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 i $1 \leqslant i \leqslant n$. 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_n's (n place predicates) from P_{n+1}'s. So it has an n-tuple category as above in which for each i, D_i is an $n+1$ place predicate category and C_i is the appropriate n-place predicate category. (n place predicates, P_n's, are expressions which combine with those of an appropriate argument category A_n 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 insightfullness 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).

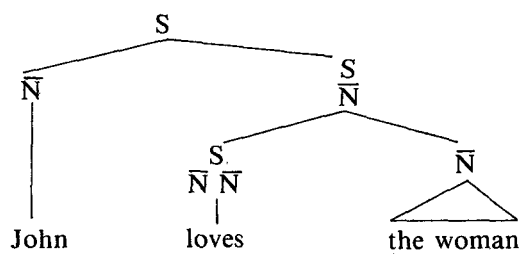
Broadly, VAR's are rules which derive predicates from predicates. We shall informally think of *n-place predicates* (P_n's) as expressions, perhaps syntactically complex, which combine in one way or another with n expressions of appropriate argument categories to form a sentence (S), an 0-place predicate (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 exampe, using $\bar{N}$ for the category of full NP, $S/\bar{N}$ 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 $\bar{S}$ 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 $S/\bar{S}$, as they combine with an $\bar{S}$ 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 $(S/\bar{N})/\bar{N}$ as they combine

with full NP's to yield P_1's of category $S/\bar{N}$. Similarly, expressions such as *believe, hope and believe,* etc. as they occur in *John hopes and believes that Fred will win* have category $(S/\bar{N})/\bar{S}$. And expressions such as *surprise, surprise and annoy,* as they occur e.g. in *That Fred left early surprised John* will have category $(S/\bar{S})/\bar{N}$. Using the argument categories $\bar{N}$ and $\bar{S}$ 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 $\bar{N}$ 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).

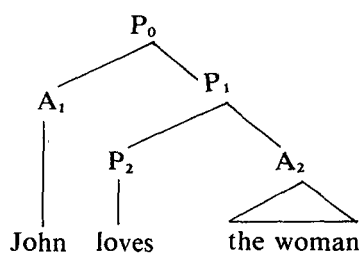
In general, where $A_1, \ldots, A_n$ are argument categories, $(\ldots(S/A_1)/\ldots)/A_n$ is the category of n place predicate which combines with expressions of category A_n to form ones of category $(\ldots(S/A_1)/\ \ldots)/A_{n-1}$. As this notation is slightly cumbersome we shall commonly write $S^{A_1, \ldots, A_n}$ 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)



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)



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, P_1 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 P_1, and thus should have category $P_1/\overline{N}$. But in *John is hungry* it appears to combine with an Adjective Phrase *hungry* to form a P_1. 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 $P_1/(N/N)$.

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) If $C_1, \ldots, C_n$ and $D_1, \ldots, D_n$ are categories then $(C_1, \ldots, C_n)/(D_1, \ldots, D_n)$ 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 $(P_3, P_2)/(P_2, P_1)$.

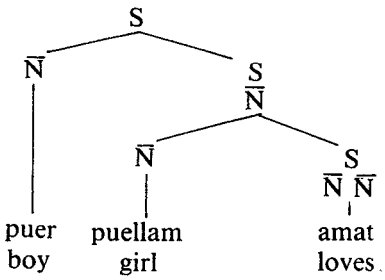
In fact of course an exact statement of the category of L^a Causative operator—let us call it Cause for the nonce—would have to be given both with more precision and with more generality. Concerning the latter for example we might in some language want Cause to combine with P_3's to form P_4's, and perhaps even with P_0'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

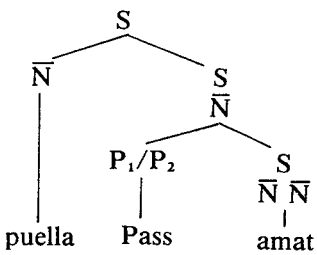
In the simplest and most widespread structures called passive, we are motivated to assign a passive morpheme the (schematic) category P_1/P_2. Using Pass as a cover term for a passive morpheme, we think here of Pass as combining with a P_2 to form a P_1. E.g. in Latin (using third singular forms for 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.

(4)



'The boy loves the girl.'

(5)



= puella amatur 'The girl is loved.'

Here, for the nonce, we use P_1 as an abbreviation for $S/\overline{N}$ and P_2 as an abbreviation for $(S/\overline{N})/\overline{N}$.

