VALENCY AFFECTING RULES IN EXTENDED CATEGORIAL GRAMMAR

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An extension of categorial grammar is formally defined in which \((C_1, \ldots, C_n)/(D_1, \ldots, D_n)\) is a category whenever the \(C_i\) and \(D_i\) occur. Expressions in such categories combine with those of category \(D_i\) to form those of category \(C_i\), all \(1 \leq i \leq n\). Within this framework we show how to formulate Valency Affecting Rules (VAR's) such as Passive, Causative, Raising to Object, etc. E.g. Passive is defined as a way of deriving \(P\)'s (n place predicates) from \(P_{n+1}\)'s. So it has an \(n+1\) place predicate category and \(C\) is the appropriate \(n\)-place predicate category. (n place predicates, \(P\)'s, are expressions which combine with those of an appropriate argument category \(A_i\) to form \(P_{n+1}\)'s. \(P_0\) is identified with \(S\)).

0. Introduction

We are primarily concerned in this article to characterize a class of rules, called Valency Affecting Rules (VAR's), from which we may choose in forming the grammars of particular languages. We formulate these rules within a framework we call Extended Categorial Grammar (ECG) and argue for the insightfulness of this formulation as opposed to the treatment of the phenomena we account for in other frameworks, such as GPSG, LFG, RG (Relational Grammar), and GB (Government-Binding theory).

Broadly, VAR's are rules which derive predicates from predicates. We shall informally think of \(n\)-place predicates (\(P_n\)'s) as expressions, perhaps syntactically complex, which combine in one way or another with \(n\) expressions of appropriate argument categories to form a sentence (\(S\)), an 0-place predicate (\(P_0\)). We use the notation \(S\) and \(P_0\) interchangeably. More specifically, 1-place predicates (\(P_1\)'s) combine with one expression of an appropriate argument category, say \(A_1\), to form a 0-place predicate or sentence. And in general an \(n+1\) place predicate, \(P_{n+1}\), will combine with an expression of an appropriate argument category, say \(A_{n+1}\), to form a \(P_n\) or \(n\)-place predicate. If \(A_1\) is an argument category we shall use the standard categorial notation \(S/A_1\) for the category of \(P_1\)'s which combine with expressions of category \(A_1\) to form a \(P_0\) or \(S\). For example, using \(\overline{N}\) for the category of full NP, \(S/\overline{N}\) will be the category of \(P_1\) which combines with a full NP to form a sentence. Expressions such as \(walk\), \(walk\) \(slowly\), \(both\) \(walk\) \(and\) \(talk\) in English are expressions of that category. Similarly, using \(S\) for the category of sentence complements—\(that\) \(Fred\) \(left\) \(early\), \(both\) \(that\) \(Fred\) \(left\) \(early\) \(and\) \(that\) \(John\) \(stayed\) \(late\), —expressions such as \(is\) \(clear\), \(is\) \(strange\) \(but\) \(true\), etc. are \(P_1\)'s of category \(S/S\), as they combine with an \(S\) to form an \(S\). Similarly, we treat expressions such as \(kiss\), \(kiss\) \(loudly\), \(hug\) \(and\) \(kiss\) as two place predicates (\(P_2\)'s) of category \((S/\overline{N})/\overline{N}\) as they combine
with full NP’s to yield P₁’s of category S/N. Similarly, expressions such as believe, hope and believe, etc. as they occur in John hopes and believes that Fred will win have category (S/N)/S. And expressions such as surprise, surprise and annoy, as they occur e.g. in That Fred left early surprised John will have category (S/S)/N. Using the argument categories N and S the reader may easily construct for himself the categories to which expressions such as give, persuade, and entail belong.

(Note here, to avoid confusion with GB theory, that we use N for the category of full NP. E.g. expressions such as John, John and every student, Every tall student, etc. have this category. In general, our extension of categorial grammar has in common with standard categories grammar the fact that vocabulary items (lexical expressions) do not have distinctive categories).

In general, where A₁, …, Aₙ are argument categories, (…(S/A₁)/…)Aₙ is the category of n place predicate which combines with expressions of category Aₙ to form ones of category (…(S/A₁)/…)Aₙ₋₁. As this notation is slightly cumbersome we shall commonly write S for this category. Using this notation, the gross syntactic structure we assign to John envies the woman is as in (1) below, where we understand that linear order of terminal elements is not specified.

\[
(1)
\]

\[
\begin{array}{c}
S \\
\downarrow \\
N \\
\downarrow \\
S \\
\downarrow \\
N \\
\downarrow \\
S \\
\downarrow \\
N \\
\downarrow \\
N \\
\downarrow \\
N \\
\end{array}
\]

John loves the woman

In cases where the identity of the argument categories is not at issue we shall frequently represent this structure in the schematic way indicated in (2):

\[
(2)
\]

\[
\begin{array}{c}
P₀ \\
\downarrow \\
A₁ \\
\downarrow \\
P₁ \\
\downarrow \\
P₂ \\
\downarrow \\
A₂ \\
\end{array}
\]

John loves the woman

The class of grammatical categories we have been using is naturally formulated within a (slightly) extended version of categorial grammar in which
N and S, common noun phrase and sentence respectively, are taken as primitive. We assume the standard categorial rule of functional application using the slash notation: if C and D are categories then C/D is a category—the one whose expressions combine with ones of category D to form ones of category C. In addition we have added the category formation rule: if C is a category then \( \overline{C} \) is a category. Thus we import here a version of the bar notation from GB theory. In general, categories of the form \( \overline{C} \) will be called argument categories.

