I. Postal's Extended Cross-over Principle

Postal (1971, Chapter 10 inter alia) argues that the fact that (1) is grammatical but (2) is not should be accounted for on the basis of an extended version of the cross-over principle. (For the purposes of this paper I shall consider the extended cross-over principle to be that version of the cross-over principle not limited to clusemates.)

(1) \(\text{Who}_1\) claimed Jack kissed her\(_1\)?

(2) \(\ast \text{Who}_1\) did she\(_1\) claim Jack kissed?

(A subscript \(\_i\) indicates that the element in question is coreferential with other elements similarly marked.) Sentences (1) and (2) are presumed to be derived from an underlying structure similar to (3).

\[
\begin{align*}
S & \quad \text{VP} \\
NP_1 & \quad V \\
\quad i & \quad \text{claim} \\
NP & \quad \text{VP} \\
\quad \text{claim} & \quad S \\
NP & \quad VP \\
\quad \text{claim} & \quad S \\
\text{Jack} & \quad V \\
& \quad \text{NP}_2 \\
& \quad \text{kiss} \quad i
\end{align*}
\]

In Postal's analysis of (1), Wh-Q-movement applies to NP\(_1\). Pronominalization later applies left-to-right, as would be expected. The derivation of (2) is similar to that of (1), except that Wh-Q-movement applies to NP\(_2\) rather than to NP\(_1\). Consequently NP\(_2\) is moved to the left of NP\(_1\). Since pronominalization operates left-to-right except into embedded
sentences, NP₁ should undergo pronominalization yielding the structure underlying (2). However, (2) is ungrammatical and its derivation must be blocked.

It should be noted that questions having the form of (2) are blocked only if NP₁ and NP₂ are coreferential. Hence (4) is grammatical.

(4) Who did Mary claim Jack kissed?

Indeed, (2) is fully grammatical if NP₁ and NP₂ are not coreferential.

Postal explains the ungrammaticality of the coreferential reading of (2) on the basis of the cross-over principle. Although (1) and (2) come from the same underlying structure, the application of Wh-Q-movement to NP₁ (in the derivation of (1)) does not result in that NP crossing over the coreferential NP₂. However, when the same rule is applied to NP₂ in the derivation of (2), NP₂ is moved across a coreferential noun phrase, NP₁. Hence the extended cross-over principle is violated in the derivation of (2), but not in the derivation of (1).

It should be noted that for most rules the cross-over principle must be limited to coreferential clausemates. Only in the case of Wh-Q-movement, Wh-rel-movement, and Y-movement does cross-over apply across clause boundaries. If these cases were explicable on the basis of other general principles, the formulation of cross-over would be considerably simplified.

I shall argue that given certain fairly plausible assumptions about the nature of underlying structure, cross-over is not needed to account for the ungrammaticality of (2).

II. The Keenen Hypothesis

Edward Keenan (1971a, 1971b, forthcoming) has proposed that in order to account for the differing logical properties of sentences with opaque and transparent readings, an under-
lying structure similar to (6) is needed for (5).

(5) Mary kissed Jack.

\[
\begin{align*}
 & S \\
 & NP \quad \text{Mary} \quad x \\
 & NP \quad \text{Jack} \quad y \\
 & S \quad x \text{ kiss } y
\end{align*}
\]

That is, the simplex sentence contains only variables. NP's are treated as quantifiers binding variables.¹

III. Variable Replacement

If noun phrases have the logical properties of quantifiers binding variables, the transformational apparatus of the grammar must be such that bound variables are replaced by their quantifiers in some derived structures. Thus; in order to derive (5) from (6), the variable \( x \) must be replaced by \( \text{Mary} \) and the variable \( y \) by \( \text{Jack} \).

Some form of variable replacement is necessary in any theory of grammar. If it is accepted that overt quantifiers like \( \text{all} \) and \( \text{some} \) are logically related to the sentences in which they are found in a manner similar to that represented in standard logical notation, then a rule of variable replacement is necessary so that the quantifier may appear within the noun phrase in surface structure. Thus (7) must be related by the grammar to (8).

(7) All men are chauvinist pigs.

\[
\forall x \in \text{man} \quad \text{chauvinist pig } (x)
\]

Such a rule was proposed previously by George Lakoff (1969). Lakoff refers to an apparently identical process as quantifier lowering.

