

SOME REMARKS ON QUINE'S ARGUMENTS AGAINST
 MODAL LOGIC

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In the process of investigating Quine's charge that quantified modal logic is committed to essentialism, I discovered several problems with his arguments which have not heretofore been presented. The first such problem concerns Quine's claim that terms in *all* alethic modal contexts do not occur purely referentially. The second concerns the claim that his argument denying the intelligibility of quantifying into modal contexts goes through without recourse to singular terms.*

1 Quine's argument that modal contexts are referentially opaque is familiar.¹ It may be stated as follows:

- (1) Given a true statement of identity, either of its two terms may be substituted for the other in any true statement and the result will be true.
 - (2) The principle embodied in (1) does not extend to contexts in which the term to be supplanted does not occur purely referentially.
 - (3) Given a true statement of identity, and given that a term of the identity occurs purely referentially in the true statement *S*, then either of the two terms of the identity may be substituted for the other in *S*, and the resultant sentence *S** will be true.
 - (4) If there is a true statement of identity, and if either one of the two terms of the identity is substituted for the other in a true statement *S*, and if *S** is false, then the term does not occur purely referentially in *S*.
 - (5) In alethic modal contexts terms of an identity are not substitutable *salva veritate*, that is, supplanting one term of a true identity for another in *S* results in the falsity of *S**.
- ∴ (6) Terms in alethic modal contexts do not occur purely referentially.

Counterinstances to (1) are readily at hand. For example, it is false that

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(7) Jones is unaware that 25 is the successor of 24,

even though it is both true that

(8) $25 = \sqrt[3]{15,625}$

and that

(9) Jones is unaware that $\sqrt[3]{15,625}$ is the successor of 24.

This suggests the limitation on the principle of substitutivity embodied in (2), for in the above example ' $\sqrt[3]{15,625}$ ' does not occur purely referentially in (9). Quine calls an occurrence of a singular term in a sentence purely referential, "if, roughly speaking, the term serves in that context simply to refer to its object."² An illustration of a context in which terms occur purely referentially is the position of singular terms under predication. In such cases whatever can be predicated of the object remains true when it is referred to by any other co-referential term.

Although Quine does not elaborate on whatever else a singular term in a not purely referential occurrence may refer to, he does note that the truth of the statement in which it occurs depends not only on the object referred to by the term but also on which term is used.³ Hence the truth of (9) depends upon, among other things, the particular term used to refer to the number 25. Statement contexts in which terms do not occur purely referentially are called by Quine "referentially opaque". Premise (2) can now be stated in more familiar Quinean terminology as

(2') The principle of substitutivity embodied in (1) does not extend to referentially opaque contexts.

According to (4), we have a criterion for the purely referential position of a singular term, viz., the position must be subject to the substitutivity of identicals, *salva veritate*.⁴ Quine has long pointed out that alethic modal contexts are contexts in which terms fail of purely referential occurrence. Utilizing the general idea of C. I. Lewis that alethic modalities are based on the notion of analyticity, Quine suggests that a statement of the form 'Necessarily *S*' is true if and only if the sentence represented by '*S*' is analytic, and a statement of the form 'Possibly *S*' is true if and only if the sentence represented by '*S*' is not analytic. Quine asks us to consider the following sentences, all of which he reckons as true:

(10) 9 = the number of the planets

(11) Necessarily $9 > 7$

(12) Possibly the number of planets < 7 .

Making the appropriate substitutions, we have

(13) Necessarily the number of planets > 7

and

(14) Possibly $9 < 7$.

But (13) and (14) are false, as is easily seen when both are paraphrased in terms of analyticity:

(13') 'The number of planets >7 ' is analytic

(14') '9 \neq 7' is not analytic.

Quine's support of premise (5) rests on specific examples where the failure of substitutivity of identity ostensibly occurs. (I say "ostensibly occurs" because it is the position of A. F. Smullyan and others that there is no failure of this principle in these examples when adequate attention is devoted to the scope of incomplete terms such as definite descriptions.⁵) The examples which Quine uses tend to direct one's attention away from certain complications in his position. I will argue that his argument is inadequate to support premise (5). Let's look first at the operator of logical possibility (which will be symbolized by ' M '). Consider the following sentence

(15) M (Suzie Bell is a freshman),

where the person referred to by the subject term is an actually existing individual who is a sophomore at Hardin College. If we paraphrase (15) as Quine suggests, we get

(15') 'Suzie Bell is not a freshman' is not analytic.

