Pronouns as Variables*

NATHAN SALMON
University of California, Santa Barbara

I

The English sentence,

> (1) Every male soldier overseas misses the only woman waiting for him back home

may be seen as having an underlying logical form given by the following—where items in boldface correspond to explicit elements in the surface form:

> (1′) [**every** x: **male soldier**(x); **overseas**(x)] (x **misses** [**the only** y: **woman**(y)](y is **waiting for** x **back home**)).

The expression '[every x: male soldier(x); overseas(x)]' is a *restricted universal quantifier phrase*; '[the only y: woman(y)](y is waiting for x back home)' is an open definite description.[1] The variable 'x' is bound in (1′) by the restricted universal quantifier; so the 'him' in (1) may be said to be bound by 'every male soldier overseas'.

Peter Geach holds that, with one kind of exception, anaphoric pronouns in general are bound variables.[2] The exceptions are the *pronouns of laziness*, which go proxy for another expression that the speaker chooses not to repeat. Indeed, aside from pronouns of laziness, and aside also from deictic (non-anaphoric) uses of pronouns—which correspond in some respects to free variables under an assigned value—typical pronoun-occurrences in English appear to function as bound variables. As Geach puts it,

---

1   I remain neutral concerning whether a definite description is a singular term or a uniqueness-restricted quantifier.

2   Geach, *Reference and Generality* (Ithaca, NY: Cornell University Press, 1962), at pp. 125-126, and *passim*.

"It is very important to notice that the relation of bound variables to the binding operator in symbolism *strictly* corresponds to the relation of pronoun to antecedent in the vernacular."[3] One of the most valuable insights in Alan Berger's study, *Terms and Truth*, is his critique of the increasingly popular view that certain anaphoric pronouns are, contrary to Geach, unbound.

A standard view is that free variables (and occurrences of compound designators containing free variables) designate, whereas bound variables range over a universe of values and do not also designate. An analogous view is generally assumed with regard to natural-language pronouns: deictic occurrences and some laziness occurrences designate; bound-variable anaphoric occurrences do not. Geach criticizes "the lazy assumption that pronouns, or phrases containing them, can be disposed of by calling them 'referring expressions' and asking what they refer to."[4] He says of anaphoric pronoun-occurrences, "It is simply a prejudice or a blunder to regard such pronouns as needing a reference at all" (*Reference and Generality*, p. 126). This attitude betrays a lack of analytical vision. The prejudice or blunder, I contend, is on Geach's side. He is not alone.

It is essential in what follows that the reader be ever vigilant, paying extremely close attention to the distinction between expressions themselves and their occurrences.[5]

II

Geach's contention that anaphoric pronoun-occurrences (other than pronouns of laziness) are bound variables, and his insistence that bound variables do not designate, are independent. In fact, perhaps most theoretical linguists and philosophers of language maintain with Geach that bound variables do not designate, while also maintaining with Gareth Evans that some pronoun-occurrences anaphoric upon a quantifier (besides

---

3   Geach, "History of a Fallacy," *Journal of the Philosophical Association* (Bombay), 5, 19-20 (1958); reprinted in Geach's *Logic Matters* (Oxford: Basil Blackwell, 1972), pp. 1-13, at 12-13. See also Geach's "Quine's Syntactical Insights," *Synthese*, 19, 1/2 (1968-1969); reprinted in *Logic Matters*, pp. 115-127, at 118. For present purposes I am ignoring reflexive pronouns like 'himself', although Geach's thesis extends to these. *Cf*. my "Reflexivity," *Notre Dame Journal of Formal Logic*, 27, 3 (July 1986), pp. 401-429, reprinted in N. Salmon and S. Soames, eds., *Propositions and Attitudes* (Oxford Readings in Philosophy, 1988), pp. 240-274; and "Reflections on Reflexivity," *Linguistics and Philosophy*, 15, 1 (February 1992), pp. 53-63.
4   Geach, "Ryle on Namely-Riders," *Analysis*, 21, 3 (1960-1961); reprinted in *Logic Matters* (Oxford: Basil Blackwell, 1972), pp. 88-92, at 92.
5   For most purposes, an expression-occurrence may be regarded as the expression *together with* a position that the expression occupies within a larger expression. With some trepidation, I follow the common vernacular in speaking of "bound variables" where what are mentioned are actually bound *occurrences*.

