CHAPTER FOUR

Vagaries of Reference

§ 26. VAGUENESS

In the preceding chapter we have imagined the progressive acquisition of terms and auxiliary particles by the child of our culture. Fullness of experimental detail was not an objective, but the genetic style of approach had conveniences: it helped us picture serially what devices there are to master and wherein their mastery consists, and it enabled us to study the referential claims of the devices in a cumulative order. Now in the present chapter we shall take the mastered language as a going concern and consider the indeterminacies and irregularities of reference that pervade it.

Such a study need not argue for language reform. We are accustomed daily to paraphrase our sentences under the stress or threat of failure of communication, and we can continue thus. Typical ways of doing just that are indeed all that this chapter will venture in a normative vein. The purpose of the study is to bring the referential business of our language more clearly into view.

Vagueness is a natural consequence of the basic mechanism of word learning (cf. § 18). The penumbral objects of a vague term are the objects whose similarity to ones for which the verbal response has been rewarded is relatively slight. Or, the learning process being an implicit induction on the subject's part regarding society's usage, the penumbral cases are the cases for which that induction is most inconclusive for want of evidence. The evidence is not there to be gathered, society's members having themselves had to accept similarly fuzzy edges when they were learning. Such is the inevitability of vagueness on the part of terms learned in the

primitive way; and it tends to carry over to other terms defined on the basis of these.

Insofar as it is left unsettled how far down the spectrum toward yellow or up toward blue a thing can be and still count as green, 'green' is vague. Insofar as it is left unsettled where to withhold 'muddy water' in favor of 'wet mud', 'water' and 'mud' are vague. Insofar as it is left unsettled how far from the summit of Mount Rainier one can be and still count as on Mount Rainier, 'Mount Rainier' is vague. Thus vagueness affects not only general terms but singular terms as well. A singular term naming a physical object can be vague in point of the boundaries of that object in space-time, while a general term can be vague in point of the marginal hangers-on of its extension.

Commonly a general term true of physical objects will be vague in two ways: as to the several boundaries of all its objects and as to the inclusion or exclusion of marginal objects. Thus take the general term 'mountain': it is vague on the score of how much terrain to reckon into each of the indisputable mountains, and it is vague on the score of what lesser eminences to count as mountains at all. To a less degree 'organism' has both sorts of vagueness. Thus under the first heading there is the question at what stage of ingestion or digestion to count food a part of the organism; also whether to date the individual from conception or from severance of the cord or from some intermediate stage; also whether to count a slime mold as an organism or as a colony of organisms. Under the second heading there is the question whether to count filterable vira as organic at all.

The first of the two ways in which 'mountain' is vague causes an indeterminancy of count: it is not clear when to declare a saddle to be in the middle of one mountain and when between two mountains. The issue makes all the difference between one mountain and two. Correspondingly for 'organism': it is not clear in the case of pregnancy whether to say we have one organism or two, nor, in the case of slime mold, whether to say we have one or a thousand.

An extravagant degree of vagueness, if vagueness it be, is seen in 'big' and 'little'. Now part of the oddity of these words is that we speak of big butterflies and little elephants, meaning only that they are big for butterflies and little for elephants. This relativity to classes is not vagueness, but syncategorematic use (§ 27). But the words are used also apart from such allusions to classes, in ways that

can be brought under control by retreat to the relative terms 'bigger' and 'smaller'. Similarly for 'hot' and 'cold', 'high' and 'low', 'smooth' and 'rough', 'heavy' and 'light'. Whether or not we call such relativization of polar words a resolution of vagueness, we can apply the same device to terms that are ordinarily called vague, such as 'green'. All worry over boundaries to the vague green part of the spectrum is resolved insofar as we can content ourselves with speaking of one thing as greener than another; sulphur is greener than blood, and the sky than violets.[1] Even this relative term 'greener' will indeed retain some vagueness, if it compares deviations from a central green norm which is itself not sharply specified, but it will retain no such wide-angled vagueness as that of the original vague 'green'. Much the same remedy is applicable, if less naturally, even to the vague singular term 'Mount Rainier': we can take to treating the mountain as a point, the summit, and then talk merely of relative distances down and out from that point. But this device does not afford an all-purpose resolution of vagueness; it can preclude or complicate the saying of some things in terms of 'green' and 'Mount Rainier' that we want to continue to be able to say. Alternative ways of resolving or diminishing vagueness, hereafter illustrated, serve some purposes better.

Good purposes are often served by not tampering with vagueness. Vagueness is not incompatible with precision. As Richards has remarked, a painter with a limited palette can achieve more precise representations by thinning and combining his colors than a mosaic worker can achieve with his limited variety of tiles, and the skillful superimposing of vaguenesses has similar advantages over the fitting together of precise technical terms.[2]

Also, vagueness is an aid in coping with the linearity of discourse. An expositor finds that an understanding of some matter *A* is necessary preparation for an understanding of *B*, and yet that *A* cannot itself be expounded in correct detail without, conversely, noting certain exceptions and distinctions which require prior understanding of *B*. Vagueness, then, to the rescue. The expositor states *A* vaguely, proceeds to *B*, and afterward touches up *A*, without ever having to call upon his reader to learn and unlearn any outright falsehood in the preliminary statement of *A*.

[1] But such ordering by frequency is perhaps not the most significant. See Land, pp. 89, 91.

[2] Richards, pp. 48 ff., 57 ff., 69.

Vagueness does not perturb the truth values of the usual sentences in which vague words occur. Typical truths about organisms are true by virtue of certain unmistakable organisms independently of any rulings on vira, embryos, slime mold, and cud. A sentence affirming the approximate height of Mount Rainier is independent of the vagueness of that singular term. Not so a sentence affirming the approximate area or population of Mount Rainier; but these are unusual aspects of a mountain to talk about. When sentences whose truth values hinge on the penumbra of a vague word do gain importance, they cause pressure for a new verbal convention or changed trend of usage that resolves the vagueness in its relevant portion. We may prudently let vagueness persist until such pressure arises, since meanwhile we are in an inferior position for judging which reforms might make for the most useful conceptual scheme.[8]

Sentences whose truth values hinge on vagueness usually command interest only in specialized studies, if at all, and the rulings adopted to resolve the obstructive vaguenesses are adopted only locally for the purposes in hand. One fertile field of illustration is law; another is that of almanac firsts.

Thus take the question of biggest fresh lake. Is Michigan-Huron admissible, or is it a pair of lakes? Here the briefest reflection on likely criteria will issue in a favorable verdict. Then take the question of longest river. Is the Mississippi-Missouri admissible, or is it a river and a half? The answer will depend on whether we decide to distinguish river from tributary by volume or by length.

Also, the length will depend on how we handle the sinuosities of the banks, for we might double the length by trebling our attention to minutiae. Here a possible definition is the length of the shortest wet curve from source to mouth. This aspect of the river problem recurs in the notion of length of seacoast, and can there be settled analogously by taking the shortest curve that is wet at high tide and dry at low.

