1. Introduction

The problem of interpreting ‘‘missing’’ noun phrases in predicate structures has been a central concern of transformational theory since its inception. Recently, a number of linguists, under various versions of the ‘‘extended standard theory’’, have dealt with this problem of ‘‘control’’ (see Brame (1976), Bresnan (1972; 1978), Chomsky (1957; 1965; 1973; 1976), Chomsky and Lasnik (1977), Faraci (1974), Jackendoff (1972), Solan (1978), Wilkins (1977), Williams (1977)). Many of these writers share the assumption that control is to be determined by rules operating on intermediate structures of a certain sort that contain various abstract elements such as traces, empty nodes, and complementizers.

Not so well known are treatments within a different tradition which has taken its inspiration from Richard Montague (see especially papers 6, 7, 8 in Montague (1974)). Common to all these treatments is the requirement that the fragments contain both an explicit set of syntactic rules and an explicit model-theoretical interpretation. We may view the results as systems which build ‘‘bottom-to-top’’ a syntactic structure and a corresponding representation of ‘‘logical form’’ (a structure in an interpreted intensional logic). The sole abstract elements are an infinite set of indexed pro-forms which underlie pronouns. Partee (1975a,b; 1976b), Thomason (1976), and Dowty (forthcoming) are among those who have addressed the sorts of problems we will be concerned with here. I wish to extend the treatments of these writers to cover some of the knottier problems that have been discussed in the recent transformational literature. The specific framework I will use draws upon both the transformational and the Montague traditions.¹

Montague has often been criticized for his views of syntax. A subsidiary aim of this article is to explore an approach to English syntax that is in the spirit of Montague’s practice, especially in PTQ. It seems to me that Montague syntax offers an interesting alternative to transformational syntax of all varieties.

Among the assumptions I will make are these:

A. A grammar defines sets of structural descriptions. Each is an ordered pair: (a)

¹ I will presuppose a certain amount of familiarity with Montague’s theory, particularly as exemplified in paper 8 of Montague (1974; hereafter PTQ). For expositions, see Partee (1975a); Thomason’s introduction to Montague (1974); Cooper (1977).
a well-formed labeled bracketed string over the grammatical and lexical elements of the language (e.g. English); (b) a well-formed expression of the intensional logic.2

B. With the exception of rules for coordinate structures, every structure-building rule is binary and interpreted as the application of a function to an argument.

C. For every nonempty Basic (lexical) category, there is a corresponding phrasal category.

D. Structure-building rules employ other operations besides simple concatenation.

I will also assume that we may define certain subfunctions or generalized syntactic operations once and for all and call on or compose these functions for different syntactic rules. Some of the subfunctions I will use are these.3 (I will follow the convention of always giving the items to be combined in the order “first function, then argument”. Then the interpretation will automatically be assigned: if \( a \) translates as \( a' \), and \( b \) as \( b' \), the result will be translated as \( a' (b') \).

1. **\( RCON: \)** "Right-Concatenation" \( (a/b) \)
   
   If \( a \) “is” the function and \( b \) the argument, then \( RCON(a,b) = a \overrightarrow{b} \).

2. **\( LCON: \)** "Left-Concatenation" \( (b\backslash a) \)
   
   If \( a \) is the function and \( b \) the argument, then \( LCON(a,b) = b \overleftarrow{a} \).

3. **\( RWRAP: \)** "Right-Wrap"
   
   (i) If \( a \) is simple, then \( RWRAP(a,b) = RCON(a,b) \).
   
   (ii) If \( a \) has the form \([xP \ X \ W]\), then \( RWRAP(a,b) = X \overrightarrow{b} \overrightarrow{W} \).

4. **\( PREPCON: \)** "Preposition Concatenation"

   If \( a \) has the form \( A \ Prep \) (where \( A \) is any category), then \( PREPCON(a,b) = A \overrightarrow{[pp \ Prep \ b]} \).

These subfunctions may be illustrated for English with the following examples:

5. a. \( \text{RCON:} \) try to go, present employer, the men, see Bill

   b. \( \text{LCON:} \) walk slowly, man in the street, man here

   c. \( \text{RWRAP:} \) persuade Bill to leave, easy man to please, too hot to eat

   d. \( \text{PREPCON:} \) depend on Mary, arrive at the decision, proud of his children, angry at Bill

The last two illustrate the way in which nonconcatenative operations will be used. \( RWRAP \) will be of special interest below. (Several other subfunctions will be defined below as needed.)

