion derives from the fact that they are typically strictly ordered with respect to each other in such languages. In some languages in which articles and demonstratives belong to different categories, the demonstratives may form a subclass of adjective. In both Welsh and Dehu, for example, demonstratives resemble adjectives in following the noun, in contrast to articles, which precede it. It may be that demonstratives contrast with articles in that articles combine with an N′ to form an NP, while demonstratives combine with an N′ to form an N′: in Dehu the demonstrative occurs inside the adjective (in an article + noun + demonstrative + adjective structure), which strongly implies that the demonstrative does not combine with an N′ to form an NP.

The BDT predicts that among languages in which demonstratives and articles belong to the same category, combining with an N′ to form an NP, the order of demonstrative and noun should correlate with the order of verb and object, just as the order of article and noun does, but that among languages in which the demonstrative is a kind of adjective, combining with an N′ to form an N′, the order of demonstrative and noun should not correlate with the order of

verb and object. It is less clear what to say about languages that lack articles. There are two possibilities. The demonstrative might be a kind of adjective, and the language would lack a distinction between N′ and NP (i.e. N″). Alternatively, demonstratives might be members of a small category of determiners that combine with an N′ to form an NP. Since it is difficult to distinguish these two possibilities on the basis of superficial data, it is difficult to test the predictions of the BDT. While this leaves the explanation for the properties of demonstratives under the BDT somewhat unclear, the differences in word order properties between articles and demonstratives present a problem for any account of the word order correlations.

The situation with demonstratives is thus not unlike what we observed for numerals. While they may constitute a fairly well-defined category from a semantic point of view, their grammatical properties seem to vary from language to language, so that they do not constitute a homogeneous category with respect to the predictions of the BDT. Furthermore, under the theory that determiners are heads, languages will vary as to whether demonstratives are heads or not, and they will not constitute a homogeneous category with respect to the predictions of the HDT: in English demonstratives would be heads, while in Welsh they apparently would not be. Only if we had a breakdown according to whether the demonstratives are determiners could we test the predictions of these theories with respect to demonstratives. But it is so difficult to decide whether demonstratives are determiners in a given language that it would be much harder to obtain data on this question than on the simpler question about what the order is of the demonstrative and noun.[23]

7.3. MANNER ADVERBS. Evidence was presented in §2.4 demonstrating that manner adverbs are object patterners. The BDT fails to account for this, since manner adverbs are nonphrasal. Adverbs can be modified by intensifiers, as in English *very slowly*, but, as with adjectives, fully recursive AdvPs seem uncommon crosslinguistically. Although the HDT would account for this correlation, since adverbs are dependents of the verb, it fails to account for the contrast between manner adverbs, like adjectives and intensifiers, which are not object patterners, even though these other modifiers seem to bear the same kind of semantic relationship to the words they modify as manner adverbs do to verbs. (Semantically, they all seem to be functions that take the words they modify as arguments, yielding a result of the same semantic type as the word modified: *walk slowly, tall man*, and *very small* are of the same semantic type, respectively, as *walk, man*, and *small*.) The contrast between manner adverbs and negative particles is particularly striking. While the former are object patterners, the latter tend to precede the verb in both OV and VO languages. Thus English is typical among VO languages in placing the negative particle before the verb and the manner adverb after the verb (at least as the most common position).[24]

[23] The comments in n. 22 regarding numerals are equally applicable to demonstratives.

[24] See Dryer (1988b:107–10) for further discussion of the differences between negative particles and manner adverbs.

The explanation for the correlation seems to lie in the close relationship between adverbs and adpositional phrases. The order of verb and manner adverb correlates even more strongly with the order of verb and adpositional phrase than it does with that of verb and object. Table 43 shows that PP-V languages are overwhelmingly AdvV, while V-PP languages are almost as overwhelmingly VAdv. The explanation for this correlation seems to be semantic: together they form the general class of adverbials. The range of meanings conveyed by adverbs (location, time, manner, etc.) is similar to the range of meanings conveyed by adpositional phrase modifiers of verbs. In particular, manner adverbials can take the form of either adverbs or adpositional phrases, as in English *John walks with a limp*. Manner adverbials also bear a close semantic affinity to instrumental adverbials, as can be seen from their similar grammatical properties in many languages.[25]

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
PP-V&AdvV	[5]	[12]	[3]	[9]	[8]	[5]	42
PP-V&VAdv	0	0	1	0	0	0	1
V-PP&AdvV	0	2	1	0	3	0	6
V-PP&VAdv	[15]	[5]	[7]	[3]	3	[3]	36

TABLE 43. Adpositional phrases and manner adverbs.

Thus, one account of the correlation between the order of verb and manner adverb and that of verb and object is to view it as an instance of a more general correlation between the order of verb and adverbial and the order of verb and object. On this view, manner adverbs belong to the general category 'adverbial', which is a phrasal category, since it includes adpositional phrases. It is questionable, however, whether 'adverbial' constitutes a grammatical category in the conventional sense of this term. Rather, it seems to be a functional category that includes a number of different grammatical categories that serve the same function.