(15'), and hence (15), appear true. There are co-designative terms such as 'the eldest child of F. Bell' and 'the only sister of R. Bell' which can be substituted *salva veritate* for 'Suzie Bell' in (15'). There is, however, a co-designative term, 'the tallest non-freshman coed from San Antonio,' which is not substitutable *salva veritate* in (15'). Performing this substitution, we get the sentence

(16') 'The tallest non-freshman coed from San Antonio is not a freshman' is not analytic

which entails

(17') 'A non-freshman is not a freshman' is not analytic.

Since (17') is false, (16') is false. Hence Quine's point must be that if there is some co-designative term t' that is not substitutable *salva veritate* for t and S , then S is a referentially opaque context.

However, there is a type of example which employs the possibility operator and is subject to the substitutivity of identity. It is easy to see what sort of example this would be, if we look at the procedure involved in selecting the term in (16'). What we wanted was a co-designative term that was incompatible with the predicate, 'is a freshman' in this example. The obvious choice was some definite description that included within its specification of the object the predicate 'non-freshman'. The question arises, is there any way to block such a choice of a co-designative term that is incompatible with the predicate? There is one way. Consider the true sentences

(18) Suzie Bell is a sister

and

(19) M (Suzie Bell is a sister).

Let us fabricate some term that is incompatible with 'is a sister' and would, upon substitution in (19), change the truth-value of the resultant sentence to false. Any definite description that said the object was a non-sister or non-female, such as 'the tallest non-female student at Hardin College,' would be incompatible with the predicate. But, such a description would not specify Suzie Bell, and hence would not be co-designative, for Suzie Bell is a sister, according to (18). Hence, any term that would be incompatible with the predicate in (19) would not be co-designative with 'Suzie Bell,' given the truth of (18).

The insight of this example can be generalized in the following way: (G) Whenever a sentence S of the form ' Ft ' (where t is a singular term) is true or is derivable from a set Γ of sentences that are true, then the sentence S^* formed by attaching the logical possibility operator to S , ' $M(Ft)$,' is open to the substitutivity of identity *salva veritate*. The set Γ may include without complication such sentences as ' $N(Ft)$ ' or ' $N(Fs) \& s = t$ '. I will speak of such contexts involving the possibility operator as "contexts of type (G)."

If Quine's argument in (1)-(6) had been stated so as to include the substitutivity of identity in a false statement S , we would have a counterpart to contexts of type (G). In a referentially transparent context if ' Ft ' is false, then so is ' Fs ', where ' s ' and ' t ' are any co-designative terms of an object. Consider the following situation where

(20) B. Jones is a bachelor

is false. Thus, a fortiori,

(21) N (B. Jones is a bachelor)

is false. Is there any co-designative term of 'B. Jones' such that upon substitution in (21) the resultant sentence (21') is true? The answer is negative, for whatever co-designative phrase we choose it cannot entail bachelorhood (as it must if (21') is to be true) on pain of contradicting (20). That we have here a counterpart to contexts of type (G) is plain to see. If (20) is false, then

(22) B. Jones is not a bachelor

is true, as is

(23) Not- N (B. Jones is a bachelor)

But by the usual modal equivalences and the imbedding of the negation in the singular statement, (23) yields

(24) M (B. Jones is not a bachelor).

The parallel of (22) and (24) with (18) and (19) is evident.

In contexts of type (G) we now seem to have an alethic modal context that does not fall victim to the criterion of referential opacity in (4). Quine might claim that this particular modal context is not referentially

transparent, however, for openness to the substitutivity of identity is but a necessary condition for a context's being referentially transparent. Quine does not mention what the other necessary conditions of referential transparency are, though. Perhaps we have a situation similar to the one concerning quotation contexts—some quotation contexts are referentially opaque; others are not. And the final criterion is the substitutivity of identity. If the specific context is open to the substitutivity of identity, it is referentially transparent; if not, it is referentially opaque. But now we have to alter Quine's conclusion wherein the suppressed quantifier is universal, viz., *all* alethic modal contexts are referentially opaque. Perhaps the conclusion could be altered to read: All alethic modal contexts, excepting contexts of type (G), are referentially opaque.

