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Pure Quotation in Linguistic Context

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Abstract
A common framing has it that any adequate treatment of quotation has to abandon one of the following three principles: (i) The quoted expression is a syntactic constituent of the quote phrase; (ii) If two expressions are derived by applying the same syntactic rule to a sequence of synonymous expressions, then they are synonymous; (iii) The language contains synonymous but distinct expressions. In the following, a formal syntax and semantics will be provided for a quotational language which adheres to all three principles. The point here is not merely to provide a "possibility proof", but to reveal the hard constraints on the theory of quotation, and to highlight certain assumptions at the syntax/semantics/post-semantics interfaces.

Keywords Quotation · Compositionality · Semantics · Syntax · Context

Around the year 389, Augustine cautioned, "Discussing words with words is as entangled as interlocking one's fingers and rubbing them together, where hardly anyone but the person doing it can distinguish the fingers that itch from the fingers scratching the itch" (*De Magistro*, 5.14).[1] To discuss language with language we use *quotation*. Yet, although the function of quotation seems straightforward, when theorizing about the syntax and semantics of quotation the tangles of representation this

[1]Translation from King ([14]: 112). As an example of the confusion that discussing words with words can give rise to Augustine has the following dialogue with his son Adeodatus. He asks Adeodatus "Is man a noun?", and Adeodatus responds "Yes". Then Augustine asks "Are you a noun?". Adeodatus responds "No". And then Augustine quips "Shall I point out what follows from your reply?". Adeodatus pleads: "Please don't. I see for myself that I must not be a man." Take pity on Adeodatus.

Thanks to both Nathan Klinedinst and Bryan Pickel, who in separate conversations each alluded to views that were somewhat along the lines of the view developed here—these conversations motivated me to think through the consequences and work out the details. For comments on earlier versions of the paper thanks also to Alexandru Radulescu, Mahrad Almotahari, Matt Moss, Manuel García-Carpintero, and the audience at the 2022 Pacific APA in Vancouver.

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induces can become disorienting. Without getting ourselves too entangled in these labyrinths of language we will focus on a core initial puzzle – namely, the way in which even the most basic cases of quotation resist standard semantic analysis.[2]

The target constructions, which we'd like our theory to cover, are cases of *pure* quotation such as in the following:

(1) 'Cicero spoke' is a grammatical sentence.
(2) 'Cicero' contains six letters.
(3) 'Spoke' is a simple past tense verb.

Compositionality is a principle relating the semantic value of an expression to the semantic values of the simpler expressions from which it is syntactically derived. It requires that if two expressions are derived by applying the same syntactic rule to synonymous expressions, then the derived expressions themselves are synonymous. The threat to compositionality from quotation is immediate: Take any distinct but synonymous expressions α and β, and let Q be the syntactic rule for pure quotation. The expressions α and β have the same semantic value, but since, by assumption they are distinct expressions, their quotations, $Q(\alpha)$ and $Q(\beta)$, must not co-refer. Yet this conflicts with compositionality: $Q(\alpha)$ and $Q(\beta)$ differ only by the substitution of synonyms, so they must be synonymous.

Thus, it would seem that if quotation is a syntactic operation, whereby the quoted expression is a constituent of the quoting phrase, and there are distinct but synonymous expressions in the language, then quotation violates the compositionality principle. This seemingly insurmountable impasse is commonly used in the quotation literature to frame the discussion and to weigh the costs and benefits of competing approaches (cf. [21] and [18]).

Any adequate account of quotation must at least vindicate the following principle:

> DIFFERENCE: Quotations of distinct expressions do not co-refer—as such they make different contributions to the truth-conditions of sentences in which they occur.

