A Phrasal Analysis of Passive Constructions*

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1. Introduction

In analyzing passive constructions, we must bear in mind the fundamental question: "At what level should the active-passive relation be captured?" Earlier transformational grammarians (cf. Chomsky 1957) gave the level of syntactic deep structures as an answer to this question. Syntactic transformations were motivated to capture the relation between active sentences and passive sentences. This transformational approach, however, has turned out to have some problems. In this paper, we shall treat the problems within the framework of a phrase structure grammar proposed by Gazdar (1980). We suggest that the active-passive relation should be essentially semantic, and that it should be captured at the level of semantic representation.

The reason why the phrasal approach is preferred over the transformational approach is based on the following observations.

Firstly, unlike other transformations such as Question Formation and Relative Clause Formation, passive transformations have lexical exceptions. In other words, idiosyncratic properties of some verbs do not trigger passive transformations.

(1) a. Mary is loved by John.
b. *An actress was become by Alice.

(2) a. John was persuaded to leave.
b. *John was promised to leave.

(3) a. ... the late ruler of Ramat was regarded as a friend of this country.
—A. Christie, *Cat Among the Pigeons.*
b. *Tom was struck as pompous by Mary.

(4) a. The expected result was arrived at.
b. *The station was arrived at.
— Bresnan (1978)

A pair of sentences above are derived from sentences with the same structural description, X-NP-Aux-V (Prep.)-NP-Y,[1] that triggers passive transformations. A transformational rule is, in principle, incapable of distinguishing a-sentences from b-sentences. Our phrasal approach shall account for these lexical exceptions.

Secondly, there are some cases where active sentences and the corresponding passive sentences have not exactly the same truth conditions. Svartvik observed that some kind of passive sentences have two corresponding active sentences potentially (cf. Svartvik 1966). For example, the passive sentence (5a) is considered to have two corresponding active readings (5b) and (5c):

(5) a. Oil will be replaced by coal.
b. Coal will replace oil.
c. They will replace oil by coal.

– Svartvik (1966)

The verb *replace* can take either an inanimate subject as in (5b) or an animate subject with an instrumental *by*-phrase as in (5c). The *by*-phrase in (5a) is regarded as a 'Janus Agent' by Svartivik since it has two potential functions, one as an adjunct and the other as an active subject. The ambiguity of (5a) shall be explained in the present study. Chomsky's example of an ambiguous active sentence corresponding with an unambiguous passive sentence shall also be accounted for.

(6) a. John decided on the boat.
b. The boat was decided on by John.

– Chomsky (1965)

2. Translation and the Lexicon

Instead of the position taken by earlier transformational grammarians which is characterized as "the autonomy of syntax", we assume that the syntax of a language is fundamentally connected with its semantics, i.e. that the syntax is a kind of a map which shows how the meaning of the parts is to be combined into the meaning of the whole. The idea that underlies this assumption is that any combination of truth values for the

parts determines the truth value of the result (i.e. the whole of parts put together). This idea (the so-called Fregean principle) is made explicit in the lexicon as follows. (cf. Dowty 1978):

(7) The Translation Principle:
The meaning of a phrase is a function (in the set-theoretic sense) which takes as its arguments the parts mentioned in the syntactic frame.

This translation principle enables us directly to associate the elements in the syntactic frame with the corresponding semantic representation. The principle has the power to restrict overgeneration of ungrammatical sentences within the framework of a phrase structure grammar. In this grammar, all semantic work done by transformational rules like Equi and Raising is done by lambda conversion and meaning postulates.

One of the rules in the grammar which combines subject NPs with VPs to give sentences appears as follows:

(8) $<1, {}_{S}[\underset{[\alpha]}{NP}\ \underset{[\alpha]}{VP}], \lambda x\,[VP'(x)]\,(NP')>$

The rule consists of three members, the first of which is an arbitrary rule number, the second is a syntactic frame or a syntactic rule, and the third is a semantic rule showing how the semantic representation of the expression in the syntactic frame is built up from the semantic representation of its parts. As a result of lambda conversion, the semantic rule λ x [VP' (x)] (NP') gives the translation VP' (^NP'). The notation (') represents translation of the lexical category and (^) represents intension of the translation. Thus VP's denote functions from NP intensions to truth values. Morphological operations on lexical items are indicated by agreement features such as [α] which range over permissible combination of person, number, and gender features.