An alternative account of the correlation between the order of verb and manner adverb and that of verb and object is that it is an 'indirect' correlation (cf. Prior 1985). The correlation between two pairs of elements X and Y is indirect if there is a third pair of elements Z such that the correlation between X and Y can be attributed entirely to the correlation between X and Z and the correlation between Y and Z. There is reason to believe that the correlation between manner adverbs and objects is an instance of this—that it is attributable entirely to the correlation between manner adverbs and adpositional phrases and the correlation between adpositional phrases and objects. To determine whether the correlation is indirect we must examine languages in which the object, adpositional phrase, and manner adverb do not all occur on the same side of the verb. If the correlation is direct, we would expect to find languages in which the object and manner adverb occur on the same side of

[25] In some languages not all PPs are adverbial. English indirect objects like *to Bill* in *Mary gave some flowers to Bill* are arguments of the verb, and thus not adverbial. I assume that such cases are exceptional and that PPs are typically adverbial modifiers of verbs.

the verb, while the adpositional phrase occurs on the other side. If we do not find instances of such languages, then we may conclude that the correlation is indirect.

Because both adverbs and adpositional phrases exhibit a strong tendency to occur on the same side of the verb as the object, there are few languages in my database that lack this characteristic. Out of 140 languages for which I have data on the order of the verb with respect to the object, adpositional phrase, and manner adverb, 125 place all three on the same side of the verb. The other 15 languages fall into 11 genera. There are six logically possible ways in which a language might not place all three elements on the same side of the verb. The distribution of the 11 genera over these six possible types is given in Table 44.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&PP-V&VAdv	0	0	1	0	0	0	1
OV&V-PP&AdvV	0	0	0	0	0	0	0
OV&V-PP&VAdv	1	0	0	0	0	2	3
VO&PP-V&AdvV	0	0	1	0	0	0	1
VO&PP-V&VAdv	0	0	0	0	0	0	0
VO&V-PP&AdvV	0	2	1	0	3	0	6

TABLE 44. Languages in which object, PP, and manner adverb do not all occur on the same side of the verb.

Although the numbers are too small to permit statistically significant conclusions, the pattern is precisely what we would expect if the correlation between manner adverbs and objects is indirect. There are four types attested in Table 44. These types either involve the object and PP occurring on the same side of the verb while the manner adverb occurs on the other side of the verb (the first and sixth types in Table 44), or they involve the PP and manner adverb occurring on the same side of the verb while the object occurs on the other side of the verb (the third and fourth types in the table). The two types that are not attested share the characteristic that the object and manner adverb occur on the same side of the verb while the PP occurs on the other side of the verb. In short, the following universal is exceptionless in my sample: the manner adverb does not occur on the same side of the verb as the object unless the adpositional phrase also does so. This suggests that the correlation between objects and manner adverbs is an indirect one. Only the small numbers prevent us from drawing this conclusion with confidence.

We therefore have two possible accounts of the correlation between manner adverbs and objects that are consistent with the BDT. Either adverbs belong to a category of adverbials that is a fully recursive phrasal category (since it contains adpositional phrases), or the correlation is an indirect one, entirely attributable to other direct correlations.

7.4 SUBJECTS. It was shown in §2.7 that subjects are object patterners. If one takes the view that subjects combine with VPs to form Ss, then the BDT

fails to account for this correlation, because both subject NP and VP would be phrasal categories and the VP would be a major constituent, since it is distinct from S. Even under approaches that treat the verb as head of the clause, the category of the clause is typically treated as distinct from the category of the VP. These assumptions derive primarily from work on English, which, as an SVO language, is not consistent with respect to the order of verb patterners and object patterners. But the status of VP is more suspect in V-final and V-initial languages; even if the verb plus object forms a constituent in such languages, it is not clear that it is a major constituent: if the category of the S (i.e. S + VP) were the same as the category of the VP (one possible view under the assumption that the verb is the head of the clause), then the VP would be a minor constituent. If the verb plus object is not a major constituent, then the BDT accounts for the correlation, since the subject would not be combining with a major constituent.

An alternative possibility, however, is that there is a completely different explanation for why subjects seem to behave as object patterners. The apparent correlation between the order of subject and verb and that of object and verb arises because of the rarity of OVS languages: it is because SVO is common while OVS is not that subjects precede the verb more often in OV languages than they do in VO languages. But there seems to be an independent explanation for the rarity of OVS languages—namely, that object-initial order is in general rare, both OVS and OSV. Whatever the explanation for this dispreference might be (cf. Tomlin 1986), it predicts the rarity of OVS order without treating subjects as object patterners, even though it will have the side effect that VS order will be more common in VO languages than in OV languages. Since a principle leading to the rarity of object-initial languages will also account for the rarity of OSV languages (which are consistent under the assumption that subjects are object patterners), this approach may provide a better explanation for the apparent correlation.

7.5 AFFIX POSITION. A final possible problem with the BDT is affix position. In Greenberg's 30-language sample, all but one out of 11 OV languages are exclusively suffixing, while only one out of 19 VO languages is exclusively suffixing. This suggests that stem and affix form a correlation pair: if affix-stem order is more common in VO languages than it is in OV languages, then affixes are verb patterners and stems are object patterners. Since stems are clearly not fully recursive phrasal categories, the BDT fails to predict this correlation pair. The HDT will account for it, however, under the assumption that affixes are heads (cf. Hawkins & Cutler 1988: 289–90). While such an assumption has little precedent in traditional views, much recent work in generative morphology has assumed that the notion of head does apply in morphology as well as in syntax, and that affixes are indeed heads (cf. Williams 1981). Under this assumption, the HDT would account for the correlation. While I consider the claim that affixes are heads poorly motivated and highly questionable (cf. Zwicky 1985, Bauer 1990, Newmeyer 1990), affix position would present one

apparent instance of a correlation pair that the HDT, but not the BDT, can account for, at least under one set of assumptions.[26]

One fact that discussions of affix position often fail to note (though cf. Hawkins & Cutler 1988 and Hawkins & Gilligan 1988) is that the extent to which affix position correlates with the order of verb and object varies considerably with the semantic category of the affix. Adequate consideration of affix position would require a detailed discussion of different affix types, and that is beyond the scope of this paper. To illustrate some of the issues surrounding affix type, I will discuss two types of affixes here, tense/aspect affixes and pronominal affixes on nouns indicating the possessor.

