Pronouns, Quantifiers, and Relative Clauses (I)

GARETH EVANS, University College, Oxford

1. Introduction

Some philosophers, notably Professors Quine and Geach, have stressed the analogies they see between pronouns of the vernacular and the bound variables of quantification theory. Geach, indeed, once maintained that 'for a philosophical theory of reference, then, it is all one whether we consider bound variables or pronouns of the vernacular'.[1] This slightly overstates Geach's positition since he recognizes that some pronouns of ordinary language do function differently from bound variables; he calls such pronouns 'pronouns of laziness'. Geach's characterisation of pronouns of laziness has varied from time to time, but the general idea should be clear from a paradigm example:

(1) A man who sometimes beats his wife has more sense than one who always gives in to her.

The pronouns 'one' and 'her' go proxy for a noun or a noun phrase (here: 'a man' and 'his wife') in the sense that the pronoun is replaceable in paraphrase by simple repetition of its antecedent.[2]

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1 P. T. Geach, *Reference and Generality* (Cornell University Press, Ithaca, 1962), p. 112.

2 For a record of the change in definition see first *Reference and Generality*, pp. 124ff., then 'Referring Expressions Again', in *Logic Matters* (Blackwell, Oxford, 1972), pp. 97-8, then 'Back-Reference', *Philosophia* 5 (1975), p. 194. The change turns out to be important.

However, if we leave such cases out of consideration for the time being, we are left with two main kinds of situation in which pronouns occur, and Geach appears to want to say that in both of them pronouns are functioning in the way bound variables of quantification theory function. In the first kind of situation, the pronoun has a singular term as its antecedent, as, for example, in

(2)   John loves his mother
(3)   ' John is happy when he is in love.

In the second kind of situation, the pronoun has a quantifier expression, or what Geach calls 'an applicatival phrase', as its antecedent; as, for example, in

(4)   Some man loves his mother
(5)   No man is happy when he is in love.

From Geach's writings on pronouns it becomes clear in what the analogy between pronouns and bound variables is taken to consist. Time and again, in those writings, his target is the "lazy assumption" that we can understand the functioning of pronouns by labelling them "referring expressions" and enquiring into what they refer to. Just as it makes no sense to ask about the reference of any particular occurrence of the variable 'x' in the sentence

$$(\exists x)(Fx \ \& \ Gx),$$

Geach's idea is that it equally makes no sense to enquire into the reference of English pronouns. Correspondingly, just as there are many sentential contexts containing variables which cannot be regarded as having truth values, on Geach's view there will be many English sentences containing pronouns which cannot be regarded as complete sentences with a truth value.

For at least some occurrences of pronouns in English, these parallels with bound variables appear quite striking. Geach is surely right that it does make no sense to enquire into the reference of the pronoun in

(4)   Some man loves his mother.

And, just as it makes no sense to ask for the truth value of the sentence 'Gx' in the formula

$$(x)(Fx \supset Gx),$$

468

surely Geach is right that we cannot assign a truth value to the sentence 'he admires Mozart' as it occurs in

If any man loves music he admires Mozart.

Despite this, I find myself in considerable disagreement with the *general* equation between pronouns and bound variables which Geach has put forward. My disagreement consists of two independent points which I can best summarize as follows.

First, take any sentence containing a pronoun which has a quantifier antecedent, and which is admittedly functioning like a bound variable, e.g. (4) and (5). Paired with any such sentence is a well-formed sentence in which a singular term stands in place of the quantifier expression, as (2) and (3) are respectively paired with (4) and (5). Now, Geach appears to want to insist that pronouns function like bound variables even when they have singular terms as antecedents, so that they too cannot be assigned a reference, nor can their most immediate sentential context always be assigned a truth value. For example, Geach appears to want to regard the sentence:

If John loves music he admires Mozart

as the result of attaching a complex conditional predicate to the name 'John', so that the function of the pronoun 'he' cannot be said to be that of referring to John nor can the sentence be regarded as the conditional compound of two sentences each of which has a truth value.

I do not wish to claim that Geach's way of looking at pronouns with singular antecedents is incorrect, though I shall mention one or two advantages of looking at them another way. My first disagreement with Geach is on the question of whether it is *necessary* to adopt his way of looking at such pronouns. Geach believes that if we are to recognize the status of pronouns which have quantifier antecedents as akin to bound variables — as expressions whose function is not to refer — then we must say the same about the pronouns in those singular sentences from which the quantified sentences may be regarded as got by substitution. This seems to me to be a mistake. I shall argue that the semantical significance of these pronoun-antecedent construc-tions can be exhaustively stated in terms of a simple principle according to which a pronoun refers to whatever its singular antecedent refers to. Such an account is entirely adequate, not merely in the sense that it explains the functioning of pronouns with singular antecedents, but in the sense that no further explanation of the functioning of pronouns with quantifier antecedents is called for.

The fact that there are two equally viable approaches to the semantics of these pronoun-antecedent constructions — Geach's approach and the co-referential approach — is of no great moment in itself. It is an entirely trivial consequence of the fact that there are two different approaches to the semantics of quantified sentences, which I will outline in section 2 below. As with other points that I shall make in this paper, this point is only worth making because Geach has denied it, many times and with great vehemence.

For the purpose of this first dispute, then, it is common ground that certain pronouns with quantifier antecedents function just like bound variables — the issue is rather how this effect is to be achieved. But my second, and much more important, disagreement with Geach arises over the question of just how many pronouns with quantifier antecedents can be seen as functioning in this agreed way. I want to try to show that there are pronouns with quantifier antecedents that function in a quite different way. Such pronouns typically stand in a different grammatical relation to their antecedents, and, in contrast with bound pronouns, must be assigned a reference, so that their most immediate sentential contexts can always be assigned a truth value. The relevant grammatical relation appears to be Klima's relation of 'in construction with'.[3] When the pronoun is in construction with its antecedent, as in (4) and (5), the result is a bound pronoun. But when it is not, as in

(6)   Mary owns a donkey and John beats it
(7)   John owns many sheep and Harry vaccinated them last July,

the pronouns must be regarded as having a reference, so that the second conjunct in both sentences may be assigned a truth value. I call these pronouns 'E-type pronouns'.

E-type pronouns will occupy us for the bulk of this paper. But first I want to consider the other issue, since it will help us in thinking about pronouns that do not function like bound variables to have considered some that do. And before I can embark upon the question of the proper treatment of pronouns that do function like bound variables, I must first say something about two different approaches — the Tarskian and Fregean approaches — to the semantics of quantified sentences.

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3   E. Klima, 'Negation in English', in J. Fodor and J. Katz (eds.) *The Structure of Language* (Prentice Hall, Englewood Cliffs, 1964), p. 297.

2. Two approaches to the semantics of quantified sentences

The major problem posed for semantic theory by quantified sentences of both natural and artificial languages arises because of the curious dual role which connectives and quantifiers play. The connectives 'and', 'not', 'if..., then', etc., both have the role of forming complex sentences from sentences, and of forming complex predicates from predicates. Thus we have

It is not the case that snow is white

as well as

Some men are not bald,

and

Snow is white and grass is green

as well as

Some men are young and bald

The quantifiers also have a dual role. Sometimes they form sentences from predicates, as 'Someone runs' is formed from 'runs', and sometimes they form predicates of degree n-1 from predicates of degree n, as 'loves someone' is formed from 'loves'.

This poses the following problem. Our first instinct would be to provide an account of the sentence-forming role of these expressions in terms of the *truth* conditions of the resulting expression, and of their predicate-forming role in terms of the *satisfaction* conditions of the resulting expression. So, for example, if we followed our first instinct with the expression 'and', we should have the principle

(A) Any sentence S'and'S' is true iff S is true and S' is true

to deal with the sentence-forming role, and the principle

(B) An object satisfies a predicate of the form F'and'G iff it satisfies F and it also satisfies G

to deal with the predicate-forming role. But, by having two independent principles for the single semantical unit 'and', we deem it to be ambiguous, which our second instinct would be to say is absurd.

471

Gareth Evans

There appear to be two logically possible ways of solving this problem, and theories along both lines have been constructed. Either a theory takes the sentence-forming role as basic, keeps principles like (A), and somehow or other contrives to explain the predicate-forming role in terms of it. Or alternatively, the predicate-forming role is taken as basic, and the sentence-forming role is somehow derived from principles like (B). The first approach is associated with the name of Frege, and the second with that of Tarski.

Tarski was able to manage with principles of the form (B) alone, because he assimilated closed sentences to predicates, assigning to them, as well as to predicates, conditions under which objects satisfy them.[4] The essentials of the trick can be seen if we suppose Tarski's formal language had also contained certain unstructured propositional constants P and Q, with, for example, the meaning of 'Snow is white' and 'Grass is green'. Then instead of explaining their semantic significance in a natural way

P is true iff snow is white
Q is true iff grass is green

but in a way which would not integrate with the clause for conjunction when the sentence 'P and Q' had to be dealt with, Tarski would have had clauses which effectively assigned them an extension:

An object satisfies P iff snow is white
An object satisfies Q iff grass is green

Since these clauses are of the form '$(x)(Fx \equiv R)$' we know immediately that either every object satisifes these sentences or no object satisfies these sentences according to whether or not they are true or false. So it will be open for us to define a true sentence as a (closed) sentence with the universal extension. With this definition of truth, it is easy to show that the truth-functional role of the connective 'and', for example, as forming truths when and only when flanked by truths, is a special case of its role of forming an expression which is satisfied by an object iff that object satsifies both of the expression which flank it.

Perhaps the point comes out most clearly if we look at the matter model-theoretically. 'And' is assigned a function from pairs of sets to their intersection, 'not' is assigned a function from a set to its complement, and so on. It is clear that $f_{and}(a,b)$ = the universal set iff $a = b$ = the universal set, and $f_{not}(a)$ = the universal set iff a = the

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4 A. Tarski, 'The Concept of Truth in Formalized Languages', in *Logic, Semantics and Metamathematics* (Clarendon, Oxford, 1956).

472

empty set. So if we define T = the universal set, and F = the empty set, the truth-functional role drops out as a special case.

This will achieve the desired results, but only so long as it is arranged that true closed sentences are satisfied by every object and false closed sentences are satisfied by none. It is easy to arrange this case by case for unstructured propositional constants, but it remains to be seen how Tarski arranged it for structured and closed atomic sentences. Pretend for a moment that the language under considera-tion contains only monadic predicates, and that the only way of forming a closed atomic sentence is by combining a quantifier with a predicate. Then, the most natural way of stating the semantic effect of the quantifiers would be in clauses which spoke of truth, along the lines of

(C)   A sentence of the form 'Something'$\widehat{\ }$A is true iff something satisfies A.

To give closed sentences the properties Tarski requires, (C) must be replaced by a principle which states the impact of the quantifiers in terms of satisfaction:

(D)   An object satisfies 'Something'$\widehat{\ }$A iff something satisfies A

Once again, this has the form of '$(x)(Fx \equiv R)$', and the effect that a closed sentence is satisfied by all objects iff it is true, and by no objects iff it is not true.

So long as we consider languages all of whose atomic predicates are monadic, the form of (D) could only be explained by a desire to assign closed predicates an extension, in order that the predicate-forming role of the connectives can be taken as basic. But once the language contains polyadic predicates, the quantifier also doubles as a predicate-former, so that a clause of the form of (C) is not adequate by itself, and a clause, like (D), dealing in terms of satisfaction has some independent advantages. In fact it has to be more complex than (D), speaking in terms of satisfaction by ordered *n*-tuples, or sequences, of objects, and comprising some device for keeping track of which position in a complex predicate goes with which other. But it will have the same effect as (D), in that, when the quantifier is initial and the sentence closed, the conditions under which a sequence of objects satisfies it have nothing to do with the particular properties of that sequence, so that either every sequence will satisfy it, or none will.

Frege's alternative strategy is less well known, and certainly less widely appreciated as a genuinely alternative solution to the problems

473

posed by the dual status of the connectives and quantifiers.[5] The Fregean strategy is to take the sentence-forming roles of the connectives as basic, with principles like (A) which deal in terms of *truth* as exhaustive statements of them. The theory is able to deal with sentences in which connectives operate upon predicates, or expressions which cannot be assigned a truth value, because in the course of evaluating such sentences, and by the time the contribution of the connective is to be accounted for, the sentence will have undergone a metamorphosis, as a result of which the constituents upon which the connective operates are, once again, complete sentences.

The main idea of a Fregean truth theory for quantified sentences is that 'in the case of a complex predicate, the notion of a predicate's being true or false of an object is derivative from that of the truth or falsity of the sentence which results from filling the argument-place of the predicate with a name of that object.'[6] We may use a simple principle for the quantifiers like (C) but the relation of satisfaction which holds between an expression and an object to which that clause directs us is, in the case of a complex predicate, defined in terms of the truth value of the sentence which results when a singular term referring to that object is substituted in the predicate, or, if the language contains no name for the object, in terms of the truth value, in some extension of the language, of a sentence which results when a singular term which refers to that object upon that extension of the language is substituted in the predicate. We must assume that for every object there is an extension of the language which contains a name for that object, although at no stage are we obliged to assume that there is an extension of the language which contains a name for every object.

It should be clear how such a conception of satisfaction enables a theorist to dispense with any explanation of the role of connectives and quantifiers other than that stated in terms of truth. Thus, for example, 'Some man is such that he is young and he is bald' is true iff there is a man that satisfies the predicate 'he is young and he is bald'.

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5 My attribution of this theory to Frege rests upon Dummett's. See M.A.E. Dummett, *Frege* (Duckworth, London, 1973) ch.2 and pp. 516-7. I disagree with Dummett by holding that the Tarskian approach is not just a notational variant of Frege's.

Fregean treatments of quantifiers may be found, for example, in B. Mates, *Elementary Logic* (Oxford University Press, New York, 1965), pp. 54, E. L. Keenan, 'Quantifier Structures in English', *Foundations of Language* 7 (1971), p. 262 and *passim*, and throughout Geach's writings.

6 Dummett, *Frege*, p. 405.

Now, an object y satisfies this predicate iff upon that extension of the language on which β denotes y, 'β is young and β is bald' is true.[7] At this point we may invoke the simple principle (A) for sentential conjunction, and derive the result that y satisfies 'he is young and he is bald' iff upon that extension of the language on which β denotes y, 'β is young' is true and 'β is bald' is true. Since we know that a sentence of the form 'β is young' is true iff the denotation of β is young and a sentence of the form 'β is bald' is true iff the denotation of β is bald we derive the conclusion that y satisfies the complex predicate iff y is young and y is bald, so that the whole sentence is true iff there is an object that is young and bald.

There are similarities between Fregean truth theories and the substitutional truth theories familiar from the work of Prof. Marcus.[8] Both run their recursions directly on truth, and both take the sentence-forming roles of operators as basic. But there are crucial differences which I have tried to bring out by separating the clauses for the quantifiers (like (C)) and the clause giving a general explanation of the notion of satisfaction.[9]

Unlike the substitutional truth theory, the Fregean truth theory introduces no new concept of existence — the principle (C) uses the perfectly ordinary, objectual, concept of existence. And for every object that we deem to exist in this sense, we are obliged to consider as relevant to the truth value of quantified sentences, the truth value of a substitution instance that may be formed with the use of a term denoting that object, while at no point are we permitted to consider as relevant the truth value of substitution instances formed with the use of non-denoting names.

The net effect of these two provisions is to deprive the Fregean truth theory of any ontological interest whatever. But, the fact that a

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7 β is a name assumed not to occur already in the sentence. It is convenient to define the relation of extension holding between language so that, as a limiting case, each language extends itself. We define truth not just for English but all the members of a family of languages which extend the stock of English singular terms.

8 See e.g. R. B. Marcus, 'Interpreting Quantification', *Inquiry* 51 (1962), pp. 252-259. For an excellent discussion of substitutional quantification see S. Kripke's 'Is there a problem about Substitutional Quantification?' in G. Evans and J.H. McDowell (eds.) *Truth and Meaning* (Clarendon, Oxford, 1975) pp. 325-419.