The important thing to note, however, is that this alteration was demanded on the basis of Quine's argument procedure alone. This procedure, which does not attend to scope distinctions of descriptions (given the existence of the unique referent) in its production of instances of referential opacity, may be deemed inappropriate to modal contexts. Be that as it may, my point is that Quine's justification for premise (5) as it stands is lacking. The conclusion suggested above does seem adequately supported by Quine's argument, even if the alteration is somewhat *ad hoc*. Quine's argument does not turn on questions like existence of individuals in possible worlds but depends on the possibility of specifying an existing object *o* in a way incompatible with the predicate *P* assigned to it by the sentence '*M(Pt)*'. The only way of blocking this sort of specification of *o* is to assign *P* to *o* in the actual world. And this is, of course, a context of type (G).

With respect to the stronger alethic operator, the necessity operator, Quine's support of (5) is adequate, provided that any object has at least one contingent specification.⁶ And without this provision modal distinctions collapse, as Quine shows in "Reference and Modality," pp. 152-53. Take any true sentence *S* of the form

(25) *N(Ft)*,

such as

(26) *N*(2 is even),

and it appears that the subject of the sentence, the number 2 here, can be designated in a variety of ways that will, upon substitution of the co-designative term in *S*, change the truth value of the resultant sentence *S** to false. For example, it is false that

(27) *N*(the number of R. M. Nixon's daughters is even)

for it is surely not an analytic truth that Nixon has an even number of daughters. Quine's argument is on secure ground when it is directed toward modal contexts governed by the necessity operator; but, as we have seen, the argument established a weaker conclusion in connection

with the possibility operator. Hence the conclusion which Quine's argument establishes is

(6') Terms in all alethic modal contexts, excepting contexts of type (G), do not occur purely referentially.

As an example of a context in which terms occur purely referentially Quine offers the position of singular terms under predication. Whatever is true of the object is true of it regardless of how it is referred to. But modal predicates are not in general true of an object per se, but depend for their truth upon the manner of referring to the object, so Quine argues.⁷

Before I show that Quine's comments do not hold for contexts of type (G), a statement of what Quine means by a modal predicate is needed in light of several criticisms of his position.⁸ A modal predicate for Quine is a predicate obtained from a *de dicto* sentence by replacing the subject term by a free variable. Hence the modal predicate obtained from (26) is most aptly characterized as

(28) Necessarily x is even

rather than as

(29) x is necessarily even.

In (29) the necessity operator is an adverb attaching to the predicate 'even,' and upon substitution of 'the number of R. M. Nixon's daughters' for ' x ' in we get the true *de re* statement

(30) The number of R. M. Nixon's daughters is necessarily even,

which is interpreted as saying something like

(31) The number which is the number of R. M. Nixon's daughters is necessarily even.

Several things militate against the interpretation embodied in (29) being adequate to Quine's meaning of 'modal predicate'. First, Quine's approach of translating (26) in terms of analyticity is evidence that he is concerned with a modal operator that attaches to sentences, and not an adverbial operator attaching to predicate terms. Second, had he understood (26) as a *de re* modality along the lines of Plantinga and Cartwright's analysis, his remarks concerning quantification *into* modal contexts would have been beside the point. Such *de re* modalities (not within the scope of some other *de dicto* modal operator) are open to quantification, for the quantification is *not* into the modal context.⁹ For instance, performing E.G. on (30), we have

(32) $(\exists x)$ (x is necessarily even).

The variable bound by the quantifier is outside the scope of the modal operator, whereas for quantification into modal contexts the quantifier stands outside the context and binds a variable within the context.