The following sentence (9a) is translated by the semantic rule in <1> as (9b):

(9) a. John yawns.
b. $\lambda x\,[yawn'(x)]\,(j')$
c. $yawn'(\hat{}j')$

The symbol *j'* stands for the denotation of *John*. The logical form (9b) roughly says, "John has a property of yawning". (9c) is the result of quantifying in the subject NP *John* via lambda conversion.

In an analogous way, translation of VPs containing transitive verbs is done by the following VP rule and the rule <1>:

(10) a. Mary *loves John*.

b. $<4, {}_{VP}[V\ NP], \lambda x\ [V'(x)]\ (NP')>$
$[\alpha]$

c. $\lambda x\ [love'(\hat{}j')(x)]\ (m') = love'\ (\hat{}j')(\hat{}m')$

The italicized part of (10a) is translated by the semantic rule in <4> to yield *love'* (^*j'*) via lambda conversion. Then, the subject NP *Mary* is quantified in by the semantic rule in <1>. (10c) roughly says, "Mary has a property of loving John". Hereafter our analysis is mainly concerned with the translation of VPs since the difference between a-sentences in (1)~(4) and b-sentences in (1)~(4) can be captured at this phrasal level.

Let us examine two kinds of active verb phrases. One has corresponding passive verb phrases, and the other does not. Verbs such as *eat, sing, love,* etc., are of the former kind. Verbs like *become* and *be* are of the latter. The first kind of VPs are introduced by the rule <4> which is repeated as follows:

(11) a. $<4, {}_{VP}[V\ NP], \lambda x\ [V'(x)]\ (NP')>$
$[\alpha]$

b. $V_4^* = \{ eat, sing, love, \ldots \}$

The semantic rule indicates that V denotes a function from NP intensions to truth values. The latter kind of VPs are introduced by the following rule <5>:

(12) a. Alice *became an actress.*

b. $<5, {}_{VP}[V\ \overline{NP}], \lambda x\ [V'(\hat{}\overline{NP}'(x))]>$
$[\alpha] \quad [\alpha]$

c. $V_5^* = \{ become, be, \ldots \}$

Rule <5> is not explicitly mentioned in Gazdar's framework, but it is the natural consequence of extending Bresnan's VP hypothesis (cf. Bresnan

1978). In her approach of functional interpretation, VP complements of verbs like *tend* and *seem* denote functions taking subject NPs as arguments. A noun phrase complement in (12a) can be analyzed just in the same way.

The difference between VPs in (11a) and (12b) lies not in the syntactic rules but in the semantic rules. Also the agreement feature [α] differentiates (12b) from (11a). In (12b) the subject NP must agree with the object NP in person, number, and gender.

Two kinds of VPs that contain infinitival complements in (2) are introduced by the following lexical rules:[2)]

(13) a. Mary *persuaded John to leave.*

b. $< 19, {}_{\underset{[\alpha]}{VP}} [V\ NP\ \overline{VP}]_{[\beta]\ [\beta]}, \lambda x\ [V'\ (\hat{}\overline{VP}'(x))]\ (NP') >$

(14) a. Mary *promised John to leave.*

b. $< 20, {}_{\underset{[\alpha]}{VP}} [V\ NP\ \overline{VP}]_{[\alpha]}, \lambda x\ [V'(\hat{}NP')\ (\hat{}\overline{VP}'(x))] >$

Again the difference between VPs in (12a) and (14a) is captured at the level of semantic representation. At the phrasal level *persuade* is a one-place predicate, while *promise* is a two-place predicate.