9 Now that this heuristic purpose has been discharged, I shall in later pages collapse the two principles into something along the more familiar lines of:
   A sentence of the form 'Something' A is true iff, upon some
   extension of the language, there is a substitution instance of
   the form βA which is true.

475

Fregean truth theory is not an ontological rival to a Tarskian theory should not lead us to think that it is not a semantical rival. Using the leading idea of the Fregean theory, it is easy to construct homophonic theories for standard first order languages which unquestionably take the sentence-forming roles of the quantifiers and connectives as basic. And the idea can be generalized to deal with quantification into any context. From the Fregean point of view, once an operator has been given a clear sense when attached to a closed sentence (containing singular terms), then no additional explanation is required for quantification into the context created by that operator.[10]

Although this is not the place to argue the matter, I do not think that the existence of the Fregean alternative is of merely technical interest. It is true that the Fregean theory with its direct recursion on truth is very much simpler and smoother than the Tarskian alternative, whose mechanism of infinite sequences differing in at most this or that place is dispensed with. But its interest does not stem from this, but rather from examination at a more philosophical level. It seems to me that serious exception can be taken to the Tarskian theory on the ground that it loses sight of, or takes no account of, the centrality of sentences (and of truth) in the theory of meaning; Tarski's assimilation of sentences to a certain kind of complex predicate is open to objection along just the same lines as the later Frege's assimilation of sentences to a certain kind of complex name.[11] Further, in the case of some expressions which double as both sentence- and predicate-formers, a direction of explanation which takes their sentence-forming role as basic seems to be the only possible one,[12] while in all cases it is more natural.[13] This greater naturalness has a lot to do with

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10 It is interesting to note that some of the delicacy of substitutional quantification into opaque contexts can be retained by Fregean quantifiers despite the ontological burden — that is to say, despite the fact that we are given licence to consider, for every object, a substitution instance involving reference to it. However, once we are dealing with opacities, we must interpret an object's satisfying a complex predicate $A(x)$ in terms of the truth of *some* (potential) singular sentence of the form $A(t)$ in which refers to it, and not the truth of *any* such singular sentence.

11 For cogent statements of this criticism, see Dummett, *Frege* pp. 3-7, pp. 194ff.

12 I particularly have in mind operators like 'It is certain that', 'John believes that'. I disagree with J. Wallace's paper 'Belief and Satisfaction', *Nous*, 6 (1972), p. 85, in which the converse, Tarskian, direction of explanation is defended.

13 This naturalness has certainly struck Quine; see the account in *The Roots of Reference* (Open Court, La Salle, Illinois, 1973), pp. 93-5, of the child's understanding the satisfaction by an object of a complex predicate in terms of the substitution of singular terms.

476

the fact that the interpretation of these operators is empirically more determinate in their sentence-forming roles.

Important though these points are for the general theory of quantification, they are not of immediate importance for us.[14] For us, all that matters is that the Fregean theory of meaning for quantified sentences should at least be deemed to be a coherent theory. Certainly Geach's opposition to the position on pronouns which I wish to defend as coherent does not rest upon doubt about this point, for he himself is prone, in his writings, to give truth conditions for quantified sentences along Fregean lines.[15]

Let us turn directly to the bearing these matters have upon the proper treatment of pronouns.

3. Bound pronouns and pronouns with singular antecedents

What function do the pronouns have in the sentences

(2)   John loves his mother
(3)   John is happy when he is in love ?

In addressing myself to this question, I am going to assume that there exists no compelling syntactic reason for supposing that sentences containing pronouns are derived transformationally from underlying structures in which there are repeated occurrences of singular terms. I do not make this assumption because I have been persuaded by the arguments against the existence of such a transformation, but because it seems to me that if such were the origin of pronouns in singular sentences, the dispute between Geach and myself would have an easy resolution in my favour.

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14   Those who are interested in the strengths and weaknesses of Fregean truth theory for quantifiers would benefit from reading T. Baldwin's paper, 'Quantification, Modality and Indirect Speech', in S. Blackburn (ed.), *Meaning, Reference and Modality* (Cambridge University Press, Cambridge, 1975). Baldwin dispenses with the idea of enlarging the singular terms of the language by exploiting the machinery independently needed for dealing with sentences containing demonstratives.

15   See, for example, the truth conditions for the quantifiers given throughout *Reference and Generality*, and also the discussion in 'Quantification Theory and Objects of Reference', *Logic Matters*, pp. 141ff. It is true that it is not always possible to tell whether Geach has in mind purely substitutional or Fregean truth theories.

Gareth Evans

One pretty obvious answer to the question is this: the pronouns are singular terms referring to whatever their antecedents refer to. Let me try to expand this answer a bit.

Let us suppose that the base component of a grammar for English generates what I shall call *sentence frames* of the form

(   ) loves (   )
(   ) is happy when (   ) is in love

In addition, we are permitted to form sentence frames from sentence frames by linking together two or more singular term positions in any sentence frame. Any device for this linking will do. We could use repeated occurrences of the same letter to link a number of singular term positions together, and then our sentence frames would look like this:

(x) is happy when (x) is in love.

Alternatively, we could use a brace notation suggested by Quine,[16] and then they would look like this:

(⌐) is happy when (⌐) is in love.

We can call a series of singular term positions linked together in this way a *chain* of singular term positions, and for convenience we regard a single position as a 1-link chain. We can form sentences from sentence frames by the insertion of singular terms into singular term positions in such a way that there is one and only one term in every chain. Thus

(John) loves (   )

(John) loves (⌐) and (Mary) loves (   )

are sentences. Chained, but empty singular term positions will be realized in surface structure as pronouns of the appropriate number and gender.[17]

A semantic theory which issues the simple answer which I have just given to the question 'What are these pronouns doing here?' would be

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16 W.V.O. Quine, *Mathematical Logic* (Harvard University Press, Cambridge, 1965), p. 70.

17 In allowing unrestricted forward and backward 'pronominalization' this simple grammar is quite unrealistic, but the tricky syntactical question of demarcating where 'pronominalization' is allowed and where obligatory really does not affect the semantical issues I am dealing with.

478

one which contained the following principle as an exhaustive account of the significance of the pronoun + brace device:

(F)   If σ is a sentence containing the singular term positions p_i and p_j which are chained together, and p_i contains the singular term τ and p_j contains the pronoun κ, then the denotation of κ in σ is the same as the denotation of τ.

By the application of such a principle, the truth conditions of sentences (2) and (3) would be given in the (slightly non-homophonic) theorems:

'John loves his mother' is true iff John loves John's mother
'John is happy when he is in love' is true iff John is happy when John is in love.[18]

Let us call the treatment which rests upon a principle like (F) the *co-referential treatment of pronouns*. I should say right away that I regard this as a proposal quite different from the proposal that pronouns with singular antecedents are 'pronouns of laziness'. When we say that an expression 'goes proxy for' some chunk of text, we evaluate the sentence containing it just as if the expression was replaced by what it goes proxy for.[19] In many cases, the two treatments will have the same results, but they nevertheless invoke different mechanisms which produce divergent results in some examples.

Now, it has been widely thought that the co-referential treatment of pronouns is simply inadequate to deal with pronouns whose antecedents are not singular terms but quantifier expressions, like those in (4) and (5). But this criticism is ill-informed. For, if a Fregean statement of the truth conditions of quantified sentences is adopted, nothing more needs to be said about the pronouns with quantifier antecedents — they simply look after themselves.

Let us call expressions like 'some', 'many', 'the', 'a', 'few', 'every' *quantifiers*, and a quantifier plus a common noun, like 'some man', 'a girl', etc. a *quantifier expression*.[20] We extend the grammar to allow that any sentence containing a singular term in a position, p_i remains well formed when a quantifier expression is substituted for it in p_i. (Inserting the quantifier into the singular term position being

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18   I consider the significance of the departure from homophony below.

19   I discuss the merits of the 'going proxy for' idea below.

20   I do not introduce quantifier phrases with relative clauses until section 5.

generalized upon does appear to be the way we indicate in English which quantifier goes with which position.) Since left-right ordering is not reliably used to indicate scope, we had better indicate with numerical subscripts the order in which the quantifiers are inserted in the construction of a sentence. Thus we distinguish

> (Every$_1$ man) loves (a$_2$woman) = There is a woman every man loves

from

> (Every$_2$ man) loves (a$_1$ woman) = For every man, there is a woman he loves.

The semantic account of the quantifiers will have the form with which we are already familiar, but in which some account is taken of the common noun restricting the quantifier. Thus, for example, we have the following principle for the quantifier 'Every':

(G)   If σ is a sentence containing in its ith singular term position the quantifier expression 'every'$_j$ δ (where σ is a common noun and j an index than which no other index attached to any quantifier in σ is higher) then σ is true (in L) iff on every extension of L with respect to some singular term β which does not already occur in σ on which the object which β denotes on that extension satisfies δ, σ^{β}/p_i is true.

(I write 'σ^{β}/p_i' as an abbreviation for 'the sentence which results when β is substituted for whatever occurs in the ith singular term position in σ'.)
It should be easy to see how clauses like (G) and (F) suffice to deal with the occurrence of pronouns with quantifier antecedents. The grammar enables us to form sentences like:

(Some$_1$ man) loves (‾‾‾) mother

realized in surface structure as

(4)   Some man loves his mother.

Certainly we would get nowhere if we attempted to apply the rule dealing with pronouns directly, for the quantifier expression 'Some man' has no denotation. But if we apply the rule for the quantifier first, as we should, since the order in which the sentence is constructed gives it widest scope, we find that the truth of (4) depends upon

whether or not there is some true (potential) substitution instance of the form

(β) loves ($\quad$) mother.

Now the pronoun rule can apply, eventually yielding the result that such a sentence is true iff the denotation of β loves the mother of the denotation of β. By elementary manoeuvrings which can easily be imagined, we will arrive at the result that (4) is true iff there is a man such that that man loves that man's mother.

Just as a semantic theory which adopts a Fregean explanation for the truth conditions of quantified sentences can take the truth-functional role of the connectives as basic, so such a theory can regard pronouns as devices for registering co-reference (understood strictly). Or at least, so it would appear. We shall have to consider Geach's arguments against this way of understanding pronouns, but I hope it does not appear *obviously* absurd and unpromising.

I suspect that many philosophers and linguists have meant no more by talking of the existence of variables in deep structure, and of the parallelism between pronouns of the vernacular and variables of quantification theory, than that there exists in natural language a device for marking chains of co-reference of which pronouns are the superficial manifestations.[21] But this is certainly not what Geach intends by his claim of parallelism. For Geach's claim to be correct, pronouns must be the manifestations of a device which is essentially a device for the formation of complex predicates. With the Tarskian semantics in mind, we might say: a device that registers co-assignment, not co-reference. On the semantic theory just sketched, this claim will not hold good, as we may see by considering a sentence like:

If John is here, he will be sorry.

On the one hand, the expression:

If ($\quad$) is here ($\quad$) will be sorry

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21 See, for example, the discussions in G. Lakoff, 'Linguistics and Natural Logic', in D. Davidson and G.H. Harman (eds.), *Semantics of Natural Languages* (D. Reidel, Dordrecht, 1972) p. 633, and E. Bach, 'Nouns and Noun Phrases', in E. Bach and R.T. Harms (eds.), *Universals in Linguistic Theory* (Holt Rinehart and Winston, New York, 1968).

481

receives no semantic interpretation, and is not acknowledged to constitute a semantical unit, while the expression which is realized in surface structure as 'he will be sorry' is treated as a semantical unit, and is assigned *truth* conditions.

As I have said, Geach believes that any proposal which treats pronouns with singular antecedents as referring expressions can be shown to involve a definite mistake. We had better look at his arguments.

(I) The first argument I want to consider occurs in many places in Geach's writings. At one point, he put the argument like this:

Let us consider an example:

(22)   If any man owns a donkey, he beats it.

(23)   If Smith owns a donkey, he beats it.

The pronoun 'he' is replaceable by 'Smith' in (23) without changing the import of the proposition; it is not thus replaceable by 'any man' in (22); so it looks as if it were a pronoun of laziness in (23), but not in (22). All the same, (23) predicates of Smith precisely what (22) predicates of any man; both contain the same unambiguous complex predicable 'If_____ owns a donkey, he beats it',... On the other hand, the proposition:

(24)   If Smith owns a donkey, Smith beats it

contains the completely different predicable 'if_____ owns a donkey, Smith beats it'; when attached to the quasi-subject 'any man', this gives us the proposition:

(25)   If any man owns a donkey, Smith beats it

which is wholly different in force from (22). Thus the wholly different sense of the predicables 'If_____ owns a donkey, he beats it' and 'if_____ owns a donkey, Smith beats it' shows that even in (23) 'he' has a definite logical role of its own and is not a mere pronoun of laziness_____not a mere device for avoiding the repetition of 'Smith'.[22]

It is true that in this argument Geach is opposing the view that such pronouns are pronouns of laziness going proxy for their antecedents, rather than the view that they have the same reference as their antecedents. However, this does not matter since, if his argument is effective against the former view, it will be effective against the latter view also, and, on other occasions on which it is deployed, the conclusion is expressly stated as that the pronouns do not refer.[23]

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22   *Reference and Generality*, p. 128. The same argument is used many times; see 'Ryle on Namely-Riders' *Logic Matters* pp. 89-90, 'Referring Expressions Again', *Logic Matters* p. 98 and p. 101.

23   On the first and second occasions mentioned in footnote 22.

Later in the same work, Geach offers an exactly parallel argument in connection with the reflexive pronoun.[24] In essence it is this:

(1)   'Everyone contradicts himself' says of everyone what 'Hegel contradicts himself' says of Hegel.

(2)   'Hegel contradicts **Hegel**' says of Hegel that he contradicts Hegel.

(3)   If the import of 'Hegel contradicts himself' were the same as that of 'Hegel contradicts Hegel', then 'Everyone contradicts himself' would say of everyone that he contradicts Hegel, which is absurd.

(4)   *Therefore* the import of 'Hegel contradicts himself' is not that of 'Hegel contradicts Hegel'.

This argument is unsound; its second premise is false. Ironically, it is Geach, more than anyone else, who has been concerned to emphasize that it is false. Consider, for example, the following passage:

> We may in some instances recognise a common predicate in two propositions even though this predicate is not an identifiable expression that can be picked out; for example, 'John shaved John' propounds the very same thing concerning John as 'Peter shaved Peter' does concerning Peter, and thus we may regard the two as containing a common predicate but this is by no means identifiable with the mere word 'shaved' occurring in both.[25]

The significance of Geach's observation is this: seeing the import of the proposition 'Hegel contradicts himself' as being the same as 'Hegel contradicts Hegel' does not preclude us from seeing the same predicable occurring in 'Hegel contradicts himself' as occurs in 'Geach contradicts himself' and in 'No one contradicts himself'. To maintain, as Geach's argument appears to require, that 'Hegel contradicts Hegel' contains *only* the predicable '____contradicts Hegel' is to reject the possibility of multiple equally correct ways of breaking down a proposition into its constituents without which, as Geach has often reminded us, logic would be so hopelessly crippled.

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24   The argument with reflexive pronouns occurs in *Reference and Generality*, p. 132.

25   A similar point is found at many places in Geach's writings. See, for example, 'Logical Procedures and the Identity of Expressions', *Logic Matters*, p. 112, 'Names and Identity', in S. Guttenplan (ed.), *Mind and Language* (Clarendon Press, Oxford, 1975), pp. 139-40.