Now the full extension of categorial grammar we require to represent VARs (Valency Affecting Rules) goes beyond what we have indicated above by generalizing in a mathematically obvious way the rule of functional application. Observe, to motivate the extension, that within a standard categorial framework, even as augmented with a bar notation as above, many expressions of English, and we believe, any natural language, would have to be assigned multiple categories. Using, for the nonce, P₁ as an abbreviation for the category S/\( \overline{N} \), consider for example the categories to which the English verb be would be assigned. In John is a student it appears to combine with an NP a student to form a P₁, and thus should have category P₁/\( \overline{N} \). But in John is hungry it appears to combine with an Adjective Phrase hungry to form a P₁. Representing the category Adjective Phrase as N/N—they combine with common noun phrases such as tiger to form common noun phrases such as hungry tiger—the appropriate category for be would be P₁/(N/N).

Now to represent the polyvalency of be we might simply design our grammars such that certain expressions have more than one category, as Montague did in 'English as a Formal Language' (1970). For reasons discussed below, and developed in much more detail in Keenan & Timberlake (1985b) however we prefer a different alternative. Namely, we shall extend the categorial notation and assign be a single, albeit "fat," category. The extension needed is given below:

\[
(3) \text{ If } C_1, \ldots, C_n \text{ and } D_1, \ldots, D_n \text{ are categories then } (C_1, \ldots, C_n)/(D_1, \ldots, D_n) \text{ is a category.}
\]

Intuitively, an expression of the category given in (3) above is one which, for each i between 1 and n, combines with expressions of category D_i to form ones of category C_i. In this notation then, the category of be as discussed above would be \( (P_1, P_1)/(\overline{N}, N/N) \). In general, categories of the form in (3) will be called n-tuple categories.

Using n-tuple categories we may now formulate in a rigorous way the VARs which constitute the subject matter of this article. Broadly first, VARs are ways of deriving predicates from predicates. More specifically, for various values of n and m, they derive m-place predicates \( (P_m)'s \) from n-place predicates \( (P_n)'s \). Where m is greater than n we shall call such rules valency increasing. They will be called valency decreasing if m is less than n, otherwise they will be called valency preserving.

As an example of a valency increasing rule, presented somewhat schematical-
ly for illustrative purposes, we may naturally consider the formation of Causative constructions. Many languages allow us to form a $P_2$ of a certain sort by adding some "Causative" morphology to a $P_1$. It is natural then to think of the Causative operator as one which derives $P_2$'s from $P_1$'s in a certain way. For example, in French, from the $P_1$ pleurer 'cry, weep,' we may form the $P_2$ faire pleurer 'cause to weep.' If the domain of the causative operator were limited to $P_1$'s we could represent it naturally in a standard categorial format as an expression having, schematically, the category $P_2/P_1$. However, many languages with causatives also motivate that the Causative operator should be able to apply directly to $P_2$'s forming $P_3$'s. E.g. from a $P_2$ in French such as nettoyer 'to clean' we may form a $P_3$ faire nettoyer 'to make clean.' In such a case then we would be motivated to assign the category $P_3/P_2$ to the Causative operator. We are thus faced with a category assignment problem analogous to that for be noted above. Within the framework of ECG we propose, the Causative operator will, schematically, have the single category $(P_1, P_2)/(P_2, P_1)$.

In fact of course an exact statement of the category of the Causative operator—let us call it Cause for the nonce—would have to be given both with more precision and with more generality. Concerning the latter for example we might in some language want Cause to combine with $P_3$'s to form $P_4$'s, and perhaps even with $P_2$'s to form $P_1$'s. So in general we want Cause to form $P_{n+1}$'s from $P_n$'s. Moreover, for a given $n>0$, recall that there are in fact many $n$-place predicate categories according to the choice of argument category. And the categories of arguments of a Causative $P_{n+1}$ derived from a $P_n$ are not independent of the argument categories of the $P_n$. For example, from a $P_1$ such as weep which takes an $\bar{N}$ argument we may not derive via Cause a $P_2$ of the type appropriate to believe $(S/\bar{N})/\bar{S}$. Rather the $A_2$ (direct object) argument of the derived $P_2$ must be the same as the $A_1$ (or subject) argument of the $P_1$ causativized. I.e. the direct object of cause-to-weep must have the same category as the argument category of the $P_1$ weep.

We shall illustrate below the types of added precision and generality needed by considering another sort of VAR, this time a valency decreasing one. As in general the structures generated by the rules we propose correspond well to those traditionally called Passives, we shall refer to the VAR in question as Passive.

1. Passive as a Valency Affecting Rule

In the simplest and most widespread structures called passive, we are motivated to assign a passive morpheme the (schematic) category $P_1/P_2$. Using Pass as a cover term for a passive morpheme, we think here of Pass as combining with a $P_2$ to form a $P_1$. E.g. in Latin (using third singular forms for simplicity of presentation), from a $P_2$ such as amat 'loves' we may form the $P_1$ amatur 'is loved' by assigning the $P_2$ the appropriate morphological form. Sentences generated from such predicates are illustrated below.
Here, for the nonce, we use \( P_1 \) as an abbreviation for \( S/N \) and \( P_2 \) as an abbreviation for \( (S/N)/N \).

The most important point to note about this example is that the derivational operation represented by Pass is directly one which derives \( P_1 \)'s from \( P_2 \)'s. The rules we need to combine NP's with \( P_1 \)'s to form Ss are the same in both examples. Thus our treatment of Passive, to be considerably generalized below, differs markedly from that in Relational Grammar for example, where Passive is an operation deriving a clause (Sentence) from a clause by changing the relations which NP's bear to the clause (not the predicate).

