The notion of opacity, as bequeathed to us by Quine, is a simple notion: A grammatical construction is opaque if within it certain substitutions fail to preserve extensional values. With such a definition, a variegated collection of expressions turn out to involve opacity—quotation names, arabic numerals, tenses, modal operators, and ascriptions of psychological attitudes, to name a few. Variegated as this collection might be, Quine himself recognized no distinction among kinds of opaque construction. And Quine is not alone here: Many philosophers and linguists fail to see a principled distinction among different kinds of opaque construction.

This is unfortunate. In this paper, I distinguish two sorts of opacity and show that such a distinction can do worthwhile work for theories of the grammar and semantics of natural language. The distinction is drawn by distinguishing between kinds of productive mechanisms a grammar may contain, which I call lexical and grammatical constructions.Crudely put, the first sort of construction determines the lexicon of a language, the second generates the grammatically complex expressions. As I show, such distinctions allow us: To clearly formulate the view that “quotation names are proper names”, and defend it against objections like those lodged by Davidson; to give an account of numerals which does justice, both to the intuition that they are proper names, and to the intuition that they are polynomials (and so akin to descriptions); to formulate a defensible version of the principle of compositionality. Distinguishing different sorts of opacity also, I think, allows us to make sense out of some of Quine’s more notorious claims about opacity—for example, his claim that it is impossible to quantify into opaque contexts.

Section I reviews Quine’s notion of an opaque construction and his assumptions on the nature of a grammar. The views of Quine and Tarski on quotation are contrasted—these views being, contrary to some opinions, quite distinct. In Section II, the significance of this difference is discussed. I observe that Tarski’s, but not Quine’s view is compatible with interesting versions of the principle of compositionality. The distinction between two sorts of productive mechanisms for a grammar is introduced, in order to adequately formulate Tarski’s view. I also observe
that an independent motivation for distinguishing between kinds of grammatical construction is provided by Arabic numerals.

The discussion of Section II is employed in Section III, where Tarski’s views are defended against Davidson, who has objected that no language learnable by finite beings could involve Tarskian quotation names. The paper closes with a discussion of the differences between the sorts of opacity induced by lexical and grammatical constructions.

I

Judgments of opacity can be made only relative to a grammar, since it is only relative to a grammar that one can sensibly speak of an occurrence of a term, or of the result of embedding one expression within another. As Quine himself puts it, ‘Referential transparency has to do with constructions’, where constructions are, in Quine’s terminology, the productive mechanisms of a grammar. A discussion of opacity, then, ought to be explicit in its presuppositions about the general form of a grammar. I begin by expounding Quine’s views on the subject; in many ways, his view is the standard view on the overall structure of a grammar.

According to Quine, a grammar consists of a set of categories, a lexicon, and a finite set of constructions. ‘The lexicon of a language is a finite set’ [PL 22], each member of which is assigned to a (we shall suppose unique) category. A construction is a ‘fixed way of building a composite expression from arbitrary components of appropriate sort’ [WO 49]. A construction may be thought of as a function whose domain is a Cartesian product of categories and whose range is within a particular category. For example, assuming that one category which a grammar for English would have is that of declarative sentence (S, call it), one possible construction for a grammar for English would be that corresponding to the function which maps each member of $S \times S$ to its conjunction.

Definitions of syntactic notions which presuppose (or at least harmonize) with this idea of a grammar are the most familiar to us. For example: Given this notion of a grammar, we can say that an expression $e$ has a grammatical occurrence in an expression $e'$ iff $\langle e, e' \rangle$ is in the smallest set $S$ such that: $\langle e, e \rangle$ is in $S$, for each $e$ in some category; $\langle e, g \rangle$ is in $S$, if $\langle e, f \rangle$ and $\langle f, g \rangle$ are; if a grammatical construction maps $\langle e_1, \ldots, e_n \rangle$ to $f$, then each of $\langle e_1, f \rangle, \ldots, \langle e_n, f \rangle$ are in $S$. (For the balance of this article, I assume such a definition of grammatical occurrence.) The notion of a particular (grammatical) position within an expression can be characterized in terms of position within an
$n$-tuple on which a construction operates in order to produce the containing expression; the notion of the $i$th occurrence of an expression $e$ within an expression $e'$, as well as the notion of the result of substituting on the $i$th occurrence of an expression, can be defined in terms of the notion of position. Details of the definition of these and other syntactic notions are familiar; I hope the reader will not object if I suppress them.

A construction is opaque, on Quine's definition, if it is responsible for certain sorts of failures of extensionality. Write $e_i[a/b]$ for the result of substituting the term $b$ for the $i$th occurrence of the term $a$ in $e$; assume that constructions have, as output, only terms, formulae, and predicates; assume the usual definition of co-extensiveness to be given, for such output. Then a construction $c$ is opaque "if it turns an extensional position into a non-extensional one" — that is, if (i) there's an expression $e$ and an $i$ such that, for any co-referential terms $a$ and $b$, $e$ and $e_i[a/b]$ are co-extensive, but (ii) for some co-referential $a$ and $b$, $c(e)$ and $c(e_i[a/b])$ are not co-extensive. So, for example, in a grammar which represents English as having a construction $Q$ which maps (perhaps among other things) each sentence to its quotation name, $Q$ is an opaque construction. For substitution of a co-referential term for 'Tully' in 'Tully is dead' preserves extension: 'Tully is dead' and 'Cicero is dead' (presumably) differ only with respect to the former's having 'Tully' where the latter has the co-referential 'Cicero'. But $Q$ ('Tully is dead') and $Q$ ('Cicero is dead') are, of course, not co-extensive, naming as they do distinct sentences.