483

If we follow Geach, the phrase 'What "Hegel contradicts Hegel" says of Hegel' is an expression which fails to pick out a unique predicable — there are three different candidates. Correspondingly, on the co-referential treatment of pronouns, the same would be true of the expression 'What "Hegel contradicts himself" says of Hegel'. Perhaps this is what troubles Geach; perhaps he thinks that, unlike the proposition with repeated occurrences of the proper name 'Hegel', the proposition with the reflexive pronoun admits of only one breakdown into subject and predicate. But it is difficult to see why this should be so. For while the logical relationship between 'Hegel contradicts himself' and 'No one contradicts himself' requires us to see a common predicable, a similar connection between 'Hegel contradicts himself' and 'No one contradicts Hegel' would seem equally to suggest that they share a predicable.[26]

(II) The second argument concerns the sentence 'Only Satan pities himself'.

> Moreover, it is not even true that when the antecedent is a singular term, it can always take the place of a reflexive pronoun. 'Only Satan pities himself' and 'Only Satan pities Satan' are quite different in their import.[27]

This objection may also be dealt with by taking seriously a point which Geach himself makes, namely that 'Only Satan' is not a singular term, but rather an applicatival phrase in its own right.[28] Consequently, a pronoun which has the expression 'Only Satan' as its antecedent is not a pronoun to which the co-referentiality principle may be directly applied. Like the expression 'Someone other than', 'Only' is an expression which takes a name to form a quantifier. The truth conditions of the resulting proposition are essentially those given by Geach (in Fregean style) :

> 'F(only α)' is true iff no interpretation of 'x' as a proper name makes 'F(x)' true unless 'x' names something that is named in or by ' α '.[29]

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26 This point is made in Dummett's *Frege*, p. 14, and, with explicit reference to Geach's treatment of pronouns, by B.H. Partee, 'Opacity, Co-reference and Pronouns' in D. Davidson and G.H. Harman (eds.), *Semantics of Natural Language*, p. 436.

27 *Reference and Generality*, p. 132.

28 *Reference and Generality*, p. 188.

29 *Reference and Generality*, p. 186.

Applying such a principle to the sentence

$$\overline{\text{(Only Satan)}} \text{ loves ( )}$$

we will be directed to consider the truth value of substitution instances of the form

$$(\overline{\beta}) \text{ loves ( )}$$

to see if we can find one which is true, yet in which β does not refer to Satan. Such 'exclusive propositions' then, can present no more difficulty for the co-referential treatment of pronouns than is presented by any other quantified sentence.

It is worth taking note of the fact that certain such 'exclusive propositions' are ambiguous. For example, the sentence:

(8)   Only John loves his mother

admits also of the reading on which it is equivalent to 'Only John loves John's mother'. This ambiguity can be explained quite easily.

To secure the reading on which the sentence asserts that only John is an own-mother-lover, it must be built from the sentence frame

$$(\overline{\ \ }) \text{ loves ( )'s mother}$$

by the insertion of the quantifier expression 'Only John', thus:

$$\overline{\text{(Only (John))}} \text{ loves ( )'s mother.}$$

On this reading, the quantifier has a scope wider than that of the co-referentiality brace. For the other reading, the sentence would be constructed from the sentence frame

(Only (   )) loves (   )'s mother

by the insertion of the brace and singular term 'John', yielding

$$(\text{Only (}\overline{\text{John}})\text{) loves ( )'s mother}$$

in which the co-referentiality brace has a scope wider than the quantifier.

Similar ambiguities are found in a variety of sentences in which there occurs a modifier of a complex predicate containing a pronoun:

485

John is elderly for a man who loves his mother
John is the oldest man who loves his mother
John is too anti-semitic to love himself.

Sentences of this general character have been considered by B. H. Partee who supposes that they constitute a difficulty for *Geach's* view of pronouns.[30] It is not difficult to see why this should be supposed. Capturing the reading of (8) on which it means that only John loves John's mother seems to require seeing the sentence as containing the predicable '(x) loves John's mother' which is then attached to the 'quasi-subject' 'Only John'. And so it might appear that at least *some* pronouns have to be regarded as referring to what their antecedents refer to, or at least as going proxy for their antecedents.

I do not think that the dispute between Geach's treatment, and the co-referential treatment of pronouns can be settled by this kind of example. For, take that proposition which gives the truth conditions of a sentence upon the co-referential theory. Replace each occurrence of a recurrent proper name or singular term in that statement of the truth conditions with a variable, and thus form a predicate abstract. Now, envisage a semantic theory on which truth conditions are derived for the sentence by deriving satisfaction conditions for that complex predicate. Such is Geach's theory. For example, Geach can represent the ambiguity in (8) as that between the results of attaching to 'John' the different complex predicates:

$$\hat{y} \, [\text{Only} \ \ y : \hat{x} \, [\ \hat{x} \ \text{loves} \ x\text{'s mother} \ ] \ ]$$
$$\hat{y} \, [\ \text{Only} \ y : \hat{x} \, [\ \hat{x} \ \text{loves} \ y\text{'s mother} \ ] \ ]$$

(III) The third argument I want to consider is not to be found in Geach.[31] Consider the sentence:

(9)   John thinks he's under suspicion.

For reasons which Castaneda has made his own[32], this proposition is not equivalent to the proposition 'John thinks that John is under

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30   B. H. Partee, 'Deletion and Variable Binding', in E. L. Keenan (ed.), *Formal Semantics of a Natural Language* (Cambridge University Press, Cambridge, 1975).

31   Hints of this argument are to be found on p. 29 of Partee's paper 'Deletion and Variable Binding'.

32   H.N. Castaneda, ' "He" : a study in the logic of self-consciousness', *Ratio 8* (1966), p. 130, and many other papers.

suspicion'. I have heard it suggested that here at least we should see the pronoun 'he' as being used in the construction of the complex predicate '*x* thinks that *x* is under suspicion'.

I want to concede right away that the pronoun 'he' in (9) does not have the function of indicating co-reference. This is not because if it did have that function, (9) would then ascribe to John the notional belief, that John is under suspicion, for it would not. The ascription of such a notional belief would be the result of seeing the pronoun in (9) as a pronoun of laziness, which is a different proposal from the one we are considering. But, nevertheless, it is true that the result of applying the principle (F) can amount to no more than the ascription to John of the belief *of* John that he is under suspicion. Interpreting pronouns with singular antecedents according to (F) renders the position occupied by them referentially transparent. Beyond acknowledging that the pronoun in (9) is not to be dealt with by principle (F), I have nothing definite to say about it; perhaps we should see (9) as somehow derived from the *oratio recta* sentence: 'John thinks "I'm under suspicion" '.[33]

With that said, it is none the less true that the observation is quite irrelevant to the current dispute. For it is just as much a consequence of the suggestion that we see (9) as built up out of the complex predicate '*x* thinks that *x* is under suspicion' and the proper name 'John', that the belief (9) ascribes to John is merely the transparent belief of John, that he is under suspicion. There is no magic in the recurrent variable '*x*' that somehow ensures that we assign a 'self-conscious' belief to John. The recurrent variable merely serves to ensure that, in considering whether or not a particular sequence satisfies the predicate, we assign the same object to both occurrences of the variable as its denotation-relative-to-the-sequence. Such an explanation makes no apparent sense of the recurrence of a variable both inside and outside an opaque context. An application of a mechanism for guaranteeing co-assignment to singular term positions in a complex predicate supposes those positions to be referentially transparent in just the way an application of a method for co-reference does.

(Since confusion upon this point has occurred in the literature, I think it worth emphasizing that the relational formulation '*x* believes *of x* that he is under suspicion' does not capture the idea of 'self-conscious' belief though, of course, if it did, so would the formulation

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33 This proposal is essentially made in G.E.M. Anscombe's paper 'The First Person', in S. Guttenplan (ed.), *Mind and Language* (Clarendon, Oxford, 1975), p. 47. See also Susumu Kuno, 'Pronouns, Reference and Direct Discourse', *Linguistic Inquiry* **3** (1972).

'(John) thinks (⌐) is under suspicion'. Admittedly, it is unclear *what* the relational formulation captures, for it is unclear what additional premises are required to license the inference from the notional '*x* believes that *a* is F' to the relational '*x* believes of *a* (that is to say *b*) that it is F'. But all the principles that have been suggested would appear to allow that a man could believe of someone who was in fact himself that he is F, without knowing that it was he himself. If this is so, then it is possible for *a*, that is to say, *b*, to satisfy '*x* believes of *x* that he is under suspicion' in virtue of *a*'s possession of the notional belief that *b* is under suspicion (when he does not realize that he is *b*).[34]

We have been able to find no reason for modifying the view that a theory which sees pronouns as devices for marking co-reference (strictly speaking) is perfectly viable, provided that it incorporates a Fregean statement of the truth conditions of quantified sentences. In conclusion, I should like to mention a consideration which would give a decisive edge to one treatment of pronouns over its rival, *if* it applied, but which does not seem to me to apply, and some considerations which give the referential treatment a mild advantage over Geach's approach.

I come to semantic investigations with a preference for *homophonic* theories; theories which try to take serious account of the semantic and syntactic devices which actually exist in the language by deriving for each sentence of the object language a statement of truth conditions in which the very resources employed in it occur and are not analyzed away in favour of resources which do not occur. To take a relatively trivial example, I would prefer a theory which was sensitive to the binary structure of the sentence 'All A's are B's' and which, being thus sensitive, was able to deduce the theorem that 'All A's are B's' is true iff all A's are B's, over a theory which is only able to

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34 For an example of confusion on this point see e.g. Wallace's paper 'Belief and Satisfaction', *op. cit.* Wallace symbolizes a teleological principle as follows:

$(x) (y) (z)$ [Wants $(x, <y>, z)$ and Can $(x, <y>, z)$ and Believes $(x, <x, y, z>, \hat{x} \hat{y} \hat{z}$ [Can $(x, <y>, z])$ then Satisfies $(x, z)]$ `

and writes:

It is important to notice that this principle makes essential use of universal quantification into the argument place made available by the relational sense of belief. The reader may if he wishes give notional formulations ... but I think he will find any such principles ... distinctly implausible the reason being that it appears impossible to capture notionally the idea that Nelson believes *of himself* that *he* has the ability to perform the contemplated action.

488

deal with this sentence by 'discovering' hidden logical constants, and deducing the result that 'All A's are B's' is true iff all things are B-if-they-are-A. The objection would not be that such truth conditions are not correct, but that, in a sense which we would all dearly love to have more exactly explained, the syntactic shape of the sentence is treated as so much misleading surface structure.[35]

Obscure though this formulation is, it is not necessary for the purposes at hand to make it any clearer. For while it must be admitted that the co-referential theory of pronouns does depart from homo-phony in that the truth conditions of the sentence 'John loves his mother' are given by the sentence 'John loves John's mother', no remotely homophonic theory constructed on Geach's lines seems in prospect. The introduction of variables and the parsing of singular sentences of the kind we have been considering as involving complex predicates is as much a departure from the actual pronoun-antecedent construction which we find in English as one which eliminates pronouns altogether. Perhaps we just have to learn to live with the idea that this pronoun-antecedent construction is, in the relevant sense, just so much surface structure.[36]

I will now mention some considerations which tell against Geach's way of treating pronouns, at least in so far as it is applied quite generally to pronouns with singular antecedents.

First, Geach's treatment requires such pronouns to be bound by names, which can be regarded, for this purpose, as singulary quantifiers. He thus requires the scope of a name to include any pronoun which has that name as its antecedent. Now in extensional contexts names are scopeless, and thus no difficulties arise from this requirement since names can always be given maximum scope. But it does not appear to be true that names are scopeless in all contexts of natural language; such would be the case only if all name-containing contexts were referentially transparent. Now, take any opaque construction containing the proper name β, O(β). If a pronoun which is outside the construction looks back to the name as antecedent, it cannot be dealt with as Geach requires. The only way of

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35 A consideration first stated explicitly in J. Wallace, 'On the Frame of Reference', in Davidson and Harman, *op. cit.*, p. 237. See also D. Davidson, 'In Defense of Convention T', in H. Leblanc (ed.), *Truth, Syntax and Modality* (North Holland, Amsterdam, 1973), p. 83, and S. Kripke, *op. cit.*, p. 356.

36 It would be an interesting exercise for the reader to attempt to construct a strictly homophonic theory for the simple 'brace' notation for co-referentiality introduced above, or for that fragment of English with the devices 'the former' and 'the latter'.

binding the pronoun would require the legitimate formation of the complex predicate

$$\hat{x} \, [\, O(x)...x]$$

which as I have said, would render the context created by O transparent.

It does not appear difficult to construct sentences containing pronouns which look back to terms occurring inside opaque contexts; the following seem perfectly natural:

> Oedipus thinks that Jocasta is childless, but she isn't
> Giorgione was so-called because of his size, and he hated it.

Such sentences present no difficulty for the theory which treats pronouns in terms of co-reference strictly interpreted. Upon that view, all that is required is that names in opaque contexts have a referent; it is not required that their referent is all that is semantically relevant.

There is a second mild advantage to the referential treatment. Consider the following dialogue:

> A: John came today.
> B: Did he stay long?

It seems desirable to allow that B is using the same device of cross-reference to ask his question as we have seen used in the construction of a single sentence. (This seems particularly desirable when we observe that B may not have the epistemological resources to make a reference to John on his own account[37].) It requires only a trivial modification of the grammar to allow the chaining of singular term positions to singular terms which occur in other sentences. No modification of the referential semantics is required at all, once we allow the units processed by our semantic theory to be chunks of dialogue, not just single sentences.

It does appear rather difficult to deal with such pronouns on Geach's view, since we would somehow have to see A and B engaged

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37   It is in this way that I would like to account for the fact, made much of by Kripke (see 'Naming and Necessity' in Davidson and Harman *op. cit.*) that if A uses the proper name β with the intention to refer to whoever B was referring to when *he* used the name β, then the referent of β on A's lips will be the same as on B's. I do *not* wish to deal with it by so extending (and weakening) the concept of 'epistemological contact' that one is in such contact with an object *x* if one has simply come into contact with someone who uses a name to refer to *x*.

490

in the co-operative construction of a complex predicate in a way which appears inconsistent with assigning a truth value to either of their remarks taken independently. Do we not want to allow that B *contradicts* A when he continues

B: No he didn't ?[38]

Finally, I think that the suggestion that pronouns make a contribution which is to be explained by principle (F) can claim to be somewhat more explanatory of the morphological shape which expressions which are used in this way actually have. First of all, we should realize that many expressions other than pronouns, strictly so called, may be used exactly as pronouns are used. For example, 'that logician' is functioning like a bound pronoun in the sentence

Every logician was walking with a boy near that logician's house.

In fact, almost any singular term can be used to make a back-reference provided it is reduced in stress[39]. Thus consider the sentence

Amin was widely disliked, but the Ugandan president did not seem to mind.

We can see this sentence as resulting from the sentence frame:

$$\overline{(\text{Amin}) \text{ was widely disliked, but } (\quad)} \text{ did not seem to mind;}$$

reduced stress being the superficial manifestation of the brace.

If we collect together all the devices that can occur in a singular term position chained to some other referring expression, we discover that they are all capable of being used, in other contexts, to make independent references. This little generalization will surely come as no surprise to one who holds a theory according to which expressions occupying such positions do refer (albeit with the aid of a co-referring device). But upon Geach's theory, this generalization must remain quite unexplained. For Geach, pronouns are part of a device for complex-predicate formation. Now, as I shall argue later, there are

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38   In order to accommodate this simple logical relation between A's remark and B's, we must use the apparatus of co-referentiality we have been considering, and must not suppose that B's reference is *fixed by the description* 'the item A referred to by his use of the token "John" '.

39   Not just expressions like 'the bastard' and 'the fool' as seems to be suggested by R.S. Jackendoff on p. 110 of *Semantic Interpretation in a Generative Grammar* (MIT Press, Cambridge Mass., 1972).

Gareth Evans

devices in English which have precisely the function which Geach assigns to pronouns — namely the relative pronouns 'who', 'which'. In the expression 'who loves Mary and whom everyone despises', the relative pronoun is being used to keep track of which position goes with which in the formation of a complex predicate. But if such is the function of pronouns, and of expressions which function like them, there would be no more reason to expect them to be capable of being used to make independent references than there is to expect 'who' and 'which' etc., to be capable of being used in this way.

