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Free Word Order Languages, Free Constituent Order Languages, and the Gray Area in Between

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0. Introduction.

The existence of languages which exhibit fairly rigid word order (such as English), and those which exhibit extremely free word order (Walbiri, for example) has posed serious problems for syntactic theory. This difference with respect to order freedom among natural languages has prompted some linguists to provide theoretical proposals in which free order languages are treated in a formally distinct way from fixed order languages.

Among those proposals which differentiate languages according to whether they have fixed or free order, the one which makes the most extreme distinction is that made by Hale (1979) with respect to Walbiri. He claims that there are two kinds of natural languages, those whose base component consists of the familiar phrase structure rules espoused by $\bar{X}$ theory (along the lines of Chomsky (1970) and Jackendoff (1977)), and those whose syntax is of the W* sort, where the syntactic component consists only of a concatenation rule at the word level. Bracketing procedures then form some syntactic constituents and the semantic translation rules finally filter out all but well-formed strings.

Other formal proposals have involved not the radical distinction between language type that Hale suggested, but differences in

rule type. Within the Transformational Grammar (TG) paradigm, the first formal proposal with respect to free order languages was made by Ross (1967) for Latin. Ross wrote a special transformational rule, a Scrambling Rule, which, he notes, differs radically from other transformations in its excessive power. I will return to these differences at a point later in the paper. The notion of a Scrambling Rule has remained throughout subsequent revisions in the TG paradigm, although its place in the grammar could be taken to be among the stylistic rules rather than among the movement rules (see Chomsky (1980) for relevant distinctions). Yet another proposal has been made by Lapointe (1980a,b). He suggests that languages are not of two fundamentally different types, as Hale has proposed, and that they do not differ in type of transformational rule, but, rather, that languages may differ in type of phrase structure rule. Working within the EST paradigm and under the assumptions of $\bar{X}$ theory, Lapointe proposes that languages may have either fixed order phrase structure rules, free order phrase structure rules, or a combination of both. The free order phrase structure rules are formulated to operate at the S-level only. They are of roughly two types, those that concatenate constituents at the maximal $\bar{X}$ level (e.g. $\bar{N}$, $\bar{A}$) and those that concatenate at the lexical level (e.g. N, A). Lapointe's Argument Determining Procedures (which establish grammatical relations) together with his semantic translation rules filter out the ill-formed strings. These three proposals do not exhaust those which have surfaced with respect to the formal treatment of fixed and free order languages, but they have in common that free and fixed order languages are treated in formally distinct fashions.

In this paper I would like to do two things. One is to discuss data from a language that exhibits an intermediate degree of order freedom both with respect to which level of constituent is free and with respect to where the constituents may appear in a sentence. The second area I would like to explore is a model in which there is no fundamental formal difference of the sorts made by the above mentioned proposals between fixed and free order languages. The language under consideration is Makua, a Bantu language spoken in Tanzania and Mozambique. The data discussed in this paper comes from the Imit^{h}upi dialect, spoken in Tanzania. Makua is not clearly a free word order language nor a free constituent order language, because it allows freedom of at least one lexical category and some, but not all constituents. Thus, at first glance, it does not seem appropriate to treat it as a fixed order language, either. The analysis of this language that I have developed (Stucky 1981) is cast within a particular theory of phrase structure grammar developed by Gerald Gazdar (1980a,b). Interestingly, the analysis of Makua within this version of phrase

structure grammar requires no additional rule types. Extrapolating from the analysis of Makua then, I would like to suggest what a phrase structure grammar analysis of a language with very free order would look like within this version of PSG.

One caveat is in order, however. It is obviously impossible to provide either a sensibly large chunk of the analysis of Makua or a full-fledged theory of free order in this short paper. The discussion will, therefore, be limited to clause-bounded phenomena, pointing to what I see to be the gray area between free constituent order and free word order.

The first section of the paper contains a rough account of the Makua data. The second section presents the formal description. The concluding comments in the third section include a comparison of this approach for order with the three mentioned above, although I will not argue explicitly against any of those proposals.