Does English have a quotation construction? Quine seems to have thought that it obviously did: 'Quotation is the referentially opaque context par excellence', he writes [TGM 161]. Since opacity is a matter of constructions, quotation is a construction, and, syntactically speaking, expressions such as terms may occur within the scope of quotation marks, on Quine's view, in just the sense in which they occur within the scope, say, of the negation sign.

This suggests that the quotation construction has as its domain the union of all grammatical categories and its range within the set of individual terms. But this can't be Quine's considered opinion; "'oeihrf' " is a perfectly acceptable quotation name. Rather, the domain of the quotation construction must, one thinks, be something like the set of all concatenates, i.e. the set of all the concatenations of symbols (including the space) of a language.

How might a grammar, faithful both to Quine's particular views on quotation and his general views about grammars, be constructed? Let us assume for the nonce that (i) we may identify grammatical expressions
with concatenates, and; (ii) quotation has as its domain the set of all concatenates. This class is denumerable. Since the lexicon of a grammar, on Quine's view, is finite, the concatenates themselves will have to be generated from some finite store of lexical items by some (grammatical) construction or constructions. It is easy enough to come up with a finite list of elements (the letters, punctuation symbols, the digits, the space, etc.) and an operation (concatenation) with which one can generate all of the concatenates. So perhaps Quine could give the following account of quotation: The letters, etc. are lexical items, members, let us say of the category *concatenate*; Concatenation is a grammatical construction, with \((n\text{-tuples of members of})\) the category of concatenate as domain, and range within the category of concatenates; Quotation is a grammatical construction which projects the class of concatenates into the class of terms.

There are at least three serious objections to this proposal. (i) It requires us to treat practically all grammatical expressions as ambiguous, in so far as they are members of distinct grammatical categories. For example: Since Quine wishes to say that the *term* 'Tully' occurs in ""Tully"" [WO 144], and the latter term is the result of applying quotation to the *concatenate* 'Tully', the term and the concatenate must be identical. (ii) Yet more seriously: Thi_s proposal seems to obliterate the distinction between a 'mere surface occurrence' (an 'orthographic accident', to use Quine's phrase) and a grammatical occurrence. For example: 'Roman' is the result of applying concatenation to 'Ro' and 'man'. Thus, since concatenation is a grammatical construction, it will follow (given the definition of *occurs in*), that 'man' is as much of a grammatical constituent of 'Tully is a Roman' as is 'Tully'.

This result cannot be avoided by restricting the way in which concatenation operates. For example, one might require that concatenation be restricted, operating only on a concatenate and a single letter: 'Manny's here' is built up in 12 painful steps, by concatenating 'M' with 'a', then concatenating the result, 'Ma', with 'n', then . . . . If this account of concatenation is adopted, it is true that 'man' is not a constituent of 'Tully is a Roman'; but 'Man' is a constituent of the sentence 'Manny's here'. It is also unclear, on a view which so restricts concatenation, that those things which should be constituents of concatenates become such: 'ne que' will not, for example, be a constituent of 'je ne dit que 'oui'', as the latter is constructed via 'restricted concatenation'. But then how can the concatenate be identical with the french sentence 'je ne dit que 'oui'', as it must be, if the sentence is to occur as a grammatical constituent of its quotation name? (iii) Finally, on the view we are criticizing, every
concatenation is a member of a grammatically significant category: ‘eghi’ is as much a grammatically significant expression as is ‘quantification’.

A much more satisfactory approach for Quine would seem to be this: Allow one grammatical construction, quotation, to have a domain which is not a grammatical category. Rather, the domain of quotation is the set of all concatenates, which includes, but is not exhausted by, the union of all the (grammatical) categories of the language. (Thus, concatenation is not itself to be taken as a grammatical construction at all. Rather, it is an operation which generates, from a finite base, a set of elements which form the domain of a construction.) The output of an application of quotation is a quotation name, in which occur (grammatically) any expressions which occurred (grammatically) in the operand of that operation of quotation. The output of quotation is, of course, within the class of terms, quotation applied to a concatenate e being a name of e. I will call the view just adumbrated Quine’s official view of quotation.

I do not think Quine’s official view is obviously untenable. I do think that it is a somewhat odd view, and that its oddness, especially in the context of Quine’s other views on grammar and semantics, has not been sufficiently appreciated. Thus, before contrasting Quine’s view with Tarski’s view of quotation (a view with which it is sometimes confused), I will point out some of the consequences of Quine’s view.

First of all, note that Quine’s views about the finitude of the constituents of a grammar are compromised, upon the official view, even if they are not altogether abandoned. For it can no longer be said that the expressions of the language are generated, from a finite stock of lexical items by a finite number of grammatical operations. Indeed, one might argue that on the official view the grammar contains, in some sense, denumerably many primitive items (the concatenates) even though these items cannot be properly said to be lexical items.

Secondly, consider

(1) ‘nine is the number of nuggets’
(2) canine
(3) “Nine is identical with the sum of three and six.

On Quine’s view, the relation of ‘nine’ to (1) is, from a syntactic perspective, just like its relation to (3); it is totally unlike its relation to (2). ‘nine’ enjoys grammatical occurrence in both (1) and (3); it occurs at best accidently in (2). If appeal is confined only to syntactic criteria, there is not an interesting distinction to be drawn between the occurrence of ‘nine’ in (1) and (3). This is worth stressing if only because Quine’s most
oft quoted comments about quotation so strongly suggest another view of the relation between (1), (2), and (3). The following passage is representative:

Intuitively, what occurs within a referentially opaque context may be looked upon as an orthographic accident, without logical status, like the occurrence of ‘cat’ in ‘cattle’. The quotation context has, perhaps ... a deceptively systematic air which tempts us to think of its parts as somehow logically germane. Insofar as this temptation exists, it is salutary to paraphrase quotations by [spelling, where] there is no non-referential occurrence of [any term], for there is no occurrence [in a spelling of an expression of any term (other than the name of a letter) at all]. ([TGM 161]; see also [RM 18], [WO 143–4])

Surely this is an odd passage. We are counseled to pretend that expressions do not occur within opaque contexts. But the claim, that ‘what occurs within a referentially opaque context may be looked upon as an orthographic accident’ is literally false, on Quine’s view. It is, furthermore, extremely misleading, implying that occurrence within quotation is, somehow, at best second class occurrence. The only second class occurrence which Quine recognizes is occurrence in the sense of “mere orthographic accident”. But occurrence within the scope of quotation marks is not, on Quine’s view, an orthographic accident.