The common framing, then, has it that any adequate treatment of quotation has to abandon one of the following three principles:

> CONSTITUENCY: A quoted expression is a constituent of the quote phrase, e.g. the quote phrase is the result of applying a syntactic rule to the quoted expression (and perhaps the quotes themselves).[3]

[2]Conventions on notation and use/mention are as follows: We use the standard denotation brackets, $[\![.]\!]$, to map an expression to its semantic value (cf. [10, 37]; and [30]). On this convention, $[\![\phi]\!](i)$ is value of ϕ at parameter i, and we will sometimes abbreviate this as $[\![\phi]\!]^i$. In prose we will use single quotes '.' to mention an expression, but within denotation brackets we will instead use boldface to mention. So for example, instead of $[\![$'Cicero'$]\!]$ we will often write $[\![$**Cicero**$]\!]$. After providing an explicit syntax it will often be clear that the input to the denotation brackets is a syntax tree and so we will just write, e.g., $[\![[_{NP}[_{Q}\ \text{QUOTE}][_{N}\ \text{Cicero}]]]\!]$, although even here we may resort to the visually more appealing $[\![$**QUOTE Cicero**$]\!]$.

[3]This principle captures the platitude that a quote expression contains a quoted expression. Cappelen and Lepore ([1]: 124) likewise put forward a platitude called "containment": For any quotable item α if an expression α' quotes α, then α is *contained in* α'. By "contain" they mean contain as a constituent. Note that on some views the quote expression is syntactically identical to the quoted expression, e.g., the standard interpretation of Frege [5]. I'll assume that these views trivially uphold CONSTITUENCY.

COMPOSITIONALITY: If two expressions are derived by applying the same syntactic rule to a sequence of synonymous expressions, then they are synonymous.[4]

SYNONYMY: The language contains synonymous but distinct expressions.

One might think that it is simply *impossible* to provide a theory which retains all the principles.[5] While it is true that all standard accounts abandon at least one of these principles, there is an overlooked position which vindicates them all. We will call this the *endophoric theory*, for reasons that will become clear. The point of providing a formal syntax and semantics which vindicates all these principles is not merely to provide a "possibility proof", but to reveal the hard constraints on the theory of quotation, and to highlight certain assumptions at the syntax/semantics/post-semantics interfaces. Once the positive theory is provided we uncover a questionable implicit assumption behind the common framing. The aims, then, are both theoretical and metatheoretical: an under-explored theory of quotation will be introduced, and this will illuminate certain methodological issues in the philosophy of language and formal semantics.

1 The Standard Accounts

Before developing the proposal which vindicates all the principles, let's first briefly recall the standard accounts and what principles they give up.[6] The positive theory will borrow features from these standard accounts.

The *name theory*, which is associated with Tarski [39] and Quine [29] explicitly gives up CONSTITUENCY. Here is a representative expression of the idea:

> From the standpoint of logical analysis each whole quotation must be regarded as a single word or sign, whose parts count for no more than serifs or syllables. ([29]: 26)

On this view quote phrases don't have any syntactic structure—they are atomic terms of the language. So for every expression of the language α it is stipulated that there is also a simple name α^*, which refers to α, e.g. in addition to 'Cicero' the language

[4]That is, where R is a syntactic rule for deriving a complex expression from more basic expressions: if $\phi = R(\alpha_1,\ldots,\alpha_n)$ and $\psi = R(\beta_1,\ldots,\beta_n)$ and $[\![\alpha_i]\!] = [\![\beta_i]\!]$, for all i, then $[\![\phi]\!] = [\![\psi]\!]$. See [21] for variations and more complete definitions.

[5]For example, Pagin and Westerståhl [22] say "A straightforward account of (the use of quote marks in) pure quotation is one which (a) takes the quoted phrase to be a syntactic constituent of the quoting phrase (the quoted phrase surrounded by quote marks), and (b) allows at least one case of two syntactically distinct and quotable expressions having the same semantic interpretation (meaning). Then it should be uncontroversial that no such account can be compositional: By (a), application of quote marks is a syntactic rule, on a par with other syntactic rules used for building or analyzing sentences, so compositionality requires that there be a corresponding semantic operation yielding the meaning of the quoting expression from the meaning of the quoted expression and the quote marks rule, but (b) provides a counter-example." (382).