4. 'E-type pronouns'

A. In this section, I wish to defend the view that some pronouns with quantifier antecedents are quite unlike bound variables; in particular they may be assigned a reference and their immediate sentential contexts can be evaluated independently for truth and falsehood. Such pronouns are not genuine singular terms in the sense in which ordinary proper names and demonstrative expressions are; rather they are singular terms whose reference is fixed by description.[40] How exactly we are to secure the right semantical results is a matter of detail which I will discuss later;[41] to begin with I will be mainly concerned to establish the limited conclusion that such pronouns cannot be regarded as analogous to bound variables.

Consider the sentence

(10) John owns some sheep and Harry vaccinates them.

For all we have said up to now, we can see this sentence as built up in the following way:

( ) owns ( ) and ( ) vaccinates ( )

( ) owns (‾) and ( ) vaccinates (‾)

(John) owns (‾) and (Harry) vaccinates (‾)

(John) owns (some sheep) and (Harry) vaccinates (them).

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40 I borrow the notion of a description's fixing the reference of a singular term from Kripke, *op. cit.*

41 See section 4 (D) and section 7.

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To see (10) as built up in this way is to see the quantifier 'some sheep' as having the whole sentence as its scope, and (10) as equivalent to

> John owns some sheep which are such that Harry vaccinates them

or

> Some sheep are such that John owns them and Harry vaccinates them.

Now, although it *may* be possible to construe the sentence in this way, it is not open to dispute that this is neither the only, nor the most natural interpretation. Upon the most natural interpretation, the sentence would not be true unless Harry vaccinates *all* the sheep which John owns. A paraphrase of (10) upon that interpretation would be

> John owns some sheep and Harry vaccinates the sheep that John owns.

In the same way, the sentence

> (11) Few M.P. s came to the party, but they had a marvellous time

is not equivalent to

> It holds good of few M.P.s that they both went to the party and had a marvellous time

both because (11) entails, while its supposed paraphrase does not, that few M.P.s went to the party, and also that *all* the M.P.s that came had a marvellous time. Similarly:

> (12) Mary danced with many boys and they found her interesting

is not equivalent to

> Mary danced with many boys who found her interesting.

What this strongly suggests is that we must see (10), (11) and (12) as the conjunction of two sentences with the scope of the quantifier going only to the end of the first conjunct.

So, the first piece of evidence that pronouns like those in (10), (11) and (12) are not functioning like bound pronouns is that, if we

493

interpret them as bound pronouns, we do not give the sentences the meaning they are most naturally interpreted as having. There is another piece of evidence. In none of the sentences can we substitute a quantifier of the form 'No' + common noun *salva congruitate*:

*John owns no sheep and Harry vaccinated them
*No M.P.s came to the party but they had a marvellous time
*Mary danced with no boys and they found her interesting.

Now, upon the view that these pronouns are bound pronouns, this fact is inexplicable. For upon that view, if we remove the quantifier from these sentences, we are left with a complex predicate, which was affirmed to be satisfied in the case of some sheep, few M.P.s, or many boys, and which we ought to be able to affirm to be satisfied in the case of no sheep, no M.P., or no boy. If the pronoun 'them' in (10) was genuinely within the scope of the quantifier 'some sheep', as it is in the sentence

John owns some sheep such that Harry vaccinates them,

then the ungrammatical sentence ought to have just the interpretation of

John owns no sheep such that Harry vaccinates them.

Essentially the same point can be made with the quantifier expression 'every' + common noun, once we move to singular sentences of the same syntactic structure. If the sentence

(13) Socrates owns a dog and it bit Socrates

was the result of attaching the complex predicate 'Socrates owns x and x bit Socrates' to the quantifier 'a dog', as is the sentence

A dog is such that Socrates owns it and it bit Socrates,

then the sentence

*Socrates owns every dog and it bit Socrates

ought to be well formed and have the same meaning as

Every dog is such that Socrates owns it and it bit Socrates.

494

What appears to be going on is this. The most important determinant of the scope of a quantifier is its syntactic position in the sentence. Roughly, and not inflexibly, the scope of a quantifier is naturally interpreted as constituting the smallest sentence which includes all the constituents which are *in construction with it*. (Klima defines the notion 'in construction with' so that a constituent is in construction with another iff the former is dominated by the first branching node which dominates the latter.) In (10), for example, the scope of 'some sheep' extends only to the end of the first clause. If we wish to say that some man is both bald and tall, we must not insert the 'some man' quantifier into the sentence frame:

(⌐) is bald and (⌐) is tall

in which its scope will reach only to the end of the first clause, but we must transform the tree so that the singular term position into which we propose to insert the quantifier *governs* 'tall'.[42] For example, we may use the conjunction reduction transformation, to produce

( ) is bald and tall

or the 'such that' construction

(⌐) is such that (⌐) is bald and (⌐) is tall.[43]

We must suppose a prohibition to be in force against the insertion of a quantifier expression into a singular term position to which another singular term position which it does not govern is chained — the result would be an unbound pronoun.

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42 I follow the example of K. Wexler, P. Culicover and H. Hamburger in calling the converse of the 'in construction with' relation, 'governs'. See *Learning Theoretic Foundations of Linguistic Universals*, Social Sciences Working Paper No. 60, University of California at Irvine, 1974, p. 42. I am grateful to Mr. Geoffrey Pullum for the reference to this and other relevant literature in Linguistics.

43 There is a range of transformations — passivization, conjunction reduction, Neg-placement, amongst them — which are only 'meaning preserving' when they apply to singular sentences. (See, for example, B.H. Partee, 'Negation Conjunction and Quantifiers: syntax vs. semantics', *Foundations of language* **6** (1970), pp. 153-165). This strongly suggests to me that the best course is to restrict such transformations to singular sentences, and to allow quantifiers insertion to take place at any stage in the transformational cycle. If Fregean truth conditions are given for the quantifiers, this will enable us to give the meaning of any sentence affected by these transformations in terms of the equivalence of meaning between transformed and untransformed singular sentences. This is simply an extension of the strategy we have adopted for singular pronouns.

Let us consider a few examples:

> The man who owns Fido vaccinates him ('Fido' does not govern 'him')
> Fido loves his master ('Fido' governs 'his')
> Fido loves Mary and also loves his master ('Fido' governs 'his')
> Fido loves Mary and he also loves his master ('Fido' does not govern 'he', nor 'his')
> Mary owns Fido and beats him with her broom ('Mary' governs 'her', 'Fido' does not govern 'him')[44]
> Fido barks when he is happy ('Fido' governs 'he')
> If Fido barks then he is happy ('Fido' does not govern 'he')
> Either Fido is unhappy or he barks ('Fido' does not govern 'he').

I think it will be discovered that when an existential quantifier 'some dogs' is substituted for 'Fido' (and 'he', 'his' are changed to 'they', 'them' etc.) then the pronouns are naturally interpreted as bound pronouns, and the quantifier as having wide scope if and only if the quantifier expression governs the pronoun. Similarly with 'many dogs', 'few dogs', 'most dogs', etc. Equally, a well formed sentence results when 'no dogs' is substituted for 'Fido' (and appropriate changes are made to the pronouns) only when the quantifier governs the pronoun.

I said 'roughly and not inflexibly' for two reasons. First of all, we can often just about hear quantifiers which are not in a governing position as having wide scope. For example, it is just about possible to hear the sentence

> If a friend of mine comes, we are done for

as being equivalent to

> A friend of mine is such that if he comes we are done for.

Second, there are quantifiers which we almost always interpret as having maximum scope; 'any' is one, and 'a certain' is another. Thus:

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44 It was this example which showed that the relevant relation is 'in construction with' rather than Langacker's notion of 'command', for 'Fido' does command 'him'. I am very grateful to Deidre Wilson for pointing this out to me, and for suggesting that the relevant relation might be 'in construction with'.

If any dog is happy he barks
If a certain friend of mine comes, we are done for

are both naturally interpreted in a way which gives the quantifier wide scope.

As far as the present topic is concerned, these points do not matter. What matters is simply the fact that there are sentences containing pronouns with quantifier antecedents which are not naturally interpreted in the way that would result if the pronouns were bound by those quantifiers. For the semantic role of these pronouns, another account must be provided. It really does not matter that those sentences should also be capable of another interpretation, or that other sentences, of the same grammatical pattern but with different quantifiers, should not be capable of the troublesome interpretation. Nevertheless, I think that if we exclude the wide-scope-seeking quantifiers 'any' and 'a certain', the generalization I have offered, as to which pronouns will *naturally* be interpreted as being bound by a quantifier, is substantially correct.

I should say that I have adopted the less radical and possibly the less interesting explanation of the phenomenon of E-type pronouns. According to the explanation I have adopted, sentence frames of the form

$$(\quad) \text{ loves } (\quad) \text{ and } (\quad) \text{ loves } (\quad),$$

in which 'pronominalization' takes place across co-ordinate structures, can be generated, and underlie sentences of the form

(14) Mary loves John and he loves her.

But, on my account, we are prevented from inserting quantifiers into the chained singular term positions because their scope will not be interpreted as reaching across the co-ordinate structure to bind the pronouns. A more radical explanation would be one which supposed 'pronominalization' — or the drawing of braces between two singular term positions — to be restricted to those structures in which the singular term position to be occupied by the pronoun is governed by the singular term position to be occupied by the singular term. We would then see the pronouns in singular sentences, like (14), to be E-type pronouns, but we will so account for the semantic contribution of the E-type pronouns that when their antecedents are singular terms, the net effect is simply that of co-reference.

The attraction of this position is a measure of harmony it offers between the conditions on forward and backward 'pronominalization'. This *rapprochement* is particularly appealing since it turns out

497

that Klima's notion of 'in construction with', which seems to account for the distribution of bound and E-type pronouns, has been called upon by those who are looking for constraints upon backward 'pronominalization'.[45] Unfortunately, I do not have sufficient competence in linguistics to be able to assess the plausibility of this more radical suggestion, for surely, if two fundamentally different processes are at work in the range of data which have hitherto been collected together as examples of 'forward pronominalization', then this fact should have countless ramifications and consequences of a purely syntactic character.

Nothing that I say of any importance hinges upon the truth of the more conservative explanation which I have offered. Nor, in fact, does it depend upon whether, in Klima's notion of 'in construction with', I have correctly identified the relevant syntactic relation. The semantic and syntactic properties of E-type pronouns are sufficiently well defined for the type to be recognized independently of its final location in the theory of syntax. It *is* important to my account that there be a syntactic distinction between bound and E-type pronouns; it is not essential that should be the distinction between pronouns which are, and pronouns which are not, governed by their antecedents. However I shall proceed upon the assumption that 'in construction with' is the relevant relation.

The view that pronouns which are not governed by their quantifier antecedents are not functioning as bound pronouns rests, so far, upon two pieces of evidence. The first is purely semantic: interpreting the pronouns as bound by the quantifiers does not enable us to capture the most natural interpretation which these sentences have. The second piece of evidence is the ill-formedness of sentences like

*John owns no sheep and Harry vaccinates them
*Every Londoner was there and he had a wonderful time.

Both pieces of evidence seem to me to point in the direction of treating these pronouns (E-type pronouns) as singular terms whose denotation is fixed by a description recoverable from the clause containing the quantifier antecedent. Thus the denotation of the pronoun in (10) is fixed by the description 'the sheep that John owns', in (11) by the description 'the M.P.s that came to the party', in (12) by the description 'the boys who danced with Mary' and in (13) by 'the

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45 See e.g. T. Reinhart, 'Syntax and Coreference', *Papers from the Fifth Annual Meeting of the North Eastern Linguistic Society* (Harvard University, 1974), p. 92, and P.W. Culicover, 'A Constraint on Coreferentiality', *Foundations of Language* **14** (1976), p. 109.

dog that Socrates owns'. Roughly, the pronoun denotes those objects which *verify* (or that object which verifies) the sentence containing the quantifier antecedent. (This idea is made considerably more precise in section 6.) The first piece of evidence points in this direction simply because such appears to be the interpretation we put upon these sentences. The second piece of evidence points in this way because if it is the role of such pronouns to denote the verifier(s) of the sentence containing its quantifier antecedent, then we can explain why E-type pronouns cannot follow sentences whose quantifier is 'No' + common noun, and why *singular* E-type pronouns cannot follow sentences whose quantifier is 'Every' + common noun.

I do not believe that anyone has identified the class of E-type pronouns in just the way that I am suggesting, but philosophers have often suggested treating this or that pronoun in what amounts to an E-type way. In so doing, they have drawn upon themselves the vituperation of Professor Geach, who believes that any such proposal can be shown to involve a definite mistake. For example, Geach maintains that any analysis of the sentence

(13)   Socrates owns a dog and it bit Socrates

as a conjunction of two propositions with a truth value would be 'inept'.[46] Elsewhere the proposal is described as 'quite absurd', 'a prejudice or a blunder'.[47] It is therefore with some trepidation that I *confess to thinking that a conjunction of two propositions is precisely* what (13) amounts to. Before we consider Geach's arguments and satisfy ourselves that there is nothing in them, let us fortify our spirits by looking at one or two additional advantages which an E-type treatment has over its bound pronoun rival.

B. Some advantages of the proposed account over its bound-pronoun rival

1. It is a feature of the account that I am suggesting that the quantifiers which are the antecedents of E-type pronouns do not have to be given wide scope in order to bind them. There are several contexts in which giving these quantifiers narrow scope allows a simpler semantical treatment of those contexts, and there are others in which it appears absolutely inescapable. I shall deal with several such contexts in turn.

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46   'Quine's Syntactical Insights', *Logic Matters*, p. 118.

47   *Reference and Generality*, pp. 125 and 126.

a) Conditionals

Consider the sentences:

>If Mary has a son, she will spoil him
>If someone comes in this room he will trip the switch.

These sentences appear to contain existential quantifiers, yet do not have a sense which would result from giving that quantifier wide scope; we are not saying that there is some boy such that if Mary had *him* as a son she would spoil him, nor that there is someone such that if *he* comes he will trip the switch.

The natural way to understand these sentences is as being built out of two propositions joined by a conditional; the antecedent being, for example, that some man comes, the consequent, said to be conditional upon the truth of an antecedent, being that the man who comes will trip the switch. (Obviously, if a paraphrase is to be given which uses descriptions explicitly, they must be understood as having a scope narrower than the connective.) To see the sentence in this way requires seeing the pronouns in the consequent as E-type pronouns, as would anyway be suggested by the grammatical relation in which they stand to their antecedent.

The problem presented by these sentences is familiar to students and teachers of logic — and it is normally got around by supposing in an *ad hoc* fashion that, in the antecedents of conditionals, the words 'some' and 'a man' are surface forms of the universal quantifier 'any'. This suggestion is adopted as a solution to the problem by Harman who writes: "One plausible solution is to suppose that the deep structure quantifier in (77) [the sentence 'If some arrows are green they will hit the target'] is not *some arrows* but rather *any arrows*.'[48] But as Harman points out, it is very difficult to characterize the contexts where the change from 'any' to 'some' takes place. Furthermore, as Harman also points out in the same place, a similar problem arises when any quantifier which is existential in force[49] occurs in the antecedent of a conditional as in

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48 Harman *op. cit.* p. 45.

49 A quantifier is *existential in force* iff, if a sentence of the form A(Q + Common Noun + Relative Clause), in which Q is the quantifier with maximum scope, is true, then A('Some' + Common Noun + Relative Clause), with 'Some' as the quantifier with maximum scope, is also true. 'Any' and 'No' are the most important quantifiers which do not have existential force; 'many', 'few', 'most', 'all' and each of the numerical quantifiers has existential force (as used in English).

> If several/few/many/two/three.../men come they will be disappointed.