Thirdly, quotation names form, slightly surprisingly, a variegated group: Some are grammatically complex, some aren’t. Consider

(4) eghi
(5) ‘eghi’
(6) Tully
(7) ‘Tully’

As we have formulated Quine’s view, an expression occurs in the output of an application of quotation if (and only if) it occurs within the operand of that application. (6), therefore, is a grammatical constituent of (7) (as Quine insists): For (6) is a term and, therefore, being a member of some category, occurs within itself. (7) is, thus, grammatically complex. But (4) does not occur in (5), since (4) is not a grammatically expression to begin with (and so does not have itself as a constituent). (5) is grammatically structureless.

Finally, there is the curious status, on Quine’s view, of variables which occur within the quotation construction. Quine writes

... it must be remembered that ‘x > 5’ in quotation marks is a name of the specific quoted expression, with fixed letter ‘x’. The ‘x’ in

[(8) Nec ‘x > 5’]
cannot be reached by a quantifier. To write:

\[(9)\] \((x) (Nee \ 'x > 5'), (\exists x) (Nee \ 'x > 5')\]

is like writing

\[(10)\] \((x) (Socrates is mortal), (\exists x) (Socrates is mortal)\);

the quantifier is followed by no germane occurrence of its variable. ([TGI 172]; Quine's numbering has been altered)

Of course Quine is correct: Quantifiers do not bind quoted variables. But on a position such as Quine's – on which quoted variables occur within the scope of quantifiers in (syntactically) the very same sense in which 'x' is within the scope of '(x)' in '(x)(x is red)’ – this fact requires an explanation; it should not be taken for granted. (Of course, Quine has a general thesis, that variables within an opaque construction cannot be bound by quantifiers occurring outside of the construction. But this thesis, it is currently conceded, is simply false.)

None of the preceding is intended to show that what we have called Quine’s official view of quotation is untenable. But it does suggest that the view is awkward. It would be of some interest to see if the theory of quotation suggested by the ‘orthographic accident’ passage cited above – the view on which quotation names have no grammatical constituents – is tenable. Such a theory was advanced by Tarski:

Quotation-mark names may be treated like single words of a language, and thus like syntactically simple expressions. The single constituents of these names – the quotation marks and the expressions standing between them – fulfill the same function as the letters and complexes of letters in single words. Hence, they can possess no independent meaning. Every quotation name is then a constant [i.e. closed] individual name of a definite expression (the expression enclosed by quotation marks) and in fact a name of the same nature as the proper name of a man… this interpretation seems to be the most natural one and completely in accordance with the customary way of using quotation marks….[CTFL 159–160]

The principle difference between Tarski’s view (the proper name view of quotation, it has been called) and Quine’s can be put as follows. For Tarski, quotation names are to be viewed as being part of the lexicon of a language which contains them. If we are formalizing a grammar for a language with quotation names, we would include, as part of the specification of the lexicon, a proviso to the effect that, for each concatenate \(e\), the left quote \((\text{lq})\), followed by \(e\), followed by the right quote \((\text{rq})\) is a singular term.7 There would be nothing among the list of grammatical constructions which provided for the formation of quotation names. Quine, on the other hand, would include among the list of grammatical constructions an operation mapping concatenates to quo-
tation names; no quotation names figure as part of the lexicon on Quine's view.

Perhaps some will suggest that there cannot be any real difference between these two views. This feeling may be reinforced by considering how one would construct Tarskian theories of truth for languages containing "Quine quotes" and "Tarski quotes". Each theory would contain axioms worded, roughly,

(A) For any concatenate $e$, $lq$ followed by $e$ followed by $rq$ is an individual term.

(B) For any concatenate $e$, $lq$ followed by $e$ followed by $rq$ denotes $e$.

We would, perhaps, put (A) in a different place, on the list of axioms for Tarski's theory, than we would put it on the list of axioms for Quine's theory. Perhaps we would even put axiom (B) on different places on the two lists. But such theories are simply (deductive closures of) sets of axioms - so this marks no difference at all between the two theories. Doesn't this show that there is no difference between the two views of quotation?

I suspect, rather, that what it shows is that comparing theories in terms of the Tarskian theories of truth which they generate is not always the appropriate way to bring out significant differences between them. To insist on what we have already observed, there is a significant difference between the two theories: It has to do with whether or not, for example, 'Tarski' enjoys grammatical occurrence within ""Tarski"", and, therefore, whether the latter can be said to involve opacity in Quine's sense.

II

A great deal rides upon this difference. Quine's treatment of quotation bars the truth of any but a wholly trivial version of a principle of compositionality, on which the semantic properties of expressions are determined by the semantic properties of their grammatical constituents and by their syntactic structure; Tarski's treatment of quotation is compatible with the truth of such principles.

I must be specific, in explaining what I understand by a view's being consistent with compositionality. This is complicated by the fact that there is little agreement over what a semantical interpretation for a grammar ought to be like. Simplifying matters drastically, we find that many, perhaps most, proposals concerning semantical interpretation can
be characterized as follows. A semantics consists of (a definition of) an interpretation and a (finite) set of valuation rules. Interpretations specify domains of possible values for categories of the grammar, and make appropriate assignments to lexical items. Valuation rules assign entities to complex expressions, relative to an interpretation; the entities assigned may be members of one of the sets of possible values given by the interpretation, or functions from one category to another. (Such assignments are often implicit, but can be made explicit by invoking some set theory.) Finally, a semantics yields a characterization of truth (perhaps relativized to a model, or an index in a model) for the sentences of the language interpreted.