Let us now consider a properly precise and general formulation of Passive. Observe first, analogous to the case of Causatives cited above, that there are many \( P_2 \) categories, e.g. ones like kiss whose \( A_2 \) argument is \( N \), ones like believe whose \( A_2 \) argument is \( S \), etc. Obviously the \( A_1 \) or subject argument of a passive \( P_1 \) derived from a \( P_2 \) such as kiss cannot be a \( P_1 \) like is strange which takes an \( S \) subject. Rather, the category of the subject argument of a passive \( P_1 \) must be the same as that of the \( A_2 \) or object category of the \( P_2 \) it is derived from. Thus we want to guarantee that for all argument categories \( A_1, A_2 \) if an expression \( e \) of category \( (S/A_1)/A_2 \) is passivized, the derived \( P_1 \), noted \( \text{Pass}(e) \), has category \( S/A_2 \). Using our n-tuple notation we may do this as follows: Let \( \text{Pass} \) have category \( (C_1, ..., C_4)/(D_1, ..., D_4) \), where \( D_1 = (S/N)/N \) and \( C_1 = S/N \); \( D_2 = (S/N)/S \) and \( C_2 = S/S \), etc., enumerating here all the \( P_2 \) categories built up from argument categories \( N \) and \( S \), and in each case giving the corresponding \( P_1 \) category derived by Passive.
This explicit approach however is notationally cumbersome. There will for example be argument categories other than $\mathbf{S}$ and $\mathbf{N}$ (see below), and further, the domain of Passive must include more than just $P_2$'s. Data from many Bantu languages (see below) argue that we want to be able to passivize directly $P_1$'s and even $P_4$'s, yielding $P_3$'s and $P_5$'s respectively. Similarly data from Latin and many other languages argue that we want to be able to passivize $P_1$'s yielding $P_0$'s (Sentences). For example, in Latin from a $P_1$ such as "currit 'runs'" we may form a $P_0$ "curritur 'running is being done'" using the same morphology we use to derive passive $P_1$'s ("amatur 'is loved'") from $P_2$'s ("amat 'loves'"). We want then to formulate passive in such a way that from a $P_{n+1}$ it derives a $P_n$ whose A1 or subject category is the same as the "deepest" or $A_{n+1}$ category of the $P_{n+1}$ it is derived from. The original A1 category of the $P_{n+1}$ is no longer present in the derived $P_n$.

Thus a general formulation of Passive may be given as follows. Let $D$ be an enumeration of the $n+1$-place predicate categories, all $n \geq 0$. (That is, $D$ is a function from the natural numbers onto the set of $n+2$-place predicate categories. We write simply $D_i$ for $D(i)$, the value of the function $D$ at the argument $i$.) Then,

$$\text{(6) Pass has the n-tuple category } C/D, \text{ where for each } i, \text{ } D_i \text{ is some } n+1 \text{ place predicate category } S \text{ and } C, \text{ is } S \quad A_1, \ldots, A_{n+1} \quad A_{n+1}, A_1, \ldots, A_n$$

As an abbreviation for the category of Pass we shall write simply $P_n/P_{n+1}$. We turn now to advantages of this conception of Passive.

2. Syntactic advantages of treating Passive as a Valency Affecting Rule

We shall use the term canonical passives for the most widely attested type of passive structure in the literature. These are cases in our notation where the Passive operator has combined with a $P_2$ to form a $P_1$. Informally we shall refer to passives of this type by $\text{Pass}(P_2) = P_1$, and we shall use the obvious generalization of this notation for less commonly attested types of passive structures.

2.1. A first advantage of our approach is that it correctly predicts several obvious syntactic properties of canonical passives. Specifically it predicts that the distinctive markings (syntactic or morphological) of such passives are present within the "VP" and are not marked at the level of $S$. The prediction is immediate from our treatment since what we derive by Passive in this case are "VP's", i.e. $P_1$'s. Thus for example our treatment of canonical passives will not allow us to say that e.g. passives may be formed from actives by modifying the intonation contour of an active sentence; nor may we derive passives from actives by placing a particle in a passive sentence, where the position of the particle is specified with respect to the sentence as a whole, i.e. at the beginning.
of the sentence, at the end, between the subject and the predicate, etc. Nor can we derive passives by inverting the Subject and the VP or the Subject and the Auxiliary. And in fact canonical passives are never marked in any of these ways. I.e. no language forms passives by modifying the intonation contour of an active sentence, etc. Note that these predictions do not follow from treatments of Passive in which clauses are derived from clauses. For example, in all syntactic treatments, Yes-No questions are derived (as clauses) from declarative sentences, and all the means alluded to above are used.

2.2 Second, since Passive derives predicates from predicates and thus passive structures are predicates of some degree, it is expected in our view that other types of rules which affect predicates may be sensitive to, i.e. conditioned by, whether the predicate in question is passive or not. Consider for example the case of predicate agreement rules, i.e. rules whereby the form of the predicate varies with (is inflected for) the subcategory of the subject. As is well known in Romance languages for example the actual forms which express the person and number of the subject may vary with the choice of predicate. I.e. so called first conjugation verbs (e.g. parler ‘to speak’) take one set of endings, second conjugation ones (e.g. finir ‘to finish’) take a slightly different set, etc. We may expect then to find languages where the choice of agreement morphemes with subjects varies according to whether the predicate is passive or not. And such is the case. Compare for example the active present tense indicative forms in Latin in the lefthand column below with the corresponding forms for passives:

<table>
<thead>
<tr>
<th>(7)</th>
<th>active</th>
<th>passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>amo</td>
<td>amamus</td>
<td>amor</td>
</tr>
<tr>
<td>amas</td>
<td>amantis</td>
<td>amaris</td>
</tr>
<tr>
<td>amat</td>
<td>amant</td>
<td>amatur</td>
</tr>
</tbody>
</table>

Clearly for example there is no morphological relation at all between the second person plural ending in the active, -tis, and the second plural ending in the passive, -mini.