Table 45 shows that tense/aspect affixes are overwhelmingly suffixes in OV languages, but that both prefixes and suffixes are common in VO languages, though suffixes are somewhat more common. Table 46 shows that when we compare proportions we fall short of statistical significance: in only four areas is the proportion of genera containing languages with tense/aspect suffixes higher among OV languages. However, in both of the other two areas all the languages in my database with tense/aspect affixes, both OV languages and VO languages, employ suffixes. Hence the failure to achieve statistical significance here may simply reflect a 'ceiling' effect. For this reason, we can tentatively conclude that tense/aspect affixes are verb patterners.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&T/ASuff	[16]	[23]	[4]	[15]	[27]	[24]	109
OV&T/APref	3	0	1	3	3	0	10
VO&T/ASuff	10	[8]	3	[3]	[11]	[9]	44
VO&T/APref	10	0	[5]	1	9	0	25

TABLE 45. Order of tense-aspect affix and verb stem.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.84]	1.00	[.80]	[.83]	[.90]	1.00	.90
VO	.50	1.00	.38	.75	.55	1.00	.70

TABLE 46. Proportions of genera containing languages with tense/aspect suffixes as opposed to tense/aspect prefixes.

When we examine affixes on nouns that indicate the person and/or number of a possessor, we find a rather different pattern. Table 47 shows that such

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	TOTAL
OV&PossSuff	[9]	[8]	1	7	2	3	30
OV&PossPref	1	3	[3]	[8]	[22]	[10]	47
VO&PossSuff	[12]	[2]	[3]	1	9	0	27
VO&PossPref	3	1	0	1	[14]	[8]	27

TABLE 47. Order of possessive affix and noun.

[26] Bauer (1990:21) notes that one of the strongest arguments for treating affixes as heads is the fact that their position correlates with the word order type. But the general problems with the HDT outlined in this paper entail that the fact that stems behave as object patterners provides no argument that affixes are heads.

affixes are more commonly prefixes in OV languages, though this preference is not statistically significant, since it is found in only four areas. When we compare the proportions in Table 48 we find no evidence of any correlation: three areas go one way and three go the other way.

	AFRICA	EURASIA	SEASIA&OC	AUS-NEWGUI	NAMER	SAMER	AVERAGE
OV	[.90]	[.73]	.25	.47	.08	[.23]	.44
VO	.80	.67	[1.00]	[.50]	[.39]	.00	.56

TABLE 48. Proportions of genera containing languages with possessive suffixes as opposed to possessive prefixes.

The average of proportions for possessive suffixes is actually larger for VO languages, but this difference is entirely due to one area, Southeast Asia & Oceania. We therefore cannot say that possessive prefixes are verb patterners, and thus not all affix-stem pairs are correlation pairs. But this example raises the question of whether we want to say that affixes in general are verb patterners, and it suggests that we should distinguish different types of affixes. In other words, while the data in Tables 45 and 46 might support the HDT under the assumption that tense/aspect affixes are heads, the data in Tables 47 and 48 presents a problem for the HDT under the assumption that possessive affixes are heads.

Why might tense/aspect affixes and possessive affixes exhibit such different positional tendencies? An obvious answer comes from an approach that encompasses not only affix position but also the word order correlations; this approach is forcefully articulated in a number of works by Givón (1971, 1975, 1984). According to Givón, the position of affixes and the order of words reflects the order of the elements from which they have evolved diachronically. On this view, tense/aspect affixes commonly derive from verbal auxiliaries (and ultimately from content verbs). The fact that verb stem and tense/aspect affix form a correlation pair would then be due to the fact that verb and auxiliary form a correlation pair. Possessive affixes, by contrast, would commonly derive from possessive pronouns, whose position is most often the same as nominal genitives. Since the pair genitive and noun correlates with object and verb, this predicts that possessive affixes ought to be prefixes in OV languages and suffixes in VO languages. Although we find no correlation, this approach would at least account for the difference between tense/aspect affixes and possessive affixes. If the position of tense/aspect affixes reflects the positions of the verbal auxiliaries from which they have evolved, then we can explain the fact that their position correlates with the order of verb and object without appeal to any synchronic principle like the HDT or the BDT. The positional tendencies of other classes of affixes would have to be examined in detail before we could fully evaluate the principles governing affix position, but I will assume that, insofar as we find correlations between affix position and the order of verb and object, these correlations reflect diachronic principles of this sort.[27]

[27] Various people (e.g. Comrie 1989:216–18) have observed that there are cases in which the position of affixes does not reflect the position of a word with similar meaning from which they

One issue that I cannot deal with in this paper is the question of the extent to which diachronic explanations of the sort I have discussed here for affixes might also explain the word order correlations themselves. Such a position has been defended by Givón (1975, 1984), and at least some brief discussion is called for.[28] For some correlation pairs, I consider this kind of explanation highly plausible. I suspect that the fact that verbal auxiliaries are verb patterners may be largely due to the fact that they derive from content verbs. If a verb meaning 'finish' becomes a completive or past tense auxiliary, it is natural that its position with respect to its complements will be maintained. However, we saw in §2.3 that the order of verb and adpositional phrase exhibits one of the strongest correlations with the order of verb and object. Here a diachronic approach seems unlikely: direct objects do not derive from adpositional phrases, or vice versa. To what extent diachronic factors play a role in explaining other correlations remains to be examined systematically.