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2 This view is set forth in the context of an attempt to combine Montague grammar with “classical” transformational theory in Bach (1978).
3 The use of subfunctions is implicit in some extensions of Montague’s work, e.g. Bennett (1974). The notation \( a/b \) and \( b\backslash a \) is used in Lambek (1961).
2. Clear Cases

Before turning to an analysis of some verbal constructions of English within the framework just sketched, I would like to introduce a modification of Montague’s system of syntactic categories. Montague’s system requires a function from syntactic categories to semantic types. This function is not one-to-one as is sometimes claimed. In PTQ there are several syntactic categories that are mapped into the same semantic type; for example, common noun phrases (CNP) and intransitive verb phrases (ViP) are both mapped into a type for expressions in the intensional logic (IL) that denote sets (really, characteristic functions of sets) of individual concepts, that is, expressions of type (s,e), t). The syntactic categories are kept distinct by using different numbers of slashes in the categorial system: VPs are of the category tle, CNPs of the category tle. Other writers who have dealt with such things as predicative adjectives have introduced further distinctions: tl/e and the like (Siegel (1976a,b)). On the other hand, categories that are semantically distinct must be syntactically distinct in order to preserve the functional correspondence between the syntax and the semantics. As a number of writers have noted, this leads to the undesirable consequence that various types of verbs, for example, have nothing in common. Cooper (1975) has shown how to adapt the system of complex symbols and strict subcategorization for a Montague grammar. I wish to follow a somewhat different course here, which preserves the categorial nature of the syntax. Let us adapt the notion of a complex symbol from transformational theory and represent each syntactic category as an ordered pair: (a) the major lexical category of the element (N, V, A, etc.); (b) the categorial index which determines the semantic type. This move represents an attempt to replace the ad hoc slash distinctions of PTQ (which serve merely to indicate differences) by a substantive interpretation based on the lexical categories of noun, verb, and so on. The function from categories to types will then be based on the second member of each category. Thus, we may represent the categories CNP and ViP “officially” thus:

(6)  a.  CNP: [N, t/e]
b.  ViP: [V, t/e]

(I will often, as here, introduce abbreviations for complex categories.)

Some simple verbal categories of PTQ are the following:

(7)  a.  Vi: [V, t/e] “intransitive verbs”: walk, run
    b.  Vt: [V, (t/e)/[N, t/[V, t/e]]], i.e. V/NP “transitive verb”: see, kiss, love
    c.  Vto: [V, (t/e)/[V, t/e]], i.e. V/VP: try (to)

According to assumption (C) above, we should expect phrasal counterparts to each of these categories. Thomason (1976) and Partee (1976b) have suggested that the difference between constructions with persuade and with promise is just the difference between transitive verb phrases and phrases of the category Vto. It is important to note
that "transitive verb phrase" \((VtP)\) refers to a phrasal category that acts syntactically and semantically like a transitive verb, not a verb phrase that contains a transitive verb. The rule for combining a transitive verb phrase with its object is this:

\[ (8) \text{ If } a \in VtP \text{ and } b \in NP, \text{ then } RWRAP(a,b) \in ViP. \]

According to the general convention adopted above, the result will be interpreted as \(a' (b')\), where \(a'\) and \(b'\) translate \(a\) and \(b\), respectively.

The rules for forming \(VtP\)s are defined for a rather large number of different types, according to the syntactic category of the elements with which they are combined. Some examples, with an indication of the categorial nature of their complements, are listed here:

\[ (9) \text{ Verb Phrases of Category } VtP \]

\[ \begin{align*}
    \text{ persuade to go: } & Vt/ViP + ViP \\
    \text{ teach French: } & Vt/NP + NP \\
    \text{ put into a box: } & Vt/DirP + DirP \\
    \text{ consider a friend: } & Vt/PredNP + PredN \\
    \text{ consider competent: } & Vt/AdjP + AdjP \\
    \text{ paint white: } & Vt/AdjP + AdjP \\
    \text{ put to the test: } & \text{(lexical)} \\
    \text{ give a karate-chop: } & \text{(lexical)} \\
    \text{ regard as happy: } & Vt/AdjP + AdjP \\
    \text{ keep in the cellar: } & Vt/LocP + LocP \\
    \text{ appeal to to go: } & Vt/VP + VP \\
    \text{ depend on to come: } & Vt/VP + VP
\]  