Again such properties of passives are not expected by a view in which Passive derives clauses from clauses and does not mention the predicate as a parameter in the rule. Nor is verb agreement the only verbal property which is sensitive as to whether the predicate it affects is passive or not. For example, in some languages, such as Malagasy (Malayo-Polynesian) imperative forms of verbs vary according to whether the verb is active or passive. Another case: complex verbs forms in several European languages (French, German) vary with regard to the choice of auxiliary. For example, certain verbs in the present perfect choose HAVE and others choose BE. All grammars for these languages must (directly or indirectly) distinguish among verb classes then according to the choice of auxiliary used. Similarly the complex predicates represented by passives also select their auxiliary, choosing e.g. BE typically in Romance, often BECOME in Germanic, (GO in Hindi, RECEIVE in K’ekchi (Mayan), etc.).
2.3. Third, and most important, our treatment of Passive enables us to generate a wide variety of structures which we want to generate but which are by and large ungenerable on the formulations of Passive given by most other approaches. We enumerate a variety of special cases here.

2.3.1. Impersonal passives

Expressions such as curritur ‘running is being done’ are commonly called impersonal passives (impersonal because they lack a subject, passive because they are formed with the same verbal morphology as canonical passives). Surprisingly perhaps the common views of Passive given in GB, LFG, and GPSG will not generate these structures. We do not claim of course that the formulations of Passive in those approaches could not in principle be modified so as to represent them, but various of the data exhibited below suggest that at least the obvious modifications will be difficult.

In our treatment of course impersonal passives are just the special case of Passive where the predicate passivized is a \( P_i \), and thus the derived predicate is a \( P_0 \) or sentence (and thus does not itself have a subject). Compare for example the phrase structure diagram below in (8a) for the canonical (personal) passive, a \( P_i \), and the one in (8b) for impersonals.

(8) a. personal passive  
\[ P_i \rightarrow P_{n/P_{n+1}} \]
\[ \text{Pass} \rightarrow \text{love} \]
\[ = \text{amat tur} '\text{is loved}' \]

b. impersonal  
\[ P_0 \rightarrow P_{n/P_{n+1}} \]
\[ \text{Pass} \rightarrow \text{run} \]
\[ = \text{curritur} '\text{running is done}' \]

Our approach then generates impersonal and personal passives in the same way, the only difference being the valency of the argument predicate of Pass. We, correctly, expect then to find passive morphology on predicates of valency different from 2.

A further property of impersonal passives distinguishes our approach from the otherwise somewhat similar ones in LFG and GPSG. Namely, the \( P_{n+1} \)'s passivized need not be syntactically simple (\( = \) lexical). Keenan (1979) argues, largely for semantic reasons, that we want syntactically complex \( P_2 \)'s under the scope of Pass. We refer the reader to those arguments and here concentrate on syntactic data not presented there concerning passives of \( P_i \)'s. Thus consider from Latin (Virgil):

(9) (Sic) itur ad astra  
Thus Pass (go) to stars  
‘Thus one goes to the stars.’ (lit: Thus (it) is gone to the stars)
Here the $P_1$ *ire* 'to go' is in a passive form and does not agree with any NP in the sentence (i.e. the sentence has no overt subject). It seems to us that a purely lexicalist view of Passive, i.e. one on which only lexical predicates may be passivized, is obliged to analyze (9) in such a way that *itur* is represented as the passive of 'go' and is thus a $P_0$ or sentence. Thus the goal locative modifier *ad astra* 'to the stars' must be allowed to combine with sentences to form sentences. But this is incorrect. It not only overgenerates (*John is asleep to the stars, *John remained in Chicago to the stars, etc.) but it misses a significant linguistic generalization. Namely, the possibility of introducing goal locative modifiers in a structure depends on the presence of a verb of motion of the appropriate sort. This sort of cooccurrence restriction is precisely what is expressed in the standard phrase structure rules which introduce such modifiers within the VP, not at the level of $S$.

Now on our treatment of (9) we preserve this linguistically insightful analysis by combining *to the stars* with the $P_1$ *go* both in the active sentence *John goes to the stars* and in the passive (*It) is gone to the stars*. The passive form in (9) is generated by passivizing the syntactically complex $P_1$ *go to the stars*. Compare the schematic structures below, noting that *curritur* ($=$ Pass(*run*)) differs from *itur ad astra* ($=$ Pass(*go to the stars*)) only that in the latter case the $P_1$ passivized is syntactically complex.

\[
\begin{align*}
(10) \quad \text{a.} & \quad \begin{array}{c}
\text{P}_0 \\
\text{P}_n/\text{P}_{n+1} & \quad \text{P}_1 \\
\text{Pass} & \quad \text{run} \\
(= \text{curritur})
\end{array} \\
\text{b.} & \quad \begin{array}{c}
\text{P}_0 \\
\text{P}_n/\text{P}_{n+1} & \quad \text{P}_1 \\
\text{Pass} & \quad \text{go} & \quad \text{to the stars} \\
(= \text{itur ad astra})
\end{array}
\end{align*}
\]

Further, the case for wanting complex $P_1$'s under the scope of Pass is not limited to $P_1$'s which consist of a $P_1$ and a modifier of some sort. Rather more interesting cases, problematic for approaches other than ours, are given by $P_1$'s which consist of a $P_2$ and an argument expression. We consider several such cases below.