This is a very abstract characterization of a semantics, but I think it can be seen to apply to a wide variety of semantic proposals. Obviously, model theoretic systems of semantics fall under the above description; it also can be understood as a description of a Tarskian truth definition for a language. (In this case, the interpretation is to be identified with a set of assignments characterized by the basis clauses in the truth definition.) The above also allows for a simple initial characterization of compositionality: We say that a semantics is compositional, with respect to a grammar \( G \), if whenever expressions \( e \) and \( e' \) of \( G \) differ only with respect to occurrences of expressions with the same assignment, relative to the semantics, \( e \) and \( e' \) have the same assignment relative to the semantics.

Of course, no interpretation of a grammar which embodies Quine's treatment of quotation and which assigns singular terms their referents as semantic values will be compositional. And no matter what kinds of values one proposes as the appropriate sorts of values for expressions, so long as it is possible that different members of the same category receive the same interpretation, it does not seem that an acceptable compositional interpretation for a grammar embodying Quine's view on quotation can be given: If the interpretation is compositional, and the grammar contains distinct expressions \( e \) and \( e' \) with the same interpretation, the grammar will give the quotation names of \( e \) and \( e' \) the same interpretation. This is not acceptable.

This is not true of interpretations of grammars which embody Tarski's view of quotation. It might be supposed that such a grammar will be one which assigns quotation names no structure whatsoever. This need not be true. There is no reason to think that the only sorts of structure which a grammar recognizes are grammatical structure and surface structure, the latter corresponding to what Quine calls mere orthographic occurrence. A grammar can recognize what we might call lexical or productive
structure, and a kind of occurrence, of one expression within another, which we can call lexical or productive occurrence: Roughly, e occurs productively in e' (relative to a grammar for a language) if e and e' are expressions of the language, and the specification of the lexicon involves a rule (a productive construction, if you like) which generates e' from e. (A somewhat more complicated definition of this notion could be given. For the purposes of this and the next section, this definition will suffice.) The advocate of Tarski's view of quotation needn't say that quotation names are wholly without structure — what they lack is grammatical structure.

Since Frege, it has been a goal of the systematic study of language to develop grammars for (fragments of) natural language which are capable of compositional interpretation under assignments of values which are, or at least determine, fairly natural candidates for semantic values of expressions (e.g. truth, denotation, etc.). If we recognize that there is a sense in which productive occurrences are real occurrences (and not merely orthographic accidents), but fail to draw the distinction between productive and grammatical occurrence, this goal can appear to be mistaken; at the least, it can drive us to adopt some rather odd views, such as those of Frege's concerning quotation. Productive occurrence is a result only of those operations which are used to generate the class of atomic expressions (the lexicon) of the language. As long as there is an effective procedure for determining, for each member of the lexicon, what its interpretation is to be, there is no need that productive occurrence be capable of compositional interpretation, or that the semantics for the grammar work off of the interpretations of productively occurring expressions in specifying the interpretation of the grammatically complex expressions of the language. Whatever significance productive occurrences have — this matter will be discussed below — it needn't be semantic significance. And so a natural, and nontrivial, way of understanding the goal, of constructing grammars which satisfy the principle of compositionality, is as the goal of constructing a grammar in which grammatical, but not necessarily productive, occurrence is compositionally interpretable.

We have arrived at a view of the structure of a grammar which differs from that with which we began. A grammar ought to be understood as consisting of a finite set of lexical constructions, a (finite) set of grammatical categories, and a finite set of grammatical constructions. The lexical constructions determine the lexicon of the language; each construction has as output a set, all of which is in one of the categories of the grammar. The items upon which the lexical constructions operate, in
generating lexical items, need not themselves be members of a gram-
matical category. Examples of possible lexical constructions are: Finite
lists; a set or sets of (possibly uncategorized) items along with an opera-
tion or set of operations which project the initial set or sets into some
category. (Example: The intial set consists of the letter ‘x’; the operation
is adding a stroke, which generates the variables.) Productive occurrence
is occurence in virtue of such a construction. The grammatical con-
structions, on the other hand, have as domains Cartesian products of
categories (or, perhaps, products of unions of categories) and, as ranges, a
single category.12

As simple as this view is, and as small an advance as it offers over the
view of a grammar which Quine gives us, it nonetheless provides a more
fruitful way to think about problems which arise concerning the structure
and semantics of expressions. Take the case of arabic numerals.

Many philosophers have said that such numerals are proper names of
numbers; there is surely something to such an intuition. Other philoso-
phers have insisted that the numerals are descriptions. To great extent, I
think, this is because there is so obviously a way of generating the
numerals, on which they have the digits ‘0’ through ‘9’ as constituents,
which can be interpreted as a way of encoding a simple rule, which
determines a number for a numeral to denote, on the basis of the
denotation of its constituents and the structure accorded to the numeral,
by the rule. (Indeed: There are many such ways of viewing numerals.)
This seems like good evidence for the claim that numerals have gram-
matical structure (and so are something like descriptions): It is no
accident that the numerals have all of this structure; if we deny the
numerals grammatical structure, we will just be pretending that what is
on the surface is not there. So, at any rate, one might argue.

I am not altogether sure what qualifies an expression as a proper name.
But if it is being a term which fails to have grammatical structure, then I
think that numerals should be taken to be names. This is certainly so, if
the only alternative is to suppose that there is a grammatical construction
which generates the numerals from the set of digits. (It is difficult to see
what other sort of grammatical construction could serve as a numeral
generator.)