(The last two show that a complete characterization of the formation of \(VP\)s from \(VtPs\) plus their objects must make use of the subfunction PREPCON given above. The two examples of lexical entries or idioms show that we need to list as units some transitive verb phrases; cf. Emonds (1973).)

Among these transitive verbs we may single out a special set in which the initial argument of the verb is some kind of expression denoting sets of individual concepts (or other higher order entities in fragments richer than \(PTQ\)—that is, categories with the index \(X, t/e\)). Following Jespersen, Visser, and others, we may call the latter expressions \textit{predicatives} and the verbs in question \textit{predicative transitive verbs} (strictly speaking, it is the phrase that they form with the predicative expression that is a transitive verb phrase). Such verbs take \(ViPs\) (\textit{persuade, depend on}), predicate nominals (\textit{consider}), adjectives (\textit{paint, consider, regard as}), and locative phrases (\textit{keep}). Below I will suggest that there is still another type of predicative phrase.

Just as \textit{persuade to go} is a complex representative of the category of transitive verb, so \textit{promise Mary} is a complex representative of the same category as \textit{try}. We may call these predicative (intransitive) verb phrases. And just as there are various
types of predicative transitive verbs, depending on the nature of the predicative, there are various types of predicative intransitive verbs:

(10) *Predicative Intransitive Verb Phrases*

promise Mary: \( V_{to/NP} + NP \)

strike us: \( (V/AdjP)/NP + NP \)
\( (V/PredNP)/NP + NP \)

make us: \( (V/PredNP)/NP + NP \) (She made us a good chairperson.)

These expressions are the phrasal counterparts of such simple verbs as *try*, *become*, *function as*, *serve as*, and the like.

The rule for combining such phrases with their arguments is this:

(11) If \( a \in [V/[X, t/e]] \) and \( b \in [X, t/e] \), then \( \text{RCON}(a,b) \in ViP \).

Let's pause here to consider the difference between the view of structure-building rules just sketched and that of phrase structure grammar. In a phrase structure grammar, given a tripartite structure like \( V \ NP \ VP \), there are only three possible syntactic analyses:

(12) a. 

\[
\begin{array}{c}
\text{VP} \\
\text{V} \ \	ext{NP} \ \	ext{VP}
\end{array}
\]

b. 

\[
\begin{array}{c}
\text{VP} \\
\text{V} \ \	ext{NP} \ \	ext{VP}
\end{array}
\]

c. 

\[
\begin{array}{c}
\text{VP} \\
\text{V} \ \	ext{NP} \ \	ext{VP}
\end{array}
\]

In the variant of Montague grammar we are looking at here, which requires binary constructions, one of these, (12c), is ruled out, but a new one is added, the one which takes \( V-VP \) as a kind of discontinuous structure. It is interesting to note that early transformational treatments were exactly like the analysis hypothesized here. Chomsky (1957), for example, analyzed the sentence *I found the boy studying in the library*, on one derivation, like this:

(13) \( I - \text{found} - \text{studying in the library} - \text{the boy} \).

These treatments include an obligatory transformation to flip the complement past the
object. We have already noted that there are lexical verbs of this type (cf. Emonds (1973)).

I will now try to motivate several of the distinctions I have drawn. The notions of predicative phrase, transitive verb phrase, and intransitive verb phrase enter into the following descriptive generalization:

(14) A predicative phrase must agree with the object of a transitive verb phrase and the subject of an intransitive verb phrase in number, gender, and person.

It is interesting to note that this generalization picks out just those noun phrases that are characterized as "absolutive" in ergative languages.

I can see two ways to make (14) precise in a Montague grammar. One is syntactic: we could define recursively the syntactic properties ("features", if you like) Singular, Plural, Masculine, Feminine, Neuter, 1st-person, 2nd-person, 3rd-person, and build the agreement directly into the rules for combining subjects with predicatives, and objects with transitive verbs.