1. The data.

In order to discuss the data with respect to Makua order freedom, I would like to lay out a couple of assumptions. First, I am assuming an $\bar{X}$ phrase structure (following Chomsky (1970) and Jackendoff (1977)) in which there are only two bar levels ($\bar{X}$, $\bar{\bar{X}}$) and one lexical level(X). In addition, $\bar{\bar{V}}$ (S) is to be taken as the maximal projection of the verb phrase node (V). I will lay out enough Makua data to show that the categories in (1a) below exhibit some freedom at the sentence level while those in (1b) do not. Note that there is no simple generalization with respect to which bar level or which constituent enjoys freedom.

(1) Makua (Imit^{h}upi dialect):

a. Constituents that exhibit freedom of order:
$\bar{\bar{N}}$, V, $\bar{V}$ (?), Adv, $\bar{\bar{P}}$, $\overline{VP}$ (some)

b. Constituents that do not exhibit total freedom of order:
$\bar{N}$, N, $\bar{\bar{A}}$, $\bar{A}$, A, $\bar{P}$, P, $\bar{S}$, $\overline{VP}$ (some)

In addition, it will be helpful to discuss some basic Makua facts. As is the case with all Bantu languages I am familiar with, there is no case marking on nouns. This is an important point, since it is a common assumption among linguists that a language without case marking will not exhibit as much freedom as Makua does. Nouns are divided, in Makua, into noun classes. In most

cases, these noun classes are marked by an overt prefix on the noun. The noun classes govern agreement of various sorts. Of primary interest here is verb agreement, where the verb agrees with both the subject and object nouns according to the noun class. In an example like that in (2a) below, the sentence contains a transitive verb and two noun phrase arguments, both of which are of the same noun class. Such a sentence is potentially ambiguous between two readings, SVO and OVS. I say potentially, because in a real discourse, the context together with the discourse functions associated with the orders will render such a sentence unambiguous.

(2) a. á-náfúnzí a-haá-míníhá á-fúúndí
students SA-T/OA convince experts
i. 'The students have convinced the experts'.
ii. 'The experts have convinced the students'.

b. n-náfúnzi Ø-haá-míníhá á-fúúndí
student SA-T/OA-convince experts
i. 'The student has convinced the experts'.
*ii. 'The experts have convinced the student'.

A sentence like that in (2b), in which the noun phrase arguments are of different classes, will never be even potentially ambiguous, since the noun classes are different and the verb agreement indicates which noun is the subject and which noun is the object.

Now for the order facts. First, the order within a noun phrase is fixed. In (3) below is a Makua noun phrase containing just a noun, an adjective and a demonstrative. No order of these elements other than that given is permissible. In addition, all other modifiers (e.g. relative clauses, possessives) and the genitive also follow the noun. Thus, anything that semantically belongs in a NP stays there, and the order is fixed. Attributive adjective phrases, therefore, are not free at the sentence level.

(3) Noun phrase order (Dem - N - {Adj, Poss, Gen, R.C.} - Dem)

ńná-niváká ni-kíná-ńná
dem spear ag other dem
'this other spear'

Noun phrases themselves, however, enjoy extraordinary freedom. Within a clause, noun phrases can be found anywhere at all. In an example like that in (2a) or (2b) above, all six logically possible orders are grammatical. And, as in (4) below (an example which contains a bitransitive verb and three NP arguments), all twenty-four logically possible orders are possible.

(4)

V	S	IO	DO
a-ho-ń-rúw-él-á	Asáápala	mwaán-ólé	isímá
SA-T-OA-V-ben-T	A	child-dem	porridge

(24 orders possible)
'(What happened was that) Asaapala prepared porridge for the child'.

The same distribution holds for an example like that in (5) below, in which there is a prepositional phrase. The preposition cannot be separated from its following noun phrase under any circumstances. In fact, prepositional phrases behave in a fashion analogous to noun phrases. The order preposition-noun phrase is fixed, although prepositional phrases, like noun phrases, can be found in any order within the clause they belong to.

(5)

PP	S	V	DO
wa mwaárímw-aáyá	Aráárima	áhó-rwééh-a	ibárúwa
prep teacher poss	A	SA/T send	letter

(24 orders possible)
'To his teacher, Araarima (as expected) sent a letter'.