And there is the question of the largest city, or of the number of cities of over a million, where 'city' is taken apolitically; for by gerrymandering you could count the whole human race into a region virtually as dense as can be. (One solution is to require convexity and some arbitrary density.) For that matter, our ambiguous term 'mountain' provides examples as good as any: how many mountains

[8] Cf. Waismann.

over 14,000 feet can be claimed by Colorado, or how many first ascents by some doughty alpinist, will depend on how we settle when a saddle forms the middle of one mountain and when it joins two.

§ 27. AMBIGUITY OF TERMS

Ambiguity differs from vagueness. Vague terms are only dubiously applicable to marginal objects, but an ambiguous term such as 'light' may be at once clearly true of various objects (such as dark feathers) and clearly false of them. Sometimes the ambiguity of a word is resolved by the rest of the sentence that contains it; thus 'light' when followed by 'as a feather'. But sometimes the ambiguity of a word infects the containing sentence; thus 'bore' in 'Our mothers bore us'. Then either it is resolved by broader circumstances of utterance, e.g. some contiguous remark on birth or boredom, or else communication fails and a paraphrase is in order.

Lexicographers and grammarians have long permitted themselves to treat words otherwise than as linguistic forms, by declaring of a form that it functions sometimes as one word and sometimes as another. Such are the so-called homonyms. And when shall we be said to have two homonyms, rather than one ambiguous word? An obvious sufficient condition is difference of etymology. But words even of identical etymology are sometimes listed as two, when from the typical speaker's point of view there remains no vivid analogy between their uses. A man translating a foreign language into his own may, moreover, even resort to the homonym split for no better reason than that he needs two distinct correlates in his own language to cover the ground of the foreign word.[1] In discriminating words thus beyond the dictates of form and etymology, lexicographers and grammarians suit their convenience. In particular they find it trebly convenient to see the 'bore' of the above example as a pair of homonyms, since there is divergence in etymology, in intuitive sense, and in grammatical function. Grammarians will maintain a neat exclusiveness of grammatical word classes at the cost of multiplying homonyms. This is all very well as long as one recognizes the problems of analysis thereby transferred into the

[1] Thus Malinowski; see above, § 13, note 1. But perhaps he would not, if pressed, have insisted on distinguishing homonymy from ambiguity here. And there is still a question of separating both of these from mere generality; but I anticipate.

concept of word or lexical identity. For our own purposes, matters may most easily be kept straight by calling words identical that sound alike (or look alike, if writing is in question). Supplementary terminology can always be devised for supplementary distinctions.

Among the ambiguities that even those who talk of homonymy call ambiguities, there are the systematic ambiguities of verbal nouns. One pervasive type is the process-product ambiguity (Black), illustrated by 'assignment', which can refer to the act of assigning or to the thing assigned. Another is the action-custom ambiguity (Sigwart, Erdmann), illustrated by 'skater', which can refer to one who is skating and hence awake or merely to one who skates and is now perhaps asleep.

We deliberately create ambiguity when we name a child after someone. The name 'Paul', despite the thousands who bear it, is not a general term; it is a singular term with wide ambiguity. Each typical utterance of the word designates or purports to designate one specific man. We do not say, as we would with a general term, 'a Paul', 'the Paul', 'Pauls'—unless, facetiously, we use it in the sense of the genuinely general term 'man named 'Paul' '.

Such, in English, is the grammatical contrast between an ambiguous singular term and a general term. But now in the case of an admittedly general term how are we to say how much of the term's multiple applicability is ambiguity and how much is generality? Take 'hard' said of chairs and questions. As remarked, ambiguity may be manifested in that the term is at once true and false of the same things. This seemed to work for 'light', but it is useless for 'hard'. For can we claim that 'hard' as applied to chairs ever is denied of hard questions, or vice versa? If not, why not say that chairs and questions, however unlike, are hard in a single inclusive sense of the word? There is an air of zeugma about 'The chair and questions were hard', but is it not due merely to the dissimilarity of chairs and questions? Are we not in effect calling 'hard' ambiguous, if at all, just because it is true of some very unlike things?

Relative to the initial phase of word learning we may quite reasonably call a word ambiguous (and not merely general) if it has been conditioned to two very unlike classes of stimulations, each a close-knit class of mutually similar stimulations. An instance of ambiguity at that level was cited in § 17: 'Mama' is reinforced as a response both to the looming of the mother and to the sound 'Mama'. There is a real difference genetically between conditioning a word

to a continuous region of the child's evolving quality space and conditioning it to two widely disconnected regions. But 'hard' is not a case in point, because talk of hard questions is too abstract and sophisticated. It is acquired in middle childhood as a figurative extension of the primary use of 'hard'. Are we to treat this extension as a second sense of a thenceforward ambiguous term, or are we to treat it as an extended application of a thenceforward more general term?

Essentially this same question comes up in instances that are taken seriously. There are philosophers who stoutly maintain that 'true' said of logical or mathematical laws and 'true' said of weather predictions or suspects' confessions are two usages of an ambiguous term 'true'. There are philosophers who stoutly maintain that 'exists' said of numbers, classes, and the like and 'exists' said of material objects are two usages of an ambiguous term 'exists'. What mainly baffles me is the stoutness of their maintenance. What can they possibly count as evidence? Why not view 'true' as unambiguous but very general, and recognize the difference between true logical laws and true confessions as a difference merely between logical laws and confessions? And correspondingly for existence? [2]

The striking thing about the ambiguous terms 'light' and 'bore', or 'bore us', is that from utterance to utterance they can be clearly true or clearly false of one and the same thing, according as interpretative clues in the circumstances of utterance point one way or another. This trait, if not a necessary condition of ambiguity of a term, is at any rate the nearest we have come to a clear condition of it. We have taken account of ambiguity only insofar as it figures as a contributory cause of variation in the truth value of a sentence under variation of the circumstances of utterance.

Nor is even the variation in the truth value of a sentence from occasion to occasion necessarily to be laid to ambiguity. 'The door is open' changes its truth value with the movements of the door, such is the force of the present tense; and it varies in truth value simultaneously from door to door, such is the referential instability of the singular description. Yet to count any of its four words or

[2] For examples of what I am protesting see Ryle, *Concept of Mind*, p. 23, and Russell, *Problems of Philosophy*, Ch. IX. For a critical examination of the matter see White, *Toward Reunion in Philosophy*, Ch. IV. See further Wittgenstein, *Blue and Brown Books*, p. 58, and Richman, "Ambiguity and intuition."

their combinations as ambiguous on that account would not be typical use of 'ambiguous'. The shifting of the reference of 'the door' and of the truth value of 'The door is open' with circumstances of utterance are accounted normal to the meanings of the words concerned, whereas ambiguity is supposed to consist in indecisiveness between meanings. Our reflections in Chapter II encourage us little in distinctions of this kind; having no present technical need of the notion of ambiguity, however, I shall not try to improve the boundary, but will just go on using the word as a non-technical term where it seems appropriately suggestive.

Ambiguity can invest composite terms in special ways. One way it enters is through indeterminacy between the truly attributive and the syncategorematic (§ 21) use of certain adjectives. Thus consider the rich little word 'poor'. When it is ostensibly in attributive position it may either have truly attributive use, in which case it may either impute poverty or express pity, or it may be syncategorematic, suggesting 'badly'. If in 'poor violinist' we take the use of 'poor' as truly attributive, then poor violinists are poor (or perhaps pitiable) and they are violinists; if we take it in the syncategorematic way, then poor violinists need be neither poor nor pitiable nor even, by decent standards, violinists.