laziness occurrences) designate, or at least have semantic extension.[6] Following Evans, an anaphoric pronoun-occurrence whose grammatical antecedent is a quantifier-occurrence within whose scope that pronoun-occurrence does not stand is often called an E-type pronoun.[7] It is generally held that an E-type pronoun-occurrence is an occurrence of a definite description recoverable from the antecedent quantifier—or alternatively, an occurrence of a rigid singular term whose reference is fixed by the recoverable definite description. (See note 1.) E-type pronoun-occurrences, according to Evans, are "assigned a reference and their immediate sentential contexts can be evaluated independently for truth and falsehood."

Those familiar with classical first-order logic typically treat the 'it' in

(2) If any man has a home, it is his castle.

as a variable bound by the phrase 'a home' functioning as a prenex restricted universal quantifier:

(2G) [any x: man(x)] [any y: home(y)] (if x has y, then y is x's castle).

Evans argued in opposition to Geach that the phrase 'a home' is an existential quantifier. Furthermore, according to Evans, its scope does not extend beyond (2)'s antecedent, and so does not bind the E-type pronoun 'it'. Evans hinted at one sort of consideration that counts against a treatment of the 'it' as a bound variable.[8] The analogous sentence,

(3) If any man has several homes, they are his castles

is clearly not equivalent to (2G). Neither is it equivalent to

[any x: man(x)] [several y: home(y)] (if x has y, then y is x's castle).

The latter is true even if (3) is false, merely because for any man there are several homes he does not have. The anaphoric occurrence of 'they' in (3) is therefore not a variable-occurrence bound by its antecedent. By analogy, neither is the 'it' in (2) a variable bound by its antecedent.

---

6   *Cf.* Evans, "Pronouns, Quantifiers, and Relative Clauses (I)," *Canadian Journal of Philosophy*, 7 (1977), pp. 777-797; "Pronouns," *Linguistic Inquiry*, 11 (1980), pp. 337-362.

7   In the vernacular of theoretical linguistics, the term '*E*-type pronoun' is used for an anaphoric pronoun-occurrence whose grammatical antecedent is a quantifier-occurrence that does not *c-command* that pronoun-occurrence. (See note 5 above.)

8   "Pronouns, Quantifiers and Relative Clauses (I)," at §IV*B*(*a*).

Evans takes the 'it' in (2) to be a rigid singular term whose reference is fixed by the description 'the home that he has', bound only by the initial restricted universal quantifier 'any man'. He might have represented (2) as having the following logical form:

(2E) [any x: man(x)] (if [a y: home(y)](x has y), then *dthat*[[the z: home(z)](x has z)] is x's castle). [9]

An *E*-type pronoun can also occur in a separate sentence from its antecedent. Consider the following discourse fragment:

(4) (*i*) A comedian composed the musical score for *City Lights*.
(*ii*) He was multi-talented.

The particular sentence (4ii) is ordinarily regarded as an open formula, with 'he' a free variable. As Geach has noted, the pronoun evidently functions differently as it occurs in (4). Geach takes the 'he' to be a variable-occurrence bound by a prenex occurrence of the restricted existential quantifier 'a comedian', as in the following:

(4G) [a x: comedian(x)] (x composed the musical score for *City Lights* & x was multi-talented). [10]

Evans's evidence that 'a comedian' in (4i) does not bind the 'he' in (4ii) comes by considering an analogous discourse fragment like

(5) Just two actors starred in *City Lights*. They were both multi-talented,

which is not equivalent to the quantified generalization,

Just two actors both: starred in *City Lights* and were multi-talented.

[9] Kaplan, "Dthat," in P. Cole, ed., *Syntax and Semantics 9: Pragmatics* (New York: Academic Press, 1978), pp. 221-243. Here I treat '*dthat*' as a rigidifying operator complete in itself, and into whose scope it is possible to quantify (contrary to Kaplan's intentions). Presumably Evans would offer a similar analysis for (3), perhaps
    (3E) [any x: man(x)] (if [several y: home(y)] (x has y), then *dthose*[[the z's: home(z)](x has z)] are x's castles).
where '[the z's: home(z)](x has z)' is a *plural definite description* (representing 'the homes that he has') and '*dthose*' is a plural rigidifier.
    Evans' theory encounters a serious difficulty (indeed, a counterexample) with the more natural variant of (2) obtained by replacing 'any man' with 'a man'.