Can it be seriously proposed that 'any men' can turn into each of these? If not, how is the 'solution' to be generalized?

b) 'Just one' sentences

Consider the sentence

> Just one man drank champagne and he was ill.

If we did not have to worry about such an occurrence of the pronoun 'he', easily the most simple treatment of the expression 'just one man' is to see it as a quantifier which, when attached to a predicate A, yields a truth just in case just one man satisfies A. To use such a treatment in the sentence above, we would have to suppose the scope of 'just one man' ends at the conjunction; to let it extend beyond the conjunction would be to generate the different proposition

> Just one man drank champagne and was ill.

Treating the pronoun 'he' in the second clause as an E-type pronoun enables us to adopt this simple treatment of the expression 'just one man'.

If, on the other hand, we are to treat it as a pronoun bound by the quantifier, the best we can do is to adopt the suggestion Geach has recently made[50] that 'just one man' is a binary quantifier taking two open sentences, or predicates, to make a sentence.

The trouble is, there is absolutely no evidence that 'just one man' is, in this way, a binary quantifier; we seem to have no difficulty in forming a complete sentence by attaching the 'just one man' quantifier to a single open sentence, as in

> Just one man opened the box.

Geach suggests that we can see that sentence as 'got by deletion' from

> Just one man opened the box and he opened the box.

That Geach could make such a proposal suggests to me that he and I are engaged on different enterprises. I am interested in the quantifiers

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50 'Back-Reference', *op. cit.*, p. 204.

501

and pronouns that occur in the English natural language (and in a good many others, I bet). I am not interested in the quantifiers and devices of back reference which exist in logically possible languages which we might speak but do not.

c) Relative scope difficulties

An abstract description of a type of sentence that will present *relative scope difficulties* for Geach's view of pronouns is this: it contains some operator O within whose scope a quantifier expression must fall, and outside whose scope a pronoun looking back to that quantifier must fall. Schematically:

....O(....Quantifier + CN ....).... it/he/etc.,....

I shall present two examples of this kind of sentence, though no doubt many others can be found.
Consider the sentence

Just one man owns a donkey and he beats it.

I am not now concerned with the pronoun 'he' which we have just been considering, but with the nexus: 'a donkey' ...'it', for taking 'Just one man' as our operator O, we have here an example of the kind described. Whether or not the sentence admits of a reading on which it is equivalent to

A certain donkey is such that just one man owns it and he beats it

(which I doubt), it also admits of another interpretation, on which the property said to be uniquely exemplified is that of being a donkey-owner. For this latter reading, the 'a donkey' quantifier has to have a scope narrower than that of 'just one man', which would then leave the pronoun 'it' unbound, if it were a bound pronoun. However, it is open to us to give 'a donkey' narrow scope it we treat the pronoun 'it' as an E-type pronoun — a treatment which is anyway suggested by the grammatical relation in which it stands to its antecedent.
Geach's reaction to this kind of sentence can be gauged from a discussion he offered of a sentence which presents a very similar problem; namely:

502

The only man who owns a donkey beats it.[51]

He wrote:

> We still have not an acceptable analysis of (1) [the sentence 'The only man who ever stole a book from Snead made a lot of money by selling it']; for the use of 'The only man who ever ...' precludes our taking the initial ten word phrase in (1) to mean the same as 'The man who stole a (certain) book from Snead' ... I think the right account of the initial ten word phrase in (1) is that it neither simply means the same as 'The only man who ever stole *any* book from Snead' as it does in (2) nor simply means what 'The man who stole a (certain) book from Snead' means ..., but rather corresponds in force to a combination of the two: 'The man who stole a (certain) book from Snead, in fact the only man who ever stole any book from Snead.'[52]

On Geach's analysis', then, we find *two* quantifiers 'a book'; one which is given wide scope, and which is therefore conveniently there to bind the troublesome pronoun, and one with narrow scope to give the intended uniqueness condition upon the description. It must be acknowledged to be desperately *ad hoc* to suggest that two quite different quantifiers, with different scopes, collapse into one in surface structure. Is there any kind of sentence which exhibits this kind

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51 This sentence certainly does present difficulties for Geach, but actually belongs with the sentences like 'Most men who own a donkey beat it,' discussed under d) below. However, Geach's remarks, if appropriate at all, belong at this point, since his 'two-quantifier' solution obviously does not deal with the general problem presented by the sentences we shall consider under d).

52 'Referring Expressions Again', *Logic Matters*, p. 100. It is worth pointing out to those who might otherwise be misled that Geach's views on the treatment of pronouns in such sentences have undergone a complete change. In 1963 ('Referring Expressions Again') the suggestion made by L. Cohen ('Geach on Referring Expressions — A Rejoinder', *Analysis* 23 (1962-3), pp. 10-12) that such pronouns should be treated as pronouns of laziness was rejected with a certain amount of brusqueness. In 'Back-Reference', *op. cit.* (1975), p. 195, without a word of acknowledgement, Geach makes the same proposal himself. The pronoun-containing sentence for which Cohen proposed a 'pronoun of laziness' account was:

> The only man who ever stole a book from Snead eventually
> made a lot money by selling it.

The sentence for which Geach proposes a 'pronoun of laziness' account is

> The youngest man who brought a girlfriend to the party kissed her.

I do not myself favour the laziness account, but agree with Cohen that some other account than the bound-variable one must be given.

503

of collapsing? Are we not interested in how someone might understand such a sentence upon the basis of its structure?[53]

Other examples conforming to the schematic description offered above can be constructed with the use of adverbial modifiers. Consider:

John stupidly touched some snakes and they bit him

when it is being used to assert that it was stupid of John to touch some snakes — any snakes — not that there were some particular snakes that it was stupid of him to touch. Equally:

John slowly kissed all the guests and they hated it

can mean that John was a slow all-the-guest-kisser, not that he slowly kissed each of the guests. But plainly, in neither of these two sentences can the pronoun fall within the scope of the adverb.

d) Quantifiers in clauses restricting quantifiers with higher scope

Sentences which have the form of

Most men who own a car wash it on Sundays
Every man who owns a donkey beats it

appear to conform to our schematic description of sentences which provide relative scope difficulties for Geach's approach to pronouns. If the sentence is to express the intended restriction upon the major quantifier — that of being a car - or donkey-owner — it would appear that the second quantifier must be given a scope which does not extend beyond the relative clause, and this rules out a bound variable

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53 Geach is not alone in proposing a 'two-quantifier' solution to these and related difficulties; it is also to be found in N.W.Tennant's contribution to his joint paper with J.E.J.Altham, 'Sortal Quantification', in E.L.Keenan (ed,) *op. cit.* pp. 46-60. (See especially examples (4) and (6) on pp. 53-4). Tennant's claim is that adopting a 'sortal logic' (apparently a binary structure for quantified sentences of natural languages, enables him 'to provide many English sentences with more congruous logical forms than they would receive in the classical predicate calculus'. Insofar as this claim concerns sentences which are problematical because of the occurrence of E-type pronouns, it is entirely spurious. No essential use is made of the binary structures in dealing with these pronouns; the *ad hoc* introduction of an additional quantifier is a manoeuvre available to those working within the unary structures of the classical predicate calculus.

504

interpretation of the later pronouns. Further, with sentences such as these, Geach's 'two-quantifier' proposal does not even get off the ground, since they do not entail the sentence which results when the existential quantifier is given wide scope. This provides yet another reason against adopting his proposal in the case of a sentence like

The only man who owns a donkey beats it

which should be seen as sharing a form with the initial pair of sentences. It entails a wide-scope sentence

A donkey is such that the only man who owns it beats it,

not in virtue of its form, but in virtue of particular semantic properties of the quantifier 'The'.

That the pronouns in these sentences are not functioning like bound variables is exactly what we should expect, since their quantifier antecedents most certainly do not govern them.[54] However, though it may be clear that they are not bound pronouns, what should *not* yet be clear is how they can be regarded as E-type pronouns. For on the account of E-type pronouns I have suggested, they are referring expressions; yet surely it is as silly to enquire after the reference of 'it' in our examples as it is in the case of a bound pronoun.

I cannot provide a complete answer to this objection until section 5, in which relative clauses restricting quantifiers are studied in some detail. But I can indicate the main lines on which the answer will run by considering simpler sentences.

I am putting forward the view that, in the sentence

John owns a donkey and beats it,

the pronoun 'it' has the function of designating the object (if any) that verifies the antecedent clause containing the existential quantifier. However, the process of substituting quantifiers into singular term

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54 It should be pointed out that the difficulty presented for the 'pronouns as variables' view by sentences like these was mentioned in two important papers by Lauri Karttunen: 'Pronouns and Variables', in *Papers from the Fifth Regional Meeting of the Chicago Linguistic Society* (Department of Linguistics, University of Chicago, Chicago, 1969), and 'Definite Descriptions and Crossing Co-Reference' *Foundations of Language* 7 (1971). See especially footnote 12 of the latter paper where Karttunen writes: 'Thus he (Geach) completely overlooks the fact demonstrated above that pronouns are sometimes used in a way which is not possible with variables in the more restricted syntax of the predicate calculus.'

position can be indefinitely iterated: by substituting a quantifier for the remaining singular term, we may construct the well-formed sentence:

Every man owns a donkey and beats it.

Once the singular term 'John' is supplanted by the quantifier, the E-type pronoun can no longer be regarded as having a reference. But *no new explanation of its role in the resulting sentence is called for.* For, once again, provided the derivation of truth conditions for the quantified sentence runs through a stage at which the truth conditions of singular substitution instances are considered, the existing explanation of the role of E-type pronouns — that which assigns them a denotation determined by certain conditions — can be drawn upon. Since the 'every man' quantifier has a scope wider than that of the E-type pronoun, we do not begin evaluating the sentence by enquiring into the denotation of the E-type pronoun.

The situation is exactly the same as we found with pronouns that *were* governed by their antecedents. There, we discovered that not being able to assign 'himself' a denotation in the sentence

Every man loves himself,

neither meant that we could not say that 'himself' refers to John in

John loves himself

nor that we need say anything more.

In a parallel way, I shall argue that the pronouns in the initial pair of sentences are E-type pronouns, but that they have a scope less than that of the main quantifier, and can (and need) only be interpreted relative to some substitution instance of the main quantifier. And, when we are considering such substitution instances, it is clear that we put an E-type interpretation on the pronoun. Once again, this comes out most clearly with plural quantifiers. The evaluation of the sentence

Every man who owns some sheep vaccinates them in the spring

directs us to consider the relative truth values of pairs of sentences

John owns some sheep; John vaccinates them in the spring

506

when the latter sentence is only true if John vaccinates all the sheep he owns.[55]

2. We have seen how Geach treats 'There is just one man who F's and he G's' as involving a binary quantifier. Since all the numerical quantifiers give rise to the problem to which this purports to be a solution, it is reasonable to suppose that Geach will adopt a similar account of the sentence:

> Exactly two men got off their bicycles and then they fainted.

But now consider the sentence

> Exactly three men got off their bicycles and they pushed the Volkswagen up the hill.

Now, perhaps this sentence does have a reading on which it entails that each of the men who got off their bicycles separately pushed the Volkswagen up the hill — the reading which would result if 'Exactly two men' was a binary quantifier whose second open sentence is 'x pushed the Volkswagen up the hill'. But there is clearly another reading which is, in the circumstances, more likely, and according to which the men are said to have together pushed the Volkswagen up the hill. This reading can not be captured along Geach's lines. In order to capture it, the scope of 'Three men' has to be closed off at the end of the first conjunct, and 'they' must involve a plural reference.

3. Consider the sentence

> Socrates owned a dog and it bit Socrates.

On the bound variable view, which Geach favours, the whole sentence is strictly equivalent to a sentence of the form

> (For some dog x) (Fx & Gx)

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55 The fact that we consider pairs of sentences rather than a single sentence is a reflection of the fact that I regard these quantifiers as binary in form. But the current point does not depend upon that; we could impose a unary structure in the normal way, in which case the substitution instance would be

If John owns some sheep then he vaccinates them in the spring,

a sentence of the form considered under a) above.

507

with its logicians' paraphrase,

> Some dog is such that Socrates owned it and it bit Socrates.

If this is indeed what our original sentence means, what could explain our unwillingness to express the thought:

> Some finger is such that it is Socrates' and it hurts Socrates

by uttering

> Socrates has a finger and it hurts Socrates   ?

What can explain our reluctance to report the existence of at least one woman doctor in Manchester by uttering

> There is a doctor in Manchester and she is a woman,

or the existence of a number with an even successor by uttering

> A number has a successor and it is even   ?

Suppose someone deduces that at least one and possibly several of the people at the meeting smoked upon the basis of the fact that the room was filled with smoke. If Geach's 'wide-scope' rendering of these sentences was accurate, what could explain the oddness in reporting the result of this deduction in the sentence

> Someone came to the meeting and he smoked   ?

It is a quite clearly marked feature of the use of pronouns that are not governed by their quantifier antecedents that one does not utter a clause containing such a pronoun unless one is in a position to answer the question: 'He? Who?' or 'It? Which?'.[56] Perhaps this fact is not so striking to one who makes no distinction between pronouns that are, and those that are not, governed by their antecedents, for of course, no such requirement is made upon the use of a bound pronoun. But even so, it remains a pretty striking fact about the use of certain pronouns, not less striking for being at odds with the bound variable treatment of them. It is therefore surprising that nowhere in any of

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56   This is implicitly conceded by Geach in the reply (19) given to B in an imaginary
     dialogue in 'Back-Reference', p. 199.

Geach's quite extensive writings on the subject of pronouns is it ever mentioned. This omission cannot be explained by Geach's professed lack of interest in the nuances of idiom; the fact I have just mentioned is no more a matter of nuance than is a blow from a sledge-hammer.

C. The arguments against

It cannot be over-emphasized that the proposal that I am making concerns a limited, and syntactically identified, class of pronouns. I acknowledge that many pronouns whose antecedents are quantifier expressions do correspond to bound variables at least in the sense that it does not make sense to enquire into their denotation, but I doubt that all do. The possibility of a principled, syntactic demarcation of E-type pronouns from bound pronouns is really the strongest weapon in our defensive armoury. For I am sure that the consideration that has most influenced philosophers to falter in their defense of the view that this or that pronoun with quantifier antecedent refers, has been an incapacity to see how to differentiate such pronouns from genuine bound pronouns, in regard to which such a view is absurd. 'So I suppose you are going to say that 'his' refers to some man, in "Some man beats his dog" ', thunders the opponent, and aghast at the prospect, one is shamed into silence. Well, that move can no longer be made. Let us see what other moves can be made.

Against my proposal, appeal has sometimes beem made to an *intuition* that pronouns in the two syntactic positions are functioning in the same way. Harman, for example, considers the sentence

> If some arrows are such that those arrows are
> green, those arrows will hit the target,

and observes that the second occurrence of 'those arrows' may be replaced by the phrase 'those arrows that are green' (as we would expect, if it is an E-type pronoun) and the first occurrence cannot be.[57] But against this he appeals to the fact that 'the phrase "those arrows" seems to have the same function in both its occurrences'. But, instead

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57   Harman, *op. cit.*, p. 45.

509

of using the observation to undermine the intuition, he uses the intuition to undermine the observation, concluding that, contrary to first appearances, there is no special connection between the second occurrence of the phrase 'those arrows' and the description 'those arrows that are green' after all. One wonders how the intuition of similarity of functioning would respond to the observation that the substitution of the quantifier 'No arrows' has a different effect upon the two occurrences:

> If no arrows are such that those arrows are
> green, those arrows will hit the target.[58]

I. 'A man' does not refer

Geach tends to assume that anyone who holds that the pronoun 'it' in the sentence

> John owns a donkey and he beats it

has the role of referring to some particular donkey, must hold that its job is that of 'picking up the reference made by the expression "a donkey" '. And Geach has no trouble in showing that the expression 'a donkey' *never* refers.[59]

The position which Geach refutes so decisively is a position which fails to make any discrimination between my two classes of pronouns and crudely extends the explanation in terms of co-reference which is appropriate for members of one class, to members of the other.