If in 'intellectual dwarf' we take the use of 'intellectual' as truly attributive, then anyone referred to will be both intellectual and a dwarf. If we take it in the syncategorematic way, then anyone referred to will be unintellectual and quite possibly gigantic.

The use of 'true' and 'false' in 'true artist' and 'false prophet' is syncategorematic; for a false prophet is no prophet, and a true artist though truly an artist, is not an artist who is true. On the other hand true and false sentences are sentences that are true and false; here the use of the adjectives is truly attributive in sense. The term 'true love' is ambiguous on the point. Take the use of 'true' here as truly attributive in sense, and you construe 'true love' as referring to steadfast love, or perhaps to a steadfast or steadfastly loved one. Take the use of 'true' rather as syncategorematic, and you construe 'true love' as referring merely to that which is truly love, or perhaps to him or her who is truly loved.

A particularly prominent species of the syncategorematic use of adjectives is that in which an adjective that admits of comparison, e.g. 'big', is used with a substantive in the fashion '*F G*' to express the sense '*G* that is more *F* than the average *G*'; thus 'big butterfly'.

Jakobson has suggested to me that 'white wine', 'white man', and 'black bread' might best be construed under this head, with 'white' and 'black' as comparative adjectives. There is no threat of ambiguity between these senses and the categorematic or attributive ones, but only because, e.g., no wine is white stuff and no men are white things.

Where ambiguity turns on the syncategorematic use of an adjective, the ambiguous *term* is the compound and not the adjective; for an adjective in syncategorematic use is not used as a term. In any event one quite naturally speaks of ambiguity in wider application than was hinted for it at the beginning of this section. Thus one conveniently speaks of some indefinite singular terms as ambiguous, though they do not refer. An example is the ambiguity of 'a lion' as between 'some lion' and 'every lion'; compare 'A lion escaped' with 'A lion likes red meat'.

An indefinite singular term whose ambiguity has especially invited confusion, real and feigned, is 'nothing', or 'nobody'. As tired humor the device is quite familiar enough: Gershwin's "I got plenty o' nothin'," Lewis Carroll's " 'I passed nobody on the road.' 'Then nobody walks more slowly than you.' " Locke, if we go along with Hume's unsympathetic interpretation,[3] humorlessly succumbed to this same confusion in his defense of universal causality, arguing that if an event lacked a cause it would have nothing for a cause, and that nothing cannot be a cause. Heidegger, if we may read him straight,[4] was beguiled by the same confusion into his dictum *"Das Nichts nichtet."* And Plato evidently had his troubles with Parmenides over this little fallacy.

What is troublesome about the indefinite singular term 'nothing' is its tendency to masquerade as definite. The cause is evident. Sheer multiplicity serves as a reminder of indefiniteness when an indefinite singular term is built with 'some' or 'each', but that reminder is lacking when the particle is 'no'. Furthermore the idea of a zero quantity is fostered by consideration of limits, and, once embraced, is easily mistaken for a designation of 'nothing' *qua* definite singular term. The persistence of the confusion is attested daily, as in 'They fight over nothing'. Take 'nothing' strictly as indefinite singular term, and the sentence is consonant with peace

[3] Hume, p. 81.

[4] See Carnap's comments, "Ueberwindung," pp. 229 ff.

on earth; but in practice it is likely to mean that they fight without provocation.

§ 28. SOME AMBIGUITIES OF SYNTAX

One extends the notion of ambiguity beyond terms to apply to particles—notably 'or', with its proverbial inclusive and exclusive senses—and even to syntax. Thus attributive position might be said to be syntactically ambiguous as between the truly attributive use and the syncategorematic. The same may be said of predicative position; for 'The violinist was poor' can mean that he was impoverished or that he played poorly. (Curiously the third alternative, expression of pity, lapses in this position.)

There is scope for syntactical ambiguity in the versatility of plural subjects and objects of verbs. Sometimes the plural form of a general term does the work merely of the singular form with 'every'; thus 'Lions like red meat', 'I dislike lions'. Sometimes it does the work rather of a singular with 'an' or 'some', but with an added implication of plurality; thus 'Lions are roaring', 'I hear lions'. (Cf. § 24.) Sometimes it does the work of an abstract singular term designating the *extension* of the general term (i.e., the class of all the things of which the general term is true); thus 'Lions are numerous', 'Lions are disappearing', 'Humble persons are rare' (§ 25).

Yet a further kind of work is done by the plural in such an example as 'Ernest is hunting lions', if what is meant is not that he is intent on a certain lion or lions but just that in his unfocused way he is out for lions. Benighted persons can in this sense even hunt unicorns. This use of 'hunt' and other verbs will be examined further in § 32.

Finally the plural form plays a special role as subject or object of a verb used *dispositionally*. I may best illustrate this by dropping lions at last and switching to 'Tabby eats mice'. The idea here is not just that there is, are, was, were, or will be a mouse or various mice that Tabby will have eaten; it is rather that Tabby is regularly disposed to eat mice given certain favorable and not exceptional conditions.

The syntactical ambiguities noted thus far, first in the categorematic and syncategorematic uses of adjectives and now in the various

uses of plural substantives, are syntactical ambiguities only in that what are ambiguous are certain constructions. We turn now to syntactical ambiguities in a fuller sense: ambiguities of structure, ambiguities as to what is syntactically connected with what.

Notable among such syntactical ambiguities is that of pronominal reference. An example is quoted by Jourdain:

> And Satan trembles when he sees
> The weakest saint upon his knees.

Such ambiguity is partially prevented in familiar languages by the devices of gender, number, and person, but only hit and miss; thus for the prevention of the above case it would have sufficed that the weakest saint be female. But we can clear up this case by supplanting the troublesome pronoun by its grammatical antecedent, saying 'the weakest saint's knees'. What makes ambiguity of pronominal reference serious is that grammatical antecedents cannot always be thus repeated. We saw in § 23 that they cannot be repeated, unless with the wrong effect, when they are indefinite singular terms. The pronoun whose antecedent is indefinite is not dispensable as a mere abbreviation of the antecedent would be. An example of ambiguous cross-reference to indefinite antecedents is:

(1) Everything has a part smaller than it.

Another, adapted from an example with definite antecedents which Peirce quoted from Allen and Greenough,[1] is:

(2) A lawyer told a colleague that he thought a client of his more critical of himself than of any of his rivals.

One possible device for such cases is that of manifolding the pronominal 'it', or 'he', into 'former' and 'latter', or 'first', 'second', and 'third', etc. The device makes for very artificial English but reputedly for natural Chippeway.[2] The mathematicians, happily, have a more readable method. They use arbitrary letters instead of 'first', 'second', etc., introducing each letter in apposition with its intended grammatical antecedent, thus:

(3) Everything x has a part smaller than x.

[1] Peirce, vol. 2, paragraph 287. Against the popular misconception of pronouns as standing for nouns, see his footnote.