The other way is to make use of the machinery of conventional implicature (Karttunen and Peters (1975)) in combination with meaning postulates to ensure that violations of (14) would be characterized as conventionally deviant. The meaning postulates in question would associate the predicative expression with the subject of an intransitive verb and the object of a predicative transitive verb (i.e. with the "absolutive" NP).

I will not try to choose between these two approaches here, but simply note that, whichever way we do it, we will have solved some typical problems of control, illustrated in the following examples:

(15) Mary persuaded the men to like themselves/each other.
(16) *Mary persuaded the men to like herself.
(17) John promised the men to like himself.
(18) *John promised the men to like themselves/each other.

4 Lees (1960) includes these rules:
(i) VP → V_t + NP
(ii) Vt → V_t + C(OMP)

Visser (1963–1973, part I, 555) includes a particularly clear statement of the point of view followed here.

5 Cf. Anderson (1977), who discusses several of the distinctions drawn here in terms of case relations.

6 Thinking of features as recursively defined properties of expressions was suggested orally by Parsons, but it was done explicitly in Friedman (1974). For other examples, see Bach (1978) and Partee (forthcoming).

7 What would be needed here to make this precise would be something like the following. For transitive verbs like persuade we would need a meaning postulate like this:

(i) ∨R ∧x ∧y ∧γ [persuade' (x, y, γ) iff R(x, y, γ(y))]

where R is an appropriate variable type

For promise:

(ii) ∨M ∧x ∧y ∧γ [promise' (x, y, γ) iff M(x, y, γ(x))]

Then we would be able to account for the clash of implicatures on the basis of the formulas γ(x) and γ(y).
CONTROL IN MONTAGUE GRAMMAR

(19) I regard John as proud of himself.
(20) *I regard John as proud of myself.
(21) John strikes me as proud of himself.
(22) *John strikes me as proud of myself.
(23) I consider those people friends.
(24) *I consider those people a friend.

You will note that (15)–(18) are among the sorts of examples that have been used to motivate the Specified Subject Condition by Chomsky (1973; 1976). The account suggested here generalizes to examples like (19)–(24), where, as far as I know, no one would posit the existence of the underlying sentences in the complement that would be required to make the Specified Subject Condition apply.

There is strong independent support for the contrast I have drawn between verbs like promise and strike on the one hand and persuade and regard on the other in the behavior of the various verbs under Passive. Within the set of verbs occurring with NP + COMPLEMENT adjuncts, we can say that all and only transitive verb phrases occur in the passive. Some contrasts are illustrated in the following examples:

(25) John was persuaded to go.
(26) John was regarded as incompetent.
(27) Mary has always been considered our friend.
(28) The cat was put into a box.
(29) The body was kept in the cellar.
(30) Bill was put to the test.
(31) We were appealed to to give a lot.
(32) *John was promised to go.
(33) *We were struck (by John) as incompetent.
(34) *We were made a good chairperson by Mary.
(35) *We were appeared to by John to be crazy.

This is an extremely strong constraint, noted by Visser (1973, part III 2, 2118) (Bresnan (1978) has referred to the constraint as "Visser's generalization"): "a passive transform is only possible when the complement relates to the immediately preceding (pro)noun." (Visser is commenting on an observation about strike and regard in Chomsky (1965, 163 f.; fn. 13, 229 f.).)

Ambiguous verbs are disambiguated in the passive:

(36) a. They asked the teacher to go to the bathroom. (ambiguous for some)
    b. The teacher was asked to go to the bathroom.
(37) a. She made him a good spouse.
    b. He was made a good spouse by her.
The firmness of the judgment can be tested by considering an invented verb:

(38) We scorpioned him into the kitchen.
(39) He was scorpioned by us into the kitchen.8

Any English speaker knows that if (39) is grammatical then scorpion must mean something like ‘push, force’, etc., and the successful result of scorpioning someone into the kitchen is to get that person into the kitchen. Conversely, if we are told that scorpion means ‘slip past’, ‘escape’, etc., so that we are the ones ending up in the kitchen, then (39) will be ungrammatical.