Although the question of whether rules like variable replacement should be considered syntactic transformations or rules of semantic interpretation remains controversial,
the need for a rule like variable replacement somewhere in the grammar is obvious. I shall assume throughout this paper that variable replacement is a syntactic transformation. Of course, some reformulation of my conclusions would be necessary should it turn out that variable replacement must be considered part of a separate semantic component. This matter will be considered further later in this paper.

A somewhat modified rule of variable replacement is necessary in order to derive (9) from an underlying structure like (10).

(9) That Henry won the race confuses him.

(10)

```
NP
\[ S \]
\[ NP \]
\[ S \]
\[ NP \]
\[ S \]
Henry x race y x won y z confuse x
```

To derive (9) from (10), the noun phrase Henry must replace one instance of the variable it binds. The replacement of variables would follow the normal restrictions on pronominalization, allowing a choice as to whether (10) would be realized as (9) or as (11).

(11) That he won the race confuses Henry.

What is of crucial importance for the purposes of this paper is that a noun phrase may replace on and only one instance of the variable it binds. Hence (12) could not be properly generated from (10).

(12) That Henry\textsubscript{1} won the race confuses Henry\textsubscript{1}.

Thus a consequence of the adoption of the proposal that noun phrases have the properties of quantifiers is that the rule of quantifier replacement necessitated by such a proposal
be constrained from replacing more than one instance of a variable by the noun phrase which binds that variable. In general, the variable replaced by the noun phrase would be the left-most instance of that variable, although an instance of the variable to the right of the left-most instance might be replaced by the noun phrase binding it if the instance of the variable to the right is in a sentence containing an embedded sentence $S_i$, and $S_i$ contains the left-most instance of the variable. Variables not replaced by the noun phrases binding them in underlying structure appear as pronouns in surface structure. Of course, the above conditions on variable replacement are directly analogous to conditions on pronominalization in the standard theory.

IV. Variable Replacement in Place of the Extended Cross-over Principle

I shall now show that the independently motivated restrictions on variable replacement are sufficient to explain the ungrammaticality of the coreferential reading of (2). I will assume that within the general framework of Keenan's system the underlying representation of (1) and (2) is not (3), but a structure similar to (13). The essential difference between (13) and (3) is that in (13) the question element is treated as a quantified noun phrase. Any other treatment of Wh-questions would appear to violate my basic assumption that noun phrases are to be considered quantifiers binding variables. (I do not claim that (13) is an adequate underlying representation for (1); rather, the only claim is that who in (1) derives from a quantifier-like constituent outside the sentence quantified over. The use of syntactic features has only expository significance.)
In accord with the rules proposed earlier in order to deal with the derivation of (5) from (6) and (9) and (11) from (10), variable replacement would apply to the left-most instance of the variable $x$. (I am ignoring the replacement of $y$ by $NP_y$. Nothing regarding $NP_y$ is crucial for this example.) After the replacement of $x$ by $Wh$, $Wh-O$-movement would apply vacuously (or not at all). Thus (1) would be generated from (13). That the derivation of (2) would be blocked is apparent from the restrictions on the application of variable replacement. In order to generate (2), the rules of the grammar would have to permit the replacement of an instance of a variable other than the left-most instance by its NP (before $Wh$-movement). However, the conditions on variable replacement permit this only when the instance of the variable to the right is in a sentence in which the left-most variable is embedded. Since this is not the case in (13), sentence (2) is blocked (i.e., it cannot be derived from (13), where the instances of $x$ are coreferential).

I wish to emphasize that the condition on variable replacement (i.e., pronominalization) is necessary in any theory of grammar. In fact this condition is precisely the backwards condition suggested by Postal (1971, p. 20). The virtue of the analysis I am presenting is that a known and independently motivated principle of grammar is employed in place of a somewhat ad hoc rider on the cross-over principle.

The derivation of (4), as well as the non-coreferential reading of (2), indicate that variable replacement as formulated above, and $Wh-O$-movement are sufficiently powerful to account
for the full range of cases. Sentences (4) and (2) are repeated here for the convenience of the reader.

(4) Who did Mary claim Jack kissed?
(2) *Who did she claim Jack kissed?

Sentence (4) derives from an underlying structure similar to (13), but containing an additional noun phrase.

In the case of (4), the bound variable $x$ occurs within only one sentence. Since $x$ occurs only once, it is replaced by the noun phrase binding it. Wh-O-movement later moves the object of kiss to the front of the entire sentence. A similar process allows the derivation of the non-coreferential reading of (2). In the non-coreferential reading the subject of claim is not bound by the noun phrase $NP_x$.