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58 Geach makes a similar appeal to intuition in 'Referring Expressions Again' (*Logic Matters*, p. 100). See the sentence: 'All the same the relation of the dangling pronoun 'it' to its antecedent 'a book' is pretty clearly the same as (1) as it is in (10)'.

59 See e.g. the discussion in *Reference and Generality*, pp. 6ff. and in 'Back-Reference', pp. 203-4.

Such is not my position — and I wish to emphasize that *one is in no way committed, by saying that E-type pronouns have a referential role, to the view that their quantifier antecedents refer.* (In general the pronouns denote the items (if any) that *verify* the quantified sentence.)

II. 'Buridan's Law'

Geach considers the sentence

(15)   Just one man broke the bank at Monte Carlo, and he has recently died a pauper

and writes the following:

> Supposing the first half of (15) were true, it seems plausible to take 'he' as referring to the man who broke the bank at Monte Carlo; and then the second half of (15) would be true — and thus (15) as a whole would be true — iff it were true of that man that he had (at the time of the statement) recently died a pauper. But if the first half of (15) is false, there is no plausible way of specifying a reference for 'he'; yet (15) does not then cease to be a proposition with a truth value because an ostensibly referring expression in it fails to refer — (15) is then simply false.[60]

It is a plausible principle that no proposition whatever is expressed by purportedly genuine singular terms which lack a referent. But the same does not hold for singular terms whose reference is fixed by description. Precisely because the term has its reference fixed by description, its reference may be specified, and therefore the truth conditions of any sentence containing it may be specified, whether or not it has a referent. (Of course, *we* cannot specify the reference in the simple form

> In the second clause of (15) 'he' refers to the man who broke the bank at Monte Carlo,

for such a specification might reasonably be taken to commit *us* to there being such a man. The specification must rather take the form

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60   *Reference and Generality*, p. 126. I have changed the number of the example to agree with our ordering in this and subsequent quotations.

511

> For any *x*, the denotation of 'he' is the second clause of (15) is *x* iff *x* is the only man who broke the bank at Monte Carlo.

Thus Geach's claim that, if the first conjunct of (15) is false, there is no plausible way so specify the reference for the pronoun, is just wrong.[61]

Whether we say that the smallest sentence containing an empty singular term whose reference is fixed by description is false or that it has a third but non-designated truth value, is a matter which need not concern us here, for there will anyway be no difficulty in securing the result that (15), which is a conjunction of a false proposition with a proposition, is false.

What of 'Buridan's Law'? Geach states the law in various ways. On one occasion he stated it like this:

> But as Buridan pointed out long since, the reference of an expression can never depend upon whether the proposition it occurs in is true or false.[62]

If 'the reference of an expression' is interpreted as 'whether or not an expression has a referent', this principle can indeed be used against an E-type analysis of the pronoun in (15) but, upon that interpretation, it is wholly unacceptable, for it is then simply equivalent to a denial that there can be expressions whose reference is fixed by description. For, if an expression, a, has its reference fixed by the description ϕ, then whether or not a has a referent depends upon the truth value of the proposition 'There is something uniquely ϕ', and then the conjunction 'There is something ϕ and F(a)' would infringe the 'Law'. The 'Law' remains unacceptable even when it is restricted to atomic sentences, for under the same conditions, the perfectly acceptable proposition ϕ (a) would infringe it.

If there is an acceptable version of the principle, it concerns the *specification* of the reference of an expression. We might put the principle like this:

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61 For denotation clauses of this character see e.g. M.A.E. Dummett 'What is a Theory of Meaning?', in Guttenplan (ed.) *op. cit.*, p. 110-111, and T. Burge, 'Truth and Singular Terms', *Nous* 8 (1974), pp. 309-325.

62 *Reference and Generality*, p. 52.

512

> It is unacceptable for the specification of the reference of an expression occurring in any sentence to explicitly mention the truth value of that sentence; so that the only way of determining whether or not some object x is the referent of that expression would explicitly require a prior determination of the truth value of that sentence.

The word 'explicitly' in the principle is doing some work. There can be no objection to so fixing the reference of an expression that a determination of whether or not some object is its referent should *as a matter of fact* involve a determination of the truth value of the sentence in which it occurs; such would be the case for any sentence $\phi(a)$ when a has its reference fixed by the description ϕ. In such a situation, a clear way has been laid down for determining the referent of the expression and thus the truth value of the sentence; there just happens to be an overlap between the different stages of the operation of discovering its truth value. We find a genuine infringement of the principle in the paralogism of a kind which, according to Geach, prompted Buridan to state the principle: In 'Is A a donkey?' 'A' shall stand for you if the right answer is 'yes' and for Brownie, the donkey on the village green, if the right answer is 'no'. Here the *specification* of the **reference** of an expression *explicitly* involves the truth value of the very sentence in which it occurs, and Buridan is right to object to it. It is difficult to see what connexion a principle concerned with such a case could have with the proposal that the pronoun in (15) refers. On that proposal, a clear route has been laid down for the determination of whether or not something is the referent of the pronoun, a route which does not *explicitly* involve the truth value of the first conjunct, let alone the truth value of the sentence in which it immediately occurs.

III. Treating E-type pronouns as referring expressions involves assigning the wrong truth conditions to sentences containing them.

Considering the sentence

(16) Socrates owned a dog and it bit Socrates

Geach writes:

> A medieval would treat this as a conjunctive proposition and enquire after the reference (*suppositio*) of the pronoun 'it': I have seen modern discussion that made the same mistake. For mistake it is. If we may legitimately symbolize (16) as "$p \wedge q$" then a contradictory of (16), correspondingly symbolizable as "$.\neg p \vee (p \wedge \neg q)$", would be

> (17) Socrates did not own a dog, or else: Socrates
> owned a dog, and it did not bite Socrates.

But (16) and (17) are not contradictories; a moment's thought shows that they could both be true. So "$p \wedge q$" is an inept schema to represent (16).[63]

Presumably Geach's idea is that (16) and (17) can both be true when Socrates owns at least two dogs. But, if Socrates owned two dogs, on the proposal which I am defending (16) is not true; the second conjunct would not be true for failure of reference of 'it'. So this is really not an argument at all, but a counter-assertion. Geach claims that the sentence like (16) means no more and no less than

> Socrates owns a dog which (such that it) bit Socrates.

Should we be moved by this?

I have already given strong *prima facie* evidence against this claim of equivalence in meaning. It is easy to envisage circumstances in which someone might accept as true the sentence

> John has a finger which hurts him,

while rejecting its supposed paraphrase

> John has a finger and it hurts him.

We can easily envisage circumstances in which someone might accept as true the sentence

> John owns some sheep which he vaccinates,

while rejecting its supposed paraphrase

> John owns some sheep and he vaccinates them.

Now of course it is always open to philosophers or linguists to reject such *prima facie* evidence as to the meaning of sentences in the light of a systematic theory, when that theory not only works more smoothly by assigning a meaning to those sentences other than that suggested by the evidence, but also explains why we react to the sentences in the way that we do (by showing how independently well

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63 'Quine's Syntactical Insights', in *Logic Matters*, p. 118.

514

attested conversational factors deform and modify the sentences' strict and literal meaning). But such considerations of system and theory that there are, seem not to tell against, but rather to reinforce, the *prima facie* evidence of non-equivalence; in the preceding sections I have presented a mass of interlocking evidence that suggests that the pronoun in (16) is functioning in a way which is quite unlike the pronoun in its supposed paraphrase. And how can 'conversational factors' be invoked to account for the divergence sentences containing E-type pronouns have from their Geachian paraphrases, when the divergence depends crucially upon quite specific *grammatical relations* in which the pronoun stands to its antecedent?

In the light of all that has gone before, one who presses *this* argument of Geach's resembles, not so much someone executing an aggressive manoeuvre, but rather someone burying his head in the sand.

IV. We are obliged to introduce psychologizing

Suppose someone says

(18)   A Cambridge philosopher smoked a pipe and he drank a lot of whisky.

Suppose further that there were two pipe-smoking Cambridge philosophers, X and Y, one of whom did, and the other of whom did not, drink a lot of whisky. Now, given that there was a Cambridge philosopher who smoked a pipe, the truth value of (18) will be that of the second conjunct. And if we treat 'he' in the second conjunct as a referring expression, then the truth value of the entire remark will be determined by whether or not it is X or Y we fix on as the referent of 'he'.

> And so we might find ourselves trying to determine the truth value of (18) by asking who a man would have in mind when he uttered or wrote down the sentence (18)...Such psychologizing is really not necessary...[64]

The first point to observe is this: on the view of E-type pronouns I have so far outlined there is equally no license to engage in 'psychologizing'. On that view, the second conjunct, being equivalent to the sentence:

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64   'Logical Procedures and the Identity of Expressions', in *Logic Matters*, p. 11.

515

> The Cambridge philosopher who smoked a pipe drank a lot of whisky

will not be true, because the pronoun lacks a **referent**. Though, as we shall see, this position involves a certain divergence from idiom precisely because it contains no psychologizing, if psychologizing is indeed to be deplored, it still represents a much better position than any that results from an attempt to read the pronoun in (18) as a bound variable. A conviction that the bound variable approach is superior can only come from a conviction that, in the circumstances outlined above, (18) would be true. And this, in its turn, must rest upon the view that sentences of the structure of (18) are equivalent to sentences of the form

> A Cambridge philosopher both smoked a pipe and drank a lot of whisky.

And as we have seen, this view simply cannot stand up.

However, although this seems to me a perfectly adequate fall-back position, there does not seem to be any great harm in liberalizing the account we give of the truth conditions of sentences containing E-type pronouns with a dash of psychologizing, in the interests of a greater realism. For, when the speaker is manifestly *talking about* something,[65] for example, in narrating an episode, it is acceptable to continue with the use of an E-type pronoun even when the antecedent containing sentence or clause has not provided the basis for a unique specification. One might begin a story:

> One day, a man and a boy were walking along a road, and the man said to the boy: "Would you like to be King?"

One does not want to be committed, by this way of telling the story, to the existence of a day on which just one man and boy walked along a road. It was with this possibility in mind that I stated the requirement for the appropriate use of an E-type pronoun in terms of having

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65 I use the concept 'talking about' in a way quite different from the concept 'referring to'. One talks about an item *x* in uttering a sentence S which contains the predicate F in such a way that S entails that something is F, iff, in uttering S, one is *expressing* a belief about *x* to the effect that it is F. Thus one may be talking about something even though one manifestly refuses to let one's audience know which item it is that one is talking about, and this is inconsistent with my, and I think any decent, concept of (speaker's) reference.

516

answered, *or being prepared to answer upon demand,* the question "He? Who?" or "It? Which?"

In order to effect this liberalization we should allow the reference of the E-type pronoun to be fixed not only by predicative material explicitly in the antecedent clause, but also by material which the speaker supplies upon demand. This ruling has the effect of making the truth conditions of such remarks somewhat indeterminate; a determinate proposition will have been put forward only when the demand has been made and the material supplied.

Acutally, this way of 'fixing the reference' of an E-type pronoun can involve cancellation of explicit predicative material in the antecedent. Consider the exchange:

A: A man jumped out of the crowd and fell in front of the horses.
B: He didn't jump, he was pushed.

It is tempting to see, in B's remark, an application of the same use of E-type pronouns as we have been considering, especially since it is quite difficult to make sense of it while construing 'he' as a bound pronoun.

If this liberalization is made, it is important to see that such psychologizing as it involves infects merely the truth conditions of the sentences containing the E-type pronouns. The truth condition of the simple, unquantified sentence

A man jumped out of the crowd

can and should remain as given before; the undeniable fact that we may have particular individuals in mind in uttering such sentences must not be used to tamper with their truth conditions, which can obtain in virtue of the condition of some individual the speaker did not have in mind.[66]

In attempting to formalize the treatment of E-type pronouns in the succeeding section, I shall ignore the wrinkle introduced by this

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66 This is ignored by C. Chastain ('Reference and Context', unpublished mimeo, due to appear in a future volume of the *Minnesota Studies in the Philosophy of Science*) who invokes the concept of reference to give the truth conditions of sentences containing expressions like 'A man', at least partly because of the possibility of subsequent E-type pronouns. For reasons mentioned in fn 65 I would also reject Kripke's suggestion (made in the John Locke Lectures for 1973) that succeeding pronouns should be dealt with by invoking the concept of speakers' reference in connexion with sentences containing expressions like 'A man'; Kripke quite rightly insists upon leaving their truth conditions unchanged. Neither proposal seems necessary.

517

liberalization. I hope it is obvious how it can be incorporated into the final product.

D. Are E-type pronouns 'pronouns of laziness'?

It appears that any treatment of E-type pronouns that does justice to all the considerations we have mentioned will involve recovering a description from the sentence containing its antecedent. The ease and uniformity with which native speakers supply descriptions in answer to the questions 'He? Who?', 'It? Which?' etc., when they are raised in connection with E-type pronouns, is certainly indicative of a rule-governed process. But should we see the E-type pronoun as 'going proxy for' this recoverable description or as a semantic element whose reference is fixed by it? This question encapsulates a summary formulation of two different anaphoric processes. If an E-type pronoun is going proxy for the description, this would mean that the semantic evaluation of the sentence containing it proceeds exactly as if the description stood in its place. Now, there certainly are sentences in English for which we appear to need to invoke such a mechanism; the sentence, (1), with which we started is a good example, as are sentences which result from verb-phrase deletion, like

John listened to music and so did Harry.

However, there seem to me to be at least two arguments against regarding E-type pronouns as going proxy for descriptions.

The first is purely semantic; the sentence which results when the description takes the place of the E-type pronoun (the 'prolix sentence') is often ambiguous in a way in which the original sentence is not. The trouble arises because definite descriptions give rise to scope ambiguities when interacting with almost all operators. As a consequence, prolix sentences have interpretations, not possessed by the original sentences, which result when the description is not given maximum scope (in its clause). Examples illustrating this point can be found with each of the familiar operators that give rise to scope ambiguities with descriptions.

Negation

John owns a donkey but it is not the case that it is male

is unambiguous, while

> John owns a donkey but it is not the case that the donkey John owns is male

is ambiguous and might be asserted on the ground that there is no such thing as *the* donkey John owns, i.e. giving wide scope to the negation sign.[67]

Modality

> John owns a donkey and it likes carrots thought it might not have been the case that it liked carrots

seems to me to be unambiguous, with just the referentially rigid reading, while its prolix version is ambiguous:

> John owns a donkey and the donkey John owns likes carrots although it might not have been the case that the donkey John owns likes carrots.

Time

> Boston has a Mayor and he used to be a Democrat

is unambiguous, while its prolix version is ambiguous:

> Boston has a Mayor and the Mayor of Boston used to be a Democrat.

Psychological Attitudes

> A man murdered Smith, but John does not believe that he murdered Smith

attributes to John merely a non-contradictory belief *of* the murderer that he is not the murderer, while:

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67 Incidentally, this shows that Geach's two sentences (16) and (17) are not contradictories because they can both be false; it is not possible to use a sentence containing an E-type pronoun to form the full contradictory of another sentence containing and E-type pronoun, because the mere use of an E-type pronoun carries with it a commitment to the existence of a referent. E-type pronouns are like definite descriptions which insist upon widest scope.

> A man murdered Smith, but John does not believe that the
> man who murdered Smith murdered Smith

is ambiguous, with one (unlikely) reading on which John is attributed
the self-contradictory belief that the man who murdered Smith did
not murder Smith.