In the theory we are exploring here, if we adopt a particular view of passive that has been put forth by Thomason (1976; see also Dowty (forthcoming)), these facts about the passive follow. Thomason views Passive as a rule that applies to a transitive verb phrase like regard as happy or hit to yield either directly or indirectly a VP of the form be Ven X: be regarded as happy or be hit (the Agent phrase plays no role here, so I will stick to simple agentless passives). The translation of such a phrase is this, where γ translates the transitive verb:

(40) \( \lambda x \lor y \{[\gamma (x \{x\} (y)] \}

It denotes a set of (here) individual concepts. A sentence like (41) has the translation indicated:

(41) John is regarded as happy.

\[
j^*(\lambda x \lor y \{[\text{regard}' (\text{happy}') \} (x \{x\} (y)) = \lor y \{[\text{regard}' (\text{happy}') \} (x \{y\} (y))
\]

If we applied (wrongly) the Passive rule to strike to generate be struck, we would get this:

(42) \( \lambda x \lor y \{[\text{strike}' \} (x \{x\} (y)) \}

But this is incoherent, since the interpretation of strike NP (on our analysis) is of the wrong logical type to form a meaningful expression in this formula. This is striking support for the general view of syntactic categories pursued here, for this analysis, and for Thomason’s view of passives.9

It is worth noting that the analysis of passive suggested above falls somewhat in between the rule dichotomies proposed by many transformationalists. It is neither an unbounded and purely structurally governed rule like Wh Movement nor a lexical rule that applies to individual lexical items; rather, it is a perfectly general rule (cf. fn. 9)

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8 David Dowty has pointed out to me that there actually are verbs like the second scorpion in English:

(i) We took the subway downtown.
(ii) The subway was taken downtown by us.

9 I follow out this approach in a paper specifically devoted to the passive (Bach (forthcoming)). By and large, it seems that the heuristic suggested by the results here is borne out. For most verbs that absolutely do not passivize, there are independent grounds for claiming that the verb is not transitive.
defined for a syntactic category that cannot be directly represented in terms of strict subcategorization.

It is possible that a number of further contrasts between the two types might be explained on the basis of the above hypothesis (but without analysis of the phenomena this can only be considered suggestive evidence). The two types contrast in various constructions that “move” one or another part of the complex structures involved:

(43) **Heavy NP Shift**
    I regard as nutty anyone who holds such a view.
    I persuaded to do the dishes the three kids that were hanging around the house.
    ?I strike as nutty anyone who holds such a view.
    ?I promised to do the dishes the three kids that were hanging around the house.

(44) **Pseudocleft**
    ?What I persuaded John was to do the dishes.
    ?What I consider John is competent.
    What I promised John was to do the dishes.
    What I strike John as is nutty.

(45) **Question** (pointed out by Jane Grimshaw)
    Who did you persuade to do the dishes?
    Who do you regard as competent?
    ?Who does this idea strike as nutty?
    ?Who did you promise to do the dishes?
    (Similar facts for relative clauses)

What is common to these contrasts in acceptability is that in the good cases the remnant of the VP is a semantic unit (on our account also a syntactic unit), in the bad cases just a fragment with no “syntactic coherence” (Ajdukiewicz (1935)).

Facts about conjunction also provide independent support for the existence of a category of transitive verb phrases:

(46) Sally visited and persuaded to vote for her everyone in the precinct.
    Harry admires and regards as brilliant the pianist he heard last night.
    ?Sally visited and promised to stay her friend from New York.
    ?Harry admires and strikes as brilliant everyone he meets.

3. Some Unclear Cases

Armed with the results of the last section, I would now like to consider some more recalcitrant constructions. We have seen that structures of the form $V\ NP$ to $VP$ can be analyzed in two ways: in one, $V\ NP$ corresponds to a function taking the interpretation
of the VP as argument; in the other, the function is V...to VP and NP is the argument. It follows from our analysis that these examples will be ungrammatical:10

(47) *I tried (for) me to go.
(48) *I promised Bill (for) me to go.
(49) *I promised Bill (for) Mary to go.
(50) *I persuaded Bill (for) his kids to sweep the sidewalk.
(51) *I forced John (for) him to do the dishes.

What we are to say about verbs like want?

(52) I want to go.
(53) I want me to go.
(54) I want him to go.
(55) I want very much for you to go.
(56) Bill wants very much for him to go.
(57) I want myself to win.