Rather, the subject of claim is a free variable, or, possibly, is bound anaphorically to a noun phrase in an earlier sentence.
V. \textit{Wh} Marking

In the remainder of this paper I will attempt to show that all of Postal's arguments against the sort of treatment of the phenomena in question which I presented above are flawed. Postal's arguments are of two sorts. First, he claims that only the cross-over principle can account for the proper placement of Wh-elements in relative clauses in sentences like (16). Second, Postal contends that restrictions on some cannot account for the ungrammaticality of the coreferential reading of (2).

(16) The elephant who \textsubscript{1} thought he \textsubscript{1} didn't like Mary to believe he \textsubscript{1} hurt himself \textsubscript{1} died of elephantiasis at midnight.

The problem is that of formally specifying the coreferential noun phrase which is marked as the unique Wh form. Postal notes that in sentences like (16) only the left-most coreferential element appears in surface structure as a Wh form. Rejecting an explanation of this fact requiring that pronominalization be cyclical, Postal concludes that

No other principle of English grammar or of universal grammar is known which predicts this fact. The solution to the pickout problem is the cross-over principle. (p. 247)

However, we saw earlier that in the case of the coreferential reading of (2), the ungrammaticality resulted from the misapplication of variable replacement. Sentence (2) can be coreferential only if the left-most instance of the variable \( \mathbf{x} \) is replaced by the quantifier \textit{Wh}, which binds it. Intuitively, a similar process would appear to apply in the derivation of (16). Let us assume that (17) underlies (16) at some point in the derivation. (My use of (17), a tree of the sort usually found in transformational grammars, has no theoretical significance. Since the point which I wish to make can be
made equally well with (17) as with a structure more exactly representing the underlying logical relations of (16) (i.e., a Keenan tree like (15)), the familiarity of structures like (17) suggests that they be employed for expository purposes.

(17)

\[ S \rightarrow NP \rightarrow VP \rightarrow NP \rightarrow S \]

\[ \text{the elephant, } x \]

\[ \text{died of elephantiasis at midnight} \]

\[ NP_1 \rightarrow S \rightarrow VP \rightarrow NP \rightarrow V \rightarrow NP \rightarrow S \]

\[ x \rightarrow \text{thought} \]

\[ NP_2 \rightarrow VP \rightarrow NP \rightarrow V \rightarrow NP \rightarrow S \]

\[ x \rightarrow \text{not like} \]

\[ NP_3 \rightarrow VP \rightarrow NP \rightarrow S \]

\[ x \rightarrow \text{believe} \]

\[ NP_4 \rightarrow VP \rightarrow NP_5 \]

\[ x \rightarrow \text{hurt} \]

The rule of variable replacement would apply left-to-right, marking \( NP_2 \) with the Wh form. \( NP_3, NP_4, \) and \( NP_5 \) could not undergo variable replacement (and later Wh-rel-movement) since they are neither the left-most instance of the bound variable \( x \), nor are they in a sentence containing an embedded sentence in which \( NP_1 \) appears. That is, assuming noun phrases to be quantifiers binding variables, the correct solution to the
problem of marking Wh forms in relative clauses is solved by the application of an exceedingly general principle of variable replacement. Since variable replacement is the direct analogue of pronominalization in the standard theory, it is necessary in any adequate grammar of English.

VI. Variable Replacement in Relative Clauses

There are some difficulties with the application of variable replacement to relative clauses. Variable replacement has been formulated as an extremely general process accounting for the incorporation of noun phrases as quantifiers into simple sentences which contain only variables in underlying structure. It is obvious that the head noun phrase is not incorporated into any of the instances of the variables it binds in relative clauses. To do so would generate (18) rather than (16) from (17), and (20) rather than (19) from the structure underlying (19).

(18) *Which elephant thought he didn't like Mary to believe he hurt himself died of elephantiasis at midnight.
(19) Tarzan slew the mean old elephant who thought he didn't like Mary to believe he hurt himself.
(20) *Tarzan slew the mean old which elephant thought he didn't like Mary to believe he hurt himself.

It is intuitively clear what the problem is. In the case of relative clauses, the head noun phrase, which presumably binds one or more variables within the relative clause, is not incorporated into the embedded sentence. Instead, the same variable, which in simple sentences and Wh-questions is replaced by the binding noun phrase, is marked as a Wh form and becomes subject to Wh-rel-movement.