The problem is that such a construction will not be productive across
the class of singular terms. (Say that the construction is given by the rule:
A digit is a numeral; if d is a digit other than zero and n is a numeral,
then d followed by n is a numeral. The construction is not one which
constructs a term, given an arbitrary term, but only operates within the
class of numerals. Of course, to expand the rule’s domain is to end up
generating the likes of ‘2the number of planets’.) We seem to be committed to recognizing a homogeneous grammatical category of terms which include both the numerals and the non-numerals. But a (traditional) mark of a grammatical category is that its members are inter-substitutable *salva congruitate* in all grammatical contexts. Since the grammatical contexts are defined by the grammatical constructions, the elevation of the numeral generating construction to the status of a grammatical construction would require it to be productive across the class of terms.

A closely related problem involves quantification into numerals. Many, though not all, speakers find expressions such as ‘∃x(x ≈ 309)’ and ‘There is a number less than six such that it 09 [or: the number 09] is less than 1000’ to be ill-formed. (This fact seems to irrevocably scotch the idea that numerals are descriptions or polynomials – for there is no problem about quantifying into them.) Once again, we are in trouble, if we say that there is a grammatical construction which generates the numerals, and say further that numerals are terms. For then ‘x90 = 309’, and therefore its existential closure, ought to be well formed, as members of the same grammatical category are supposed to be intersubstitutable *salva congruitate*.\(^\text{13}\)

The notion of a grammar introduced above can accommodate all of the facts and intuitions mentioned thus far. We would insist that numerals are lexical items, generated by a lexical construction which projects the digits into the class of terms. Numerals are not grammatically structured, and so may be said, in some sense, to have the status of proper names. Nonetheless, numerals have a structure, indeed, a structure isomorphic with that, which those who wish to classify numerals among descriptions, ascribe to them. But since the structure is not induced by the set of grammatical constructions, we are not forced to deny that substitution of non-numerals into numerals, or quantification into numerals, is forbidden.\(^\text{14}\)

I have strayed somewhat from the topic of quotation marks. I have said already that I did not consider Quine’s view of quotation untenable, but only awkward. Nonetheless there are good reasons for preferring Tarski’s view to Quine’s. First of all, Quine’s view is awkward; Tarski’s opens the way to significant and intuitively satisfactory simplifications and generalizations of logical and semantic theory. For example: Tarski’s view doesn’t require *ad hoc* riders in the definition of syntactic notions, where Quine’s does (e.g. in the definition of bound variable); Tarski need not, Quine must, introduce a convoluted theory of grammatical constructions, on which some, but not all, constructions yield complex expressions,
some but not all constructions operate exclusively upon meaningful expressions. Furthermore, Tarski allows for the truth of a non-trivial version of the principle of compositionality. Even if we eventually decide that we must give up the principle of compositionality, this does not mean that we should give up compositional interpretations, when they are possible.

All things being equal, then, I think that we should prefer Tarski's account of quotation to Quine's.

III

But is Tarski's theory an acceptable theory? Many have thought the answer 'Obviously no'. I propose to focus upon Davidson's objections, since they are well known, well articulated, and representative, I believe, of the best extant objections to the view.

We begin by considering an objection which Davidson considers a secondary one; responding to it will help us to respond to Davidson's primary objection. Davidson writes

(a) If quotations are structureless singular terms, then there is no more significance to the category of quotation-mark names than to the category of names that begin and end with the letter 'a'. . . . (b) On this view, there is no relation, beyond an accident of spelling, between an expression and the quotation-mark name of that expression. . . . (c) nothing would be lost if for each quotation-mark name we were to substitute some unrelated name, for that is the character of proper names. (d) And so no echo remains . . . of the informal rules governing quotation: If you want to form a quotation-mark name of an expression, flank that expression with quotation marks . . . [Q 82-83; lettering added]

We may, in some sense, grant (a). Quotation mark names are not, on this theory, a grammatically significant category. They are not the range of some grammatical construction, nor are they the whole of some category of a grammar. Of course, they are a significant category in the sense of being the range of some productive construction. In this sense, they are significant in a way that "'a'-words" are not.

(b) is a more problematic comment. There is clearly a sense in which it is not just an "accident of spelling" that each quotation name contains the expression, of which it is a name, as a constituent. For as we understand Tarski's view, it involves the claim that there are three different senses in which one expression can occur within another: It can enjoy a merely accidental occurrence, it can enjoy what we called in the last section a productive occurrence, or it can enjoy grammatical occurrence. Of course, a major theme, in my defense of Tarski against Davidson, will be that there is an important difference between produc-
tive occurrence and grammatical occurrence. So, if we are to understand (b) as the claim that expressions enjoy mere orthographic occurrence in their quotation names, it is incorrect. If, on the other hand, Davidson means simply that they do not enjoy grammatical occurrence, he is correct.

(c) is an interesting comment, one which is at the heart of many complaints concerning Tarski’s theory. I expound the claim. Let $N$ be a denumerable set of expressions, not of English, which are wholly without recognizable structure; let $f$ map the concatenates of English one-one (and, we might say, willy nilly) into $N$. Now let English* be “the language just like English”, save that it contains no quotation names and, instead, has $f(e)$ as a name of $e$, for each concatenate $e$. (That is to say: English* has these names as lexical items, but they are not to be understood as being generated by what we have called above a lexical construction.) Davidson intimates that on Tarski’s view, ‘nothing would be lost’, if, for example, we were to stop speaking English and begin speaking English*.