If we let want and similar verbs appear in the same class as try, we can account for (52), but they must also appear in some other class. Following Bresnan (1972), we may assume on the basis of examples like (55) and (56) that want is in a category that can take for-to clauses. The lack of for in (53) and (54) will result, as is assumed by other linguists, from the requirement that for drop immediately after a verb. Note that this is yet a third binary function/argument structure that can be assigned to the sequence V NP to VP. The lack of a passive follows from this analysis.

(58) *Bill is wanted to go by Mary.

This prediction is quite independent of the phrase structure we assign to the phrase want Bill to go, according to the formulation of Passive above: want to go is simply not a transitive verb.

What is not explained on this analysis, in which want is given two lexical categorizations, is why in (56) Bill and him cannot be “coreferential” (apparent exceptions will be considered below). In early transformational treatments, an obligatory rule of Equi was postulated to account for this fact. The arguments against full NP deletion are well known, and I will not repeat them. More recent treatments have included some in which a designated element (PRO) is deleted or in which there is an “empty” NP which is interpreted in some fashion as linked to the subject of want.11 An analysis that would be more consistent with Montague’s practice and would conform to Partee’s “well-formedness constraint”, which eschews obligatory rules (Partee (forthcoming)), would be the following. Just as we have built into the verb/object rule the obligatory (?)

10 In this respect the analysis is just like those transformational analyses which claim that such verbs are simply subcategorized for VPs.
11 It is not clear to me exactly what is intended when linguists talk about “coreference”. 
transformation posited by early transformationalists to flip VPs past the object, we can build Equi not into the rule that puts together want and its argument clause but rather into the rule that combines subject NPs and VPs. Let us remove want from the class of try altogether. The subject rule (S4 in PTQ) would now look like this:

\[(59) \text{ If } \alpha \in NP \text{ and } \gamma \in ViP, \text{ then } f'_4(\alpha, \gamma) \in S \]
\[\text{where } f'_4(\alpha, \gamma) = \alpha\text{Pres}[V \text{ to } VP] \text{ if } \alpha \text{ has the form } pro_i \text{ and } \gamma \text{ has the form } \]
\[V \text{ for } pro_i \text{ to } VP \]
\[= \alpha\text{Pres } \gamma \text{ otherwise.}^{12}\]

If we assume that first and second person pronouns are not derived from abstract pro-forms, then we can account for examples (52)–(56) in this way (I will not try to deal with the reflexive of (57) here). (52) will have this kind of a derivation:

\[(60) \quad \text{I want to go} \]
\[\text{I} \quad \text{pro}_3 \text{ Pres want to go} \]
\[\text{pro}_3 \quad \text{want for pro}_3 \text{ to go} \]

The deviance of sentences like *I want to like himself will be accounted for by either of the routes suggested above (syntactic or implicative). The derivation of an example like Bill wants him to go is this:

\[(61) \quad \text{Bill wants him to go} \]
\[\text{Bill} \quad \text{want for pro}_3 \text{ to go} \]

If we assume that subscripted pro’s that do not correspond to bound variables can be turned into pronouns and interpreted as free variables, then we have a basis for explaining why, in fact, him in (56) can be interpreted as referring to Bill. It will fall under the heading of a “pronoun-of-laziness”, along the lines of Partee (1975b). Note that if we substitute a nonreferring expression for Bill, we cannot interpret him as “coreferential”.

\[(62) \quad \text{Every soldier wanted very much for him to go.} \]

This is because pronouns can be linked to phrases like every soldier only via variable-binding rules.

\(^{12}\) I think there is a lot more to be said about the semantics of for-to complements. Debbie Nanni has pointed out to me that in many sentences they seem to be related to purpose clauses (cf. Faraci (1974)). I think that a good analysis would generate such clauses independently and then make them available for government by various verbs like choose or want.
It is interesting that (52) and (53), which appear on first reading to be synonymous, get different interpretations when they are picked up by VP-anaphora.

(63) I want to go but Bill doesn’t.
(64) I want me to go but Bill doesn’t.