Thus, although the explanation of sentences like (16) on the basis of variable replacement seems clearly to capture the correct generalization, it entails a complication
of what was previously an extremely simple and elegant rule of grammar. However, I do not believe that this complication constitutes an argument for the abandonment of the hypothesis that noun phrases are in fact quantifiers. It would be relatively simple to have a separate rule of variable marking (analogous to variable replacement) which would apply to the structural description of relative clauses. Such a solution would seem premature, however. It seems equally plausible that inadequacies in our understanding of the logical relations in relative clauses might account for the apparent anomaly.

Indeed, it is clear that the treatment of relative clauses implicit here is incorrect in part. I have treated the relation between the head noun phrase of the relative clause and the sentence embedded in the relative clause as though it were the same as the relation between a noun phrase and the simple sentence in which it occurs. However, the logical relations between the men and the sentence x arrived are not the same in (21) and (22).

(21) The men arrived. \( \leq (\text{the men, } x) \ x \text{ arrived} \)
(22) The men who arrived \( \subseteq? (\text{the men, } x) \ x \text{ arrived, } y \)

Ignoring the definite description (which does not seem relevant to this discussion), in (22) the head noun phrase the men specifies a set \( S = \{ \text{men} \} \). The following sentence defines a subset of that set: namely, those of the set men who had arrived. This has (often been noted to be) the usual function of restrictive relative clauses in natural language. It is obvious that no set-subset relation exists in (21). The logical relations of (21) might be paraphrased roughly as follows. Arrival is a predication attributed to all those individuals of the class the men. Of course, the latter is equivalent to saying that arrival is predicated of the variables bound by the quantifier the men.

On the basis of the above examples, it would seem that
the formalism which I have implicitly used for relative clauses does not make the correct empirical claims. Although I cannot show that this is the case, I would hope that a more adequate treatment of relative clauses within the framework of the system developed by Keenan would also eliminate the complication of the rule of variable replacement which I discussed previously. It is not inconceivable that a more insightful treatment of the logical relations in relative clauses would allow the simple form of the rule of variable replacement to be used with relative clauses. The reader should note that the deficiencies in the underlying representation of relative clauses which I have just noted seem to be unconnected to the problem of picking out the left-most instance of a variable in a relative clause.

VII. Restrictions on Some

In the previous section I showed that the extended cross-over principle is not the only principled explanation of the fact that the left-most coreferential variable in a relative clause is marked as the unique Wh form. In this section I shall consider Postal's discussion of similarities in the restrictions on some and Wh forms.

In Chapter 21, Postal notes that there are similarities between the restrictions on Wh forms and those on some. We have seen that (1) is grammatical given a coreferential reading, but (2) is ungrammatical for that reading. The same pattern is true for (23) and (24).

(23) Who\textsubscript{i} first recognized Zeus created him\textsubscript{i}?
(24) *Who\textsubscript{i} did he\textsubscript{i} first recognize that Zeus created?

It might be proposed that this pattern is related to the fact that (25) is grammatical, but (26) and (27) are ungrammatical.

(25) Someone\textsubscript{i} first recognized that Zeus created him\textsubscript{i}.
Postal recognizes that the apparent restrictions on some in fact comply with the backwards condition on pronominalization. This is shown by sentences like (29) and (30), which would seem to derive from a structure similar to (26).

Thus, Postal notes no difference in the restrictions on pronominalization with some quantifiers.

On this basis Postal claims that sentences like (2) and (23) cannot be blocked on the basis of the restrictions on some. Since these restrictions are in fact restrictions on pronominalization, it would have to be the case that the restrictions on pronominalization are stable prior to those on Wh-Q-movement. However, Postal claims to have shown earlier that pronominalization follows Wh-Q-movement. Thus, according to Postal, the restrictions on pronominalization cannot be used to block (2) and (23).

VIII. The Relevance of Postal's Argument to the Hypothesis that Noun Phrases are Quantifiers

A brief review of how Postal's argument affects the present analysis is in order. My proposal does not attempt to link Wh forms to some or to any particular quantifier. Instead, I claim that all noun phrases are in fact quantifiers (or that they bind variables like quantifiers). Pronouns (in the form of bound variables) are generated in the underlying structure; the first instance of a variable is either replaced by the noun phrase binding it, or is marked as a Wh form in the case of relative clauses, or both, in the case of Wh-questions. It has therefore
been an explicit assumption of my analysis that the analogue of pronominalization, variable replacement, must be allowed to occur before Wh-Q-movement. Hence any valid argument that Wh-Q-movement must always precede variable replacement would be fatal to my proposal. Thus Postal's claim that Wh-Q-movement precedes pronominalization must be examined with greater care, in order to see whether that argument is valid in the case of variable replacement.