I now turn to the question of the freedom of the verb. Note that even in the simplest case, i.e. a sentence with just a subject and a verb such as that in (6) below, it is impossible to tell by inspection if one should regard this as order freedom of the verb phrase (i.e. $\bar{V}$ under my assumptions) or the lexical V.

(6) a.

S	V
Asáápala	a-ho-t^{h}áwá
A	SA-T-flee

'Asaapala has fled'.

b.

V	S
a-ho-t^{h}áwá	Asáápala
SA-T-flee	A

'(What happened was that) Asaapala has fled'.

This issue becomes even more complicated when a subject, a verb, and an object are involved, since, if there is evidence for a syntactic verb phrase in the language at all, then it is important to resolve which, if any, of the orders, SVO, OVS, SOV, and VOS contain syntactic verb phrases. But for a VSO order it is not possible maintain an analysis in which there is a contiguous verb phrase. I would like to sidestep the evidence for which, if any, of the orders in Makua have a syntactic verb phrase. There is such evidence, but it is too complicated to go into here (see Stucky 1981). At least, given paradigms like that in (2) above, where all six orders are possible, and those like (4) and (5) where all twenty-four are possible, it is possible to claim that either both lexical V and $\bar{V}$ are free, or that only lexical V is free at the clause level. So far then, the data suggest that $\bar{\bar{N}}$, $\bar{\bar{P}}$, V and possibly $\bar{V}$

are free within a clause, but that $\bar{N}$, $\bar{P}$, N, P, and $\bar{\bar{A}}$ are not.

There is one more set of constructions that I would like to take up, and that set includes infinitival and sentential complements. The generalization here is that a complement sentence and one sort of infinitival complement must follow the verb. The other categories which exhibit freedom may, however, be distributed around the complement sentence. A simple example is the one in (7). There, as long as the complement sentence follows the verb, any order is acceptable.

(7)

V	S	DO	$\bar{S}$		
áhó-ń-hímérya	Híń-Sepété	ńt^{h}ú	wiírá	ásúúlúpaály-áálé	
SA/T-OA-tell	Hin-Sepete	S.o.	that	old man	dem

áhó-límá	váá	mweécána
SA/T-cult.	here	last year

'(What happened was that) Hin-Sepete told someone that the old man cultivated here last year'.

Nothing has been said about what can happen to the various categories (or constituents) when they are found outside the clauses to which they belong semantically (i.e. cases of unbounded dependencies), and I won't introduce the formal analysis of those phenomena either. The reader is referred to Gazdar (1980a,1980b) which show, among other things, how unbounded dependencies can be expressed in a general way within a purely context-free phrase structure grammar. Obviously such phenomena can interact with word order. Topicalization in English results in OSV order, for example. Any complete treatment of Makua order would have to include an account of these constructions as well.

The following section contains a brief introduction to the relevant formalism and a discussion of the Makua facts just outlined within that version of phrase structure grammar.

2. A generalized phrase structure grammar.

A rule in this grammar takes the general form in (8) below. Such a rule, known as a Constituent Structure Rule (CSR), is an ordered triple consisting of a rule number, a phrase structure rule, followed by a semantic translation.

(8) General form of a Constituent Structure Rule (CSR):

<rule number, PS rule, semantic translation>

Since most of what I have to say concerns the second member of the ordered triple, I will take a little more time to discuss that member than I will to discuss the first and third members.

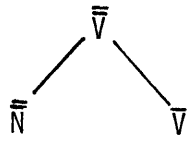
FREE WORD/CONSTITUENT ORDER

The phrase structure grammar (from which the second member of the CSR is drawn) consists of the usual four items: 1) a finite set of terminal symbols (the lexical items of the language in question), 2) a set of non-terminal symbols which are taken to be complex symbols which incorporate information regarding the $\bar{X}$ level of the category, as well as subcategorization facts, morphological and morphosyntactic information in the form of feature bundles, 3) the distinguished symbol $\bar{\bar{V}}$ (the S node) on which well-formedness is defined, and 4) the rules themselves. It is important to note that as conceived here, the phrase structure rules constitute a context-free phrase structure grammar. Gazdar has taken the phrase struc--ture rules under a node-admissibility interpretation (following McCawley (1968)) rather than under the more familiar rewrite interpretation.[1] The notation is, accordingly, different.