2.3.2. Multiple passives "off the same source"

Consider first the natural syntactic structure for *Marcus envies me* in Latin given below.
Note that the $A_2$ argument $mihi$ ‘to me’ of the $P_2$ *invidere* ‘to envy’ is in the dative case, rather than the somewhat more usual accusative case. Now consider that the $P_1$, $mihi$ *invidet* ‘envies to me’ has the same category as *currit* ‘runs.’ Following our analysis of Passive we may expect to form a passive of such a $P_1$, and indeed we can as is illustrated in (12) below.

Note here that the verb *invidetur* ‘is envied’ is in the impersonal (third singular) form and thus does not agree with the only NP, $mihi$ (me + dative), in the sentence. This follows our analysis since the $P_1$ of the sentence has no subject to agree with.

This example thus provides another type of complex $P_1$ we want to be under the scope of Passive. However, the interest of the example extends well beyond this fact, for we note, at least in literary registers, that dative object verbs like *invidere* ‘to envy’ can also form personal passives. Thus we have from Horace *Cur (ego) invideo?* ‘Why am I envied?’ The correct analysis here is obvious. We have passivized the $P_2$ *envy* forming the $P_1$ *is envied*, which combines with its subject argument $I$ (in the nominative, as is usual for subjects) and which shows agreement with it. The analysis we provide is given below:
We note that pronominal subjects in Latin usually drop.

Strictly lexicalist approaches, it seems to us, will have difficulty in generating both passives in (12) and (13). There is only one passive form for invidere, but it must determine two types of argument structures. On one it combines with an NP in the nominative to form an S, on the other it combines with an NP in the dative to form an S. Such a systematic (for dative argument P₁'s) double analysis is certainly possible but obviously undesirable. In our view the two passives are generated simply as special cases of the single Passive operator we defined. Invidere itself has only one analysis: it is a P₂ taking an N argument in the dative to form a P₁ taking an N argument in the nominative to form a P₀.

We should note further that the possibility of getting two passives "off the same verb" is not always limited (as it largely is in Latin) to verbs whose non-subject arguments take some non-typical case. For example, the verb cut down in Polish takes its object in the accusative and forms a personal passive, as illustrated in (14a). However in (14b) we see that the P₁ consisting of the verb cut down plus its NP object argument (in the accusative) is passivized to form an impersonal P₀.

Further examples of this sort of dual passive are not hard to come by. Thus in (15a) from N. Russian (Kuz'mina and Nemcenko 1971) we see that the P₂ slaughter takes its A₂ argument calf in the accusative. (15b) illustrates the passive of that P₂ forming a P₁, which takes calf as nominative case subject argument. The passive P₁ of course agrees with its nominative subject. But in (15c) we see that calf is still accusative (and remains in its postverbal position), and

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\[\text{(14) a. [P₀ Lipa [P₁ PASS [P₂ ścieńa ]] ]}\]
\[\text{[linden(nom.fem.sg.) cut(nom.fem.sg.Pass)]}\]
\[\text{‘The linden was cut down.’}\]

\[\text{b. [P₀ PASS [P₁ [P₂ Ścieńo ] ] lipę ]}\]
\[\text{[cut(nt.nom.sg.PASS) linden(fem.acc.sg.)]}\]

\[\text{Further examples of this sort of dual passive are not hard to come by. Thus in (15a) from N. Russian (Kuz'mina and Nemcenko 1971) we see that the P₂ slaughter takes its A₂ argument calf in the accusative. (15b) illustrates the passive of that P₂ forming a P₁, which takes calf as nominative case subject argument. The passive P₁ of course agrees with its nominative subject. But in (15c) we see that calf is still accusative (and remains in its postverbal position), and}\]

\[\text{₁ This example and several others in this paper are taken from Keenan and Timberlake (1985).}\]
the passive predicate is in the neuter, nominative singular, i.e. the non-agreement form. These facts are again predicted by our analysis in which it is the P, *slaughter the calf* which is passivized in (15c).

(15) a. Ja zarezal talenka [active]
   1.nom. slaughter calf(acc.sg.)
   'I slaughtered a calf.'

b. (U menja) telenok zarezan [PASS(P2) = P1]
   by me calf(m.nom.sg.) slaughter(PASS.m.nom.sg.)
   '(By me) a calf was slaughtered.'

c. (U menja) zarezano telenka [PASS(P1) = P0]
   nt.nom.sg.PASS acc.sg.
   '(By me) there occurred slaughtering a calf.'

As a last example of this sort consider the active sentence in (16a) from Hindi (Sinha 1978). The case marking here is ergative and the direct object argument, *girl*, is in the dative/accusative form. In (16b) we have passivized the P2 *drive out from the class* to form the P1 which takes *girl* in the absolutive case as subject and shows agreement with it. In (16c) on the other hand *girl* remains dative/accusative and the passive predicate shows no agreement with anything. This again follows our analysis treating (16c) as derived by passivizing the P1 *drive out the girl from the class*.

(16) a. Sikšōk ne larki ko klas se nikal diya [active]
   teacher erg girl DO class from drive out
   'The teacher drove the girl out of the class.'

b. Larki-Ø klas se nikal di gayi [PASS(P2) = P1]
   girl-abs class from drive out PASS
   'The girl was driven out from the class.'

c. Larki ko klas se nikal diya gaya [PASS(P1) = P3]
   girl DO class from drive out PASS
   '(It) was driven out the girl from the class.'

We have so far illustrated dual passives off the same verb in terms of cases where we passivize a complex P1 or a P2. But exactly comparable cases arise as between P2's and P3's (and even P's). A modestly simple case here is given by the Kinyarwanda examples in (17)-(19). (17) illustrates a simple active sentence formed from the lexical P3 *give*. We note that neither of its non-subject arguments can be constructed with a preposition.