Postal (p. 80) contends that in order to generate both (32) and (33) from (31), it is necessary that Wh-Q-movement precede pronominalization.

(31) Charley\textsubscript{1} attacked Wh some of the men who hated Charley\textsubscript{1}.
(32) Which of the men who hated Charley\textsubscript{1} did he\textsubscript{1} attack?
(33) Which of the men who hated him\textsubscript{1} did Charley\textsubscript{1} attack?

If pronominalization precedes Wh-Q-movement, then only the second instance of Charley in (31) is in the correct environment for pronominalization. The first instance of Charley cannot be pronominalized since the conditions for backwards pronominalization are absent. However, if backwards pronominalization cannot apply to (31), then (32) cannot be generated—given the assumption that the correct order is pronominalization, then Wh-Q-movement. However, if Wh-Q-movement precedes pronominalization both (32) and (33) may be generated. Thus Postal concludes that the only possible ordering is Wh-Q-movement followed by pronominalization.

The same arguments which Postal uses with regard to pronominalization and Wh-Q-movement would appear to be valid with regard to variable replacement and Wh-Q-movement. Tree (34) shows the approximate underlying structure (excluding some) of (32) and (33), assuming that noun phrases should be represented as quantifiers.
If all instances of variable insertion occur before Wh-Q-movement, the following derivations are possible.

a. Insert NP_x in place of x in S_1, yielding 'Charley attacked x'. Then insert NP_y in S_3, yielding 'the men who hated x'. Next NP_z replaces x in S_1, giving as output 'Charley attacked the men who hated x'. Finally, x is rewritten 'him', giving 'Charley attacked the men who hated him'. Upon completion of all variable replacement transformations, the structure undergoes Wh-Q-movement, yielding a final output of 'Which men who hated him did Charley attack?'.

b. Insert NP_z in place of z (presumably after NP_y replaces y), yielding 'x attacked the men who hated x'. NP_x is then inserted in place of x in S_1. NP_x cannot replace x in S_3 since this would violate the backwards condition. After the insertion of NP_x and Wh-Q-movement, the final output would be 'Which men who hated him did Charley attack?', the same output as in a. above.

A general condition on variable insertion would be needed to prohibit the insertion of NP_x into S_3 before the insertion of NP_z containing S_3 into S_1. Otherwise it would be impossible to apply the backwards condition on variable replacement. This is because if NP_x were inserted into S_3 before S_3 were inserted in S_1, then the object of hate in S_3 would be the left-most (and only) instance of the variable x in the sentence. Thus x would be replaced by Charley. Upon insertion of NP_z in S_1, (35) would be generated.

(35) *He attacked the men who hated Charley.

Given (35) as an input, Wh-Q-movement would produce (36).
(36) Which men who hated Charley did he attack?

Thus it would seem that in order to generate (36), it would be necessary to predict that (35) is a well-formed surface structure—if all instances of variable replacement must precede Wh-Q-movement. That is, Postal's argument regarding the relative ordering of pronominalization and Wh-Q-movement would appear to be valid with regard to variable replacement and Wh-Q-movement. That this should be the case is not surprising, since variable replacement is intended to be analogous to pronominalization in every way. However, if the correct ordering is Wh-Q-movement and then variable replacement, variable replacement cannot be used to block the generation of (2), since if who is to the left of she at the time variable replacement occurs there is no violation of the backwards condition on variable replacement.

If the possible rule orderings are (a) all instances of variable replacement precede Wh-Q-movement, or (b) Wh-Q-movement precedes all instances of variable insertion, then Postal's arguments in Chapter 21 constitute a refutation of the main claim of this paper—that the rules of variable replacement (pronominalization) necessary for any grammar of English are sufficient to explain the ungrammaticality of sentences like (2). I have contended that no extension of the cross-over principle to those cases is necessary or desirable.