[10] *Reference and Generality*, at pp. 129*ff*; and "Quine's Syntactical Insights," at pp. 118-119 of *Logic Matters*.

Many writers, including several critics, have followed Evans in concluding that the pronoun 'they' in (5) is an occurrence of a closed expression. By analogy, the 'he' in (4) appears to be a free occurrence of a closed definite description or, as Evans maintained, a rigidified variant. Evans thus represents (4) as having the following logical form:

(4*E*) (*i*) [a *x*: comedian(*x*)] (*x* composed the musical score for
         City Lights).

      (*ii*) *dthat*[[the *y*: comedian(*y*)](*y* composed the musical score for
         City Lights)] was multi-talented.

The full 'dthat'-term (a closed expression) is alleged to be the formal counterpart of the 'he' in (4ii).

III

Persuaded that *E*-type pronouns are not bound variables, some writers have miscataloged certain directly referential singular terms as non-rigid definite descriptions, partly as a result of a failure to distinguish sharply between the term and its occurrence. Michael McKinsey, Scott Soames, Stephen Neale, and others argue that the 'he', as it occurs in (4), is synonymous with 'the only comedian who composed the musical score for *City Lights*'.[11] Consider a possible world *W* in which Buster Keaton composed the musical score for Chaplin's classic silent film. The discourse fragment (4) is true with respect to *W* iff Keaton is a multi-talented comedian in *W*, never mind Chaplin.[12] With respect to *W*, it is argued, the 'he' in (4) designates Keaton. The entire discourse fragment is thus depicted as having the following logical form, in contrast to (4*E*):

(4*M*) (*i*) [a *x*: comedian(*x*)] (*x* composed the musical score for *City Lights*).

      (*ii*) [the *y*: comedian(*y*)](*y* composed the musical score for *City Lights*) was multi-talented.

---

11 McKinsey, "Mental Anaphora," *Synthese*, 66 (1986), pp. 159-175, at 161; Soames, review of Gareth Evans's *Collected Papers*, in *The Journal of Philosophy*, 86 (1989), pp. 141-156, at 145; Neale, "Descriptive Pronouns and Donkey Anaphora," *The Journal of Philosophy*, 87 (1990), pp. 113-150, at 130, and *Descriptions* (Cambridge, Mass.: MIT Press, 1990), p. 186.

12 Insofar as the modal truth-conditions for (4) yield this result, the 'he' does not function in (4) as a demonstrative. The sentence '*Dthat*[the comedian who composed the musical score for *City Lights*] was multi-talented' is true with respect to a context *c* and a possible world *W* iff the comedian who *in the possible world of c* (rather than *w*) composed the musical score for *City Lights*, was multi-talented *in W*.

The full definite description in (4*Mii*) is alleged to be the formal counterpart of the 'he' in (4).

That the pronoun 'he' (the expression) is in fact rigid is confirmed in the present instance by positioning it in the scope of a modal operator-occurrence:[13]

> A comedian composed the musical score for *City Lights*. That he was multi-talented is a contingent truth.

The second sentence here does not impute contingency to the fact that whichever comedian composed the music for *City Lights* was multi-talented. (If it did, it would presumably be false.) Instead it expresses something about Chaplin himself: that although in fact multi-talented, he might not have been.

This does not mean, however, that Evans was right and Geach wrong concerning *E*-type pronouns.

IV

Classical semantics does not abide by Frege's admonition that *one should never ask for the designatum or content of an expression in isolation, but only in the context of a sentence*. Classical semantics imputes semantic designation to expressions (under assignments of values to variables), not to their occurrences in formulae. Yet Frege's Context Principle has a point. One reason for departing from classical semantics—and one possible motivation for the Context Principle—is the desire for universal principles of extensionality for designation and of compositionality for semantic content. Even more important is our intuition concerning what is actually being mentioned in a particular context. Consider, for example, the following fallacious inference:

> In 1999, the President of the United States was a Democrat.
>
> The President of the United States = George W. Bush.
>
> Therefore, in 1999, George W. Bush was a Democrat.

The invalidity is partially explained by noting that whereas the definite description in the second premise designates Bush, there is no mention of Bush in the first premise. Though perhaps incomplete, the explanation is intuitive, even satisfying.