To take a familiar language and a familiar example, a phrase structure rule for English would be the one in (9a) below, which is to be interpreted as admitting the node V when it dominates N and V in that order. It thus analyzes a partial tree like that in (9b).

(9) a. $< 1, [_{\bar{V}}\ \bar{\bar{N}}\ \bar{V}\ ], \ldots >$

b.

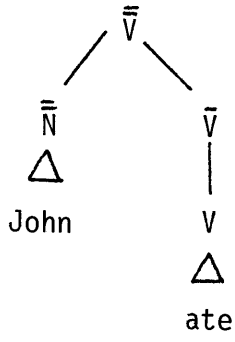


Further node admissibility conditions will be needed to admit $\bar{\bar{N}}$ and $\bar{V}$. Of those rules which will be needed for English are those in (10a) and (10b) which admit intransitive and transitive verbs, respectively. Together with the rule in (9a), they analyze partial trees, as in (10c) and (10d), where I have filled in lexical items for perspicuity.

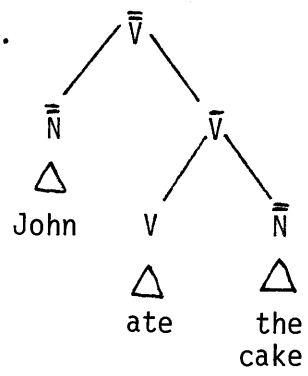
(10) a. $< 2, [_{\bar{V}}\ V\ ] \ldots >$

b. $< 3, [_{\bar{V}}\ V\ \bar{\bar{N}}\ ] \ldots >$

c.



d.



The rule numbers and the phrase structure rules together capture facts regarding subcategorization. Part of the lexical entry for a lexical item is a list of rule numbers that restricts which sort of rule a particular lexical item may participate in. I will not got into the details of the notation here, but that notation insures that transitive verbs subcategorize for NP's but that intransitive verbs do not. For those transitive verbs (such as eat) which have intransitive counterparts, a redundancy rule in the lexicon is used to relate the subsets of transitive verbs which have intransitive counterparts.

The third member of the CSR is the semantic translation which gives the meaning of a constituent as a function of that constituent's parts. This takes the form of a translation into intensional logic along the lines utilized by Montague and others. Because of the fact that each syntactic rule is associated with a semantic rule, this then commits one to what Bach (1976) has called the rule-by-rule hypothesis about the relationship of syntax and semantics. I will have little to say about the semantics, although it is the semantic translation in tandem with the syntax that defines grammatical relations.

I now take up the formal treatment of order. First of all, it should be apparent that phrase structure rules as envisioned here induce a particular order. In the simple English example just discussed, for example, we get SVO order in a rather direct fashion. But the problem to be addressed in this paper is how to characterize lots of orders with some degree of generality.

First, consider giving an inductive definition of the set of rules in a grammar, rather than a recursive definition of the sentences of a language, as in traditional transformational grammar. As Gazdar puts it, "Such an inductive definition could be seen as a grammar for the grammar. This "hypergrammar" might express generalizations about the language generated by the "object grammar" that were not themselves expressible in the latter."(Gazdar 1980b: 40)

Suppose, by way of example, that for a given language, one has the distribution of categories as expressed by the rules in (11a) below. Suppose, in addition, that for this same language, one has the parallel set of rules in (11b). The only difference between the rules in (11a) and the rules in (11b) is the placement of the verb with respect to the other categories participating in the verb phrase.

FREE WORD/CONSTITUENT ORDER

(11) a. $[_{\bar{V}}\ V\ ]$ b. . . .