(17) [P0 Umugabo [P1 [P2 [P3 yahaa-ye] umugore] igitabo]]
      man gave-asp woman book
     'The man gave the woman the book.'

Now, from the predicate structures illustrated in (17) above we may form
two passives. On one, illustrated in (18) below, we passivize the $P_3 \text{give}$ yielding the $P_2 \text{was given}$. And in (19) we passivize the complex $P_2$, $\text{gave the woman}$, to form the $P_1 \text{was given the woman}$

(18) $P_o \text{Umugore } [P, [P_3, \text{PASS } [P_3, -\text{haa-ye }] \text{igitabo}]]$

$= \text{Umugore } \text{ya-haa -w -ye igitabo}$

$\text{woman she-give-PASS-asp book}$

'The woman was given the book.'

(19) $[P, \text{Igitabo } [P_2, \text{PASS } [P, -\text{haa-ye umugore}]]$

$= \text{Igitabo cy-ahaa-w- ye umugore}$

$\text{book it-gave-PASS-asp woman}$

'The book was given (to) the woman.'

Even more problematic for other approaches here are the passives formed from four place predicates as illustrated in (20) below. Here, from the lexical $P_3 \text{give}$ we have formed a $P_4$ by the addition of an affix, here realized as $-\text{er}$- and in general noted IR. This represents a valency increasing rule which maps $P_n$'s to $P_{n+1}$'s in such a way that the new argument is understood to bear a benefactive relation to the original $P_n$.

(20) $[P_o \text{Umugore } [P, [P, [P, a- ra- he- er- a ] \text{umugabo}\text{jimbwa\text{ibiro}y}]]$

$\text{woman she-pres-give-IR-asp man dog food}$

'The woman gave on behalf of the man (to) the dog the food.'

Now passivizing on the $P_4 \text{give + on + behalf + of used in (20) we form a } P_3$

which takes the benefactive argument as subject, as illustrated in (21a) below. And passivizing on the $P_3 \text{give + on + behalf + of the man}$, illustrated in (20), yields a passive $P_2$ as in (21b). And finally, passivizing on the $P_2$

$\text{give + on + behalf + of the man the dog}$ yields the passive $P_1$ illustrated in (21c).

(21) a. $\text{Umugabo a- ra- he- er- w- a imbwa ibiryo}$

$\text{man he-pres-give-IR-PASS-asp dog food}$

'The man has food given to the dog on his behalf.'

b. $\text{Imbwa i- ra- he- er- w- a umugabo ibiryo}$

$\text{dog it-pres-give-IR-PASS-asp man food}$

'The dog is given food on behalf of the man.'

c. $\text{Ibiryo bi-ra- he- er- w- a umugabo imbwa}$

$\text{food it-pres-give-IR-PASS-asp man dog}$

'The food is given (to) the dog on behalf of the man.'

Overall then the existence of such multiple passives is problematic for strictly lexicalist views. A given lexical form will have to be able to enter a great many distinct argument structures (in terms of which of its arguments bear which thematic roles, etc.). But all of these passives fall out naturally as special cases of our single Passive operator.
In fairness of course we must note that our approach does require us to define
a passive morphology rule, one which not only assigns passive morphology to
lexical predicates but also to syntactically complex predicates. The rules need-
ed however are what we expect from other morphological rules known to ap-
ply to phrases, not just lexical items. Intuitively for example case marking rules
must spell out the morphological realizations of case on syntactically complex
as well as syntactically simple NP’s. And there are several obvious regularities
here (not without exceptions). For example the case form of a coordinate NP,
(NP₁ and NP₂) is normally the coordination of the case forms of the conjuncts.
E.g. the nominative function NOM satisfies NOM(NP₁ and NP₂) = NOM(NP₁)
and NOM(NP₂). Similarly the case form of a nominal consisting of a head noun
and a prepositional phrase modifier (e.g. children on the floor) is the case form
of the head noun plus the PP modifier (i.e. the Case assignment function skips
PP’s) etc.

Now consider birefly the behavior of the passive morphology assignment
function, noted here PASS. It assigns lexical Pₙ’s a passive form as given by some
morphological rule (or by a list, in the worst of cases). It assigns to coordinate
Pₙ’s the conjunction of its values at each Pₙ (as in the case of case marking),
it skips PP’s (i.e. PASS(go to the stars) = (PASS(go) + to the stars), etc. We
are not of course claiming here that the assignment of passive morphology is
completely trivial—in fact later we note one interesting property it has on some
non-obvious structures—we are merely claiming that such a morphology assign­
ment rule behaves broadly in accordance with what we independently know con­
cerning morphology assignment rules.

Overall then it seems to us that our conception of Passive as a valency decreas­
ing rule does not entail significant complications elsewhere in the grammar. By
contrast the sort of massive homophony in the lexicon entailed by strictly lex­
cicalist views seems to us to receive little support from other subsystems of the
grammar.

We are somewhat less clear regarding the extent to which multiple passives
“off the same source” are problematic for GB views of Passive. Published ac­
counts we are aware of treat the presence of the distinctive passive morphology
(-EN) at the level of the “predicate” as opposed to the sentence. But we are
not sure whether the fact that it is usually represented as a sister to V (a lexical
category) is an essential feature of that account or simply an accident of the
examples considered. Further, the GB account is not purely a predicate level
analysis, since on that analysis the subject argument of a passive predicate in
surface originates as the direct object of a P₂ and gets moved to subject posi­
tion by Move a subject to certain conditions, e.g. Burzio’s generalization.
Without entering into any details, it seems to us quite difficult to extend Bur­
zio’s generalization to the multiple passives from P₂’s, P₃’s, and P₄’s cited above
for Kinyarwanda. Moreover the multiple passives from P₁’s and P₂’s illustrated
above from Polish (14), Hindi (16), and N. Russian (15) are straightforward
counterexamples to Burzio’s generalization. We note further in this regard that
quite generally impersonal passives cannot be limited to $P_1$‘s variously called ergative and unergative. Several counterexamples for Turkish are cited in Ozkaragoz (1982). An additional and more comprehensive set from Lithuanian is given below. Obviously Lithuanian allows impersonal passives from virtually all semantic types of $P_1$‘s.