My conclusion, then, is that we must interpret a modal predicate for Quine as one which provides a context that resists substitutivity

salva veritate of singular terms and one which, upon the attachment of a quantifier, results in quantification *into* the modal context. Predicates formed like (28) are modal predicates that meet these conditions. In brief, Quine's view is that since modal contexts resist the substitutivity of identicals, the predicate formed from a *de dicto* modal statement by replacing the subject term by a free variable is not a predicate true of the object irrespective of how specified. However, we have seen that the substitutivity principle does not break down in contexts of type (G). This suggests that the predicate

(33) $M(x \text{ is a sister})$

formed from (19) is true of the object regardless of how Suzie Bell is referred to. For, given the truth of (18), we know that all co-designative terms of Suzie Bell can be substituted for the variable in (33) and the resultant sentence will be true. Hence we seem to have a modal predicate (in Quine's sense) that is true of the object. Quine may have realized this exception for he states that modal predicates are "*in general* not a trait of the object concerned."¹⁰ If Quine denies that the predicate in (33) is true of the object (and, as I have suggested, it is not clear that he would), he must do so on grounds other than the failure of the substitutivity of identicals.

The isolation of a modal context that does not fall victim to Quine's arguments has obvious implications for quantification into that context—namely, it is open to such quantification without the usual restrictions on singular terms. However, since the question of essentialism arises out of quantification into contexts governed by the necessity operator, I fail to see any implications for the question of the commitment of quantified modal logic to essentialism.¹¹ Although (20) and (21) present a referentially transparent context involving the necessity operator, one would not be prompted to quantify into (21) for the simple reason that existential generalization is not "falsity-preserving". For example, just because 'Huey Long is the present Governor of Louisiana' is false, it does not follow that 'There is someone who is Governor of Louisiana' is also false.

2 In the previous section Quine's arguments, seeking to establish the referential opacity of modal contexts, made extensive use of singular terms. He has sought to establish a similar conclusion without recourse to singular terms. My purpose here is to show that his argument fails to establish this conclusion. Quine presents his argument in the following way:

Actually, though, this expository reversion to our old singular terms is avoidable, as may now be illustrated by re-arguing the meaninglessness of (30) [(Ex) (x is necessarily greater than 7)] in another way. Whatever is greater than 7 is a number, and any given number x greater than 7 can be uniquely determined by any of various conditions, some of which have ' $x > 7$ ' as a *necessary* consequence and some of which do not. One and the same number x is uniquely determined by the condition:

(32) $x = \sqrt{x} + \sqrt{x} + \sqrt{x} \neq \sqrt{x}$

and by the condition:

(33) There are exactly x planets,

but (32) has ' $x > 7$ ' as a necessary consequence while (33) does not. *Necessary* greatness than 7 makes no sense as applied to a *number* x ; necessity attaches only to the connection between ' $x > 7$ ' and the particular method (32), as opposed to (33), of specifying x .¹²

Quine's general argument may now be sketched.

(1) If Gx and Fx (open sentences) are two different conditions that uniquely determine an object x , and if Hx is a necessary consequence of Gx but not of Fx , then 'necessarily Hx ' is not a predicate true of an object independent of how determined.

(2) One and the same number x is uniquely determined by the condition Gx , ' $x = \sqrt{x} + \sqrt{x} + \sqrt{x} \neq \sqrt{x}$,' and by the condition Fx , 'There are exactly x planets.'

(3) Gx has ' x is greater than 7' as a necessary consequence, whereas Fx does not.

∴(4) 'Necessarily x is greater than 7' is not a predicate true of an object independent of how determined.

(5) Existential generalization is justified only in those contexts where a predicate is true of an object regardless of how determined.

∴(6) The inference to '($\exists x$) (Necessarily x is greater than 7)' is unjustified.

Quine's support of (4) is somewhat confusing because of a failure to state precisely what he intends by a "necessary consequence" or by "necessary greatness than 7." What is a necessary consequence? One could say that B is the necessary consequence of A in 'If A , then it is necessarily true that B ' [$A \supset N(B)$]. Or, one might say that B is the necessary consequence of A in 'It is necessarily true that if A , then B ' [$N(A \supset B)$]. It is doubtful that Quine meant the first interpretation. On this interpretation his argument must reckon

(7) If there are x planets, then Necessarily x is greater than 7

as false. But Quine does not provide evidence that (7) is false. Without such evidence this construal of the argument makes of it no more than a simple denial of the claims of Smullyan and others that (7) is true and that "necessary greatness than 7" is a predicate true of an object.¹³ Of course, Quine could claim that the truth of (7) involves essentialism. But that would change the present argument, which is not that quantification into modal contexts involves essentialism and essentialism is a metaphysical horror, but that such predicates are *not* even true of objects per se.