[2] Jespersen, *Philosophy of Grammar*, p. 220.

(4) A lawyer x told a colleague y that x [or y?] thought a client z of y [or x?] more critical of z [or y? or x?] than of any of z's [or y's? or x's?] rivals.

For unobvious though traceable reasons, arbitrary letters used for cross-reference as in (3) and (4) are called *variables*.

We remarked that the supplanting of a pronoun by its grammatical antecedent is an obvious solution of ambiguity of pronominal reference when the antecedent is a definite singular term, but that it is not permissible when the antecedent is an indefinite singular term. Note now that it is likewise not permissible, leading indeed simply to nonsense, in another case: where the antecedent is a relative pronoun, 'who' or 'which'. An example of ambiguous cross-reference to mixed antecedents, comprising one relative pronoun and two indefinite singular terms, is provided by this relative clause:

(5) who told a colleague that he thought a client of his more critical of himself than of any of his rivals.

Whereas (2) was a sentence, the relative clause (5) is a general term (cf. § 23); but in their ambiguity they are alike. Now in the case of a relative clause an obviously sensible preliminary step is expansion of the relative pronoun into 'such that' and an ordinary pronoun (cf. § 23); for this step segregates the referential function of the relative pronoun. Often also, in examples other than (5), it helpfully rectifies word order. Another good move is to recover and incorporate the term to which the relative clause was to have been attributively attached; for relative clauses occur only attributively. In the case of (5) the term was, we may suppose, 'lawyer'. We get:

(6) lawyer such that he told a colleague that he thought a client of his more critical of himself than of any of his rivals.

Now we are ready to introduce variables just as in (4):

(7) lawyer x such that x told a colleague y that [etc. as in (4)].

Note that though (5) may have been preceded in context by 'the lawyer' or 'a lawyer', it is still just to the general term 'lawyer' that (5) is attributive (cf. § 23). Accordingly (6) and (7), like (5), are framed as general terms, to which a 'the' or 'an' may or may not be

superadded to derive a singular term. The example (7) contrasts instructively with (4) in exhibiting 'x' in apposition not to an indefinite singular term but to a general term.

In the context of a logical or semantical discussion the phrase 'cross-reference' is unfortunate in a way in which its French equivalent *renvoi* is not. For, a pronoun or other singular term may also be said to refer, permanently or in passing, to some person or other object. Reference in the latter sense is genuinely the relation of sign to object, whereas cross-reference is only a relation of sign to coordinate sign, a harking back of pronoun to grammatical antecedent. Logicians happily have another terminology for talking of cross-reference, where variables are concerned: they speak of *binding*. The introductory or appositive occurrence of 'x' is said to *bind* the various recurrences of 'x', insofar as they hark back to that apposition and not to some independent use of the letter.

If a sentence or relative clause contains an appositive or binding occurrence of 'x' and sundry recurrences of 'x', then ordinarily it will include a component sentence that contains some of the occurrences of 'x' but, within itself, none to bind them. Such a component sentence, considered by itself, is called an *open* sentence, and its unbound occurrences of variables are said to be *free* in it. Examples:

x has a part smaller than x.

x thought a client z of y more critical of z than of any of z's rivals.

Open sentences are sentences in form but, because of the free variables, neither true nor false.

Another structural species of syntactical ambiguity is ambiguity of grouping. We can make sense of 'pretty little girls' camp' in any of five groupings: '(pretty (little girls')) camp', '(pretty little) (girls' camp)', and so on. We cope with such ambiguity by variously stressing and pausing, by inserting particles for coordination or ballast, or by rephrasing altogether (thus 'rather little camp for girls').[3] A graphic means of marking grouping in mathematics is parentheses, as above.

[3] See further my *Elementary Logic*, §§ 11–13, whence the present example, or *Methods of Logic*, § 4.

§ 29. AMBIGUITY OF SCOPE

More subtle problems of grouping are presented by what is called *scope*. Thus take 'big European butterfly': is it to be true of just the European butterflies that are big for butterflies, or is it to be true of all the European butterflies that are big for European butterflies? The question may be phrased as a question whether the scope of the syncategorematic adjective 'big' is 'butterfly' or 'European butterfly'; and what is subtle about it is that it cannot be settled by a simple choice between two positions for parentheses. Perhaps the version allowing the wider scope could be rendered 'big (European butterfly)' and the other could be rendered with a comma: 'big, European butterfly'. Or, of course, we can paraphrase.[1]

No such problem of scope arises when adjectives are used categorematically, in the truly attributive way. Between 'round black box' as true of black boxes that are round, and 'round black box' as true of boxes that are black and round, no distinction is required.

I shall not find further occasion to pursue the syncategorematic use of adjectives. But there is also another connection in which ambiguity of scope obtrudes, and one that is peculiarly central to our language; viz., in connection with indefinite singular terms. Thus consider:

(1) If any member contributes, he gets a poppy.
(2) If every member contributes, I'll be surprised.

Sentence (1) makes of every member this assertion: if he contributes, he gets a poppy. Sentence (2) does not correspondingly make of every member the assertion: if he contributes, I'll be surprised. For that would mean that I expected no contributions, whereas all (2) says is that I expect less than unanimous contributions. It is rather the component clause 'every member contributes', in (2), that makes an assertion (however false) of every member; and then (2) as a whole is compounded of that closed-off clause and 'I'll be surprised'. The contrast between (1) and (2) brings out the idea of the scope of an indefinite singular term. The scope of 'any member' in (1) is (1) in its entirety, whereas the scope of 'every member' in (2) is just 'every member contributes'.

[1] This paragraph issued from a discussion with Jakobson.

The example 'I believe he saw a letter of mine', unlike (1) and (2), threatens ambiguity of scope. If the scope of the indefinite singular term 'a letter of mine' is taken to be just 'he saw a letter of mine', then the whole sentence 'I believe he saw a letter of mine' applies 'I believe' to the self-contained sentence 'he saw a letter of mine'. Under this interpretation the whole sentence amounts to saying merely that I believe he did not miss all my letters. If on the other hand the scope of 'a letter of mine' is taken to be the whole sentence including 'I believe', then the whole sentence amounts rather to saying that there are one or more letters of mine which, specifically, I believe he saw.

If in 'Each thing that glisters is not gold' [2] we take the scope of the indefinite singular term 'each thing' as the whole sentence, we have a falsehood: a sweeping denial of goldhood with respect to glistering things. If we take the scope rather as 'each thing that glisters is gold', and so reckon 'not' as an outside operator governing the whole, we have the truth that Shakespeare intended.

Sentences (1) and (2) were unambiguous for three instructive reasons. One is that (1) has 'he' in its second clause, with 'any member' as grammatical antecedent; we cannot take the scope of 'any member' as just the first clause of (1), on pain of leaving 'he' high and dry. A second reason is that 'every', by a simple and irreducible trait of English usage, always calls for the shortest possible scope. A third reason is that 'any', by a simple and irreducible trait of English usage, always calls for the longer of two possible scopes. This third reason is supernumerary for (1), on account of the 'he'; but it asserts itself in:

(3) If any member contributes, I'll be surprised.