There is a relation between the two languages – linguistic isomorphism, we might call it – which seems to bolster Davidson’s claim. I will not attempt an exact definition of this relation; intuitively, two languages are linguistic isomorphs if there are grammars for the languages related in such a way that there is a mapping between their lexicons, and a mapping between their sets of grammatical constructions, which jointly provide a very simple method for converting a (correct) truth theory for one language into a (correct) truth theory for the other. The mappings, in the case of linguistic isomorphs, do this because the mapping of the lexicons preserves semantic values, and because the mapping of grammatical constructions works in such a way that (i) if $c$ is mapped to $c'$, then, if $c$ operates on $e$, $c'$ operates on the image of $e$ ($e'$, call it) under the mappings, and (ii) the semantic value of $c(e)$ is the same as that of $c'(e')$.

On some views, linguistic isomorphs aren’t in any very important sense different languages: Isomorphs differ, roughly, only in the way in which they spell things; the mappings simply show how spelling differs from language to language. There is undoubtedly an important relation between isomorphs, one which may seem to justify the claim that isomorphic languages possess the same syntax and semantics.

Let us accede to the claim, that English, conceived as having Tarskian quotation names, and English* are linguistic isomorphs. Even if we grant further that this means that in some interesting sense, the two languages are ‘spelling variants’ of one another, it simply does not follow that
'nothing would be lost' by a move from, say, speaking English (or trying to teach it) to speaking (trying to teach) English*. The important difference between the two languages, with respect to learnability or 'teachability' is due to the fact that the grammar and semantics of English is finitely axiomatized, or, at least, axiomatizable; that of English* is not. And this difference, in turn, is due to the fact that the lexicon of English can be effectively generated, while the lexicon of English* cannot be. (At least, we have no reason to think that it could be.) I conclude that Davidson's comment (c) is incorrect.

It is worth observing that what we have said at least establishes that it does not obviously follow, from the fact that a language's lexicon is denumerable, that the grammar of the language is not finitely axiomatizable. Someone who thinks that it does follow owes an argument for this claim.

Finally, there is (d): Davidson protests that there is 'no echo of the informal rule governing quotation' (form a quotation name of e by enclosing it in quotes). This is false. It is, of course, true that there is a linguistic isomorph of English in which no such echo remains. But unless English is to be identified with this other language, or unless we are to suppose that the lexicon (abstracted from the way it is generated), grammatical constructions and semantical rules determine all the significant properties of a language, (d) does not follow from this. And, of course, there is a distinct echo of the informal rule in Tarski's view - it is in the productive component of the grammar, our axiom (A) of Section I.

Davidson's principal criticism of Tarski revolves around the issues which emerged in our discussion of (c):

... there is a further... and decisive objection, which is that on this theory we cannot give a satisfactory account of the conditions under which an arbitrary sentence containing a quotation is true. In an adequate theory, every sentence is construed as owing its truth or falsity to how it is built from a finite stock of parts by repeated application of a finite number of modes of combination. There are an infinite number of quotation-mark names... But on the theory we are considering, quotation-mark names have no significant structure. It follows that a theory of truth could not be made to cover generally sentences containing quotations. [Q 83]

To be fair to Davidson: He seems to have thought that there can be only one sense in which one expression can occur within another (ignoring orthographically accidental occurrences). It would be uncharitable simply to complain that his claim, that on Tarski's view quotation names are without structure, is false. So let us see whether his argument will go through, if we interpret the claim, that Tarski must say that quotation names are structureless, as the claim that they are grammatically struc-
ectureless. Then, I think, the objection must be construed in this way: An acceptable theory (about the syntax and semantics of a natural language) involves a grammar with a finite lexicon and a finite number of grammatical constructions; but a theory incorporating Tarski’s view violates this constraint, as quotation names are not the output of any grammatical construction. We can grant the second premiss; but why does an acceptable theory have to have a finite lexicon?

When we can regard the meaning of each sentence as a function of a finite number of features of the sentence... we... understand how an infinite aptitude can be encompassed by finite accomplishments. For suppose that a language lacks this feature... [it] is unlearnable. Let us call an expression a *semantical primitive* provided the rules which give the meaning for sentences in which it does not appear do not suffice to determine the meaning of the sentences in which it does appear... a learnable language has a finite number of semantical primitives.... [TMLL 9]

The argument would have to be: An acceptable grammatical theory represents the language as learnable; a theory represents a language as learnable only if it has finitely many semantical primitives; a theory has finitely many semantical primitives only if it has a finite lexicon.

Grant the first two claims; the third claim is simply false. Think of the rules which give a sentence’s meaning, a la Davidson, as the rules of a truth theory for the language of the sentence. Then, relative to a theory for English which incorporates our axioms

(A) For any expression e, lq followed by e followed by rq is a term.

(B) For any expression e, lq followed by e followed by rq denotes e.

none of the quotation names of English are semantic primitives. But such a theory will have a denumerable lexicon. So, provided that no other aspect of English requires infinitely many semantic primitives in Davidson’s sense, we have an example of a language with only finitely many semantic primitives but an infinite lexicon.

Let me now address a possible reaction to my argument. It is that a theory which accounted for quotation names by employing axioms (A) and (B) would not be a theory which embodied Tarski’s theory of quotation names. For such a theory takes quotation names to be structured entities, whose semantic properties are determined by their structure. But it is the essence of Tarski’s theory that quotation names are without structure.

This is a remarkably uncharitable view of Tarski’s remarks. What Tarski wished to deny was that quotation-mark names had semantically
significant structure in the sense in which, for example, names involving function symbols have such structure: The latter sort of names are (and are supposed to be) compositionally interpretable, while quotation names seem not to be; function symbols names, as a matter of course, can be quantified into, allow substitutions, etc; quotation mark names do not. In these senses, quotation names are like proper names, and unlike functional names.\textsuperscript{15} Tarski, rightly in my view, wanted to characterize this difference as a difference in structure. Why should Tarski be barred from ascribing any structure whatsoever to such expressions?