By the same token, VPs that take adjectival complements in (3) are analyzed as follows:

(15) a. Mary *regarded John as pompous.*

b. $< 21, {}_{\underset{[\alpha]}{VP}} [V\ NP\ \overline{AP}]_{[\beta]\ [\beta]}, \lambda x\ [V'\ (\hat{}\overline{AP}'(x))]\ (NP') >$

(16) a. Mary *promised John to leave.*

b. $< 22, {}_{\underset{[\alpha]}{VP}} [V\ NP\ \overline{AP}]_{[\alpha]}, \lambda x\ [V'(\hat{}NP')\ (\hat{}\overline{AP}'(x))]$

Now the seemingly basic VPs in (11a), (13b), and (15b) are regarded as the output of metarules that expand TVPs. Metarules are defined as operation mapping TVP rules into VP rules. They provide a recursive definition of the set of rules in the grammar. They are stated in the following form: "if *r* is a rule of format R, then F (*r*) is also a rule." (cf.

Gazdar 1980). TVP rules are inputs of the following active metarule:

(17) For every lexical rule $<n, {}_{TVP}^{[\beta]}\ [V\ X], \lambda x\ [F(x)]>$,
there is also a rule $<n, {}_{VP}^{[\alpha]}\ [V\ NP\ {}_{[\beta]}X], \lambda x\ [F(x)]\ (NP')>$.

F stands for any single or complex function consisting of the intensional language composed by the elements in the syntactic rule. Semantic rules in <4>, <19> and <21> are functions taking NP intensions into truth values. After lambda conversion, they give translations of the general form; F (^NP'). In the semantic rules in <5>, <20> and <22>, on the other hand, lambda conversion does not take place unless the subject NPs are quantified in by the rule in <1>. This difference of control seems to be the essential property for distinguishing TVP-based VPs from VPs of another kind.

VP rules <4>, <19>, and <21> are replaced with TVP rules as follows:

(18) a. $<4, {}_{TVP}^{[\beta]}\ [V], \lambda x\ [V'(x)]>$

b. $<19, {}_{TVP}^{[\beta]}\ [V\ \overline{VP}], \lambda x\ [V'(\hat{}\overline{VP}'(x))]>$

c. $<21, {}_{TVP}^{[\beta]}\ [V\ \overline{AP}], \lambda x\ [V'(\hat{}\overline{AP}(x))]>$

Passive VPs are derived from TVPs by the following passive metarule:

(19) For every lexical rule $<n, {}_{TVP}^{[\beta]}\ [V\ X], \lambda x\ [F(x)]$,
there is also a rule $<n, {}_{VP}^{[{}^{\beta}_{PAS}]}\ [V\ X\ (PP)]_{[by]}, \lambda x\ [F(x)\ (\hat{}PP')]>$.

The *by*-phrase in (19) is an optional sequence. We need some kind of convention like Gazdar's "Optional argument convention" to ensure that the missing argument position is expressed by existential quantification. For example, the following sentence (20a) should be given the translation like (20b):

(20) a. John is *persuaded to go.*
b. $\lambda x \exists y$ [*persuade'* (^*go'* (x))] (y)] (*j'*)
c. $\exists y$ [*persuade'* (^*go'* (^*j'*)) (y)

(20b) can be read as "John has a property of being persuaded to go by someone."

The rule for PPs would look like the following:

(21) $<2_{,PP}$ [P NP], λx [P' (x)] (NP') >

The meaning of PPs like the agentive *by*-phrases in the passive sentences are ensured as identical to the meaning of NPs they dominate by Gazdar's Head Feature Convention (henceforth HFC). This HFC enables one to distinguish a case-marking type of PPs from the other type of PPs like temporal and locative PPs. By HFC, the name of the preposition is carried as a feature and relevant PPs are expressed as complex symbols PP [*by*], PP [*to*], PP [*for*], etc. The following rule ensures that in agentive PPs the preposition does not carry any independent meaning but merely serves to indicate the argument position of the NP:

(22) $<3_{,p}$ [ψ], $\lambda\gamma$ [γ] >
where $\psi \in$ { *by, to, for,* . . . } and γ is of type $<<e, t>, t>$.

The semantic rule in <3> is an identity function that maps NP extensions into themselves.