---

[13] This is also pointed out by Alan Berger in his book, *Terms and Truth* (Cambridge, Mass., MIT Press, 2002), 171-178. *Cf*., my "Demonstrating and Necessity," *The Philosophical Review*, 111, 4 (October 2002), pp. 497-537, at pp. 536-537*n*52.

Frege regarded the attributing of semantic values to expressions *simpliciter* as legitimate only to the extent that such attribution is derivative from semantic attribution to those expression's occurrences in sentences. One need not adopt Frege's attitude in order to make sense of attributing semantic values to an expression-occurrence. Semantic attribution to occurrences may be regarded as derivative from the metalinguistic *T*-sentences (and similar meta-theorems) derived from basic semantic principles. Thus, we may choose to say that whereas 'the President of the United States' *customarily* designates Bush, the *occurrence* of 'the President of the United States' in the major premise above designates the function that assigns to any time t, the person who is President of the United States at t. The semantic value of the description that bears on the truth-value of the sentence is not Bush, but this function.

It is indeed a mistake to treat a bound variable (or other bound expression-occurrence) as having its customary, or default, designatum.[14] The value of a variable, under an assignment of values to variables, is what free occurrences of the variable designate. Does a bound variable have a non-standard designatum? It does; it has what I call the variable's *bondage designatum*. In a properly developed semantic theory applicable to expression-occurrences, the occurrences of 'x' in (1′), and the 'him' in (1), each designate the identity function on the universe of individuals over which those variables range.[15]

A similar situation obtains with regard to *E*-type pronouns. As Berger remarks,

Usually in linguistic literature when it is argued that an anaphoric pronoun should not be analyzed as a bound variable, what is argued [i.e., what is actually shown] is simply that the immediate anaphoric antecedent does not bind the variable occurrence representing the pronoun.… But it does not follow that the pronoun is not to be analyzed as a bound variable. For it is possible to analyze the pronoun as a bound variable without regarding it as bound by the immediate anaphoric antecedent (p. 166).

The pronoun-occurrence in (4) is plausibly regarded as a variable-occurrence bound by a restricted quantifier implicit in (4*ii*). The entire discourse fragment is plausibly regarded as having a logical form more like the following:

(4′)(*i*) [**a** *x*: **comedian**(x)] (*x* **composed the musical score for *City Lights***).

---

14   When a quantifier (or other variable-binding operator) "quantifies into" an open expression, I say that the external quantifier-occurrence, in addition to binding the variable occurrence, also binds the containing open-expression occurrence itself.

15   A justification for this claim is offered in my "A Theory of Bondage," *The Philosophical Review*, 115, 4 (October 2006), pp. 415-448.

(*ii*) [a *y*: comedian(*y*); *y* composed the musical score for *City Lights*] (**y was multi-talented**)**.**

The open formula '*y* was multi-talented' occurring in (4′*ii*) makes an explicit appearance in the surface form, as (4*ii*). The rest of (4′*ii*) does not. On this analysis, an *E*-type pronoun-occurrence is a species of bound-variable occurrence, as Geach has long maintained. In fact, (4′) is equivalent to (4*G*). Contrary to Geach, however, the anaphora between an *E*-type pronoun and its antecedent is not the same relation as that between a bound variable and its binding operator. Instead the *E*-type pronoun is bound by an absent operator recoverable from the antecedent.

One important advantage of this analysis over both (4*E*) and (4*M*) is that the mere grammar of (4) does not support an inference to a uniqueness claim of the sort presupposed or otherwise entailed by the use of '*the only* comedian that scored the music for *City Lights*'. This is obvious with the following discourse:

A comedian panned the musical score for *City Lights*. He was jealous. Another comedian also panned the musical score for *City Lights*. He wasn't jealous; he was tone-deaf.