Now, it may be that the real difference between Tarski, as I have represented him, and Davidson is this: Davidson would hold that there can’t be a significant difference (in terms of the kind of structure ascribed) between our axiom (A) and, say, an axiom of the grammatical component of the truth theory which introduces the conjunction construction. If Davidson is right about this, his criticisms of Tarski go through. However, we have already seen that there are very good reasons (in the case of numerals) for introducing the distinction between our two kinds of structure. And even if there were not such reasons (and the analogous reasons, in the case of quotation mark names), I can find no suggestion in Davidson of a reason to reject this distinction. So matters stand thus: Davidson’s objections to the theory are cogent only if the distinction between productive and grammatical structure is illegitimate; and while we already know of good reasons for drawing the distinction, Davidson offers us no reason to think that the distinction is without content. I conclude that Davidson’s objections don’t show Tarski’s theory to be untenable.

IV

With productive occurrence clearly distinguished from grammatical occurrence, we have distinguished clearly between two kinds of opacity – and, more generally, between two kinds of non-extensional construction.\textsuperscript{16} We can subscript ‘opaque’ and ‘non-extensional’ with ‘L’ and ‘G’, in order to distinguish failures of substitutivity in contexts defined by lexical constructions from such failures in contexts defined by grammatical constructions. Let us consider whether there are interesting generalizations one can make, concerning the two sorts of non-extensionality.

The distinction between the two sorts of constructions, it will be recalled, was introduced in part to defend the significance of the principle of compositionality. There is a straightforward sense, discussed in
Section II, in which an interpretation is supposed to work off grammatical occurrences, a sense characterized by the principle of compositionality. And so non-extensionality $G$ requires appeal to non-extensional semantic values; at least in the cases of non-extensionality $L$ which we have discussed thus far, such appeal isn’t necessary.

Non-extensionality $G$ needn’t be a source of ontological anxiety. In some cases, the new kinds of semantic values, from an ontological perspective, are relatively benign. For example, if tenses are treated in a grammar by the introduction of a grammatical operation which maps sentences to sentences, leaving on the surface a tense operator, we have at the least a case of a non-extensional $G$ construction, and perhaps an opaque $G$ construction. But we need only invoke functions from some sort of temporal entities (instants or intervals) to extensions as semantic values, in order to produce an adequate compositional interpretation for a language involving such operators. Of course, this isn’t always the case. Treating modal contexts as sentence operators requires appeal to semantic values which, in the opinion of some, are suspect: We need functions from possible situations to extensions, or *possibilia*, or, at the least, properties and relations.

What of non-extensionality $L$? It is not quite right to say that non-extensional $L$ occurrences cannot be interpreted compositionally, save by the desperate ploy of assigning expressions themselves as semantic values. This isn’t right, since arabic numerals can be interpreted by an interpretation which assigns the digits their numeric interpretations. It is even possible to assign a function, to the syntactic function which constructs complex numerals, which, applied to the semantic values of the operands of the syntactic function, yields the semantic value of the output. (The function, applied to the pair $\langle n, m \rangle$ yields $m + n \times 10^a$, where $a =$ the number of digits in the standard decimal representation of $m$; the function which maps a number to the number of digits in its representation can quite easily be expressed without reference to numerals.)

What appears to be common to cases of non-extensional $L$ constructions is the impossibility of sensibly applying to them all of the syntactic transformations defined by the grammatical constructions: It is, for example, impossible to quantify into numerals or quotation names. It is a virtue, of the proposal to segregate lexical constructions from grammatical constructions, that it provides the basis of an explanation of this fact. The lexical constructions serve a different purpose, from that served by the grammatical constructions. Lexical constructions construct atomic expressions. While it is wrong to say that the occurrence of an expression, which elsewhere might have a certain grammatical
significance, is in a lexical item wholly accidental (for the expression may be there in virtue of a lexical construction), such an occurrence is, from a grammatical perspective, a complete accident. We cannot quantify into a numeral or a quotation name simply because a variable cannot enjoy a grammatical occurrence within such a term.

Indeed, it seems to me that Quine’s intuitions about opacity, while incorrect, if supposed to apply indiscriminately to opacity\textsubscript{G} and opacity\textsubscript{L}, are correct about opacity\textsubscript{L}. Expressions which occur within a larger context in virtue of a lexical construction are behaving differently from the way in which they do in grammatical contexts; if we take a “logically germane” occurrence of an expression to be one which is “simply doing duty for its semantic value” (so that any other expression, of the same grammatical type and with the semantic value, can be substituted for a logically germane occurrence of an expression, without altering the semantic value of the whole), then expressions within the scope of a lexical construction are not logically germane.\textsuperscript{18} Quine’s thesis, that one cannot quantify into an opaque context, can even be rescued, simply by supplying a subscript.\textsuperscript{19,20}

Notes

\textsuperscript{1} [WO 144]. Reference to this and other works will henceforth be indicated in the text, using the bracket names introduced in the bibliography.
\textsuperscript{2} This is somewhat oversimplified. For one thing, we might want to have some constructions map the union of several categories into a category.
\textsuperscript{3} I am slurring over complications having to with the fact that, generally, a grammar allows different derivations of (intuitively) non-ambiguous expressions. Thus, the definitions to which I allude in the text require a fair amount of machinery not mentioned here.
\textsuperscript{4} This is adapted from Quine’s definitions of referential transparency and opacity found at [WO 144]. There are subtle but important differences between the notions of an opaque construction and an opaque context. I am ignoring these differences in this paper; my concern is with the notion of opacity as a property induced by certain grammatical constructions.

There are a number of things which might make one worry about this definition. One is that Quine’s definition doesn’t collect essentially similar phenomena. We might wish that non-extensionality – the failure of a construction to preserve extensional values for any sort of co-extensional substitution (of terms, predicates, sentences, or whatever) – be recognized as being on all fours with opacity. Quine doesn’t recognize this. A second worry is that the definition fails to corral the constructions which Quine explicitly labels opaque, for the reasons mentioned in note 6.