8. TOWARDS A FUNCTIONAL EXPLANATION OF THE BRANCHING DIRECTION THEORY. While I have formulated the BDT in purely syntactic terms, I want to propose that the word order correlations ultimately reflect the nature of the human parser. My remarks in this direction are not intended to be more than suggestive, and they will be limited to showing how the claims of the BDT converge with proposals of Kuno 1974, Frazier 1979, 1985, and Hawkins 1990. There are a number of differences among these proposals, but I will focus on their commonality and on the similarities between them and the empirical generalization embodied in the BDT.

8.1 KUNO. Kuno argues that some of the Greenbergian word order correlations can be explained in terms of a tendency to avoid center-embedding in language. He claims, for example, that in a language with postnominal PP modifiers a phrase meaning *the color of the flowers in the vase on the table* will take the form 23a if the language is prepositional and 23b if its is postpositional (1974: 127):

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evolved. Such cases do constitute a problem for the use of morpheme order as the sole basis for reconstructing earlier word order, but they have no bearing on the hypothesis that the correlations between affix-stem order and verb-object order are due to the nature of diachronic processes—as long as cases in which the position of affixes does reflect their diachronic source are common enough to result in a correlation. (See Hall 1988:333 for a similar point.) While we need further solid diachronic evidence on the origin of tense/aspect affixes, the fact that the position of these affixes correlates with the order of verb and object provides some evidence that verbal auxiliaries are a common source for the affixes.

[28] Aristar 1991 offers a diachronic account of the fact that the order of genitive and noun and the order of relative clause and noun correlate with each other and with the order of object and verb. Space does not permit discussion of his proposals here, but I should note that some of the generalizations his account purports to explain turn out to be invalid—as I have demonstrated in this paper. An example is the supposed correlation between the order of adjective and noun and that of object and verb. Similarly, he claims to have explained the supposed ambivalence of SVO languages. But here his account is based on the order of relative clause and noun, and in fact SVO languages are not at all ambivalent in their placement of relative clauses; the only attested cases of SVO&RelN are the so-called dialects of Chinese.

(23) a. Prepositional: color [of flowers [in vase [on table]]]
b. Postpositional: color [flowers [vase [table on] in] of]

Conversely, in a language with prenominal PP modifiers this phrase will take the form in 24a if the language is prepositional and 24b if it is postpositional.

(24) a. Prepositional: [of [in [on table] vase] flowers] color
b. Postpositional: [[[table on] vase in] flowers of] color

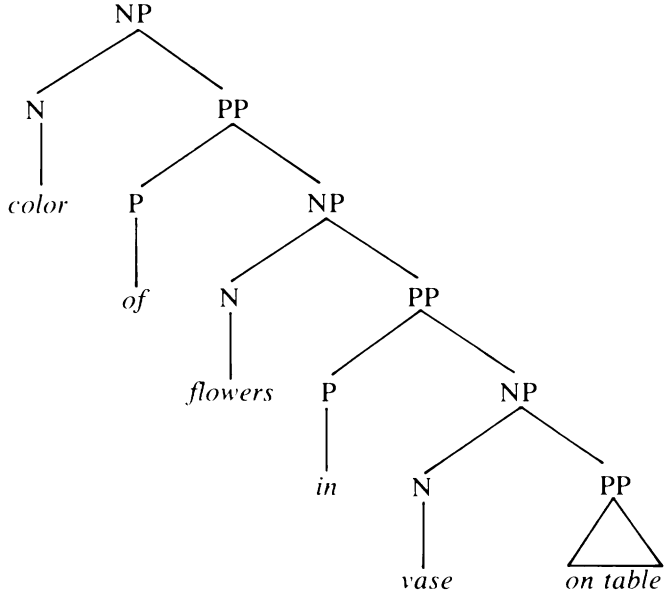
Kuno observes that the structures in 23b and 24b are likely to be difficult to process because of the multiple center-embedding: these structures resemble classic examples with multiple center-embedded relative clauses in English, like 25.

(25) The cheese [that the rat [that the cat chased] ate] was rotten.

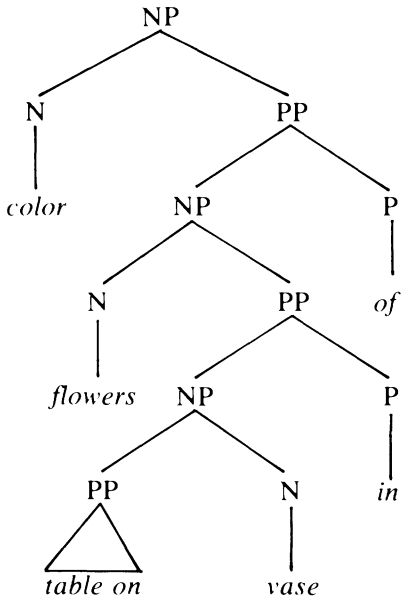
In 23b the PP *table on* is center-embedded within the PP *vase* [*table on*] *in*, which is in turn embedded within the PP *flowers* [*vase* [*table on*] *in*] *of*.

When we examine the possible tree structures for 23a and 23b shown in 26, we find that the difference can equally well be characterized in terms of consistency of direction of branching. The structure in 26a is consistently right-branching, while the structure in 26b involves alternating left- and right-branching: the path of phrasal branches in 26b goes first to the right, then to the left, then to the right again, and so on. Structures with alternating left- and right-branching and with multiple nestings of the same category will in general present the kind of processing difficulty associated with center-embeddings. Since the BDT involves a tendency towards consistent direction of branching and thus a tendency to avoid both left- and right-branching within the same language, its effect is to decrease the number of possible instances in which structures like 26b might arise. On this approach the question of whether elements are heads or dependents does not arise. Nor will any processing difficulties

(26) a.



b.



arise with dependents that are not fully recursive, since only with fully recursive phrases will we find the kind of multiple nesting illustrated in 26b.