Another important difference is that there is no definite description in (4′) to be regarded as a formal counterpart of the 'he' in (4). There is no designation at all of Chaplin in (4′), except by the variables '*x*' and '*y*' under appropriate value-assignments. The rigidity of 'he' suggests that its formal counterpart in (4′) is simply the last occurrence of '*y*'.[16]

It is extremely important here to distinguish sharply between the English *sentence* (4*ii*) and its *occurrence* in the discourse-fragment (4). The former is the natural-language analog of an open formula. That is the sentence itself, whose logical form is given, nearly enough, by '*y* was multi-talented'. The occurrence of (4*ii*) in (4) is a horse of a different color. Here the surface form of an occurrence is not a reliable guide to the logical form. The occurrence of (4*ii*) in (4) corresponds not merely to '*y* was

---

[16]   Likewise, (2) is plausibly seen as having the following logical form:

   (2′) [**any** *x*: **man**(*x*)] (**if** [a *y*: **home**(*y*)] (*x* **has** *y*)**,** then [any *z*: home(*z*); *x* has *z*] (**z is x's castle**)).

The boldface occurrence of '*z*' corresponds to the *E*-type pronoun 'it' in (2). This more long-winded alternative to (2*G*) is equivalent to it. A similar analysis may be given for (3).

   The analysis Berger provides for discourse-fragments like (4), *ibid.*, at pp. 159-189, 203-227, looks to be similar to (4′) but for a difference in presupposition.

   Both anaphoric pronoun-occurrences in 'If a man has a home, it is his castle' are naturally taken as variable-occurrences bound by restricted-universal-quantifier occurrences. The sentence is plausibly regarded as having the following logical form:

   If [**a** *x*: **man**(*x*)] [**a** *y*: **home**(*y*)] (*x* **has** *y*)**,** then [any *x*′: man(*x*′)] [any *y*′: home(*y*′); *x*′ has *y*′] (**y′ is x′'s castle**).

multi-talented' but to the whole of (4′*ii*), in which a quantifier binds the open formula. Though superficially an occurrence of an open formula, the underlying logical form is that of a closed sentence, one that "can be evaluated independently for truth and falsehood." In effect, the second sentence-occurrence in (4), though syntactically an occurrence of (4*ii*), is semantically an occurrence of (4′*ii*). One could say that the *sentence* (4*ii*) itself is bound in (4), though not by any element of (4*i*)—indeed, not by any element of the surface form of (4). One might say that the occurrence of (4*ii*) in (4) is a *pro-clause of laziness*; it has the logical form of the whole consisting of (4*ii*) *together with a binding quantifier phrase*. The quantifier phrase itself, though invisible, is present behind the scenes.[17]

If the occurrence of '*y* was multi-talented' in (4′*ii*) is to be regarded as having an extension, its extension is not a truth value, but rather the function that maps individuals in the range of '*y*' who were multi-talented to truth, and maps those who were not to falsehood. The whole of (4′*ii*)—and hence the occurrence of (4*ii*) in (4)—is true iff the class characterized by this function includes a comedian who composed the musical score for *City Lights*. The occurrence of (4*ii*) in (4) is thus true with respect to the possible world *W* iff Keaton was multi-talented in *W*.

The very fact that the occurrence of (4*ii*) in (4) has these modal truth-conditions despite the rigidity of 'he' indicates that, contrary to Evans and several of his critics, the 'he' in (4) is a bound variable. One can say with some justification that the 'he' in (4)—the occurrence—is a non-rigid designator. This is not because the occurrence designates Chaplin with respect to one world and Keaton another. It does neither. Where it occurs free (e.g., a deictic use), 'he' is a rigid designator of its customary extension under a designatum-assignment. If the pronoun-occurrence in (4) is to be regarded as designating at all, it has its bondage designatum. Insofar as the occurrence is non-rigid, it is so because it ranges over different universes with respect to different worlds.

---

17   The discourse fragment (5) is plausibly regarded as having the following logical form:

(5′) (*i*) [**just two** *x*: **actor**(*x*)](*x* **starred in** *City Lights*).

(*ii*) [every *y*: actor(*y*); *y* starred in *City Lights*] (***y* was multi-talented**).

See the previous note. Consider, in contrast, the discourse fragment:

(*i*) A man and a woman starred in *City Lights*.

(*ii*) The man was multi-talented.

If this does not entail that only one man starred in *City Lights*, its logical form is arguably given by,

(*i*) [**a** *x*: **man**(*x*)] (*x* starred in *City Lights*) **and** [**a** *x*: **woman**(*x*)] (*x* **starred in City Lights**).

(*ii*) [a *y*: man(*y*); *y* starred in *City Lights*] ([**the** *z*: **man**(*z*)](*z* = *y*) **was multi-talented**).