As will become clear, these problems are not germane to the discussion of this paper, and so I will not pursue them here.
\textsuperscript{5} There are, one must admit, ways of avoiding objection (ii) while keeping the letters, etc. as members of the lexicon and a grammatical construction of concatenation. These involve alterations in the definition of occurs in: The trick (and I think this is all this amounts to) is to stipulate that the members of a tuple occur in an expression if and only if a construction besides concatenation maps a tuple which contains them to the expression. This seems rather \textit{ad hoc}.
\textsuperscript{6} The question of whether Quine’s thesis is true is somewhat more subtle than many people
realize. For if definite descriptions are not terms, then, by the letter of the law, the fact that we can quantify into modal and temporal contexts does not falsify Quine's thesis. For the failures of substitutivity of terms into such contexts all involve definite descriptions. If descriptions aren't terms, then such contexts, on Quine's definition, aren't opaque!

7 This is only a first approximation.

8 In the following discussion, I simplify rather significantly. Thus, for example, one might want to allow that interpretations assign a family of semantic values to expressions. If so, a variety of distinct "principles of compositionality" would be possible. In particular, one might hold that only one kind of semantic value has to be compositionial (so long as it somehow determines other semantic values). I also ignore possible complications having to do with semantic determinants (like contexts), with the possibility that some categories are to be uninterpreted, etc.

9 In arguing in this way, I am assuming that if the interpretations of two terms are identical, so are their referents.

10 One interpretation of Frege's views is that he held that quotation marks are not parts of expressions. Rather, they are "reference shifters": Inside of quotation marks, expressions shift their reference, as they do within the scope of 'that', on Frege's theory. Another interpretation is that quotation marks are both function symbols and reference shifters: Inside of quotation marks, expressions name themselves; the reference (and the sense) of quotation marks are identity functions. While either of these theories is prima facie compatible with compositionality, each theory seems to have trouble with quotation names such as "'eghi'": On these theories, 'eghi' and every other meaningless expression which has a quotation name becomes a meaningful expression, with a sense and a reference, once enclosed within quotation marks. Even confining attention to the reference side of this story, this seems a bit implausible. (In finding views of quotation to ascribe to Frege, I am indebted to Terence Parsons' [WQ].)

I do not mean to suggest that Tarski's theory of quotation is the only theory of quotation which is both compatible with compositionality and free of unacceptable consequences. I do think that it is superior to all of its compositional rivals. But it is not part of my project to argue for that here.

11 David Auerbach suggests that the requirement, that there be an effective procedure for determining the interpretation of the members of the lexicon, is stronger than it need be. Perhaps so. (There obviously is such a procedure, in the case of quotation names.) My point in the text is just that denumerability of the lexicon, along with the requirement that all lexical items be interpreted, does not require that lexical occurrence be treated in just the way that grammatical occurrence be treated.

12 Of course, some constraints concerning finitude are appropriate as constraints of the form of a grammar for a natural language. "Mere lists" must be finite; the set of lexical and grammatical constructions must be finite. A lexical construction which generates vocabulary from an initial set must either operate on a finite initial set, or, at the least, there must be an effective procedure for determining membership in the initial set. None of these restraints, of course, require that the output of a lexical construction be finite.

13 An extreme course here would be to resist the temptation to put numerals in the same grammatical category with other terms. One might try complicating grammatical constructions: The sort of complication needed would be that which, for example, turns a grammatical construction which operates on the Cartesian product of the set of terms with the set of sentences into a construction with domain the product the union of the set of terms and the set of numerals with the set of sentences. An artful version of such a grammar would never generate the likes of 'x09'. Two objections: This is ad hoc, while the solution given below is a natural one; this violates the natural constraint that an identity is well-formed only if the expressions flanking the identity sign are of the same grammatical category.

14 It might be objected that we have failed to account for the intuition that numerals are
like descriptions in the sense that someone who understands the numerals understands a rule which determines, on the basis of the structure of the expression, and the interpretations of its constituents, what is the interpretation of the whole.

Perhaps we should say that, in order to be a competent speaker of a language which contains arabic numerals, one must know a rule of the above sort which supplies one with a description which fixes a numeral's reference. It does not follow from this that numerals are descriptions. Here, we might say, we have an "institutionalized" case of a description fixing the reference (in Kripke's sense) of a name. To be a competent speaker, one must know, with respect to the numerals, that their reference is fixed by this system of descriptions (this is what makes the case an institutionalized one); but it is not the case that the terms whose reference is fixed are thereby descriptions (thus, it is a case of fixing the reference). (This last suggestion surfaced in discussion with Scott Soames.)

15 It is clear that Tarski himself had such considerations in mind when he made his proposal concerning quotation. (See [CTFL 160–62].)
16 As noted above, the more general notion is of interest, if there are constructions for which term substitution preserves extensional values, but for which other substitutions do not.
17 See the above note.
18 Because of morphophonetic niceties, this characterization of "doing duty for a semantic value" will not really do. This doesn't effect the point under discussion.
19 The attentive reader will have noticed my silence, as to whether occurrence of expressions within the scope of propositional attitude verbs is lexical or grammatical. I am uncertain as to what to say here. I am persuaded that no substitutions within such contexts will generally preserve extensional, or any other, semantic values; this is a reason for treating such occurrences as lexical. But we certainly seem to be able to quantify into such contexts, which suggests that such occurrences be taken as grammatical. I hope to discuss this matter elsewhere.
20 I am indebted to David Auerbach, Douglas Cannon, Dan Dennett, George Smith, and Scott Soames for comments and discussion. Portions of this paper were read at the San Francisco APA meetings, 1985, under the title 'The Proper Name Theory of Quotation'; Sarah Stebbins, the commentator, made a number of very helpful comments on various drafts of this paper, for which I thank her.

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