(Cf. Sag (1976); Williams (1977).) Finally, let us consider the difficult cases discussed in Solan (1978) (see also Clark (1974)):

(65) I chose to read War and Peace.
(66) I chose Bill to read War and Peace.
(67) I chose War and Peace for Bill to read.
(68) John chose War and Peace to read.

(65) and (66) seem to me to be unproblematical. We can say that choose belongs to both the categories of try (VP/VP) and persuade (Vt/VP). This decision predicts these judgments:

(69) *I chose immediately for Bill to read War and Peace.
(70) *I chose Bill for his children to read War and Peace.
(71) Bill was chosen to read War and Peace.

(67) requires something new. There is a good passive:

(72) War and Peace was chosen for Bill to read.

Thus, the VP must involve a transitive verb phrase, so choose must also be categorized as Vt/X. What is X? To answer this question in any detail would take us too far afield, but it seems clear that X should be some kind of predicative expression. I will tentatively call it PredS. A rule for forming such phrases might be formulated thus:

(73) NP Pres X pro\i Y \Rightarrow for NP to X Y’

where Y’ is formed from Y by replacing all further occurrences of pro\i by him, by her, by it, etc.\(^{13}\)

We want to interpret the phrase as a predicative expression (that is, as being of type \langle(s,e), t\rangle), so we can stipulate that if the input sentence is translated as \(\varphi\) then the result is \(\lambda x_1 \varphi\). When we put this together with choose to form a transitive verb phrase, we will get the interpretation indicated in this formula: choose’ (\(\hat{x}_1 \varphi\)).

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\(^{13}\) It must also be required that X contain no pro\i, i.e. it must be the first one. This condition, which we encounter again and again for variable-binding rules, should probably be built directly into the definition of various subfunctions, unless it can be shown to be an instance of a more general condition on rule application. It is highly reminiscent of the interesting Variable Interpretation Convention of Wilkins (1977), except that in the sorts of rules we are looking at here it is merely the string of terminal elements that needs be considered, rather than the structure. It might be that we could generalize so that the interpretation of the convention would be predictable from the nature of the elements named in the rule. The cases Wilkins considers are mostly rules in which the constant terms are structures, and the condition is interpreted structurally. The elements here are terminal; hence, we might say that the condition is interpreted in terms of terminal elements.
The agreement facts line up just as with persuade:

(74) I chose those patients for you to explain to themselves/*himself.

Finally, consider (68). It is not clear to me that (68) exhibits a case of obligatory control by the subject. If it does, then we will want the subject-verb phrase rule (59) to require Equi in this case also. What makes me suspicious of this treatment is that there exist sentences in which no overt controller is present:

(75) War and Peace was chosen to read by the class.

So it might be the case that (68) actually exhibits a case of free control. Sentences like the following occur:

(76) Go get War and Peace to read for a bedtime story.

And it does not seem as if the addressee has to be the one to read.¹⁴

4. Syntactic Autonomy and Montague Grammar

The relation between syntactic categories and semantic types in Montague’s general theory is functional: no single syntactic category may be mapped into different semantic types.¹⁵

In the analysis of various verb classes above, I have used the categorial structure to characterize the difference between verbs that take various arguments to form complex transitive verbs and verbs that take NPs to form complex verbs that take other kinds of arguments. I then noted that this difference correlates strongly with the ability of a verb to enter into a productive passive structure. The difference in interpretation is reflected in the “constituent structure” of the translation into IL:

(77) persuade John to go [persuade’ (‘go’)] (j*) cf. feed John
promise John to go [promise’ (‘j*)] (‘go’) cf. try to go

This much of the “nonautonomy” of Montague syntax follows from the compositionality principle, which may be stated thus:

(78) When putting things together in the syntax, one must say what they mean, and the meaning of the result must be a function of the meaning of the parts.

It may be worthwhile to consider why one might want to preserve such a functional relationship between syntactic categories and semantic types. It is easiest to see this by considering an alternative. Suppose that we assigned intransitive verbs like swim and

¹⁴ Cooper (forthcoming) has made some interesting suggestions about the interpretation of pronouns as free variables of various sorts, and it may be that something like that would work for some of the cases of free control of VPs.