IX. Wh-Q-movement as an Anywhere Rule

In fact, there is another ordering possibility. If Wh-Q-movement is unordered with respect to variable replacement, the result will be the correct output. That is, I propose that Wh-Q-movement is an "anywhere rule": a rule which applies when its structural description is met.\(^3\) Of course, in a sense Wh-Q-movement would continue to be ordered after variable replacement, since the structural description of Wh-Q-movement requires the prior application of variable
replacement to the noun phrase marked Wh. However, if Wh-Q-movement is an anywhere rule, it would apply as soon as variable replacement moved the noun phrase marked Wh into the sentence. The following derivations demonstrate that if Wh-Q-movement is an anywhere rule, both (32) and (33) can be generated from (34).

c. NPz replaces z in S1, yielding 'x attacked the men who hated x'. Wh-Q-movement then moves NPz to the front of the sentence, producing 'Which men who hated x did x attack?'. This intermediate structure is then subject to either forwards or backwards variable replacement. Both (37) and (38) are generated by the rules of the grammar.

(37) Which men who hated Charley did he attack?
(38) Which men who hated him did Charley attack?

Since the general condition on variable insertion would prevent the insertion of NP into S3 before the insertion of NPz, which contains S3, into S1, the ungrammatical declarative sentence (35) would be blocked.

I believe I have shown that if it is assumed that noun phrases are quantifiers binding variables, and that the transformation of Wh-Q-movement is an anywhere rule in the post-cycle or final cycle, then there is no need to extend the cross-over principle to Wh-questions.

X. Constraints on Quantifier Crossing: an Apparent Counterexample

If it is the case that noun phrases are quantifiers, as I have claimed, it might be expected that they would obey any constraints which exist on overt quantifiers. By overt quantifier I mean words like all, some, etc. which are represented as quantifiers in standard logical notation. One characteristic often true of sentences with quantifiers—first noted by Noam Chomsky (1957)—is that the passive and active are not paraphrastic. For example, (39) is not synonymous with (40).
(39) All women love some men.
(40) Some men are loved by all women.

This does not seem to be the case with ordinary noun phrases, however. Sentence (41) is synonymous with (42).

(41) Women love men.
(42) Men are loved by women.

Thus it might be claimed that noun phrases cannot be quantifiers since, unlike overt quantifiers, their passives are paraphrastic.

However, a closer consideration of sentences like (41) and (42) suggests that the reason they are paraphrastic is not because they do not contain quantifiers, but rather because the subject and object superficial noun phrases are commanded by a covert quantifier which I shall call the "generic quantifier" (G). The underlying representation for (41) and (42) might be something like (43).

(43) \( (G, x (\text{women}, x)) \times ((G; y (\text{men}, y)) (y \text{ love } x)) \)

That is, noun phrases are to be embedded within quantifiers. The synonymy of (41) and (42) would then be explicable on the basis of the fact that the crossing of like quantifiers often produces no change in meaning. That this is true can be seen from the following examples.

(44) All women love all men.
(45) All men are loved by all women.

Sentences (44) and (45) are synonymous. This contradicts any claim that the crossing of quantifiers per se results in non-synonymy. It has been claimed that only the crossing of unlike quantifiers is non-paraphrastic. This is not correct, however. McCawley (1970) has pointed out that when sentences containing subject and object noun phrases with most are
passivized, the active and passive do not mean the same.

(46) Most of the boys danced with most of the girls.
(47) Most of the girls were danced with by most of the boys.

I assume most to mean more than half. In situation (48) sentence (46) is true, but (47) is not. Lines indicate who danced with whom.

(48) Harry Moishe Jose Ahmad Lew
     Zippi Mary Najet Florence Loretta

Three of the boys (Harry, Moishe, and Jose) danced with three girls. Hence (46) is true. However, only two girls (Mary and Najet) danced with three boys. Thus (47) is false.

In fact, I should not wish to claim without detailed investigation that the crossing of any unlike quantifier results in non-synonymy. If the definite description is a quantifier as has generally been assumed, unlike quantifiers are crossed in (49) and (50). However, no loss of synonymy is immediately apparent.

(49) All of the guys love the new secretary.
(50) The new secretary is loved by all of the guys.

Clearly, a detailed examination of the crossing behavior of natural language quantifiers is called for. Crossing behavior does not seem to me to provide evidence against the hypothesis that surface noun phrases are quantificational.

There may be some question regarding whether it is necessary to posit a new quantifier G for generic noun phrases. One might claim that generics are variants of the universal quantifier. However, the incorrectness of identifying generics with the universal quantifier can be seen from the following examples.
(51) All women love all men.
(41) Women love men.