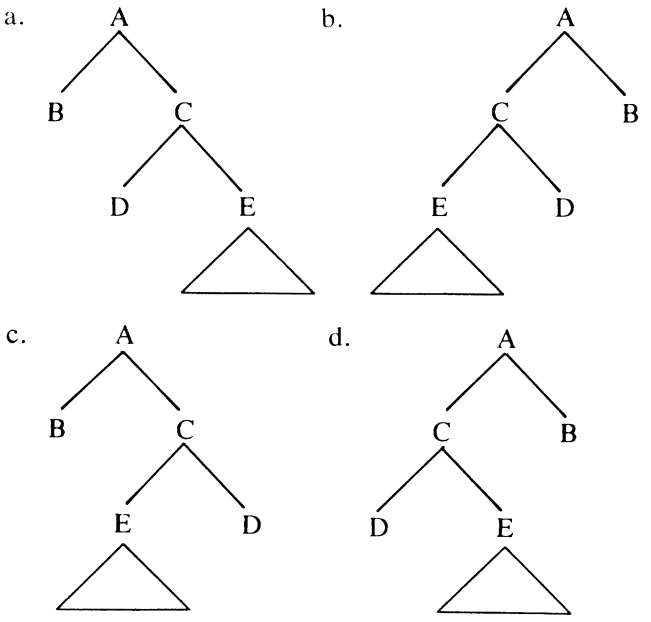
8.2 FRAZIER. Frazier (1979, 1985) proposes a Head Adjacency Principle, motivated by the parsing model of Frazier & Fodor 1978, to explain some of the Greenbergian correlations. This principle has the effect that recursive phrasal dependents will tend not to occur between the head of a phrase and the head of the mother phrase. Thus, for example, relative clauses will tend not to occur between a noun and an adposition, so that prepositional languages will tend to have structures of the form P + N + Rel rather than P + Rel + N. Frazier argues that structures of the form P + Rel + N would present a problem for the parser, since the P + Rel + N might be too long a unit for the parser and the P + Rel would not form a semantic unit. This argument apparently applies to any structure that first branches to the right and then branches to the left, and again explains why consistent direction of branching should be favored. It also explains why only recursive phrases act as object patterners: nonrecursive phrases will be sufficiently short that the kinds of problems that recursive phrases can cause will not arise. Thus P + AdjP + N will not present a problem for the parser since, unlike P + Rel + N, the P + AdjP + N will normally fit in the viewing window of the parser.

Frazier's principle specifically refers to grammatical heads, but it is not clear that this is necessary. Consider a structure of the form X + Y + Z, analogous to the case of P + Rel + N, where Y + Z forms a constituent, where X and Z are nonphrasal and Y is phrasal, but where X and/or Z is not a head. Frazier's explanation for the infrequency of P + Rel + N would seem to apply equally well to this case: X + Y + Z might be too long for the parser, but X + Y would not form a semantic unit. Hence it seems possible that Frazier's general line

of argumentation could be extended as a principle by which nonphrasal elements of a phrase tend to occur next to nonphrasal elements of a mother phrase.

8.3. HAWKINS. In 1983 Hawkins proposed to account for the word order correlations with a principle of Cross-Category Harmony that is formulated in terms of the notions of head and dependent, but more recently he has argued that many phenomena in the area of word order can be explained in terms of the nature of parsing. He proposes in Hawkins 1990 a parsing preference principle that he calls Early Immediate Constituents (EIC), the basic idea of which is to prefer those orders of words that enable the parser to recognize all I[mmediate]C[onstituents]s of a mother node as rapidly as possible, once the first IC has been recognized. The effect of this is that consistently left- and right-branching structures are preferred. In a right-branching tree like 27a, the ICs of A can in general be recognized quickly: if D allows the parser to construct C, then all ICs of A will have been recognized by the time D is recognized. In a left-branching tree like 27b, the parser does not (at least ideally) recognize the first IC of A until D is encountered; hence the domain from the recognition of the first IC of A to the last one is again just two words. In a structure like 27c, however, with mixed left- and right-branching, the domain from recognition of the first IC of A to recognition of the second IC of A will be longer, since it will start with B and will not finish until unit D is recognized. Similar comments apply to 27d.

(27)



While space precludes lengthier discussion of Hawkin's principle, its effect is consonant with the BDT, preferring consistent left- or right-branching over a mixture of the two. His theory predicts that fully recursive phrasal categories will be most costly for mixed branching if one assumes that phrases are typically

longer than other categories. And the predictions of the theory are independent of the notions of head and dependent.

Hawkins' theory makes other predictions yet to be tested on a large sample of languages and for the full gamut of possible combinations of elements. Like the basic version of the BDT, and unlike the alternate version (which claims that the correlations involve a tendency towards consistent ordering of heads with respect to phrasal dependents), Hawkins' theory predicts that the ordering AMONG dependents will be governed by the same principles as those governing the ordering of HEADS with respect to dependents, and he cites supporting evidence from the order of adjective and relative clause. This prediction requires further investigation. Hawkins' theory also makes a prediction that goes beyond the BDT; while it shares with the BDT the prediction that mixing left- and right-branching will be dispreferred, it also predicts (cf. pp. 238–39) that a right branch within a left branch, as in 27d, should be worse than a left branch within a right branch (27c). This also requires further empirical investigation.