This, in contrast to (2), asserts of every member that if he contributes I'll be surprised. Whereas the scope of 'every member' in (2) is just 'every member contributes', the scope of 'any member' in (3) is (3) as a whole. Here we see the reason for joint survival of the apparent synonyms 'any' and 'every': distinctive scope connotations. The same point is illustrated by the pair:

(4) I do not know any poem,
(5) I do not know every poem.

[2] I have changed Shakespeare's 'All' in order not to invite the proposal, irrelevant to present purposes, that 'all that glisters' be treated as a definite singular term designating the whole glistering content of space-time.

Since 'any' takes wide scope, (4) means that, given each poem in turn, I do not know it. Since on the other hand 'every' takes narrow scope, (5) merely denies that, given each poem in turn, I know it. The scope of 'any poem' in (4) is (4); the scope of 'every poem' in (5) is 'I know every poem', which (5) negates.

The remarkable divergence between (5) and:

(6) I am ignorant of every poem

can be accounted for by the affinity of 'every' for minimum scope. Sentence (6), unlike (5), contains no subsidiary sentence, since the negative 'i-' of (6), unlike the 'not' of (5), is inseparable. Thus whereas the scope of 'every' in (5) is not the whole of (5), the scope of 'every' in (6) is necessarily the whole of (6); and thus (6) is equivalent not to (5) but to (4).

A graphic means of exhibiting scope lies ready to hand in the 'such that' construction. Representing the indefinite singular term as '*b*' and its scope as '. . . *b* . . .', we may sum the method up in this maxim: rewrite the scope '. . . *b* . . .' as '*b* is such that . . . it . . .'. Thus (1)–(5) become:

(7) Each member is such that if he contributes he gets a poppy.
(8) If each member (is such that he) contributes, I'll be surprised.
(9) Each member is such that if he contributes I'll be surprised.
(10) Each poem is such that I do not know it.
(11) Not each poem is such that I know it.

I have here rendered 'any' and 'every' indifferently as 'each', since the distinctions of scope so subtly indicated by one's choice between 'any' and 'every' are self-evident under 'such that'.

The two interpretations of 'I believe he saw a letter of mine' become:

(12) I believe that some letter of mine is such that he saw it,
(13) Some letter of mine is such that I believe that he saw it.

But there will be more to say of (13) in § 31.

This way of showing scope is essentially a matter of getting the indefinite singular term into the position of grammatical subject of a predication which is its scope, and so reducing the question of scope to the question of spotting a subject's predicate. The point

of 'such that' is just that it enables us to convert anything '... *b* ...' that we might want to say, about anything *b*, into a single complex predicate 'such that ... it ...', attributable to *b*.

The special thing about (8) is that 'each member' is already the subject of its scope 'each member contributes', so that the 'such that' manoeuvre is superfluous. Sentence (8) is the ideally simple case. At the other extreme, the 'such that' clause may become so complex that we have to resort to variables to keep pronominal references straight. But this we are prepared for by recent pages; 'is such that ... it ...' merely gives way to 'is an object *x* such that ... *x* ...'. The intrusion of 'object' here, which substantivizes the adjectival 'such that' clause, is merely for the grammatical purpose of giving '*x*' something to stand in apposition with. Commonly also, in complex cases, one welcomes the opportunity to mark the limits of a scope by parenthesizing the 'such that' clause. Much of the value of the 'such that' manoeuvre in settling scope is that it makes scope more explicitly a matter of grouping, amenable to parentheses.

'Which' clauses are adjectives which, like 'mere', occur only in attributive and not predicative position. And reasonably enough, one might say; for predication of a 'which' clause would accomplish nothing that is not accomplished more simply by the clause alone, with 'which' supplanted by the subject of the predication. Much the same might have been said of 'such that' clauses: predication of a 'such that' clause accomplishes nothing that is not accomplished by the part after 'such that' alone, with its pronoun supplanted by the subject of the predication. Yet 'such that' clauses do occur, unlike 'which' clauses, in predicative position. And we now see that such use of them is not idle after all; for it is precisely the means of making scopes explicit, as in (7)–(13).

§ 30. REFERENTIAL OPACITY

Definite singular terms may shift in reference with occasions of use, either through ambiguity or through the peculiar functions of 'the', 'this', and 'that' (§ 27). Under some circumstances the term may simply fail of reference, through there being no object of the required sort. And there is a further kind of variation: in sentences there are positions where the term is used as a means simply of specifying its object, or purporting to, for the rest of the sentence to

say something about, and there are positions where it is not. An example of the latter sort is the position of 'Tully' in:

(1) 'Tully was a Roman' is trochaic.

When a singular term is used in a sentence purely to specify its object, and the sentence is true of the object, then certainly the sentence will stay true when any other singular term is substituted that designates the same object. Here we have a criterion for what may be called *purely referential position:* the position must be subject to the *substitutivity of identity.*[1] That the position of 'Tully' in (1) is not purely referential is reflected in the falsity of what we get by supplanting 'Tully' in (1) by 'Cicero'.

If we understand the sentence:

(2) The commissioner is looking for the chairman of the hospital board

in such a way as to be prepared to affirm it and yet to deny:

(3) The commissioner is looking for the dean

even though, by recent appointment and unknown to the commissioner,

(4) The dean = the chairman of the hospital board,

then we are treating the position to the right of 'looking for' as not purely referential. On the other hand if, aware of the commissioner's persistent avoidance of the dean, we are still constrained by (2) and (4) to treat (3) as true, then we are indeed treating the position as purely referential.

Example (2), even if taken in the not purely referential way, differs from (1) in that it still seems to have far more bearing on the chairman of the hospital board, dean though he be, than (1) has on Tully. Hence my cautious phrase 'not purely referential', designed to apply to all such cases and to affirm no distinction among them. If I omit the adverb, the motive will be brevity.

An illustration of purely referential position is the position of singular terms under predication. For, the predication is true so long merely as the predicated general term is true of the object

[1] The concept and its criterion are due essentially to Frege, "On sense and reference." But there is much in his associated theory that I do not adopt; see end of § 31.

named by the singular term (§ 20); hence the substitution of a new singular term that names the same object leaves the predication true. In particular the question whether to take the main singular-term positions in (2) as purely referential is the question whether to treat (2) as a predication of a relative term 'looking for'.

The positions that we have been classifying into purely referential and other are positions of singular terms relative to sentences that contain them. Now it is convenient to extend the concept to apply also to positions of singular terms relative to singular terms that contain them. Thus, take quotation marks: applied to any sort of expression, what they produce is a singular term (naming, as it happens, the expression inside). It is convenient to be able to speak of the personal name in (1) as having non-referential position not only in the sentence (1), but equally in the singular term, of quotational form, that is the grammatical subject of (1). Indeed, it is rather the quotation than (1) as a whole that is primarily in point here; the personal name has non-referential position in (1) simply because of the quotation.