There is another kind of argument against treating E-type
pronouns as pronouns of laziness. It appears that those anaphoric
devices which are evaluated as proxies actually originate transfor-
mationally; a deletion transformation being triggered by relatively
superficial syntactic identity between the antecedent segment and the
segment that is either deleted entirely, or replaced with a pro-form.
Now, it is difficult to see how E-type pronouns could have had such a
transformational origin. For the descriptions for which they are
supposed to be going proxy do not correspond to any syntactically
coherent unit in the antecedent sentence. The relevant description is
'reconstructible out of' the antecedent sentence but does not occur in
it.[68] For example, in the sentence

> John owns some sheep which bite their tails and they are on
> the mountain

the pronoun 'they' would have to stand for the description

> the *sheep which John owns which bite their tails*

the italicized portion of which certainly does not correspond to any
syntactic unit in the antecedent sentence.

Syntactic theory is currently in too great a state of flux for any great
weight to be placed upon this argument. Nevertheless, I think we may
claim that, when both these arguments are taken together, at least a
prima facie case has been established against treating E-type pronouns
as pronouns of laziness. More conclusive considerations can only be
forthcoming in the context of a general theory of anaphora in
English.[69]

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68 This is why the change Geach has made in the concept of 'pronoun of
    laziness' does matter. The original idea — of an expression 'eliminable in
    paraphrase by a repetition of its antecedent' — 'might correspond to some
    underlying syntactic reality, whereas with the later addition '... or by a
    repetitious phrase somehow reconstructible out of its antecedent', the
    possibility of such a correspondence seems to be ruled out.

69 It was comforting to read the recent paper by Jorge Hankamer and Ivan Sag,
    'Deep and Surface Anaphora', in *Linguistic Inquiry* 7 (1976), pp. 391-428. In it,

5. Quantifiers with relative clauses

A. We are now in a position to set about constructing a theory which incorporates a rather more rigorous treatment of E-type pronouns than exists in the informal remarks and hints I have offered so far. To do so, we must offer some account of the main devices with which E-type pronouns interact; this means that we must extend both the syntax and semantics of quantified sentences to allow quantifiers to be restricted by relative clauses. Once the extension is made we will have a fragment of language rich enough to allow pronouns to get up to all their distinctive tricks, and a theory rich enough to deal with most of the sentences which philosophers and linguists studying pronouns have found troublesome.

The main lines of the treatment are these. I regard all natural language quantifiers as binary, taking two predicates, or open sentences, to make a sentence. This is partly because of my desire to construct a homophonic theory of meaning — a theory which stays as close as possible to the grammatical structures that are actually found in the language. Therefore, I look with a rather jaundiced eye at the reduction of the apparently binary structures of 'Some A's are B's' and 'All A's are B's' into unary structures — using connectives to join the two general terms A and B to form a single predicate. But, also, since some quantifiers, like 'Most', appear to *need* a binary analysis, considerations of simplicity strongly suggest adopting it for all.[70]

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they propose as generally applicable a distinction between anaphoric processes which corresponds to the distinction I have made in the case of pronouns. In their terminology, I am proposing that E-type pronouns are deep anaphors, and pronouns of laziness are surface anaphors. By their tests, which include an ambiguity test similar to that used in the text, deep anaphors are certainly what E-type pronouns turn out to be. See also O. Dahl, 'On So-Called Sloppy Identity', *Synthese* 26 (1973), pp. 81-112.

70 To guard against confusion it is worth distinguishing the binary structure here adopted from the binary structure suggested by Geach for the 'just one man' quantifier, and criticized above.   The break in Geach's binary structure was to come at the point marked by 'and' in the sentence

Just one man opened the box and he went home

and there is no evidence whatever that 'Just one' sentences are ill-formed unless they have two such constituents. The binary structure I am suggesting for all quantifiers would discern in the initial conjunct into the two constituent general terms 'man' and 'opened the box', and there is evidence that we need both of *these* constituents to have a well-formed sentence, though when we wish, in English, to approximate the effect of unrestricted quantification, the first constituent is the universal predicate 'thing' or 'object'.

Intuitively, the first predicate of the binary structure has the role of identifying the objects whose satisfaction of the second is relevant to the sentence's truth or falsity, or, in Fregean language, the role of identifying the *relevant* (potential) substitution instances. (The relevant singular terms are those which, when coupled to the first predicate, yield a truth.) Hitherto, this first predicate has always been a single common noun. We are now to allow it to be complex. Whereas before the relevant range was restricted by expressions like 'man', 'donkey', now it may be restricted by 'man who owns a donkey', 'donkey that can bray', and so on.

To understand the role of the common noun + relative clause in this way requires that the restricting clause on the quantifier with maximum scope should yield, when attached to a singular term, a complete sentence assessable as true or false. This is just a matter of sensible logical procedure; if we did not follow it, no start could be made upon the assessment of the whole sentence as true or false. It is also true that to understand the role of the expression common noun + relative clause in a quantified sentence along these lines brings me once again into headlong collision with Geach, who argues that the phrase cannot be understood as functioning in this way, and even its apparent unity is a kind of logical mirage. There is no more in Geach's arguments on this matter than there is to any of the arguments we have scrutinized on other matters, but for those who wish to rest their view of this subject on deductive rather than inductive grounds, I have included an Appendix specifically addressed to this point.[71]

I will treat the English relative pronouns, 'who', 'which', etc., as devices of predicate abstraction, enabling us to form a predicate:

(who) loves (John)

from a sentence frame with one free singular term position:

( ) loves (John).

Such predicates are satisfied by an object iff the sentence which results from substituting a singular term designating that object for the relative pronoun is true. (I shall ignore inflection and 'WH-movement' which together yield 'whom John loves' from '(John) loves (who)').

On this account[72], the use we make of the relative pronoun is very

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71 The Appendix is to be published in the next issue of the *Canadian Journal of Philosophy* (Vol. VII, No. 4).

72 This is essentially the account given by Quine in *Word and Object* (M.I.T. Press, Cambridge, 1960), pp. 110-114, and *Roots of Reference*, pp. 89-92.

similar to the use made of variables in forming predicate abstracts —
that of indicating the position in a sentence being abstracted upon.
However, the relative pronouns are not used with the full generality of
variables in formal language, since chains of co-reference *within* a
clause must be left to the pronominal apparatus. Thus we have:

(who) loves (his) father

rather than

(who) loves (who)'s father

However, when the sentence frame is truth-functionally complex we
find the repeated relative pronoun doing exactly the job of recurrent
variables:

(who) loves (John) and (who) does not love (Harry)
(who) loves (John) and (John) loves (who)

As we would expect, we have something parallel to 'lambda
elimination':

(John) A's iff John is one (who) A's.

When we had one-word general terms restricting the quantifiers,
there was no reason why the quantifier expression and the main clause
into which it is to be inserted should not be generated separately, but
if we are to generate, and evaluate, sentences with E-type pronouns in
the main clause which look back to quantifier antecedents in the
relative clause, the two constituents of a binary structure have to be
simultaneously constructed. To see exactly why this is so, let us
introduce E-type pronouns into the picture.

I shall indicate that a pronoun κ is being used as an E-type pronoun
by prefixing it with the symbol '#'. Syntactically '# κ' is a singular term.
We also need a device for indicating which quantifier expression an E-
type pronoun has as its antecedent. Since each quantifier acquires a
numerical index as it is inserted into the main clause, to keep track of
scope, we can attach the same index to the pronoun which has it as its
antecedent. Following the old procedure, we would construct the
sentence 'Socrates owns a dog and it bit Socrates' as follows:

( ) owns ( )
( ) owns (a₁ [dog])
(Socrates) owns (a₁ [dog])
(Socrates) owns (a₁ [dog]) and ( ) bit ( )

523

(Socrates) owns (a_1 [dog]) and (   ) bit (Socrates)
(Socrates) owns (a_1 [dog]) and (# it_1) bit (Socrates)

(Several steps of the construction could have been reversed without altering the overall effect.) So far so good. But now consider a sentence like

Most men who own a car wash it on Sunday,

in which the E-type pronoun is not actually referring, since the process of substituting quantifiers into singular term position has been iterated after the stage at which the pronoun was generated. The construction of the quantifier phrase is not difficult:

(   ) owns (a_1 [car])
(who) owns (a_1 [car])
Men: (who) own (a_1 [car])
Most [men: (who) own (a_1 [car])].

The main clause, into which we insert the quantifier cannot yet contain '#it' for want of a suitable antecedent, so it must be

(   ) washes (   ) on Sunday,

which after insertion yields

($Most_2$ [men:(who) own (a_1 [car])]) wash (   ) on Sunday.

But, now it is *too late* to insert the singular term '#it'. For to insert it at this stage would give it wider scope than 'most men' and have the consequence that the first operation in evaluating the sentence would be to enquire into the denotation of '#it'. This would be wrong, for, at the first stage in the evaluation of the sentence, the pronoun cannot sensibly be assigned a denotation.

Put briefly, the problem is that the E-type pronoun in the main clause must be inserted *after* the 'a car' quantifier but *before* the 'most men' quantifier. This puts paid to the separate construction of the quantifier phrase and the main clause.

Adopting the binary form, the process of the construction of the sentence looks like this:

Car ; (   ) owns (   )
A [car]; (   ) owns (   )
(   ) owns (a_1 [car])
Man: (who) owns (a_1 [car])

Man: (who) owns (a_1 [car]) ; ( ) washes ( ) on Sunday
Man: (who) owns (a_1 [car]) ; ( ) washes (#it_1) on Sunday
Most [man:(who) owns (a_1 [car])] ; ( ) washes (#it_1)
     on Sunday
($Most_2$[man:(who) owns (a_1[car])]) washes (#it_1) on Sunday.

(I shall continue to substitute the quantifier expression into a singular term position in the main clause because this does appear to be the way we indicate, in English, which position in the main clause is being quantified.)

The semantic evaluation will unpick what we have just knitted; the whole sentence will be true iff for most interpretations of β on which '(β) is a man (who) owns (a_1 [car])' is true, '(β) washes (#it_1)' is true.

B. Pronouns in relative clauses restricting quantifiers

The first thing I want to establish concerns bound pronouns, namely that it is not possible on the account of bound pronouns which I have offered to generate sentences in which a pronoun in a clause which restricts a quantifier Q is bound by a quantifier Q' with a lesser scope than Q. It is an immediate corollary of this that there can be no pair of quantifiers each of which binds a pronoun in a clause which restricts the other. This is no weakness of expressive power, but on the contrary, a matter of correct logical procedure.

On my account, a pronoun is bound by a quantifier when that quantifier is inserted into a singular term position to which the position occupied by that pronoun is chained. So, if a pronoun in a clause restricting a quantifier Q, is to be bound by another quantifier Q', the main clause into which Q' is to be inserted must look something like this:

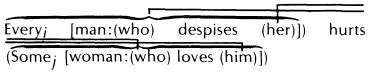(‾) R (Q [CN:(who) R' (‾)]) = (‾) hurts (a woman:(who)
loves (him))

which would turn, with the insertion of a singular term into the unoccupied chain, into a sentence like 'John hurts a woman who loves him'. Now, the quantifier Q' could also have its restrictive clause, so that, before the insertion of Q', we might have a binary frame which looks like this:

[CN:(who) R" (*)] ; (‾) R (Q [CN:(who) R' ( )]),

or:

[Man: (who) despises (*)]; (‾) hurts (a [woman: (who) loves (him)]).

But there is no way in which the empty singular term position in the clause restricting Q', which I have marked with an asterisk, could be bound by the quantifier already *in situ*. We cannot *now* connect with a brace the *-position and the singular term position occupied by the quantifier Q, for, although we are permitted to draw such braces at any stage in the construction of a sentence, we may do so only between two as yet unoccupied singular term positions. But equally, such a brace could not have been drawn between these two positions *before* the latter was occupied by the quantifier phrase containing Q, for while we are engaged in constructing the sentence frame:

$$(\overline{}) R (Q [CN:(who) R' ( )])$$

we have no legitimate place for a sentence which is going to restrict a quite separate quantifier, and thus no opportunity of creating relations of co-reference between positions like * in such a sentence, and positions in the sentence we are constructing.

There is thus no way of ending up with sentences which would look like this

$$\text{Every}_i \quad [\text{man:(who)} \quad \text{despises} \quad \text{(her)}]) \quad \text{hurts}$$
$$(\text{Some}_j \ [\text{woman:(who) loves (him)}])$$

($i > j$ or $j > i$); and a good thing too, for they are obviously meaningless.

Now, I do not deny that there are intelligible sentences which have the superficial form of this meaningless sentence — for example:

> A boy who owned them ran down some sheep that were in his way.

But elementary logical considerations enable us to deduce that, in this sentence, *either* the relative clauses do not restrict the quantifiers, *or else* the pronouns cannot be **bound-variable-type** pronouns. Since we can produce some examples of the same construction in which the clauses must be understood as restricting the quantifier, such as

> Every boy who asked him eventually got his father to agree,

sentences of this general type can be used in the construction of an elegant demonstration that at least some pronouns in English cannot be construed as bound-variable-type pronouns. Yet, paradoxically,

these very same sentences have been triumphantly cited as examples which can only be dealt with if we adopt a bound variable treatment of pronouns![73] It is easy to demonstrate that there is no way of assembling the 'deep-structures' proposed for these sentences into a sentence of quantification theory (restricted or unrestricted) in which every variable is bound.[74]

What of E-type pronouns in relative clauses? An E-type pronoun evidently cannot have as its antecedent a quantifier with wider scope. But, can an E-type pronoun, *in a clause restricting* one quantifier, have a quantifier with lesser scope as its antecedent? If we try to construct such sentences, we find them very odd:

> Almost every man who loves her kills one of his sisters
> Everyone who inherits it sells a house.

The reason for the oddness is not hard to discover. Attempting to evaluate the sentence for truth, we peel off the quantifier with maximum scope, and address ourselves to this question, for example: 'Are all of the interpretations of β, on which' β inherited #it' is true, interpretations on which ' β sold a house' is true?' Well, which interpretations are these? Understanding the E-type pronoun in the only way possible, the relevant interpretations must be those on which ' β inherited the house which he sold' are true. And this means that the discovery of whether or not the interpretation is relevant already presupposes that the predicate in the main clause applies. There seems no point in allowing such sentences to be constructed.

Not all relative clauses appended to a quantifier expression need to be interpreted as restricting it; it is always possible to regard the relative clause appended to a simple existential quantifier as a non-restrictive clause. And it appears that we only find intelligible occurrences of E-type pronouns whose antecedents are quantifiers with lesser scope in relative clauses upon which a non-restrictive reading may be imposed. Thus, the sentence

> A boy who owned them ran down some sheep that were in his way

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73 By J.D. McCawley, in 'Where Do Noun Phrases Come From?', in R.A. Jacobs and P.S. Rosenbaum (eds.), *Readings in English Transformational Grammar* (Ginn, Waltham Mass., 1970), pp. 176-7.

74 That such sentences pose a *problem* for the 'pronouns as variables' position was clearly indicated by Harman (*op. cit.*, pp. 41-3).

may be interpreted as

> A boy, who owned them, ran down some sheep that were in his way,

and thus as equivalent to

> A boy ran down some sheep that were in his way, and he owned them.

It is easy to verify that we place an E-type interpretation upon the pronoun in the original sentence — for it to be true the boy has to own all the sheep he ran down.[75] Since they do not appear to raise any new problems of interest or importance, I shall not bother further with non-restrictive relative clauses.

Finally, there are some sentences in which the pronoun in the clause restricting a quantifier cannot be interpreted either as a bound pronoun or as an E-type pronoun, but has to be seen as a genuine pronoun of laziness. Consider the sentence

> Every boy who plucked up the courage to ask him got his father to agree

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75   Harman considers a sentence of this kind, namely:'A boy who was fooling them kissed many girls that loved him', and claims that it seems 'roughly equivalent to'

> A boy who was fooling many girls that loved him kissed and was fooling many girls that loved him.