The second interpretation is the most usual one of the phrase 'necessary consequence', and that this is Quine's intent receives some support from the fact that in stating a similar argument in another place, he says in this connection ' A entails B '—which translates ' $N(A \supset B)$.'¹⁴ On this interpretation his example is that

(8) Necessarily (if $x = \sqrt{x} + \sqrt{x} + \sqrt{x} \neq \sqrt{x}$, then x is greater than 7)

is true whereas

(9) Necessarily (if there are x planets, then x is greater than 7)

is false. Utilizing the usual language of possible worlds, we could say that (8) is true for in every possible world whatever satisfies the antecedent of the conditional (presumably always the number 9) also satisfies the consequent. (9) is false, since the statement 'If there are x planets, then x is greater than 7' is false in any possible world with seven or less planets in our solar system. The phrase 'there are x planets' is thus interpreted as not being fixed to any particular number in every world; whatever number it determines in a world H is dependent upon the number of planets in H .

However, from (8) we have nothing that resembles the predicate "necessary greatness than 7". From (8) and the fact that some object satisfies the condition (32), it merely follows that the object is greater than 7. Even as from the truth of 'John is a bachelor' and 'Necessarily if John is a bachelor, then John is unmarried,' we can derive merely that 'John is unmarried', not that it is necessarily true that he is unmarried. What must be added to (8) is

(10) Necessarily $x = \sqrt{x} + \sqrt{x} + \sqrt{x} \neq \sqrt{x}$

in order to derive

(11) Necessarily x is greater than 7.

Now the question is, Can Quine utilize (10) in his derivation of (11)? If he does not, (11) is not derivable, and all his talk about necessary greatness than 7 is pointless. If he does utilize (10), then his complaint against (11) seems most arbitrary, for (10) should be every bit as problematic on Quine's view as (11). It appears that Quine has to assume that one modal predicate is true of an object per se to show that another is not. Substituting 'the number of the planets' in (10), we get

(10') Necessarily (the number of the planets = $\sqrt{\text{the number of the planets} + \sqrt{\text{the number of the planets} + \sqrt{\text{the number of the planets} + \sqrt{\text{the number of the planets}}}}$)

which is false on Quine's reading of it but true when '9' is substituted in (10). But, given his overall strategy here, Quine might eschew such a recourse to singular terms in showing the problem with (10). One could generate an argument against (10) of the same sort as the one against (11). But to point out that, given the appropriate conditional (as in (8)), (10) is a necessary consequence of

(12) Necessarily x is a whole number such that $x \neq \sqrt{x}$ and the sum of the digits of x^2 (when written in Arabic notation of less than \sqrt{x} places) = x ,

and that

(13) Necessarily (if there are x planets, then $x = \sqrt{x} + \sqrt{x} + \sqrt{x} \neq \sqrt{x}$)

is false, is merely to push the argument back one step. Whatever complaint Quine has against (11), he has against (10) and (12), but his argument has not established that his criticism is justified.

Quine's argument serves to point out the fact that the unique determination of an object in modal contexts is beset with problems akin to referential multiplicity.¹⁵ Predicates such as (10) and (12) uniquely determine the number 9 in all possible worlds and thus represent essential predicates of that number. Of course, the number 9 can have essential properties such as (11) which are not unique to it.¹⁶ A modal predicate such as

(14) Necessarily there are x planets

is satisfied by no object, even though 9 is uniquely determined in the actual world by

(15) There are x planets.

Hence (15) is a contingent property of 9. Modal predicates may harbor an essentialist metaphysics, but Quine's argument fails to show that modal predicates are not true of an object per se.