(22) a. Kur mūs gimta, kur augta?
where by + us bear(nt.sg.PASS) where grow(nt.sg.PASS)
‘Where by us was getting born, where getting grown up?’

b. Ko čia degta / plysta?
what here burn(nt.sg.PASS) / burst
‘By what was (it) burned/burst here?’

c. Naktį gerokai palyta
night goodly rain(nt.sg.PASS)
‘Last night (it) got rained a goodly amount.’

d. Ar būta tenai langinių?
and be(nt.sg.PASS) there windows(gen.m.pl.)
‘And had there really been any existing going on by windows there?’

e. Jo būta didelio
gen.m.sg.3 be(nt.sg.nom.PASS) tall(gen.m.sg)
‘By him there had been being tall.’

f. Jo pasirodyta esant didvyrio
gen.m.sg.3 seem(nt.sg.nom.PASS) being hero
‘By him (it) was seemed to be a hero.’

We turn now to some further types of complex passives which are naturally representable by our approach and which seem to us by and large ungenerable by other approaches.

2.3.3. Iterated Passives

Our analysis of Passive allows us to derive $P_1$‘s from $P_2$‘s, but also $P_0$‘s from $P_1$‘s. Unless our analysis is constrained in some way then we shall be able to derive $P_0$‘s (sentences) from $P_2$‘s by first passivizing the $P_2$ to obtain a $P_1$ and then passivizing that $P_1$ to obtain a $P_0$.

Various generative treatments have blocked such derivations by “external” constraints, i.e. ones not part of the Passive rule itself (if there is one). For example, early transformational treatments had the Passive rule as part of the “Cycle”, a set of rules which applied to a given $S$ in order and were explicitly not allowed to reapply to the same $S$. Similarly, work in Relational Grammar has imposed various “laws” which would prevent iterated application of Passive.

These analyses assumed of course that we did not want Passive to iterate. But that is an empirical question. In fact it seems that Passive can iterate, as
we illustrate below. Consider first example (23) from Turkish (taken from Ozkaragoz, op. cit.)

(23) Harp- te vur- ul- un- ur
war- in shoot-Pass- Pass- aorist
‘In war one is shot (by one).’

(The passive morphemes -ul- and -un- above are conditioned variants of the same morpheme). The schematic form of (23) by our analysis is given in (24) below.

(24)

```
Po
 /   \
/   \   \n|   |   |   |
Pass   P_1
      /   \
     /     \
P_{n+1}/P_{n+2}
     
```

Equally Lithuanian (25) has iterated passives:

(25) Lapelio būta vejo nūpūsto
leaf(gen.m.sg.) be(nom.nt.sg.Pass) wind blow(gen.m.sg.Pass)
‘By the leaf there was getting blown down by the wind.’

To the best of our knowledge no treatment of Passive besides ours provides a straightforward analysis of these structures.
Finally let us consider the interesting case of passives of predicates which take arguments of category other than NP.

2.3.4. Passives of non-NP taking predicates

Needless to say passives of the sort illustrated in (26) are quite unproblematic with our approach (as with many other approaches).

(26) a. That arithmetic is incomplete was proved years ago.
b. That the Earth is flat was once widely believed.

Essentially here the predicates passivized are P_2’s of category (S/N)/S and their passives predictably have category S/S.

More interesting are predicates which take infinitival arguments. In general we assign an infinitive of a P_1 the category P_1. E.g. to walk, to walk and talk, to walk and to talk, to walk slowly all have this category. And in general the infinitive of a P_n will have category P_n. E.g. to kiss, to hug and kiss, to hug and to kiss, to kiss loudly are all P_1’s of a certain sort. (Of course we treat the infinitive former to as having an n-tuple category abbreviated by P_{n}/P_n, all n > 0. The complementizer that forms P_0’s from P_0’s.)
Now, as is well known, many predicates naturally select infinitival nominals as arguments. Consider for example a typical case (27a) below from Kinyarwanda, whose schematic structure is given in (27b), writing $P_i$ for $S/N$.

(27) a. Abaana ba-taangi-ye gu-soma igitabo
   children they- start-asp to-read books
   'The children are starting to read books.'

Now the passive of a $P_2$ of the sort in (27) will straightforwardly have category $S/P_i$ (where $P_i$ is $S/N$, as above). We thus may expect to generate passive sentences roughly like 'To read books is started (by children).' And in fact we can, as (28) illustrates.

(28) Gu-soma igitabo bi-taangi-w-e (na-abaana)
    to-read books it-start- Pass-asp by children

Passive of this sort, straightforwardly generated by our approach but in general ungenerable by other approaches, generalize along two dimensions, the first of which is familiar from our earlier discussion. Namely, once infinitival taking $P_3$'s such as *allow*, *order*, and *forbid* are considered we find, unsurprisingly, multiple passives off the same source.

Thus consider the active sentence in (29) below formed from the $P_3$ *allow* in Kinyarwanda. It combines with an $\overline{N}$ to form a $P_2$ of the same category as *start* noted above.