Sentences (41) and (51) are not paraphrastic. In (51) it is claimed that each individual woman loves each individual man. That is, under universal quantification the relation is *predicted of each member* of the class quantified over. This is not true for generics, however. Although (41) claims that a love relationship tends to hold between members of the class *women* and members of class *men*, it is incorrect to infer from this that such a relationship holds between any particular members of those classes. Thus the universal quantifier and the generic quantifier are not identical.

XI. Noun Phrases as Predicates

An additional difficulty with analyzing noun phrases as containing quantifiers is intuitive rather than formal. In sentences like (52) the surface noun phrase *boys* appears to function as a predicate.

(52) They are boys.

However, in (53) my analysis requires that *boys* contain a quantifier.

(53) Boys like dogs.

Sentence (53) derives from an underlying structure like (54).

```
(54)  
      S  
     /\  
    NP y  NP x  S  
   /\  /\    /\  
  Q x Q y Q x  
 /\  /\  /\    /\  /\  
G boys x G dogs y x like y
```
It would seem at first glance that in some cases surface noun phrases are quantifiers and in other cases they are predicates.

An intuitive inconsistency analogous to this is found in standard logical notation. Standard logical notation would treat both boys and dogs as predicates in (53), but would analyze Thelma and Hildegarde as logical constants in (56).

(55) \( \forall(x) \ (\text{boy}(x) \rightarrow \forall(y) \ (\text{dog}(y) \rightarrow \text{like}(x,y))) \)

(56) Thelma likes Hildegarde.

(57) Like (Thelma, Hildegarde).

Thus standard notation reflects the claim that noun phrases, which in terms of surface syntactic relations seem to function similarly, actually have dissimilar logical properties.

Reducing the problem to its essentials, it is clear that noun phrases have properties generally identified with quantifiers. In particular, they bind variables. It is also clearly the case that noun phrases often have the characteristics of predicates. These qualities are not mutually exclusive. The noun phrase boys in (53) seems to include the predication (52) in some obvious way. It seems useful to express this fact explicitly, as in (58).

(58)

Thus the previous analysis is modified so as to emphasize the dual role of noun phrases: containing both quantifiers and predicates.

At this point I would like to indicate an additional link between noun phrases, quantification, and pronominalization (variable replacement). This link is considerably more tenuous than those which I noted earlier, but still seems worth noting. Earlier
in this paper I noted that Postal's backwards condition must apply to variable replacement. The backwards condition is quite similar in form to constraints on quantifiers proposed by George Lakoff (1969). Roughly, Lakoff proposed that if a quantifier Q\(_a\) commands a quantifier Q\(_b\) in underlying structure, then Q\(_a\) is to the left of Q\(_b\) in surface structure, or Q\(_a\) commands Q\(_b\) in surface structure and Q\(_b\) does not command Q\(_a\) in surface structure.

The backwards condition can be phrased in an analogous way. If x\(_l\) is the left-most instance of a variable x bound by a quantifier Q in underlying structure, then x\(_l\) is the left-most instance of x in surface structure, or x\(_l\) commands and is not commanded by any other instances of x in surface structure. Lakoff's constraints deal with the position in surface structure of underlying quantifiers, while the backwards condition deals with the position in surface structure of variables bound by quantifiers. Thus the constraints apply to different constituents. The content of the constraints is similar, however, suggesting that the two phenomena in question may be related.

XII. Variable Replacement: Transformation or Rule of Semantic Interpretation

Earlier in this paper I argued that some rule like variable replacement is necessary in any theory of grammar. I left open the question of whether there is any evidence suggesting whether such a rule is a syntactic transformation or a rule of semantic interpretation. Jackendoff (1969) has argued in his dissertation and elsewhere that pronominalization is a rule of semantic interpretation. Lakoff (1969) explicitly claims that quantifier lowering is a cyclic transformation. Until the development of the extended standard theory, it was generally assumed that pronominalization was a transformation. Within the framework I have proposed pronominalization, quantifier lowering, and variable replacement are different names for the same phenomenon. What I would like to consider here is whether, assuming the correctness of my analysis, there is any reason to believe that variable replacement is
a syntactic transformation. I shall argue that there is in fact evidence to that effect.