¹⁵ For the revisions suggested in Parsons (forthcoming), this statement must be modified. Parsons constructs a system using variables over types, and his function is then a function from pairs of basic types and categories to semantic types. For example, NPs still have to be sets of properties of something, but the something can vary from (for example) individual concepts to sets, propositions, and so on.
transitive verbs like *love* to the same syntactic category, say *V*. We would then be unable to say anything in general about the interpretation of constructions of the form *V NP* or *V*. I take it that it is uncontroversial that (79) is to be interpreted as saying that John has a certain property or belongs to a certain set and that (80) is to be interpreted as saying that a certain relation obtains between Mary and John (or some equivalent interpretation).

(79) John swims.
(80) Mary loves Bill.

But to get this result and to distinguish (79) and (80) from (81) and (82), we must distinguish one-place predicates like *swim* from transitive verbs like *love*.

(81) Mary swims John.
(82) John loves.

Differences like these are represented in transformational theory in strict subcategorization frames like [____] and [____ *NP*], and this just means that the interpretations must be based on something more than categories like *V*, in fact on something like [*V*, ____] and [*V*, ____ *NP*]. But this is just what we are doing here, except that we are making finer-grained distinctions than are available in subcategorization frames. In this way too (cf. Bach (1978)), “classical” transformational theory bears a stronger similarity to Montague grammar than does post-Aspects theory. Lees (1960) distinguished transitive verbs—*Vt*—from other types, which he lumped together as “middle” verbs, while acknowledging that the latter did not form a homogeneous class. The expectation was that the determination of these smaller categories would lead toward a fruitful taxonomy of syntactic categories, and Lees himself justified his classes by showing that his distinctions appeared in a variety of places in the syntax. Montague’s theory differs from transformational theory in insisting that the connection between the syntactic categories and the semantics be made explicit. I believe that his approach, coupled with a view of at least English syntax and semantics as largely of a function/argument structure, leads to interesting results.

5. Alternatives

The principal alternative theories that I would like to compare with the treatment above are Bresnan’s “realistic” transformational models and Chomsky’s trace theory. The approach presented here is closely related to Bresnan’s. It differs from Bresnan’s theory, as far as I can tell, in the assumption that there are syntactic categories like transitive verb phrases which do not correspond directly to any constituents in surface structure (in many sentences). As I noted above, a rule like Thomason’s Passive rule is defined on a phrasal category and not on a lexical category. Some evidence for the correctness of Thomason’s view is given in Bach (forthcoming). It hinges on the analysis of purpose clauses as ad-transitive verb adverbials. Such clauses can be the arguments
of certain verbs (as suggested above for choose), but beyond that they can function as optional modifiers of transitive verbs. They also occur in the passives of such phrases; but not, in general, with intransitives:

(83) a. Mary bought it to drive to work in.
   b. It was bought to drive to work in.
   c. *The Dean came in to talk to.

This result follows from the simplest analysis within Montague grammar, since in order to handle all the passives of the various transitive verb phrases mentioned above lexically, we would have to posit an extremely complex set of lexical rules (i.e. one for each of the lexical categories represented by persuade, regard, keep, etc.). In other respects, the theory differs in the particulars of the machinery that is used to distinguish different subcategories: here, binary function argument structure; in Bresnan, strict subcategorization frames and a "functional" structure of grammatical relations. Further research is required in order to evaluate and compare the two approaches.

I have already noted some differences between the account given here and Chomsky's trace theory. In a nutshell, the main differences are these: the Montague approach uses only one kind of abstract element, the indexed variables that are also used in an account of other kinds of control (relative clauses, etc.). (Alternatives that dispense even with these elements are explored in various works of Robin Cooper, e.g. (1975).) Chomsky also uses abstract elements, some of which correspond to the indexed variables of Montague. Insofar as such elements are used in the treatment of the cases of obligatory control considered here, it seems that they are required primarily because of the assumption that there is a single level of logical form from which the interpretive process begins, whereas the approach here, which is reminiscent of early attempts to provide a semantics for pre-Aspects syntax, associates the interpretive process directly with the rules of the syntax. The Montague approach embodies the claim that the control properties of verbs and other elements, and the associated features of agreement, are direct reflexes of the meanings of the items in question and that there is no need to encode these properties into indices and the like. Once again, much more research is needed to reach a conclusion about the two programs, which cannot really be compared piecemeal.16

References


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