NOTES

1. The argument in (1)-(6) is based primarily on Quine's "Reference and modality," in *From a Logical Point of View: 9 Logico-Philosophical Essays* (2nd Edition, revised; New York: Harper & Row, Publishers, 1961), pp. 139-144. See also his "Three grades of modal involvement," in *The Ways of Paradox and Other Essays* (New York: Random House, 1966), pp. 156-174, and *Word and Object* (Cambridge: M.I.T. Press, 1960), pp. 195-199.
2. Quine, W. V., "Three grades of modal involvement," p. 158. See also Quine, "Reference and modality," p. 140 and Quine, "Notes on Existence and Necessity," in *Semantics and the Philosophy of Language*, ed. by Leonard Linsky (Urbana: University of Illinois Press, 1952), p. 78.
3. Quine, W. V., "Reference and modality," p. 140.
4. *Ibid.*; W. V. Quine, Review of *Identity and Individuation*, ed. by Milton K. Munitz, in *The Journal of Philosophy*, vol. 69 (1972), p. 491.
5. Smullyan, Arthur Francis, "Modality and description," *The Journal of Symbolic Logic*, vol. 13 (1948), pp. 31-39; Saul Kripke, "Identity and necessity," in *Identity and Individuation*, ed. by Milton K. Munitz (New York: New York University Press, 1971), pp. 138-139; Richard Sharvy, "Truth-functionality and referential opacity," *Philosophical Studies*, vol. 21 (1970), pp. 5-9.
6. I will mean by a contingent specification of an object o some singular term t such that t specifies o in the actual world but fails to specify o in some other possible state of affairs in which o exists. Quine would be more apt to say that not all of the specifications of an object are synonymous, instead of speaking of contingent specifications.

7. Quine, W. V., "Reference and modality," p. 148.
8. I have in mind Alvin Plantinga, "De Re et De Dicto," *Noûs*, vol. 3 (1969), pp. 241-243, and Richard Cartwright, "Some remarks on essentialism," *The Journal of Philosophy*, vol. 65 (1968), pp. 615-616.
9. Careful attention should be given the first four words of the sentence: "such *de re* modalities." By this I mean *de re* modalities as set up by Plantinga and Cartwright. Other logicians speak of *de re* modalities just as quantified modal logics. For instance, G. E. Hughes and M. J. Cresswell (*An Introduction to Modal Logic*, London: Methuen and Co. Ltd., 1968), p. 184, write that "a wff, α , containing a modal operator (*L* or *M*) will be said to express a modality *de re* iff the scope of some modal operator in it contains some free occurrence of an individual-variable." They give such formulas as ' $(x)L\phi x$ ' and ' $(Ex)M\phi x$ ' as instances of *de re* modalities.
10. Quine, W. V., "Reference and modality," p. 148.
11. Since the necessity operator is definable in many systems by the possibility operator, I will assume that all the formulas dealt with have been reduced to a form in which negation signs occur only where they immediately precede an atomic formula. I explicitly want to avoid reckoning a formula of the form ' $\sim M\sim(Ft)$,' where we are given the truth of '*Ft*' in the actual world, as providing a context of type (G).
12. *Ibid.*, p. 149. In accordance with my understanding of how Quine interprets the modal operators, (30) is best rendered as

$$(30') (Ex) \text{ Necessarily } x \text{ is greater than } 7.$$
13. See the works listed in footnote no. 5.
14. Quine, W. V., "Reply to Sellars," in *Words and Objections: Essays of the Work of W. V. Quine*, ed. by Donald Davidson and Jaakko Hintikka (Dordrecht: D. Reidel Publishing Company, 1969), p. 339.
15. The term 'referential multiplicity' is Jaakko Hintikka's ("Modality as referential multiplicity," *Ajatus*, vol. 20 (1957), pp. 49-64), whereby he speaks of a singular term's failure to refer to the same individual in all possible worlds.
16. I do not mean to suggest that a modal logician who quantifies into modal contexts is unalterably committed to saying that the number 9 satisfies such predicates as (10)-(12). He may deny that such essentialist predicates are true of anything, although he will admit the legitimacy of such trivial properties as ' $N(Fx \supset Fx)$.' The clearest statement of such a non-essentialist position is found in Terence Parson's "Essentialism and quantified modal logic," *The Philosophical Review*, vol. 77 (1969), pp. 32-52.

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