[6]More detailed surveys of the various positions can be found in Cappelen et al. [2] and Maier [18]. See also Saka [36], Cappelen and Lepore [1], and the classic discussion in Davidson [4].

has the name 'Cicero*', which refers to 'Cicero'—but importantly, it is not syntactically derived from 'Cicero'. This view, then, can clearly retain COMPOSITIONALITY and SYNONYMY, but does so at the cost of inflating the stock of basic expressions and without an explanation of the productivity of quotation. The common complaint against this view, then, is that "there is no relation, beyond an accident of spelling, between an expression and the quotation mark name of that expression" ([4]: 30).[7]

The *disquotational theory* instead accepts CONSTITUENCY, so that a quote phrase is syntactically derived. There is a syntactic rule Q, which when applied to an expression α produces the quote phrase $Q(\alpha)$. And there is one simple semantic axiom governing quotation (cf. [34]):

Disquotation Rule: For any expression α, $[\![Q(\alpha)]\!] = \alpha$

This view is simple and intuitive, but assuming SYNONYMY, so that, for example, the distinct expressions 'eggplant' and 'aubergine' are synonymous, it clearly violates COMPOSITIONALITY. The quote phrases Q('eggplant') and Q('aubergine') are derived by applying the syntactic rule Q to the synonymous expressions 'eggplant' and 'aubergine', respectively. But by the semantic axiom the quote phrases have different values: $[\![Q(\text{'eggplant'})]\!] \neq [\![Q(\text{'aubergine'})]\!]$. Thus, the disquotational theory saves CONSTITUENCY but only at the cost of abandoning COMPOSITIONALITY.[8] That is, the Disquotation Rule is non-compositional.[9]

Differing from these two views is the sort of approach that is associated with Frege's remark that

> ...a word standing between quotation marks must not be taken as having its ordinary reference. ([5]: 58–59)

According to this approach, an expression has meaning through its *occurrences*, and different occurrences of the same expression type may differ in meaning. In particular, an expression occurring in quote marks doesn't have its standard referent, but instead refers to itself. Call this an *occurrence-based theory*. This approach promises to vindicate COMPOSITIONALITY without ad hoc assumptions about syntax—in particular without needing to abandon CONSTITUENCY.

Consider an example:

[7]But see Gómez-Torrente [7] for a defense of this view. There is also a nearby view known as *the description theory*. Although it claims certain advantages in terms of productivity, for our purposes it can be understood as a variant of the name theory. See Davidson [4], Cappelen and Lepore [1], and Maier [18] for discussion.

[8]The view in Potts [26], at its heart, is a disquotational theory, and violates COMPOSITIONALITY for the same reason. The official account is much more complicated (to handle things such as mixed quotation) but for pure quotation all the extra complexity doesn't actually play a role.

[9]One might view the non-compositional Disquotation Rule as having a status analogous to a non-compositional rule such as the *Predicate Abstraction Rule* in Heim and Kratzer [10]. An advocate of the disquotational view will, of course, insist that abandoning COMPOSITIONALITY is not a significant cost in this isolated case. A common strategy here is to assimilate quotation to other (alleged) cases where the content of a representational device is not compositionally determined yet nevertheless systematic and productive; for example, consider the Arabic numerals or algebraic chess notation. See Szabó [38] and Pickel and Rabern [25] for discussion.

(4) 'Boston' refers to Boston.

On this view, the expression 'Boston' occurs twice in sentence (4)—first in a quotational context and second in a normal context. According to this treatment the first occurrence refers to 'Boston' and the second occurrence refers to Boston. One way of taking this would be an analysis in terms of lexical ambiguity where one might introduce distinct symbols 'Boston$_1$' and 'Boston$_2$' with different meanings, just as we might differentiate the two uses of 'bank' by writing a subscript. But that would essentially be a version of the name theory. Instead of analyzing the different contributions of 'Boston' in its different occurrences by introducing two expressions, the occurrence-based view complicates the semantics for the single expression 'Boston' (see [22]).