$[_{\bar{V}}\ V\ \bar{\bar{N}}\ ]$ $[_{\bar{V}}\ \bar{\bar{N}}\ V\ ]$

$[_{\bar{V}}\ V\ \bar{\bar{P}}\ ]$ $[_{\bar{V}}\ \bar{\bar{P}}\ V\ ]$

$[_{\bar{V}}\ V\ \bar{\bar{N}}\ \bar{\bar{P}}\ ]$ $[_{\bar{V}}\ \bar{\bar{N}}\ \bar{\bar{P}}\ V\ ]$

$[_{\bar{V}}\ V\ Adv\ ]$ $[_{\bar{V}}\ Adv\ V\ ]$

$[_{\bar{V}}\ V\ \bar{\bar{N}}\ Adv\ ]$ $[_{\bar{V}}\ \bar{\bar{N}}\ Adv\ V\ ]$

Simply listing the rules in (11) misses the generalization that a verb can come either at the beginning or at the end of the verb phrase (in this hypothetical language). This lack of generalization is one of the reasons why purely phrase structure grammars were judged to be inappropriate as a model of natural languages. If, however, one allows inductive definitions of rules of the grammar, then this objection can be overcome. One can state the generalization as a metarule of the sort in (12) below. This metarule says that for every verb phrase rule in the language in which the first category it immediately dominates in the verb phrase is the verb, then there is a set of corresponding verb phrase rules in which the last category the verb phrase node dominates is the verb.

(12) $\langle n, [_{\bar{V}}\ V\ X\ ],\ldots\rangle \Longrightarrow \langle n, [_{\bar{V}}\ X\ V\ ],\ldots\rangle$

where X is a variable ranging over some finite subset of V_N

A couple of comments about metarules are in order. First, subcategorization will be unaffected by the addition of a metarule because the rule numbers of each individual rule are not changed. All syntactic features also remain unchanged (unless specified otherwise in the metarule). Secondly, while metarules look suspiciously like transformations, it is important to understand that they map rules into rules, rather than trees into trees. Thus, the object grammar remains a phrase structure grammar. Finally, there must be a requirement that the variables (i.e. X, Y) be abbreviatory in order to insure that the language generated remains context-free.

In order to account for languages which exhibit more order freedom than either Makua or the hypothetical language in (11) above, one could imagine very general rules of the sort in (13). (13a) will, in effect, allow any order of constituents in a verb phrase. (13b) will allow any order at the clause level. A rule such as that in (13c) will allow for any order in any constituent.

(13) a. $[_{\overline{V}}\ X\ \alpha\ \beta\ Y\ ] \Longrightarrow [_{\overline{V}}\ X\ \beta\ \alpha\ Y\ ]$

b. $[_{\overline{\overline{V}}}\ X\ \alpha\ \beta\ Y\ ] \Longrightarrow [_{\overline{\overline{V}}}\ X\ \beta\ \alpha\ Y\ ]$

c. $[_{\gamma}\ X\ \alpha\ \beta\ Y\ ] \Longrightarrow [_{\gamma}\ X\ \beta\ \alpha\ Y\ ]$

Three considerations come to mind. First, it remains to be seen whether any language has a syntax best characterized by rules like those in (13), i.e. free within constituents. Secondly, while these rules look similar to scrambling rules, they are distinct in several interesting ways. They will not go on generating indefinitely as a transformational scrambling rule does, because they enumerate a strictly finite set of rules. A transformational scrambling rule will result in unspecified constituent structures (at least it will do so without some explicit pruning algorithm). The constituent structures generalized over by metarules, on the other hand, are completely specified. Finally, rules such as those in (13) will, in general, be insufficient to characterize free order since they do not allow for those structures which involve what can be called discontinuous constituents. I will now take up just one example here to show what sort of analysis is possible.

The following general definition of discontinuous constituent is adopted: any combination of categories that form a semantic unit (e.g. a noun and its modifiers) which are not syntactically contiguous (e.g. a noun separated from a modifying adjective). One might (although not uncontroversially) take VSO order to be an instance of discontinuous constituents, where the discontinuous constituent is the verb phrase, which is interrupted by the subject noun phrase. (See McCloskey (1979) for discussion of the notion semantic verb phrase, for example.) A metarule like that in (14) below will relate syntactic verb phrases to sentences in which there is no syntactic verb phrase.[2]

(14) $[_{\overline{V}}\ V\ X\ ] \Longrightarrow [_{\overline{V}}\ V\ \overline{\overline{N}}\ X\ ]$

The output of the sort of rule in (14) could interact with the output rules of a rule like that in (13b), for example, to provide for a multitude of orders.