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 $\overline{N}$, ones like *believe* whose A_2 argument is $\overline{S}$, 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 $\overline{S}$ 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 Pass(e), has category S/A_2. Using our n-tuple notation we may do this as follows: Let Pass have category $(C_1, \ldots, C_4)/(D_1, \ldots, D_4)$, where $D_1 = (S/\overline{N})/\overline{N}$ and $C_1 = S/\overline{N}$; $D_2 = (S/\overline{N})/\overline{S}$ and $C_2 = S/\overline{S}$, etc., enumerating here all the P_2 categories built up from argument categories $\overline{N}$ and $\overline{S}$, 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 $\overline{S}$ and $\overline{N}$ (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_3's and even P_4's, yielding P_2's and P_3'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 A_1 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 A_1 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 $n \geqslant 0$. (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,

(6) Pass has the n-tuple category C/D, where for each i, D_i is some n + 1 place predicate category $\dfrac{S}{A_1,\ldots,A_{n+1}}$ and C_i is $\dfrac{S}{A_{n+1},A_2,\ldots,A_n}$

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:

(7)

active		passive	
amo	amamus	amor	amamur
amas	amantis	amaris	amamini
amat	amant	amatur	amantur

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.).

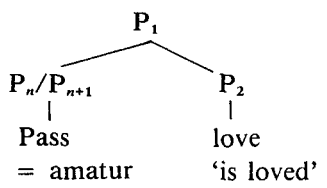
2.3. Third, and most important, our treatment of Passive enables us to generate a wide variety of structures which we want to generate but which are by and large ungenerable on the formulations of Passive given by most other approaches. We enumerate a variety of special cases here.

2.3.1. Impersonal passives

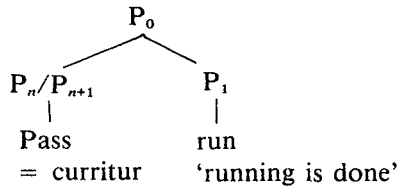
Expressions such as *currítur* 'running is being done' are commonly called impersonal passives (impersonal because they lack a subject, passive because they are formed with the same verbal morphology as canonical passives). Surprisingly perhaps the common views of Passive given in GB, LFG, and GPSG will 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_1 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_1, and the one in (8b) for impersonals.

(8) a. personal passive



b. impersonal



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.

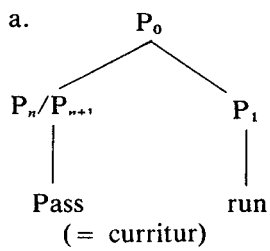
A further property of impersonal passives distinguishes our approach from the otherwise somewhat similar ones in LFG and GPSG. Namely, the P_{n+1}'s passivized need not be syntactically simple (= lexical). Keenan (1979) argues, largely for semantic reasons, that we want syntactically complex P_2's under the scope of Pass. We refer the reader to those arguments and here concentrate on syntactic data not presented there concerning passives of P_1'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.

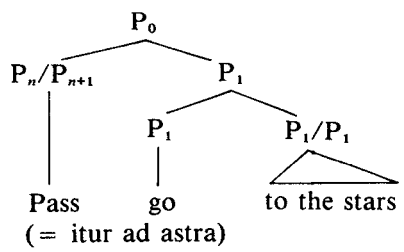
Now on our treatment of (9) we preserve this linguistically insightful analysis by combining *to the stars* with the P_1 *go* both in the active sentence *John goes to the stars* and in the passive *(It) is gone to the stars.* The passive form in (9) is generated by passivizing the syntactically complex P_1 *go to the stars.* Compare the schematic structures below, noting that *currítur* (= 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.

(10) a.



(= currítur)

b.



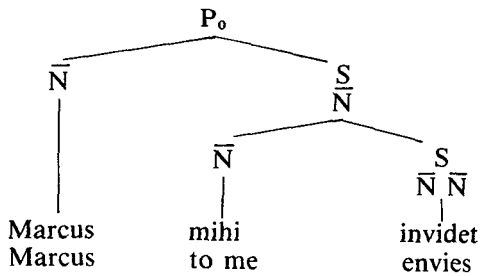
(= itur ad astra)

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.

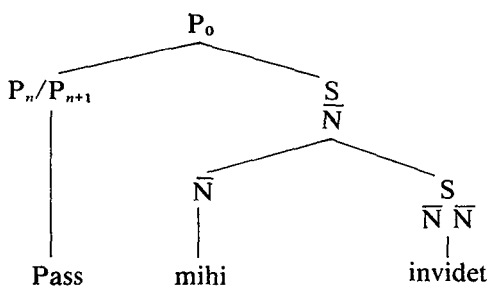
(11)



'Marcus envies me.'

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.