9. CONCLUSION. The principal object of this paper has been to present the basic empirical results of a study of the word order correlations based on a large and diverse sample of languages. Much previous discussion of these correlations was based on partly erroneous assumptions about what pairs of elements do correlate in order with the verb and object. I have presented detailed empirical evidence bearing on the degree of correlation between the order of 24 pairs of elements and the order of verb and object. In some cases the evidence has corroborated assumptions that others have made about correlations; in other cases, evidence has been presented for pairs of elements that have rarely or never been discussed in the typological literature. And in still other cases the evidence has contradicted assumptions that others have made about what pairs of elements exhibit correlations. A complete list of the correlation pairs is given in Table 39.

Previous attempts to explain the word order correlations have been marred both by a failure to consider the full range of pairs of elements that exhibit correlations and by faulty assumptions about which pairs of elements do exhibit correlations. These inadequacies are particularly clear at the level of the noun phrase. Many previous attempts have been based on the assumption that noun modifiers in general tend to precede the noun in OV languages and to follow it in VO languages. But the evidence presented in this paper shows that this is at best true only for genitives and relative clauses. The order of adjective and demonstrative with respect to the noun does not exhibit any correlation with the order of object and verb; articles and plural words show the opposite correlation, preceding the noun more often in VO languages than in OV languages; and numerals exhibit a trend in the same direction as articles.

My empirical results thus provide evidence against the Head-Dependent Theory, according to which the word order correlations reflect a tendency for dependents to precede heads in OV languages and vice versa in VO languages. I have offered an alternative theory, the Branching Direction Theory, according to which the word order correlations reflect a tendency for phrasal categories

to precede nonphrasal categories in OV languages and vice versa in VO languages. I have presented two kinds of evidence for the BDT over the HDT. First, a number of categories of dependents do not exhibit correlations, ie., they do not precede the noun any more often in OV languages than they do in VO languages—namely, adjectives, demonstratives, intensifiers (modifying adjectives), negative particles, and tense/aspect particles. The HDT predicts that these elements ought to precede their heads more often in OV languages than in VO languages, but they do not; the BDT accounts for the lack of a correlation with these words, because they are nonphrasal elements that combine with other nonphrasal elements. The second kind of evidence for the BDT over the HDT is found in various pairs of elements (such as article and noun) for which there is a lack of consensus as to which member, if either, is the head. Each of these pairs of elements exhibits a correlation, but the HDT accounts for these correlations only if there is independent evidence that the verb patterner in each pair (e.g., the article) is the head. The BDT accounts for these correlations regardless of one's assumptions about which element (if either) is head, since in these pairs a nonphrasal element combines with a phrasal element. Finally, I have proposed that the correlations ultimately derive from the nature of parsing, because the effect of the BDT is that languages tend towards consistent left-branching or consistent right-branching, and structures with a consistent direction of branching are easier to process than structures that involve a mixture of left- and right-branching.

Appendix

The following is a list of the 625 languages in the database, organized by area and by genus. Each genus is listed in italics, followed in parentheses by the individual languages represented in the database. Genus names without such a list of languages in parentheses are either genera containing a single language (e.g., *Albanian*), so that the name of the genus is also the name of the language, or genera represented in the database by a single language with the same name as the genus (e.g. *Tama*).

AFRICA: *Northern Khoisan* (Xu), *Central Khoisan* (Korana, Nama), *Kordofanian* (Katla, Moro, Masakin, Rashad), *Mande* (Susu, Vai, Mandinka, Gambian Mandinka, Bambara, Mende), *Northern Atlantic* (Fulani, Diola-Fogny), *Ijoid* (Kolokuma Ijo), *Kru* (Seme, Grebo), *Gur* (Toussian, Tenyer, Bimoba, Kirma), *Adamawa-Ubangi* (Mbum, Day, Gbaya Kaka, Gbeya Bossangoa, Sango, Nzakara, Mba), *Kwa* (Fanti, Twi, Nkonya, Lelemi, Ewe), *Defoid* (Yoruba), *Edoid* (Bini, Engenni), *Igboid* (Igbo, Izi), *Platoid* (Jukun), *Cross River* (Efik), *Kainji* (Duka), *Bantoid* (Noni, Ewondo, Bobangi, Swahili, Luganda, Nkore-Kiga, Luvale, Lamba, Mwera, Shona, Zulu), *Kadugli* (Katcha), *Songhai, Saharan* (Kanuri, Tubu), *Maban* (Maba), *Fur, Nubian* (Dongolese Nubian), *Surma* (Didinga), *Nera* (Barya), *Nyimang, Temein, Tama, Daju* (Shatt), *Nilotic* (Pari, Dholuo, Acooli, Bor, Bari, Maasai, Karimojong, Sebei, Pokot), *Kuliak* (Tepeth), *Kresh, Bongo-Bagirmi* (Sara-Ngambay, Bagirmi, Yulu), *Mangbutu-Efe* (Mamvu), *Balendru* (North Lendu), *Berta, Kunama, Komuz* (Koma), *Berber* (Berber, Shilha, Tamazight), *Biu-Mandara* (Tera, Margi, Lamang, Gude), *West Chadic* (Hausa, Kanakuru, Angas, Ngizim), *Omotic* (Ometo), *Beja, Central Cushitic* (Kemant), *Eastern Cushitic* (Afar, Arbore, Geleba, Somali, Oromo), *Southern Cushitic* (Iraqw), *Semitic* (Chaldean, Biblical Hebrew, Modern Literary Arabic, Colloquial Egyptian Arabic, Sabaic, Ge'ez, Tigre, Amharic, Gourague, Chaha).