As a criterion of referential position, substitutivity of identity works as well for positions within singular terms as for positions within sentences. For positions in sentences, what it says is that the containing sentence keeps its truth value when the contained singular term is supplanted by any other having the same reference. For positions in singular terms, what it says is that the containing singular term keeps its reference when the contained singular term is so supplanted. Thus what shows the position of the personal name in the quotation:

(5) 'Tully was a Roman'

to be non-referential is that, though Tully = Cicero, yet

'Tully was a Roman' $\neq$ 'Cicero was a Roman'.

Quotation, we see, gives rise to non-referential positions. Now this is not true of an alternative device to the same purpose as quotation, viz. *spelling*. Instead of (5) we can as well say:

tee⌢yu⌢ell⌢ell⌢wye⌢space⌢doubleyu⌢ay⌢ess⌢space⌢ay⌢space⌢ar⌢oh⌢em⌢ay⌢en,

thus using explicit names of the letters and an arch (following Tarski) to indicate concatenation. The shift from quotation to

spelling has an independent advantage (cf. § 39), but incidentally it is instructive as stressing that any non-referential occurrences caused by quotation are surface appearances, dispelled by an easy change in notation.

Also apart from quotation there are frequent cases where a not purely referential occurrence of a singular term can be banished by paraphrase. But there is no compulsion upon us to banish all non-referential occurrences of singular terms, nor to reduce them to quotation. We are not unaccustomed to passing over occurrences that somehow "do not count"—'mary' in 'summary', 'can' in 'canary'; and we can allow similarly for all non-referential occurrences of terms, once we know what to look out for.

One and the same occurrence of a term may have purely referential position with respect to its immediate surroundings and not with respect to a broader context. For example, the personal name has purely referential position in the sentence:

(6) Tully was a Roman

and yet in neither of the more extended expressions (1) and (5). Quotation, which thus interrupts the referential force of a term, may be said to fail of referential *transparency*.[2]

Referential transparency has to do with constructions (§ 11); modes of containment, more specifically, of singular terms or sentences in singular terms or sentences. I call a mode of containment Φ referentially transparent if, whenever an occurrence of a singular term t is purely referential in a term or sentence $\psi(t)$, it is purely referential also in the containing term or sentence $\Phi(\psi(t))$. Take $\Phi(\psi(t))$ as (5), $\psi(t)$ as (6), and t as the personal name, and you have the referential opacity of quotation.

Alternation, in contrast, is referentially transparent. That is, if a sentence is compounded of component sentences by means of 'or', all purely referential positions in the component sentences qualify still as purely referential positions in the compound. Clearly any truth function (§ 13) is referentially transparent.

General terms predicatively used may be looked on as constructions: modes of containment of the subject singular terms in sentences. As constructions they are referentially transparent; for this is

[2] The term is from Whitehead and Russell, 2d ed., vol. 1, p. 665.

simply to say, what was remarked above, that the subject position in a predication is purely referential.

Again the construction 'looking for' counts as transparent if adjacent term positions are treated as referential, and not otherwise. In the one case 'look for' is a genuine relative term; in the other not. What it is in the other case will become clearer in § 32.

A construction that may be transparent or opaque is the belief construction, '*a* believes that *p*'. Thus suppose that though

(7) Tom believes that Cicero denounced Catiline,

he is ill-informed enough to think that the Cicero of the orations and the Tully of *De Senectute* were two. Faced with his unequivocal denial of 'Tully denounced Catiline', we are perhaps prepared both to affirm (7) and to deny that Tom believes that Tully denounced Catiline. If so, the position of 'Cicero' in (7) is not purely referential. But the position of 'Cicero' in the part 'Cicero denounced Catiline', considered apart, is purely referential. So 'believes that' (so conceived) is opaque.

At the same time there is an alternative way of construing belief that is referentially transparent.[3] The difference is as follows. In the opaque sense of belief considered above, Tom's earnest 'Tully never denounced Catiline' counts as showing that he does not believe that Tully denounced Catiline, even while he believes that Cicero did. In the transparent sense of belief, on the other hand, Tom's earnest 'Cicero denounced Catiline' counts as showing that he does believe that Tully denounced Catiline, despite his own misguided verbal disclaimer.

'Cicero' has purely referential occurrence in (7) or not according as 'believes' is taken transparently or not. If belief is taken transparently, then (7) expresses an outright relation between the men Tom and Cicero, viz. the relation of deeming denouncer of Catiline; if belief is taken opaquely, then (7) expressly relates Tom to no man.

There will be more to say of the distinction between transparent and opaque belief. But note meanwhile that the distinction is unrelated to the familiar quirk of English usage whereby '*x* does not believe that *p*' is equated to '*x* believes that not *p*' rather than to 'It

[3] This is apparent from an example of Goodman cited by Scheffler, "On synonymy and indirect discourse," p. 42.

is not the case that x believes that p'. I have been avoiding the concatenation 'does not believe', lest this incidental idiomatic complication seem to figure in the reasoning.

It would be wrong to suppose that an occurrence of a term within an opaque construction is barred from referential position in every broader context. Examples to the contrary are provided by the occurrences of the personal name in:

(8) 'Tully was a Roman' is true,
(9) 'Tully' refers to a Roman.

Despite the opacity of quotation, these occurrences of the personal name are clearly subject to substitutivity of identity *salva veritate*, thanks to the peculiarities of the main verbs involved. On this account 'non-transparent' would be more suggestive than 'opaque'; but the term would be cumbersome, and it is rather a fine point.

§ 31. OPACITY AND INDEFINITE TERMS

Since indefinite singular terms do not designate objects (§ 23), we have had only definite singular terms in mind in our considerations of referential position. The terms that we replace by others of like designation, in testing for substitutivity of identity, are definite singular terms. Still, what we are testing are positions, and indefinite singular terms can be put into them. Let us see with what effect.

We saw that the position after 'The commissioner is looking for' might or might not be taken as purely referential, with unlike effects. But if we put an indefinite singular term in it, say 'someone', we cease to be free to choose between two interpretations. To make proper sense of 'The commissioner is looking for someone' we have to think of the position as purely referential. For, who is this person the commissioner is looking for? The chairman of the hospital board, i.e., the dean. In the sense of 'looking for' in which the commissioner can be said to be looking for someone, (3) of § 30 has to be reckoned true along with (2). The treatment that would count (2) as true and (3) as false makes the truth value of such statements depend on what epithet is used in designating the sought person; and such a distinction is inapplicable in 'The commissioner is looking for someone', where the sought person is not designated at all.

To put the point paradoxically, indefinite singular terms need referential position because they do not refer.

The same consideration would seem to suggest that for purposes of 'Tom believes that someone denounced Catiline' we must take 'believes' transparently; i.e., take the position of 'someone' as referential. But this case is complicated by a second, intersecting ambiguity: a question of the scope of the indefinite singular term. According as that scope is taken as narrow or wide, the sentence is explained by one or the other of:

(1) Tom believes that someone (is such that he) denounced Catiline,
(2) Someone is such that Tom believes that he denounced Catiline.