(12)

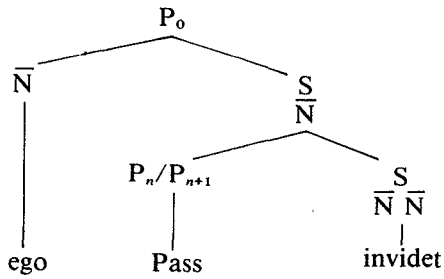


'I am envied.' (lit: To me is envied)

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) invideor?* '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:

(13)



= (ego) invideor 'I am envied.'

(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 P_2'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 P_2 taking an $\overline{N}$ argument in the dative to form a P_1 taking an $\overline{N}$ argument in the nominative to form a P_0.

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[1] takes its object in the accusative and forms a personal passive, as illustrated in (14a). However in (14b) we see that the P_1 consisting of the verb *cut down* plus its NP object argument (in the accusative) is passivized to form an impersonal P_0.

(14) a. [$_{P_0}$ Lipa [$_{P_1}$ PASS [$_{P_2}$ ścięta]]]
linden(nom.fem.sg.) cut(nom.fem.sg.Pass)
'The linden was cut down.'

b. [$_{P_0}$ PASS [$_{P_1}$ [$_{P_2}$ Ścięto] lipę]]
cut(nt.nom.sg.PASS) linden(fem.acc.sg.)

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 P_2 *slaughter* takes its A_2 argument *calf* in the accusative. (15b) illustrates the passive of that P_2 forming a P_1 which takes *calf* as nominative case subject argument. The passive P_1 of course agrees with its nominative subject. But in (15c) we see that *calf* is still accusative (and remains in its postverbal position), and

[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_1 *slaughter the calf* which is passivized in (15c).

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

b. (U menja) telenok zarezan [PASS(P_2) = P_1]
by me calf(m.nom.sg.) slaughter(PASS.m.nom.sg.)
'(By me) a claf was slaughtered.'

c. (U menja) zarezano telenka [PASS(P_1) = P_0)
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 P_2 *drive out from the class* to form the P_1 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 P_1 *drive out the girl from the class.*

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

b. Lərki-Ø klas se nikal di gəyi [PASS(P_2) = P_1]
girl-abs class from drive out PASS
'The girl was driven out from the class.'

c. Lərki ko klas se nikal diya gəya [PASS(P_1) = P_0]
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 P_1 or a P_2. But exactly comparable cases arise as between P_2's and P_3's (and even P_3'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 P_3 *give.* We note that neither of its non-subject arguments can be constructed with a preposition.

(17) [$_{P_0}$ Umugabo [$_{P_1}$ [$_{P_2}$ [$_{P_3}$ 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 *give* yielding the P_2 *was given*. And in (19) we passivize the complex P_2, *gave the woman*, to form the P_1 *was given the woman*

(18) P_0 Umugore [P_1 [P_2 PASS [P_3 -haa-ye] igitabo]]]
= Umugore ya-haa -w -ye igitabo
woman she-give-PASS-asp book
'The woman was given the book.'

(19) [P_0 Igitabo [P_1 PASS [P_2 -haa-ye umugore]]]
= Igitabo cy-ahaa-w- ye umugore
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 *give* we have formed a P_4 by the addition of an affix, here realized as *-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_0Umugore [p_1[p_2[p_3[p_4a- ra- he- er- a] umugabo]imbwa]ibiryo]]
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 *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 *give + on + behalf + of the man,* illustrated in (20), yields a passive P_2 as in (21b). And finally, passivizing on the P_2 *give + on + behalf + of the man the dog* yields the passive P_1 illustrated in (21c).

(21) a. Umugabo a- ra- he- er- w- a imbwa ibiryo
man he-pres-give-IR-PASS-asp dog food
'The man has food given to the dog on his behalf.'

b. Imbwa i- ra- he- er- w- a umugabo ibiryo
dog it-pres-give-IR-PASS-asp man food
'The dog is given food on behalf of the man.'

c. Ibiryo bi-ra- he- er- w- a umugabo imbwa
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 needed however are what we expect from other morphological rules known to apply 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, (NP_1 and NP_2) is normally the coordination of the case forms of the conjuncts. E.g. the nominative function NOM satisfies NOM(NP_1 and NP_2) = NOM(NP_1) and NOM(NP_2). 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 P_n's a passive form as given by some morphological rule (or by a list, in the worst of cases). It assigns to coordinate P_n's the conjunction of its values at each P_n (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 assignment rule behaves broadly in accordance with what we independently know concerning morphology assignment rules.

Overall then it seems to us that our conception of Passive as a valency decreasing rule does not entail significant complications elsewhere in the grammar. By contrast the sort of massive homophony in the lexicon entailed by strictly lexicalist 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 accounts 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 P_2 and gets moved to subject position by Move α subject to certain conditions, e.g. Burzio's generalization. Without entering into any details, it seems to us quite difficult to extend Burzio's generalization to the multiple passives from P_2's, P_3's, and P_4's cited above for Kinyarwanda. Moreover the multiple passives from P_1's and P_2'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.