EURASIA: *Basque, Armenian* (Classical Armenian, Modern Armenian), *Indic* (Pali, Nuri, Welsh Romany, Sinhalese, Dumaki, Shina, Marathi, Hindi, Urdu, Punjabi, Nepali, Maithili, Bishnupriya Manipuri), *Iranian* (Ossetic, Wakhi, Pashto, Persian, Southern Tati), *Albanian, Greek*

(Modern Greek), *Italic* (Latin, Rumanian, French, Spanish), *Celtic* (Irish, Scots Gaelic, Breton, Welsh), *Germanic* (Danish, Swedish, Icelandic, Dutch, German, English, Frisian), *Baltic* (Lithuanian), *Slavic* (Russian, Ukrainian, Polish, Czech, Bulgarian, Serbo-Croatian), *Samoyedic* (Nenets), *Ugric* (Hungarian), *Finnic* (Udmurt, Komi-Permyak, Eastern Cheremis, Finnish), *Mongolian* (Dagur, Kalmyk. Buriat, Khalkha), *Tungus* (Evenki, Orok), *Turkic* (Orkhon Turkic, Chuvash, Azerbaijani, Turkish, Uzbek, Karakalpak, Yakut), *Japanese*, *Korean*, *Chukchee-Kamchatkan* (Koryak, Itelmen), *Nivkh, Yukaghir, Ket, Sumerian, Hurrian, Elamite, Kartvelian* (Georgian), *Northwest Caucasian* (Abkhaz), *Nax* (Chechen, Ingush), *Avaro-Andi-Dido* (Avar), *Lak-Dargwa* (Lak, Dargwa), *Lezgian* (Archi, Lezgian), *Burushaski, Northwest Dravidian* (Brahui), *Dravidian Proper* (Kolami, Gondi, Koya, Kuvi, Telugu, Tulu, Kannada, Tamil), *Munda* (Kurku, Santali, Mundari, Ho).

SOUTHEAST ASIA & OCEANIA: *Chinese* (Mandarin, Hakka, Cantonese, Malayan Cantonese), *Karen, Tibetic* (Lepcha, Gurung, Ladakhi, Sherpa, Magari, Kham, Kusunda, Thulung, Limbu, Dafla), *Baric* (Garo, Kachari, Kokborok), *Burmic* (Ao, Bawm, Chingpaw, Burmese, Lahu), *Miao-Yao* (Miao, Mong Njua, Mjen, Pu Nu), *Khasi, Palaung-Khmuic* (Palaung), *Viet-Muong* (Vietnamese), *Katuic* (Katu), *Bahnaric* (Stieng, Chrau, Sre, Brao, Cua), *Khmer* (Cambodian), *Aslian* (Temiar), *Nicobarese* (Car), *Kam-Tai* (Nung, Lao, Thai), *Atayalic* (Atayal), *Paiwanic* (Rukai), *Philippine Austronesian* (Chamorro, Palauan, Central Agta, Balangao, Pangasinan, Kapampangan, Western Bukidnon Manobo, Tagalog, Bikol, Mamanwa, Hiligaynon, Tboli, Tondano), *Sundic* (Sundanese, Toba Batak, Indonesian), *Central-Eastern Malayo-Polynesian* (Mor, Manam, Kaliai-Kove, Patep, Wedau, Iduna, Kilivila, Pokau, Motu, Balawaia, Nissan, Tolai, Tigak, Halia, Mono-Alu, Lenakel, Iai, Dehu, Yapese, Kiribatese, Kusaiean, Mokilese, Ponapean, Puluwat, Sonsorol-Tobi, Sa'a, Arosi, Sakao, Nguna, Rotuman, Fijian, Niuean, Tongan, Samoan, Futuna-Aniwa, Easter Island, Tahitian, Hawaiian), *Andamanese*.

AUSTRALIA-NEW GUINEA: *Finisterre-Huon* (Selepet), *East New Guinea Highlands* (Kobon, Agarabi, Gadsup, Usarufa, Awa, Tairora, Hua, Yagaria, Gahuku, Golin, Salt-Yui, Banz, Kewa), *Central and South New Guinea* (Kamoro, Asmat, Auju, Kati, Mombum), *Angan* (Baruya, Kapau), *Marind* (Boazi, Marind, Jaqai), *Sentani, Dani-Kwerba* (Lower Grand Valley Dani), *Wissel Lakes-Kemandoga* (Ekari, Moni), *Binanderean* (Guhu-Samane, Suena), *Central and Southeast New Guinea* (Kunimaipa, Koita, Mountain Koiali, Barai, Omie, Yareba, Magi, Daga), *Madang* (Siroi, Amele), *Adelbert Range* (Waskia), *Trans-Fly-Yelmek-Maklew* (Jelmek, Makleu, Kiwai, Jei, Moraori, Kanum), *Kolopom* (Kimaghama), *Torricelli* (Arapesh), *Sepik-Ramu* (Ambulas, Iatmul, Alamblak, Rao, Kire, Autuw), *Bougainville* (Nasioi, Telei), *Yele-Solomons* (Yeletnye), *Mangarayi, Nunggubuyu, Tiwi, Yiwaidjan* (Jiwadja, Maung), *Gunwinyguan* (Ngandi, Gunwinggu, Dalabon, Gunbalang, Wageman), *Maran* (Alawa, Mara), *West Barkly* (Djingili), *Garawan* (Garawa), *Daly* (Maranungku, Malakmalak), *Wororan* (Ngarinjin), *Tangkic* (Yukulta), *Pama-Nyungan* (Muruwari, Gidabal, Ritharngu, Djapu, Uradhi, Anguthimri, Ngawun, Guugu Yimidhirr, Yidiny, Dyirbal, Wargamay, Nyawaygi, Margany, Gumbaynggir, Yaygir, Dharawal, Ngiyambaa, Madimadi, Wembawemba, Pitta-Pitta, Diyari, Alyawarra, Aranda, Garadjari, Yindjibarndi, Thargari, Watjarri, Western Desert, Gugada, Warlpiri).