Crucial to my argument is the assumption that Wh-Q-movement is a syntactic transformation. Although it is not impossible that the preposed forms found in Wh-questions are generated by the base, this would lead to a host of problems. In particular, it would have to be claimed that sentences with transitive verbs lacking objects are grammatical, but that they are marked anomalous by the semantic component in those cases where there is no preposed Wh form. This analysis would seem unable to capture the fact that sentences with objects and Wh questions asking about those objects are intuitively a unitary phenomenon. I shall therefore assume that Wh-Q-movement is a syntactic transformation.

Although Jackendoff et al. are less than explicit on this matter, there is reason to believe that the supporters of the interpretive framework would like to distinguish between syntactic transformations and rules of semantic interpretation in the following way. Although syntactic transformations can be input to rules of semantic interpretation, interpretative rules cannot be input to syntactic transformations. However, if my analysis is correct, the output of variable replacement must be input to Wh-Q-movement. Thus, since Wh-Q-movement is a syntactic transformation, its input must also be a syntactic transformation.

I conclude that if my analysis is essentially correct, and if Wh-Q-movement is a syntactic transformation, then variable replacement must also be a syntactic transformation. Of course, the acceptance of variable replacement as a syntactic transformation would in no way show that the bifurcation of the rules of the grammar into syntactic transformations and rules of semantic interpretation is incorrect. However, it would seem counter to the spirit of the lexicalist hypothesis if rules with the intuitively "semantic" character of variable replacement were to be included in the syntactic component. I would hope that this would raise some question as to the fruitfulness of the division of the rules of the grammar in this way.
Footnotes

Many of the ideas in this paper reflect my reaction to proposals made by Edward Keenan during his lectures to the Seminar on Mathemtico-Philosophical Semantics, which he conducted together with John Corcoran at the 1971 Linguistics Institute. The possibility of treating the phenomena which Paul Postal explains by the extended cross-over principle as an example of quantification was suggested by Jerry Morgan during classroom discussion of Postal's Cross-over Phenomena. I have elaborated Keenan's and Morgan's suggestions considerably, and they obviously bear no responsibility for errors in my analysis.

Thanks are due to the Mathematical Social Science Board and to the Center for English as a Second Language, Southern Illinois University, for supporting my participation in the Seminar on Mathemtico-Philosophical Semantics.

1 This is a simplification of Keenan's position. It is beyond the scope of this paper to explicate Keenan's motivation for positing underlying structures like (6). An earlier system with similar logical properties is presented in Keenan's dissertation (1969); his current position was presented in lectures at the 1971 Linguistics Institute and to some extent in Keenan (1971a and 1971b). A full exposition will appear in Keenan (forthcoming).

In these works Keenan presents syntactic and semantic justification for the treatment of surface noun phrases (including proper nouns) as having the properties attributed to quantifiers in standard logics. Note that a somewhat similar proposal was independently put forward in McCawley (1967).

For the purposes of this paper, it is sufficient to note that if Keenan's claim that his system constitutes an adequate treatment of logical presupposition in sentences with transparent and opaque readings is correct, this fact provides an independent motivation for the treatment of putative cross-over phenomena on the basis of general principles necessary for Keenan's system.

2 Or, $\forall x (\text{man}(x) \rightarrow \text{chauvinist pig}(x))$ in unrestricted quantifier notation.

3 Presumably, Wh-Q-movement is an anywhere rule anywhere within the post-cycle (or final cycle).

4 I realize, of course, that until a formal semantics for G is proposed in which the truth and falsehood conditions for G are rigorously specified, these remarks are conjectural.

5 Lynette Hirschman has made a detailed study of the effect of quantifier crossing in the case of universal and existential quantifiers.
In order to claim that all noun phrases are quantificational I should be able to demonstrate that there is reason to believe that all noun phrases without overt quantifiers contain covert quantifiers.

Jerry Morgan has noted some data which suggest that covert quantifiers do not behave identically to overt quantifiers. In Morgan's dialect (i) and (ii) are grammatical, but (iv) is not.

(i) Joe goes downtown when he gets up.
(ii) When he gets up, Joe goes downtown.
(iii) Each boy goes downtown when he gets up.
(iv) *When he gets up, each boy goes downtown.

For Morgan pronouns bound anaphorically to overt quantifiers may not precede their antecedents. This is not the case in regard to pronouns bound to covert quantifiers. I have no explanation for these facts at present.

These facts were pointed out to me by Jerry Morgan.
REFERENCES


_______. Forthcoming. Semantically based grammar.