The idea is that 'Boston' is governed by a *single* semantical rule that allows it to make different truth-conditional contributions in different linguistic contexts. For example, the expression 'Boston' is governed by a rule determining that it refers to the city Boston while unembedded and to the expression 'Boston' itself when embedded in quotation marks. On this view, then, the meaning of 'Boston' is given by a function from linguistic contexts to its values in these contexts. In a normal linguistic context c, $[\![\textbf{Boston}]\!](c)$ = Boston, but in a quotational context c^*, $[\![\textbf{Boston}]\!](c^*)$ = 'Boston'.

By making the semantic values of expressions sensitive to linguistic context, this approach can indeed retain COMPOSITIONALITY and CONSTITUENCY. But this also makes the semantic values of expressions very fine-grained. So fine-grained, in fact, that there aren't any synonymous but distinct expressions which can be quoted.

Consider, for example, 'eggplant' and 'aubergine'. We can assume that these expressions make the same contribution to truth conditions when they occur outside of quotes, so that, where c is such a linguistic context: $[\![\textbf{eggplant}]\!](c) = [\![\textbf{aubergine}]\!](c)$. But when they occur in c^*, the context of a quote phrase, 'eggplant' and 'aubergine' contribute themselves. So $[\![\textbf{eggplant}]\!](c^*) \neq [\![\textbf{aubergine}]\!](c^*)$. But this entails that 'eggplant' and 'aubergine' are not synonymous. They do have the same occurrence meaning at one linguistic context, but different occurrence meanings at another linguistic context. So the expressions have semantic values, respectively $[\![\textbf{eggplant}]\!]$ and $[\![\textbf{aubergine}]\!]$, that differ *tout court*. This reasoning generalizes to any pair of purported synonyms. Thus, the *occurrence-based theory* gives up SYNONYMY.[10]

Finally, in our quick survey of standard accounts, there is the view put forward by Davidson called the *paratactic theory* [4].[11] The view is summed up by Davidson as follows:

[10] Pagin and Westerståhl [22] insist that even though their occurrence-based theory of quotation gives up SYNONYMY there is nevertheless interest in the concept of synonymy *except for quotation*. They call this "use synonymy": two expressions are *use synonymous* just in case they mean the same in any non-quotational context (*ibid.*: 400). In this way they might insist that they vindicate all the principles as long as SYNONYMY is replaced with the relevant "use synonymy" counterpart. See Pickel and Rabern [24] for more discussion and criticism of this *occurrence-based theory* of quotation, and its specific commitments on compositionality and synonymy.

[11] This view is also called the demonstrative theory. See García-Carpintero [6] for recent development and defense of it.

> The singular term is the quotation marks, which may be read as 'the expression a token of which is here' [...] the inscription inside does not refer to anything at all, nor is it part of any expression that does. Rather it is the quotation marks that do all the referring, and they help to refer to a shape by pointing out something that has it. ([4]: 90)

We can isolate two main components of the view, the first syntactic, and the second semantic:

i. The expression that orthographically occurs between the quotation marks does not enter into the syntactic derivation of the quote phrase.
ii. Semantically, quote phrases are treated as a certain kind of demonstrative equivalent to *the expression of which that is a token*.

We know how to provide a compositional semantics for languages involving demonstratives (see [20] and [12]), so the *paratactic theory* should have no problem, in principle, with COMPOSITIONALITY—although the details need to be fleshed out (see [28] and [18] for some details). But the syntactic part of the view is clearly abandoning CONSTITUENCY. Davidson emphasizes that, on his view, the quoted material is *not* a syntactic constituent of the relevant expression. He suggests that a sentence such as the following:

(5) 'Alice' contains five letters.

should really be understood as

(6) The expression of which *that* is a token contains five letters.