NORTH AMERICA: *Eskimo-Aleut* (West Greenlandic, Yup'ik), *Haida, Tlingit, Athapaskan-Eyak* (Hupa, Slavey, Chipewyan, Sarcee, Western Apache, Navajo), *Kutenai, Wiyot, Yurok, Algonquian* (Blackfoot, Cree, Menomini), *Chimakuan* (Quileute), *Wakashan* (Kwakiutl), *Bella Coola, Coast Salish* (Squamish), *Interior Salish* (Shuswap, Kalispel), *Keresan* (Acoma), *Yuchi, Siouan* (Hidatsa, Lakota, Dhegiha, Biloxi), *Caddoan* (Wichita, Pawnee), *Iroquoian* (Mohawk, Tuscarora, Cherokee), *Tsimshian* (Gitksan, Coast Tsimshian), *Chinookan* (Lower Chinook, Kathlamet), *Takelma, Coos* (Hanis Coos), *Alsea, Siuslawan, Klamath, Sahaptian* (Northern Sahaptin, Nez Perce), *Wintun* (Patwin, Wintu), *Maidu* (Northeast Maidu), *Yokuts* (Wikchamni, Yaudanchi Yokuts, Yawelmani), *Costanoan, Miwok* (Sierra Miwok), *Zuni, Atakapa, Chitimacha, Tunica, Muskogean* (Choctaw, Seminole), *Yukian* (Wappo), *Huave, Totonacan* (Totonac), *Mixe-Zoquean* (Mixe, Sierra Popoluca, Copainalá Zoque, Ostucacan Zoque), *Mayan* (Tzotzil, Jacaltec, Mam, Ixil, Tzutujil), *Karok, Chimariko, Shasta, Palaihnihan* (Achumawi, Atsugewi), *Pomo* (Eastern Pomo, Southeastern Pomo), *Washo, Chumash*

(Barbareño Chumash), *Salinan, Esselen, Seri, Yuman* (Kiliwa, Diegueño, Hualapai), *Tonkawa, Karankawa, Coahuiltecan* (Coahuilteco), *Tequistlatecan* (Huamelultec Oaxaca Chontal), *Tarascan, Tanoan* (Kiowa, Taos), *Numic* (Northern Paiute, Shoshoni, Comanche, Ute, Chemehuevi), *Takic* (Luiseño, Cahuilla), *Hopi, Pimic* (Papago, Nevome, Northern Tepehuan), *Taracahitic* (Western Tarahumara, Yaqui), *Aztecan* (Pipil, Huasteca Nahuatl, Michoacan Nahuatl, North Pueblo Nahuatl, Tetelcingo Nahuatl), *Coric* (Cora, Huichol), *Otomian* (Pame, Otomi), *Mixtecan* (Jicaltepec Mixtec, Ocotepec Mixtec, Peñoles Mixtec), *Popolocan* (Mazatec), *Chinantecan* (Comaltepec Chinantec, Palantla Chinantec), *Zapotecan* (Chatino, Zapotec), *Tlapaneca*.

SOUTH AMERICA: *Yanomam* (Sanuma, Central Waica), *Misumalpan* (Miskito), *Talamanca* (Bribri), *Guaymi, Itonama, Warao, Mura* (Pirahã), *Barbacoan* (Cayapa), *Cahuapanan* (Jebero), *Zaparoan* (Zaparo, Iquito, Huao), *Quechua* (Imbabura Quechua), *Aymara, Jaqaru, Mapudungu* (Araucana), *Patagonian* (Gununa Kune), *Qawesqar* (Kawesqar), *Iranxe, Movima, Ticuna, Nambikuaran* (Nambikuara), *Puinave* (Hupda), *Tucanoan* (Tucano, Carapana, Southern Barasano, Yebamasa, Siona), *Cayuvava, Trumai, Salivan* (Saliva), *Candoshi, Jivaro* (Achuar, Jibaro), *Cariri, Tupi-Guarani* (Guajajara, Urubu-Kaapor, Guaraní, Wayapi, Cocama, Munduruku, Siriono), *Guahiban* (Cuiva), *Chipayan* (Uru), *Maipurean* (Ipurina, Piro, Axininca Campa, Machiguenga, Baure, Ignaciano, Island Carib, Resigaro, Goajiro), *Andoke, Peba-Yaguan* (Yagua), *Boran* (Muinane), *Witotoan* (Murui, Witoto), *Carib* (Carib, Apalai, Makuchi, Hixkaryana), *Mascoian* (Lengua), *Moseten* (Moseteno), *Guaicuruan* (Abipon), *Mataco, Panoan* (Chacobo, Amahuaca, Sharanahua, Cashibo, Shipibo-Conibo), *Tacanan* (Eseejja, Araona, Tacana), *Rikbaktsa, Iate, Bororoan* (Bororo), *Chiquito, Ge-Kaingang* (Kaingang, Xavante, Apinaye, Cayapo, Kraho, Canela-Kraho).

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