Surely (1) is likelier than (2) to do justice to 'Tom believes that someone denounced Catiline'; the words 'is such that he' in (1) are indeed immediately felt as superfluous. But in (1), unlike 'The commissioner is looking for someone', we remain quite free to take the position of 'someone' as referential or not as we please. This is because 'someone' obviously and unequivocally occupies referential position in the subsidiary sentence 'someone denounced Catiline' considered alone. And just because the subsidiary sentence makes sense in any event, (1) does too. In short, therefore, the denouncing position in (1) can freely be taken as referential or non-referential in (1) as a whole. In other words, belief can be construed transparently or opaquely; (1) makes sense either way.

Not so (2), which may be put more idiomatically as 'There is (or was) someone whom Tom believes to have denounced Catiline'. Here it is that those reflections apply that applied to 'The commissioner *is looking for someone*'. For, who *is this person* whom Tom believes to have denounced Catiline? Cicero, i.e., Tully. In the sense of 'believes' in which there can be said to be someone whom Tom believes to have denounced Catiline, 'Tom believes that Tully denounced Catiline' has to be reckoned true along with 'Tom believes that Cicero denounced Catiline'. In short, belief must be taken transparently to make proper sense of (2), though it can be taken either way for (1).

The two interpretations of 'I believe he saw a letter of mine' (§ 29) are on this score quite like (1) and (2). Where transparency matters in relation to indefinite singular terms is that there must

not be a pronominal cross-reference from inside an opaque construction to an indefinite singular term outside the construction. Such is the lesson of (2). Parallel considerations show also that there must not be a pronominal cross-reference from inside an opaque construction to a 'such that' outside the construction. Adapted to variables (§ 28) the maxim is this: an indefinite singular term outside an opaque construction does not bind a variable inside the construction.

The need of cross-reference from inside a belief construction to an indefinite singular term outside is not to be doubted. Thus see what urgent information the sentence 'There is someone whom I believe to be a spy' imparts, in contrast to 'I believe that someone is a spy' (in the weak sense of 'I believe there are spies'). The one corresponds to (2), the other to (1). Surely, therefore, the transparent sense of belief is not to be lightly dismissed. Yet let its urgency not blind us to its oddity. "Tully," Tom insists, "did not denounce Catiline. Cicero did." Surely Tom must be acknowledged to believe, in every sense, that Tully did not denounce Catiline and that Cicero did. But still he must be said also to believe, in the referentially transparent sense, that Tully *did* denounce Catiline. The oddity of the transparent sense of belief is that it has Tom believing that Tully did and that he did not denounce Catiline. This is not yet a self-contradiction on our part or even on Tom's, for a distinction can be reserved between (*a*) Tom's believing that Tully did and that Tully did not denounce Catiline, and (*b*) Tom's believing that Tully did and did not denounce Catiline. But the oddity is there, and we have to accept it as the price of saying such things as (2) or that there is someone whom one believes to be a spy.

Certainly we are not to blame the oddity on Tom's mere misunderstanding of a proper name, for there are parallel examples without names. Thus instead of having Tom say, "Tully did not denounce Catiline; Cicero did," have him say, "The dean is not married, but the chairman of the hospital board is," not appreciating that they are one.

Now if this much oddity on the part of the transparent sense of belief is tolerable, more remains that is not. Where '*p*' represents a sentence, let us write 'δp' (following Kronecker) as short for the description:

the number x such that $((x = 1)$ and $p)$ or $((x = 0)$ and not $p)$.

We may suppose that poor Tom, whatever his limitations regarding Latin literature and local philanthropies, is enough of a logician to believe a sentence of the form '$\delta p = 1$' when and only when he believes the sentence represented by 'p'. But then we can argue from the transparency of belief that he believes everything. For, by the hypotheses already before us,

(3) Tom believes that δ(Cicero denounced Catiline) = 1.

But, whenever 'p' represents a true sentence,

$\delta p = \delta$(Cicero denounced Catiline).

But then, by (3) and the transparency of belief,

Tom believes that $\delta p = 1$,

from which it follows, by the hypothesis about Tom's logical acumen, that

(4) Tom believes that p.

But 'p' represented any true sentence. Repeating the argument using the falsehood 'Tully did not denounce Catiline' instead of the truth 'Cicero denounced Catiline', we establish (4) also where 'p' represents any falsehood. Tom ends up believing everything.[1]

Thus in declaring belief invariably transparent for the sake of (2) and 'There is someone whom I believe to be a spy', we would let in too much. It can sometimes best suit us to affirm 'Tom believes that Cicero denounced Catiline' and still deny 'Tom believes that Tully denounced Catiline', at the cost—on *that* occasion—of (2). In general what is wanted is not a doctrine of transparency or opacity of belief, but a way of indicating, selectively and changeably, just what positions in the contained sentence are to shine through as referential on any particular occasion.

A way of doing that is to agree to localize the failure of transparency regularly in the 'that' of 'believes that' and the 'to' of 'believes to', and not in the 'believes'. Thus we may continue to write 'Tom believes that Cicero denounced Catiline' when we are content to leave the occurrences of 'Cicero' and 'Catiline' nonreferential, but write rather:

(5) Tom believes Cicero to have denounced Catiline

[1] See Church's review of Carnap for a related argument in another connection.

if we want to bring 'Cicero' into referential position.[2] Similarly we can get 'Catiline' into referential position thus:

(6) Tom believes Catiline to have been denounced by Cicero.

If we want to get both into referential position, we are driven to something like:

(7) Tom believes Cicero and Catiline to be related as denouncer and denounced.

On this convention 'believes that' is unequivocally opaque and (2) therefore simply goes by the board as a bad formulation involving cross-reference from inside an opaque construction to an indefinite singular term outside. What was offered before as an idiomatic equivalent of (2) remains legitimate, however: 'There is (or was) someone whom Tom believes to have denounced Catiline'. Similarly (13) of § 29 goes by the board, but the originally intended sense of it survives in the legitimate version 'There is (or was) a letter of mine which I believe to have been seen by him'.

Here as usual we can revise the relative clauses at will into 'such that' clauses (§ 23); thus '... whom Tom believes to ...' and '... which I believe to ...' become '... such that Tom believes him to ...' and '... such that I believe it to ...', without ever disturbing the insides of the opaque 'to' construction. Note that the 'that' of 'such that' is referentially transparent; it is only the 'that' of 'believes that', and the 'to' of 'believes to', that our convention counts opaque.

The constructions 'believes that', 'says that', 'wishes that', 'endeavors that', 'urges that', 'fears that', 'is surprised that', etc., are what Russell calls expressions of *propositional attitude*.[3] What has been observed of the first of them in recent pages applies equally to the lot. The contortions of (5)–(7) strain ordinary language in varying degrees when applied to the rest of the verbs of propositional attitude. 'Wishes', 'urges', and 'fears' fit (5)–(7) as naturally as 'believes' (except that 'urges' is inappropriate to our particular example on account of the past tense). 'Says' falls into

[2] Davidson points out to me that the rearrangement 'By Tom, Cicero is believed to have denounced Catiline' has, along with the drawback of unnaturalness, the virtue of being more graphic than (5) in two respects: it unifies the opaque 'believe to', and it displays the referential positions before mentioning belief. Similar rearrangements work for (6) and (7).

[3] *Inquiry into Meaning and Truth*, p. 210. See also Reichenbach, pp. 277 ff.

place with no great violence. 'Endeavors' and 'is surprised' have to be reworded in some such fashion as 'endeavors-to-cause' and 'is surprised-to-learn' when fitted to those positions.