Importantly neither the expression 'Alice' nor the pointing arrow enter into the syntactic derivation of (6). Instead they are completely auxiliary to the sentence—'Alice' occurs "beside" the sentence—and can be demonstrated in the context of utterance. The quotes, then, are indexical or exophoric expressions, in that they refer to something in the context of utterance. In this way the role that the expression 'Alice' plays in the syntax and semantics of (6) is really no different than, say, the role a salient tree plays when someone points at a tree and says 'That tree is dying'.

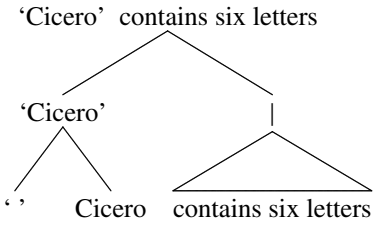
That covers, in very broad strokes, four standard accounts of quotation. We've seen that each one abandons at least one of the three principles. The name theory and the paratactic theory both give up CONSTITUENCY. The disquotational theory gives up COMPOSITIONALITY, and the occurrence-based view gives up SYNONYMY.

2 An Alternative: the Endophoric Approach

Our positive theory, the *endophoric* theory, will borrow key elements from both the paratactic and occurrence-based views. But the novel syntax and semantics that results will be shown to vindicate all the principles.

2.1 Syntactic Structure

The starting assumption is to uphold CONSTITUENCY. So, for example, the syntactic structure for (2) must be along the following lines:



Importantly, the expression ‘Cicero’ will enter into the derivation of the quote phrase. The challenge then is to provide an adequate account that retains both COMPOSITIONALITY and SYNONYMY given this syntactic assumption. In order to carry this out free from certain distractions of natural language we will first provide a simplified fragment of natural language to model these cases of pure quotation. After seeing the basic architecture, generalizing to a more realistic syntax should be fairly straightforward.

To simplify the orthography, we will use QUOTE as our proxy for quotes.[12] In addition to QUOTE, the basic nouns (‘Cicero’, ‘Tully’, ‘Chomsky’) and verbs (‘inanimate’, ‘six-lettered’, ‘human’), all the other expressions of our toy language are syntactically derived according to the following phrase structure rules:

$$\mathrm{S} \rightarrow \mathrm{NP} + \mathrm{VP}$$

$$\mathrm{VP} \rightarrow \mathrm{is} + \mathrm{V}$$

$$\mathrm{NP} \rightarrow \begin{cases} \mathrm{N} \\ \mathrm{Q} + \mathrm{S} \\ \mathrm{Q} + \mathrm{V} \\ \mathrm{Q} + \mathrm{NP} \end{cases}$$

$$\mathrm{N} \rightarrow \begin{cases} \text{Cicero} \\ \text{Tully} \\ \text{Chomsky} \end{cases}$$

$$\mathrm{V} \rightarrow \begin{cases} \text{inanimate} \\ \text{six-lettered} \\ \text{human} \end{cases}$$

$$\mathrm{Q} \rightarrow \text{QUOTE}$$

This syntax will generate simple sentences such as the following:[13]

[12] The role of QUOTE in the syntax is essentially what [23] calls the “quotation morpheme”.

[13] The structures can get very complex with multiply iterated quotations just as in English. For example, the syntax will generate the following:

$[_S[_{NP}[_Q$ QUOTE$][_S[_{NP}[_Q$ QUOTE$][_N$ Cicero$]]][_{VP}$ is six-lettered$]]][_{VP}$ is inanimate$]]$

This is a way of saying that sentence (8) is inanimate. i.e. “ ‘Cicero’ is six-lettered” is inanimate.