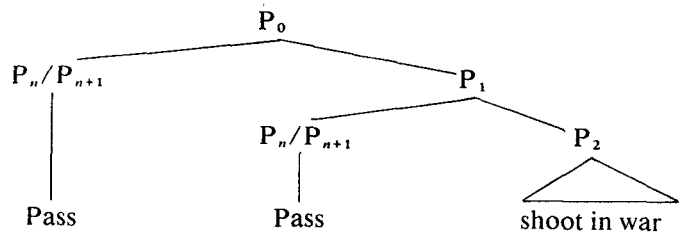
These analyses assumed of course that we did not want Passive to iterate. But that is an empirical question. In fact it seems that Passive can iterate, as

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)



Equally Lithuanian (25) has iterated passives:

(25) Lapelio būta vėjo nupūsto
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.

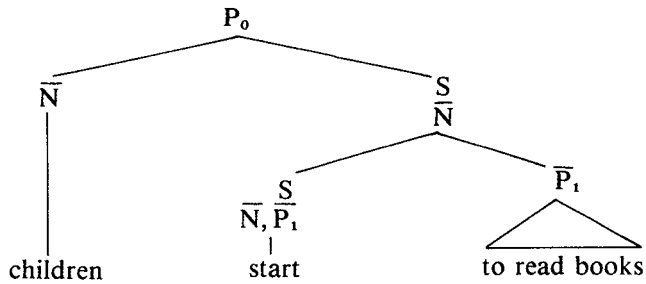
Essentially here the predicates passivized are P_2's of category $(S/\overline{N})/\overline{S}$ and their passives predictably have category $S/\overline{S}$.

More interesting are predicates which take infinitival arguments. In general we assign an infinitive of a P_1 the category $\overline{P}_1$. 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 $\overline{P}_n$. E.g. *to kiss, to hug and kiss, to hug and to kiss, to kiss loudly* are all $\overline{P}_2$'s of a certain sort. (Of course we treat the infinitive former *to* as having an n-tuple category abbreviated by $\overline{P}_n/P_n$, all $n > 0$. The complementizer *that* forms $\overline{P}_0$'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_1 for $S/\overline{N}$.

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

b.



Now the passive of a P_2 of the sort in (27) will straightforwardly have category $S/\overline{P_1}$ (where P_1 is $S/\overline{N}$, 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) $[_{P_0}$ Umugabo $[_{P_1}[_{P_2}[_{P_3}$ 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.

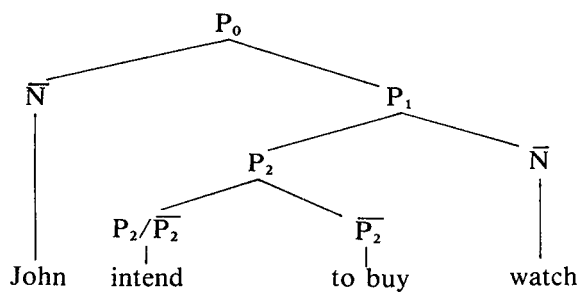
(30) a. Abaana y- akuunki-w- e gu-soma igitabo
children they-allow- PASS-asp to-read books
'The children were allowed to read books.'

b. Gu-soma igitabo bi-akuunki-w- e abaana
to-read books it-allow- PASS-asp children
'To read books was allowed the children.'

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 $\bar{P}_1$ 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 $P_1/\bar{P}_1$. And now the natural generalization suggests itself. Let us treat such predicates as having the category $P_n/\bar{P}_n$, all $n>0$. It is understood that the argument structure of the derived P_n matches that of the P_n 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 numatytė pirkti 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 pirkti 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 *pirkti* '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. PASS (Pred $+\bar{P}_n$) = PASS (Pred) + $\bar{P}_n$.

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:

(33) a. Ahmet kitab-i oku-maya başla-di
Ahmet book-DO read-inf begin-pst
'Ahmet began to read the book.'

b. Kitap (Ahmet tarafindan) oku- n- maya başla-n- di
book Ahmet by read-PASS-inf begin-PASS-pst
'The book was begun to be read (by Ahmet).'

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 PASS must say PASS(Pred + $\bar{P}_n$) = PASS(Pred) + $\overline{\text{PASS}(P_n)}$. 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 Passive 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, 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 *pass* for the semantic function which interprets the syntactic item Pass. It is defined as follows, where y and the x_i range over individuals in the appropriate sets:

(34) (pass $(P_{n+1})(X_n)\ldots(X_1)$) = $(\exists y)$ $(P_{n+1}(X_1)(X_n)\ldots(X_2)(y))$

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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