An opaque construction is one in which you cannot in general supplant a singular term by a *codesignative* term (one referring to the same object) without disturbing the truth value of the containing sentence. In an opaque construction you also cannot in general supplant a general term by a *coextensive* term (one true of the same objects), nor a component sentence by a sentence of the same truth value, without disturbing the truth value of the containing sentence. All three failures are called failures of *extensionality.* A reason for stressing the first is that one rightly expects substitutivity of identity in discourse about the identical object, whereas no such presumption is evident for full extensionality. A related reason is that the first failure is what disallows cross-reference from inside opaque constructions. Frege was bound to stress all three failures, for he treated general terms and sentences as naming classes and truth values; all failures of extensionality became failures of substitutivity of identity.[4] Failures of substitutivity of identity, moreover, were in Frege's view unallowable; so he nominally rectified them by decreeing that when a sentence or term occurs within a construction of propositional attitude or the like it ceases to name a truth value, class, or individual and comes to name a proposition, attribute, or "individual concept." (In some ways this account better fits Church, who has sharpened and elaborated the doctrine.[5]) I make none of these moves. I do not disallow failure of substitutivity, but only take it as evidence of non-referential position; nor do I envisage shifts of reference under opaque constructions.

§ 32. OPACITY IN CERTAIN VERBS

We have hit upon a convenient trick of so phrasing our statements of propositional attitude as to keep selected positions referen-

[4] Even apart from this special doctrine, the following connection between referential transparency and extensionality can be established: if a construction is transparent and allows substitutivity of concretion (§ 48), it is extensional. The argument is obvious, but see Church's review of "On Frege's way out" for exposure of a fallacy in my adaptation of it to Whitehead and Russell's theory.

[5] Church, "A formulation of the logic of sense and denotation."

tial and others not. The device does not yet apply to our earlier example:

(1) The commissioner is looking for the chairman of the hospital board,

since this example contains no expression of propositional attitude. But it can be made to do so by expanding 'look for' into 'endeavor to find':

(2) The commissioner is endeavoring that the commissioner finds the chairman of the hospital board.

The point of the bad English is to stress the parallel of 'Tom believes that Cicero denounced Catiline'. Now if we carry over the convention of two pages back, the term 'the chairman of the hospital board' has non-referential position in (2). Sentence (2) expands (1) in a way that counts 'looking for . . .' opaque. To get an expansion of (1) in a transparent sense, we must operate on (2) to bring 'the chairman of the hospital board' out from under the opaque 'endeavoring that'. The desired operation on (2) is precisely the operation which, applied to 'Tom believes that Cicero denounced Catiline', gave 'Tom believes Cicero to have denounced Catiline'. Applied to (2), the operation delivers:

(3) The commissioner is endeavoring (-to-cause) the chairman of the hospital board to be found by the commissioner.

Note that the opaque 'to' of (3) is the one after 'board' and not the one in parentheses; the parenthetical expression is for our purposes merely part of the inflection of 'endeavor'. (See end of § 31.)

So (2) construes (1) with opaque 'looking for . . .', and (3) construes (1) with transparent 'looking for . . .'. Thus (2) construes (1) in such a way that substituting 'someone' for 'the chairman of the hospital board' produces nonsense; (3) construes (1) in such a way that substituting 'someone' makes sense. Again (2) construes (1) in such a way that substitution of 'the dean' produces falsity; (3) construes (1) in such a way that substitution of 'the dean' preserves truth.

In both (2) and (3), the first occurrence of 'the commissioner' has referential position and the second has not. Thus (1), no matter whether we take its 'looking for . . .' in the opaque manner of (2) or in the transparent manner of (3), is a sentence whose

single grammatical subject implicitly plays two roles, a referential one and a non-referential one. An example in which this same phenomenon of two-role subject comes out more vividly is:

(4) Giorgione was so-called because of his size,

which anyone is ready enough to paraphrase into:

Giorgione was called 'Giorgione' because of his size.

Taking (4) as it stands, we have of course to reckon the position of the subject as not (purely) referential, because of the non-referential character of one of its two implicit roles. And the same conclusion emerges by the direct substitutivity criterion: substitution in (4) according to the identity 'Giorgione = Barbarelli' yields a falsehood.

'The commissioner' in (1) is likewise found to resist substitutivity, if (1) is construed as (2) or (3). Thus suppose the commissioner, for all his self-importance, is the least competent of the county officials. Substitution in (1) according to this identity would give 'The least competent official is endeavoring that the least competent official finds etc.', if we construe (1) as (2); and this, with opaque 'endeavoring that', is doubtless to be adjudged false. The case is similar when we construe (1) as (3).

Now the account of (4) was unexceptionable, but this parallel account of (1) is certainly a distortion.[1] Surely, on a fair account, 'the commissioner' should have referential position in (1), and be replaceable by 'the least competent official' *salva veritate.*

The non-referential status of the subject position in (4) excludes 'someone' from that position, and rightly; 'Someone was so-called because of his size' is nonsense. But the non-referential status of the subject position in (1) would likewise exclude 'someone' from that position; whereas we must surely insist on saying 'Someone is looking for the chairman of the hospital board'.

The upshot of these reflections is that (1) is wrongly construed in both (2) and (3). We must bring the second occurrence of 'the commissioner' into referential position by an additional twist, analogous to the one used on 'Cicero' in (5) or (7) of § 31. The proper account of (1) with opaque 'looking for...' is not (2) above, but rather this analogue of (5) of § 31:

[1] I am indebted here to a remark of Davidson's.

concrete or abstract, real or ideal. It is a shortcut verb whose use is set forth by 'I wish myself to have a sloop', wherein 'have' and 'sloop' continue to rate as general terms as usual but merely happen to have an opaque construction 'wish to' overlying them. This point needs to be noticed by philosophers worried over the nature of objects of desire.

Whenever sentences capable of containing 'want' or 'hunt' or 'look for' in an opaque sense are up for consideration in an at all analytic vein, it behooves us forthwith to paraphrase them into the more explicit idiom of propositional attitude. The question of transparency thereupon stands forth and can be settled, now as in (5) and (11) and now as in (6) and (12), in clear view of the alternative commitments and consequences. In general it is a good rule thus to try by paraphrase to account for non-referential positions by explicitly opaque constructions. And in the present instances there is also another benefit from the paraphrase: it exposes a structure startlingly unlike what one usually associates with the grammatical form of 'Ernest is hunting lions' and 'I want a sloop' (cf. 'I hear lions').

When 'hunt lions' and the like are meant rather in the transparent way, there is seldom call to paraphrase them into the idiom of propositional attitudes; for here the verb is a well-behaved relative term as it stands. Usually we are well enough off with 'There is a lion that Ernest is hunting', 'There is a sloop I want'; nothing is gained by expanding it in the grotesque manner of (12), except for purposes of comparisons of the sort in which we have just now been engaged. Our paraphrases, aimed at bringing out the distinction between referential and non-referential positions, have been cumbersome at best; but the most cumbersome ones are the ones least needed.