(Harman, *op. cit.*, pp. 42-3). Notice here the lengths to which one must go to produce a reading which depends upon the occurrence of E-type pronouns without actually acknowledging them. Essentially Harman treats the pronoun 'them' in the original sentence as a pronoun of laziness, but this yields only

> A boy who was fooling many girls that loved him kissed many girls that loved him,

which does not entail that he was fooling all the girls he kissed (nor, in fact, that he was fooling any of them). So, mysteriously, instead of 'kissed', the sentence's predicate somehow becomes 'kissed *and was fooling*'. It is no wonder Harman ruefully observes that 'it is not at all obvious what transformations would be used' to get away from his deep structure to the original sentence. Anyway, Harman's ruse does not work generally, as can be seen from the non-equivalence of:

> A boy who was fooling them kissed exactly two girls that loved him
> A boy who was fooling exactly two girls that loved him kissed and was fooling exactly two girls that loved him.

528

or the sentence

> The only pilot that shot at it hit the MiG
> that was chasing him.

These sentences appear to be interpreted as equivalent to their prolix versions

> Every boy who plucked up the courage to ask
> his father, got his father to agree,

and

> The only pilot that shot at the MiG that was
> chasing him hit the MiG that was chasing him.

There is every indication that these cannot be E-type pronouns. First, we noticed a general difficulty in interpreting sentences in which quantifiers having wide scope were restricted by clauses with E-type pronouns with quantifiers with smaller scope as antecedents. Secondly, E-type pronouns normally occur quite happily when there is no specific description in the antecedent clause; the material in the *whole* of the clause is used to fashion a description (and this is indeed why there is the general difficulty of interpretation mentioned in the first point). But we cannot construct happy sentences of this general shape unless there is a description in the main clause immediately ready for substitution. Thus the following sentence is infelicitous:

> *Every pilot that shot at it hit a MiG that was chasing him.

Finally, we observed that E-type pronouns were referentially *rigid*, so that, if 'it' in the clause

> The only pilot that shot at it

were an E-type pronoun, the whole clause would be equivalent to one in which an explicit description was given maximum scope,

> The MiG that was chasing him is such that the only pilot that
> shot at *it*,

which, if it is interpretable at all, would require that there was a MiG at which only one pilot shot, rather than, what the original sentence requires, that there was only one pilot that shot at the MiG that was chasing him.

529

Obviously, such pronouns cannot be bound-variable-type pronouns, for the elementary logical reason which I mentioned earlier (which is, of course, not to say that whatever interpretation we decide the sentence has cannot be represented in the notation of the predicate calculus).

It therefore seems reasonable to see at work in the construction of these sentences the 'pronoun of laziness' device which secures the correct interpretation and for which we have independent evidence.

C. As a final preliminary to formalization, we must state a principle about when an E-type pronoun can look back to a quantifier antecedent. In view of the ill-formedness of sentences like

*John doesn't own a car, and he drives it on Sunday

and

*Either John owns a car or he drives it on Sunday

it is obviously not sufficient to require that an appropriate quantifier antecedent (i.e. one with existential force) should occur as a syntactically coherent string in preceding material. But, in view of the well-formedness of sentences like

Either John does not own a donkey or he keeps it very quiet
If John owns a donkey he keeps it very quiet,

it is too stringent to insist that the sentence containing the quantifier antecedent should be embedded in the whole sentence in such a way that the truth of the whole sentence should require its truth.

The principle these last two examples suggest is this. Let Σ (σ, σ') be some sentence embedding a sentence, σ, whose main operator is a quantifier of existential force, and a sentence, σ', containing an E-type pronoun looking back to this quantifier. For Σ (σ, σ') to be well formed, it must be so constructed that, although there may be other ways in which it may be true, if there is a situation in which its truth or falsity turns upon the truth or falsity of σ', this will be a situation in which σ will also be true. (A conjunction of σ and σ' is just a special case of this.) So, intuitively speaking, if the truth value of σ' matters, there will be something for the E-type pronoun to refer to.

For truth functional modes of embedding, we can define the required relation as follows. Let us say that a sentence σ is *affirmatively embedded* in Σ relative to σ' iff, on all valuations v to the constituents of Σ on which $v(\sigma') = v(\Sigma) = T$ and which are such that,

530

for all valuations v' which agree with v save that $v'(\sigma') = F$, $v'(\Sigma) = F$, then, on those valuations v, $v(\sigma) = T$.

It seems natural to extend this concept of affirmative embedding to the binary structures in which quantified sentences originate, so that we can say that the sentence, B(who), which contributes to the restriction on a quantifier, is affirmatively embedded in the whole sentence relative to the sentence which becomes the main clause and into which the quantifier phrase is inserted. Let the quantified sentence, Σ, originally be of the form

$$Q_i \ [CN:B(who)]; \ A(\quad).$$

Now, although we cannot in general identify circumstances in which the truth value of each such quantified Σ *turns upon* the truth value of a substitution instance $A(\beta)$, the truth value of relevant substitution instances are always *germane* to the truth value of Σ. But only *relevant* substitution instances are germane in this way. So that, whenever an enquiry into the truth value of a quantified Σ obliges us to be interested in the truth value of a sentence $A(\beta)$ containing an E-type pronoun, the sentence $B(\beta)$ will also be true, and there will therefore be something for the pronoun to refer to.[76]

So we shall allow for the insertion of an E-type pronoun into any singular term position in a sentence in relation to which some other sentence, whose main quantifier is existential in force, is affirmatively embedded. Notice that this rule of grammar must be understood as relating to the deep structures generated by the base rules; by the time the superficial form of the sentence is determined, the antecedent sentence may have been deleted or transformed. Thus, for example,

> John does not own a donkey, but Harry does and he beats it every day

is well formed even though there does not appear in the surface

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76 Truth and well-formedness cannot be simultaneously and interdependently defined, on pain of ill-formed sentences being presented to the semantic theory for evaluation. In order to avoid this objection, presented to me by Barry Taylor, we should regard the notion of affirmative embedding being defined over a fragment of English that does not contain E-type pronouns, and for which truth and well-formedness are independently defined. Then the grammatical rule extending the fragment to allow for E-type pronouns will be understood as relating to contexts certified *in the smaller fragment* as being of a type in which one sentence is affirmatively embedded in relation to another. The semantical theory for the larger language will differ from that for the smaller only in containing a single additional clause for the evaluation of E-type pronouns.

531

structure an appropriate existential antecedent for the E-type pronoun. And the deep structure underlying

> Either John does not own a donkey or he keeps it quiet

can also yield

> Either John owns no donkey or he keeps it quiet.

Despite these examples, it seems necessary to state the well-formedness rule for E-type pronouns in terms of the occurrence of a specific kind of *syntactical* antecedent; a purely semantic criterion would not be able to explain the differing acceptabilities of:

> John has a wife and she hates him
> *John is married and she hates him.

6. Formalization

The purpose of constructing the following mock-up of the syntax and semantics of quantified sentences in English is simply to lend plausibility and explicitness to the distinction between the two kinds of pronouns — a distinction which I hope can be incorporated into whichever particular approach to the syntax and semantics of quantified sentences seems, in the light of detailed syntactic investigation, to be the most plausible. Although I have been concerned to adopt, in this mock-up, a syntactic account of quantified sentences of English which is at least not known to be foreign to them, in the way in which it is generally agreed amongst linguists that the syntax of unrestricted first order quantification theory is foreign to them,[77] I have not tried to present something which may be expected to form part of that final, most plausible theory. I shall suppress almost all syntactic complexities which are not relevant to my main theme, indicating with an asterisk those points at which the most considerable divergences from English proper occur; where the asterisk is not self-explanatory, an amplification follows in parentheses. I do not include any of those

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77 See, for example, J.D. McCawley, 'A Program for Logic', in Davidson and Harman, *op. cit*, especially p. 530, and E. Keenan, 'On Semantically Based Grammar', *Linguistic Inquiry* 3 (1972).

transformations which, though introducing redundancy at the level of singular sentences, are indispensible for the expressive power of the quantified fragment of the language.[78] Another omission will be any attempt to deal with plural reference, made possible by E-type pronouns with plural quantifiers as antecedents. This is not the place to explain, in general, how plural reference is to be understood; when it is understood the modifications to the theory presented here will be obvious.

A. Syntax

We suppose the fragment to contain a stock of predicates, indexed as to their degree, some of which are called *common nouns*. It also contains a stock of singular terms, some of which are called *pronouns* and a stock of quantifiers, none of which are plural* and some of which are called *existential in force*. We also have a stock of numerals called *indices*.

(1) If π is a predicate of degree n, π followed by* n singular term positions (written thus: π ( )( )( )...( )) is a sentence frame$_n$. (The numerical subscript is a record of the number of singular term positions free in the frame; a singular term position is free in a sentence frame iff no expression has been substituted in it in the construction of the frame.)

(2) If σ is a sentence frame$_n$ ⌜Not(σ)⌝ is a sentence frame$_n$ * and if σ is a sentence frame$_m$ and σ' is a sentence frame$_n$ then ⌜(σ and σ')⌝ ⌜ σ or σ')⌝, and ⌜(If σ then σ')⌝ are sentence frames$_{(n + m)}$. [σ' and both σ and σ', are respectively said to be *constituents* of the complex sentences formed by application of these rules, and the constituent-relation is transitive.]

(3) A common noun is a simple predicate expression$_0$.

(4) If σ is a sentence frame$_m$ ($m\geq1$) with position p_j free, and δ is a simple predicate expression (common noun), then [δ : σ $^{WH}/p_j$] is a predicate expression$_{(m - 1)}$.* (*No differentiation of relative pronouns; no provision for more than one occurrence of a relative pronoun in a single complex predicate.) [As before we write " σ^ϵ/p_j" for the result of substituting the expression ϵ in the position p_j in σ.] σ is said to be a constituent of the resulting predicate expression.

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78 See Dummett, *Frege*, pp. 12-14.

(5) If σ is a sentence frame$_m$ ($m \geq 1$) and π is a predicate expression$_n$, then ($\sigma : \pi$) is a binary sentence frame$_{(n + m)}$ of which π and σ are said to be constituents.

(6) If ρ is a binary sentence frame$_n$ of the form ($\pi ; \sigma$) with p$_i$ free in σ , and if Q is a quantifier and j an index, then Q_j [π] is a quantifier phrase and $\rho^{Qj[\pi]}/p_i$ is a quantified sentence frame$_{(n-1)}$ provided that no quantifier in ρ has an index higher than j, and that no singular term position to which p$_i$ is connected by a brace is not governed by it.[Observe that π does *not* become a constituent of the resulting σ .]

(7) For any n, if σ is a sentence frame$_n$ with positions p$_i$ and p$_j$ free, then the result of drawing a brace connecting p$_i$ and p$_j$ and substituting a pronoun in one or other of p$_i$ and p$_j$ is a sentence frame$_{(n - 1)}$.* (*No restriction on backward pronominalization, no gender agreement of pronouns, no pro-forms other than pronouns.)

(8) If σ is any complex sentence frame$_n$ with constituents σ' and σ'', where σ' is a quantified sentence frame whose quantifier is a quantifier of existential force whose index is the numeral j, and σ'' is a sentence frame in which the ith empty singular term position p$_i$ of σ occurs, and if σ' is affirmatively embedded with respect to σ'' in σ , then if κ is a pronoun, $\sigma^{'\#'\kappa j}/p_i$ is a sentence frame $_{(n-1)}$.

(9) If σ is a sentence frame$_n$ with a singular term position p$_i$ free, and τ is a singular term, then σ^τ/p_i is a sentence frame $_{(n-1)}$.

(10) All and only sentence frames$_0$ are sentences.

B. Semantics

I shall only state the principles for the devices with which we have been concerned in this paper.

Quantifiers. I shall take 'Every' as an example; clauses for other quantifiers can be straightforwardly derived from this example. Though the clause is stated in a semi-formal metalanguage observe that, if formalized in the language of the mock-up, it could yield strictly homophonic theorems.

If σ is a sentence frame$_0$ containing in its ith singular term position the quantifier phrase "Every" j [$\delta : B(WH)$] (where δ is a common noun and j an index higher than any index attached to any other quantifier in σ and the constituent represented by B(WH) is optional) then σ is true iff on every extension of the language with respect to some singular term β (which does not occur in σ), on which the

object which β denotes on that extension satisfies $\delta_{i\beta}$ and on which
B β/(WH) is true, if there is such a constituent, $\sigma \beta$/p$_i$ is true.

Co-reference. If σ is a sentence frame$_0$ containing positions p$_i$ and p$_j$ which are braced together, with p$_i$ containing the singular term τ and p$_j$ a pronoun κ , then the denotation of κ in σ is the same object as the denotation of τ .

E-Type Pronouns. The idea is to construct from the sentence containing the antecedent quantifier a description which is to fix the reference of the E-type pronoun. (Let us call this 'the antecedent sentence'.) In those cases where the E-type pronoun and its quantifier antecedent occur in co-ordinate clauses, the antecedent sentence is easy to identify; it is the smallest sentence which contains the quantifier and everything which it governs. But we have also allowed for the construction of sentences like

> Most men who own a car wash it on Sundays

where the antecedent quantifier is in a relative clause restricting a quantifier with greater scope. In such cases, the question of evaluating the sentence containing the E-type pronoun will only arise relative to some substitution instance of that quantifier with greater scope: 'β washes it on Sundays'; and then the antecedent sentence is the smallest singular sentence containing the antecedent quantifier and everything which it governs, formed by substituting the same constant (under the same interpretation) in that relative clause (' β owns a car').
  As we saw when considering a sentence like

> John owns a sheep which bites its tail and he beats it,

the reference of an E-type pronoun is fixed by a description which is formed from the antecedent sentence by the conjunction of a) the main clause into which the antecedent quantifier is inserted ('John owns ( )'), b) the common noun in the antecedent quantifier expression ('sheep'), and c) any relative clause restricting the antecedent quantifier ('(WH)bites ( )'s tail'). In the example, the relevant description is 'the sheep John owns that bites its tail'.
  These provisions are captured by the following laborious formulation.
  If σ is a sentence frame$_0$ which is a constituent of a sentence frame$_0$, Σ, and which contains the term '#κ $_j$ in its jth singular term position, and where σ' is the smallest sentence frame$_0$ containing the quantifier with index i which occurs in Σ, and which is of the form A(Q[δ : B(WH)]) (with the constituent represented by 'B(WH)'

535

Gareth Evans

optional), and where there is no larger sentence frame in Σ which has σ as a constituent and does not have σ' as a constituent [79]

OR

If σ is a sentence frame$_0$ which is a substitution instance with respect to the constant β of a sentence frame σ^* which is a constituent of a sentence frame$_0$, Σ, and σ contains the term '#$\frown\kappa\frown_i$ in its jth singular term position, and where σ' is a substitution instance with respect to that same constant β of the sentence frame σ'^* which is the smallest sentence frame$_0$ containing the quantifier with index i which occurs in Σ, and where σ' is of the form A(Q[δ : B(WH]) (with the constituent represented by 'B(WH)' optional) and where there is no larger sentence frame in Σ which has σ^* as a constituent and which does not have σ'^* as a constituent

THEN

Any object, x, is the denotation of "#" $\frown\kappa\frown_i$ iff x is the unique object which satisfies A( ), δ , and B( ) (if there is such a constituent), and σ is true iff, upon any extension of the language with respect to a constant, γ, (which does not already occur in σ or σ') on which the denotation of γ is the same as the denotation of "#" $\frown\kappa\frown_i$, σ^γ/p_j is true.[80]

March 1977

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79 The point of the clause 'and there is no larger sentence frame in Σ which has σ as a constituent and which does not have σ' as a constituent' is to ensure that the description which fixes the reference of the E-type pronoun has as wide a scope as does not include the sentence containing its quantifier antecedent. This will secure the referential rigidity which we observed these pronouns to display. At the same time, the scope of the description is not the whole sentence; so we do not end up with the inaccurate result that a sentence like

> Either John does not own a donkey or he keeps it very quiet

is true iff

> The donkey which John owns is such that either
> John owns no donkey or he keeps it very quiet.

(and thus false if John owns no donkey).

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536