(7) $[_S[_{NP}$ Cicero $][_{VP}$ is human]]

(8) $[_S[_{NP}[_Q$ QUOTE$][_N$ Cicero]]$[_{VP}$ is six-lettered]]

(9) $[_S[_{NP}[_Q$ QUOTE$][_N$ Tully]]$[_{VP}$ is six-lettered]]

Structure (7) is analogous to the simple natural language predication 'Cicero is human', while (8) and (9) are analogues of cases involving pure quotation, which we'd render as:

- 'Cicero' is six-lettered.
- 'Tully' is six-lettered.

Clearly, 'Cicero' occurs as a constituent of (8), so, as promised, our syntax upholds CONSTITUENCY.

2.2 Linguistic Context

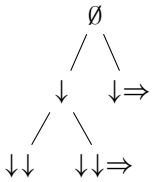
We will take certain features from both the paratactic and the occurrence-based views, but, of course, we can't accept the part of the paratactic view whereby the quoted expression is absent from the syntactic derivation. Instead we take the idea that the quotes pick out different expressions in different "contexts". Importantly, however, we won't think of the contexts as *extra*-linguistic, instead we adopt the relativity to *linguistic* context that is central to the occurrence-based views. Let's flesh out each, in turn, before proceeding to the official semantics.

First, linguistic context. The characteristic feature of an occurrence-based semantics is that the meaning of an expression is sensitive to a *linguistic context*—where a "linguistic context" is essentially a particular position in a syntactic structure. Pagin and Westerståhl gloss the basic idea as follows:

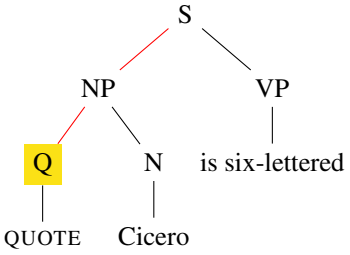
> ... take a well-formed complex term $s[u]$ and knock out the constituent u. What remains, $s[\ldots]$ is the linguistic context of that occurrence of u in $s[u]$, the environment of the argument place ([22]: 394).

They formally model this in terms of the path in the derivation tree from the root to the relevant node ([22], §4.2), and we will do something similar.

To keep things simple we will follow convention by assuming that every syntactic derivation corresponds to an ordered (rooted, binary) tree, with the root at the top, and the child vertices drawn left-to-right. To specify a node in a tree we can just provide a list of instructions for traversing from the root to a node. Directions for every possible move in a tree such as "down-left", "down-right", "over-left", "over-right", and so on, would be natural. We, in fact, will only need "down-left" ($\downarrow$), which moves from a node to its left child, and "over-right" ($\Rightarrow$), which moves form a node to the closest node to its right (at the same level). For example, we can specify every node in the following tree as the sequence of moves from the root to the node:



A linguistic context can then be modeled as a syntax tree Γ plus a sequence of moves σ, $\langle \Gamma, \sigma \rangle$. For example, consider the derivation of sentence (8) of our toy language, and focus on the path from the root to the position of the quote morpheme in the tree:



The linguistic context of the quotes in (8) will be encoded as the pair consisting of structure (8) along with the list of moves from the root to the quotes:

$$\langle [_S [_{NP} [_Q \text{ QUOTE}][_N \text{ Cicero}]][_{VP} \text{ is six lettered}]], \downarrow\downarrow \rangle$$