The output passive VP rules and translations given by their semantic rules are illustrated as follows:[3)]

(23) a. Mary is *loved by John.*
b. $<4_{,\ VP\ [^{\beta}_{PAS}]}$ [V (PP)], λx [V' (x) (^PP')] >
c. λx [*love'* (x) (^*j'*)] (*m'*) = *love'* (^*m'*) (^*j'*)

(24) a. John was *persuaded to go by Mary.*
b. $<19_{,\ VP\ [^{\beta}_{PAS}]}$ [V $\overline{VP}$ (PP)], λx [V' (^$\overline{VP}$' (x)) (^PP')] >

c. λx [*persuade'* (^*go'* (x)) (^*m'*)] (*j'*)
= *persuade'* (^*go'* (^*j'*)) (^*m'*)

(25) a. John was *regarded as pompous by Mary.*
b. $<21, {}_{VP}\ [V\ \overline{AP}\ (PP)], \lambda x\ [V'(\hat{}\overline{AP}'(x))(\hat{}PP')')] >$
$[{}^{\beta}_{PAS}]$
c. λx [*regard'* (^*pompous'* (x)) (^*m'*)] (*j'*)
= *regard'* (^*pompous'* (^*j'*)) (^*m'*)

By HCF, *as* in (25a) may have exactly the same meaning as the adjective *pompous*.

Now let us turn to the translation of the Janus Agent in (5):

(26) Oil is replaced by coal.

Agentive passive reading will give the following translation:

(27) λx [*replace'* (x) (^*c'*)] (*o'*) = *replace'* (^*o'*) (^*c'*)

(27) says, "Oil has a property of being replaced by coal." If we take the *by*-phrase in (26) as an instrumental case-marker, we would obtain the following translation:

(28) $\lambda x \exists y$ [*replace'* (x) (^*by'* (^*c'*)) (y)] (*o'*)
= $\exists$ y [*replace'* (^*o'*) (^*by'* (^*c'*))] (y)

(28) roughly says, "Oil has a property of being replaced by coal by someone." Instrumental *by*-phrases differ from agentive ones in that instrumental ones can also appear in active sentences.

(29) a. Mary replaces oil by coal.
b. λx [*replace'* (^*o'*) (^*by'* (^*c'*)) (x)] (*m'*)
= *replace'* (^*o'*) (^*by'* (^*c'*)) (^*m'*)

(30) a. Coal replaces oil.
b. λx [*replace'* (^*o'*) (x)] (*c'*)
= *replace'* (^*o'*) (^*c'*)

Verb *replace* in (27) and (30) is a two-place predicate, whereas *replace* in

(28) and (29) is a three-place predicate.

Chomsky's example (6) would be translated in an analogous way.

(31) (= 6a) John decided on the boat.

If we regard the phrase *decide on* as one semantic unit of a TVP, we can obtain the following translation:

(32) λx [(*decide on*)' ($\hat{}b'$) (x)] (j')
= (*decide on*)' ($\hat{}b'$) ($\hat{}j'$)

This TVP *decide on* can be the input to the passive metarule that yields the following passive VP:

(33) a. (= 6b) The boat was decided on by John.
b. λx [(*decide on*)' (x) ($\hat{}j'$)] (b')
= (*decide on*)' ($\hat{}b'$) ($\hat{}j'$)

We can read (33b) as "The boat has a property of being decided on by John."

If *on* in (31) is regarded as a locative preposition, the following translation would be given:

(34) $\lambda x \exists y$ [*decide'* (y) ($\hat{}$*on'* ($\hat{}b'$)) (x)] (j')
= $\exists y$ [*decide'* (y) ($\hat{}$*on'* ($\hat{}b'$)) ($\hat{}j'$)]

(34) says, "John has a property of deciding on something on the boat."

Locative PPs like *on the boat* in (31) do not receive translations given by the rule <3>. They behave in a truth-conditionally different way from PPs of the type in <3>. This can be shown in the following pairs of sentences:

(35) a. Mary is loved only by Tom.
b. Mary is loved by only Tom.

(36) a. Kim put books only on the boxes.
b. Kim put books on only the boxes.