(29) [$_{P_o}$ Umugabo [$_{P_1}$ [$_{P_3}$ y-akuundi-ye] abaana] gu-soma igitabo]]
    man he-allow- asp children to-read books
    'The man allowed the children to read books.'

Now observe that if we passivize the $P_3$ *allow* we form a $P_2$ which may take *children* as subject argument and an infinitival object argument, as illustrated in (30a) below. Similarly we may passivize the $P_2$ *allow the children* to form a $P_1$ which takes an infinitival argument, as illustrated in (30b), otherwise isomorphic to (27) above.
A second dimension of generalization concerns the actual category of infinitival taking predicates. We have treated predicates such as begin, start, intend, want, etc. as taking $P_1$ arguments to form $P_1$'s of a certain sort—in fact not of some random sort. The category of the subject argument of the derived $P_1$ must match that of the $P_1$ whose infinitive constitutes the second argument of begin, want, etc. Loosely then we may represent the category of begin, intend, etc. as $P_1$/$\overline{P_1}$. And now the natural generalization suggests itself. Let us treat such predicates as having the category $P_n$/$\overline{P_n}$, all $n>0$. It is understood that the argument structure of the derived $P_n$ matches that of the $P_1$ infinitive. Thus we claim that an active sentence such as John intends to buy a watch, as in (31a) from Lithuanian, has two analyses. In one, intend combines with the $P_1$ infinitive to buy a watch and forms the $P_1$ intends to buy a watch. On the second, illustrated schematically in (31b) below, intend combines with the $P_2$ infinitive to buy to form the $P_2$ intends to buy.

(31) a. Jonas numatyti pirkta laikrodį iš honoraro
    John intend buy watch from salary
    'John intended to buy a watch from (his) salary.'

    b. 

Now given that intend to buy in (31b) is a $P_2$ we may expect to form a passive $P_1$. In fact such passives are possible as illustrated in (32).

(32) Laikrodis numatytas pirkta iš honoraro
    watch(nom.m.sg.) intend(nom.m.sg.pass) buy from salary
    'A watch was intended to be bought from (his) salary.'

Note here, despite our attempted translation, that in (32) the verb pirkta 'buy' is active not passive in its morphology. Thus our passive morphology rule PASS for Lithuanian will have to say that passive morphology skips infinitival
arguments. E.g. \( \text{PASS} (\text{Pred} + \overline{P}_n) = \text{PASS} (\text{Pred}) + \overline{P}_n \).

Comparable cases of passives have been cited by Keenan (1975) for Malagasy, and for Turkish both in descriptive grammars (Lewis 1967) as well as in more recent generative treatments (George and Kornfilt 1977). We illustrate a Turkish example below:

\[
\begin{align*}
(33) \text{a. Ahmet kitab-i oku-maya başla-di} & \quad \text{Ahmet book-DO read-inf begin-pst} \\
& \quad \text{‘Ahmet began to read the book.’} \\
\text{b. Kitap (Ahmet tarafindan) oku-n-maya başla-n-di} & \quad \text{book Ahmet by read-PASS-inf begin-PASS-pst} \\
& \quad \text{‘The book was begun to be read (by Ahmet).’}
\end{align*}
\]

Note that in the Turkish (and Malagasy) examples, as opposed to the Lithuanian one, both the "higher predicate begin and the infinitival predicate read carry passive morphology in the passive structure. So for these languages our passive morphology rule \( \text{PASS} \) must say \( \text{PASS}(\text{Pred} + \overline{P}_n) = \text{PASS}(\text{Pred}) + \text{PASS} (\overline{P}_n) \). We note that in the Turkish and Malagasy cases either both predicates are passive in morphology or neither are. That is, we may not represent these structures as requiring two independent applications of a passive rule. Passive applies just once, but its morphology is somewhat complex (partially reminiscent of the way case marking on complex NP’s may affect the forms of items such as adjectives internal to the NP).

3. Conclusion

Using the notational apparatus of Extended Categorial Grammar, in particular n-tuple categories, we have provided an analysis of \( \text{Pass} \) which is general enough to generate a wide variety of structures which are by and large not naturally generable by other approaches.

We claim further that the syntactic generalizations encompassed in our treatment correspond as well to semantic generalizations. Specifically, \( \text{Pass} \) in our view is a syntactic function taking \( P_{n+1} \)'s as arguments and yielding \( P_n \)'s of an appropriate sort as values. It is semantically interpreted by a single function from \( P_{n+1} \) denotations to \( P_n \) denotations of the appropriate sort. Thus we claim an additional, and major, advantage of our approach is that it satisfies the condition that derived structures are semantically interpreted as a function of the interpretations of the ones they are derived from. Specifically let us write \( \text{pass} \) for the semantic function which interprets the syntactic item \( \text{Pass} \). It is defined as follows, where \( y \) and the \( x \), range over individuals in the appropriate sets:

\[
(34) \quad (\text{pass} (P_{n+1})(X_a)\ldots(X_1)) = (\exists y) (P_{n+1}(X_1)(X_a)\ldots(X_a)(y))
\]

In this way then our approach satisfies the compositionality condition. And
this is the only clearly stated basis we have for accounting for how we understand novel utterances. We know what the parts mean and on the basis of some simple examples we learn how structures derived in a certain way take their meaning as a function of the meanings of the parts. The other approaches we have considered can not make this claim, either for lack of a sufficiently general formulation of Passive or for lack of sufficiently explicit semantics.

We refer the reader to Keenan (1979) for a more detailed account of the semantic motivation of this treatment of Passive, and we refer the reader to Keenan & Timberlake (op. cit.) for a formally explicit treatment of the syntax and semantic interpretation of Extended Categorial Grammar.

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