Viewed from within this version of phrase structure grammar, then, order freedom is most naturally characterized by freedom within constituents, together with rules relating continuous to discontinuous constituents. Languages need not differ in rule type (or language type). Intermediate degrees of freedom are also allowed for, depending on the degree of generality expressed by the metarule.

3. Conclusion.

It is not possible in such a short paper to provide any substantial part of the analysis of the Makua data. I hope, however, to have given enough data to indicate that a simple statement of order with respect to freedom cannot be made by appealing to a difference between freedom at the constituent level or word level. In addition, I hope to have demonstrated that a plausible account of order (both fixed and relatively free) can be given within this version of phrase structure grammar without recourse to fundamentally different rule types. Thus, this proposal differs from those made by Ross, Hale, and Lapointe in that regard.

In addition to the last mentioned difference, this proposal also differs in another important way formally, and embodies different predictions with respect to language acquisition and diachronic change. The formal difference is between "scrambling metarules" like those in (13) and concatenation rules. Concatenation rules overgenerate wildly, allowing such strings as V V V. . . to be produced. Extensive filtering is thus needed to rule out such strings. Hale (1979) appeals to bracketing procedures (which impose some syntactic constituents) and semantic filters to rule out overgenerated strings. Lapointe (1980a,1980b) likewise appeals to his Argument Determining Procedures and semantic translations to filter out such overgenerated strings. No such filtering is required in the present proposal, since this sort of overgeneration will never arise. The predictions with respect to language acquisition and diachronic change, on the other hand, arise as a result of having no fundamentally different rule types. Children need not choose between rule types when acquiring a language. Furthermore, they might acquire varying orders in stages, generalizing order to an ever greater degree (by generalizing metarules) as new rules are acquired. It follows that languages might change in an analogous way. That is, a language could gain or lose order freedom in a step-by-step fashion rather than by becoming a W* language or by acquiring order freedom in one fell swoop, as predicted by Lapointe's fixed and free order phrase structures rules.

It remains to be seen whether the general approach advocated in this paper results in interesting and valid analyses of order. What I hope to have accomplished is to have demonstrated that there is a language which exhibits an intermediate level of freedom not easily characterized by either freedom at the word level or at the constituent level, nor correctly labelled a fixed order language. This intermediate degree of order freedom is suggestive of a continuum rather than of a fixed-free dichotomy, a parameter which can be captured in a perspicuous way given the use of inductive rule schemata.

SUSAN U. STUCKY

FOOTNOTES

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[1]It is a relevant observation that nothing in the present paper hinges on whether one takes the phrase structure rules under the rewrite interpretation or the node admissibility interpretation, since only context-free rules are employed. The interpretation of phrase structure rules matters most crucially with respect to the use of context-sensitive rules. (See Gazdar (1980b) for discussion and references.)

[2]Here is a point at which the semantics plays a crucial role. While the syntactic verb phrase is broken up in the rules enumerated by the output of the metarule in (14), a semantic verb phrase remains intact. This is because the semantic translation of the input is a verb phrase meaning. That verb phrase meaning remains intact in the output rule. A simple example will provide at least an intuitive grasp of how this works. One of the rules enumerated by the input is that in (a) below.

(a) $\langle 3, [_{\bar{V}}\ V\ \bar{\bar{N}}\ ], V'(\bar{\bar{N}}')\rangle$

In that rule a verb meaning combines with a noun phrase meaning to give a verb phrase meaning. In (b) is the corresponding output rule (indexes are added for perspicuity).

(b) $\langle 21, [_{\bar{V}}\ V\ \bar{\bar{N}}_i\ \bar{\bar{N}}_j\ ], (\bar{\bar{V}}'(N'_j))\ (N'_i)\rangle$

In (b) the verb phrase meaning is still intact. It then combines with the noun phrase meaning to give a sentence meaning. Thus, the verb phrase is syntactically discontinuous, but maintained in the semantics.

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