—Gazdar (1980)

The pair of sentences in (35) are truth-conditionally synonymous as the rule <3> predicts. But the pair of sentences in (36) differ in their truth conditions. This is because "real" prepositions like *on* have the meaning independent of the NPs that follow them. The preposition *on* in (34) and (36) has a locative meaning.

3. Conclusion

Since Freidin (1975), and more significantly Bresnan(1978), linguists have been aware of the failure of transformational accounts of passive constructions. In the analysis we have proposed here, passive VPs are treated as the output of TVP-based metarules. We hope to have shown that this phrasal approach enables us to realize a surfacy syntax and semantics of English. A healthy working relationship between syntax and semantics which was not captured by the transformational approach seems to have been achieved in the present analysis.

Notes

* This is a radically revised version of my M.A. thesis, *Passive Constructions and the Lexicon,* which was submitted in January, 1981.

1) Symbols X and Y stand for variables in a transformational theory. They are used to represent a part of the structure which is irrelevant to the transformational relationship that is being expressed.

2) The category for infinitive verb phrases, VP proposed by Bresnan (1978) is expressed by the following rule:

$$<6, {}_{VP}[V\ \bar{V}],\ \lambda x\,[V'(\bar{V}'(x))]>$$
$$[BSE]$$
$$[INF]$$
$$V^{*}_{6} = \{to\}$$

In this rule *to* is the only item. This item is considered to work as an auxiliary verb by Gazdar. (cf. Gazdar 1980) The feature BSE ensures that the verb after *to* appears in the bare infinitive form (via the HCF).

3) Passive VPs including the auxiliary verb *be* are introduced by the following phrase structure rule:

$$<16, {}_{VP}[V\ VP],\ V'(VP')>$$
$$[{}^{\alpha}_{AUX}],\ [{}^{\alpha}_{PAS}]$$
$$V^{*}_{16} = \{be\} \qquad be' = \lambda\gamma[\gamma]$$

The semantic rule here is an identity function mapping VP extensions into themselves. Thus HCF ensures that *be loved*, for example, has exactly the same meaning as *loved*.

References

Allwood, J., Andersson, L., and Ö. Dahl. (1977) *Logic in Linguistics*, Cambridge University Press.

Bach, E. (1980) "In Defense of Passive", *Linguistics and Philosophy* 3, 297–341.

Bresnan, J. (1978) "A Realistic Transformational Grammar", in Halle M., *et al.* (eds.): *Linguistic Theory and Psychological Reality*, The MIT Press.

Chomsky, N. (1957) *Syntactic Structures*, The Hague: Mouton.

Chomsky, N. (1965) *Aspects of the Theory of Syntax*, The MIT Press.

Dowty, D. (1978) "Governed Transformations as Lexical Rules in a Montague Grammar", *Linguistic Inquiry* 9, 393–426.

Freidin, R. (1975) "The analysis of Passives", *Language* 51, 384–405.

Gazdar, G. (1980) "Phrase Structure Grammar", to appear in Pullum, G. and P. Jacobson (eds.): *The nature of syntactic representation*, Boston: Reidel.

Hoekstra, T., Hulst, H., and M. Moortgat. (1980) *Lexical Grammar*, Dordrecht: Foris Publications.

Keenan, E. (1980) "Passive is phrasal (not sentential or lexical)", in T. Hoekstra *et al.* (eds.): *Lexical Grammar*, Dordrecht: Foris Publications.

Montague, R. (1974) *Formal Philosophy*: Selected Papers, (ed. R. Thomason), New Haven: Yale University.

Mōri, Y. (1980) "Goyōron ni okeru Naihō to Gaien", (Extensions and Intensions in Pragmatics), in *Ōtemae Joshidai Ronbunshū*, No. 14.

Partee, B. (1973) "Montague Grammar and Transformational Grammar", *Linguistic Inquiry* 6, 203–300.

Svartvik, J. (1966) *On Voice in the English Verb*, Mouton.

Wasow, T. (1977) "Transformations and the lexicon", in Akmajian, A., *et al.* (eds.): *Formal Syntax*, New York: Academic.