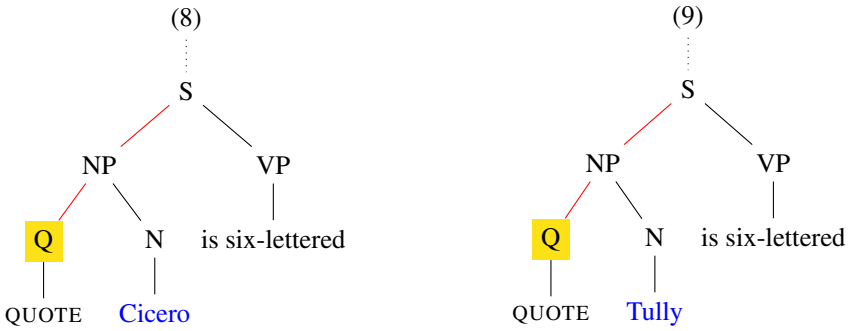
The key idea of occurrence-based approaches is that expressions are semantically sensitive to their linguistic context. According to the view, which takes inspiration from Frege [5], 'Cicero' is sensitive to its linguistic context—it refers to a man outside of quotes but refers to a name when embedded under quotes. Same goes for 'Tully'—in fact every expression is sensitive to its linguistic context.

Our positive view will also adopt the idea of sensitivity to linguistic context, but it will only be in a very limited form. The sensitivity will be located in quotation itself rather than in the quoted expressions. In fact, the only expressions that will display sensitivity to linguistic context are quotes themselves. Here is where we take some inspiration from Davidson's view. The idea is that QUOTE is sensitive to its context—in some contexts it picks out 'Cicero' in others it picks out 'Tully' or 'Chomsky' or 'human', etc. What QUOTE picks out depends on what it is "next to" in the syntax tree. Caution: While the analogy with Davidson's view may be useful in conveying the basic shape of the view, it might also be misleading. It is important to emphasize that quotes should not be understood as *demonstratives*. Instead the sensitivity to context is *linguistic* in nature.[14] To borrow some terminology, the view is that quotes are *endo*phors, in the sense that their reference is sensitive to the surrounding

[14]That is, the quote morpheme is not *demonstrative* in the sense of Kaplan [12]—instead it'd be better to say it is *reflexive* in the sense of Reichenbach [33]. Given this connection, one might construe the positive picture in terms of token-reflexives: Each token of QUOTE refers to the syntactic sister of that token. While the token-reflexive approach to semantics is interesting and worth considering, I won't develop the positive picture in those terms. See Kaplan [13] and Predelli [27] for discussion of the token-reflexive approach.

syntax, whereas Davidson's view construes quotes as *exo*phors, whose reference is determined by the extra-syntactic situation of utterance.[15]

Consider again (8). We noted that QUOTE is in a certain linguistic context, namely $c = \langle [_S [_{NP} [_Q \text{ QUOTE}][_N \text{ Cicero}]][_{VP} \text{ is six lettered}]], \downarrow\downarrow\rangle$. Relative to that linguistic context, where its sibling is 'Cicero', QUOTE picks out 'Cicero'. But in (9), QUOTE occurs in a different linguistic context, namely $c' = \langle [_S [_{NP} [_Q \text{ QUOTE}][_N \text{ Tully}]][_{VP} \text{ is six lettered}]], \downarrow\downarrow\rangle$. And here its syntactic sibling is 'Tully'.



If QUOTE has different values relative to c and c', then the noun phrases $[_{NP}[_Q \text{ QUOTE}][_N \text{ Cicero}]]$ and $[_{NP}[_Q \text{ QUOTE}][_N \text{ Tully}]]$ can have different values (relative to their contexts), even on the assumption that 'Cicero' and 'Tully' are completely synonymous. So although the view employs sensitivity to linguistic context, the sensitivity is highly constrained, and thus, as will be spelled out below, there is no threat to SYNONYMY.

2.3 Compositional Semantics

We will now provide the formal semantics showing that the view also obeys COMPOSITIONALITY. And so it will be shown to uphold the three principles.

Let a model for our language be a tuple $\mathfrak{A} = \langle D, V, C\rangle$, where D is a domain of objects, V is an interpretation, and C is a set of contexts. Furthermore, since we want to interpret this language as a quotational language we will stipulate that the set of the expressions of the language (i.e. all sentences, noun phrases, and verbs) are a subset of D. The interpretation V assigns the simple nouns an entity from D and assigns the verbs subsets of D. Each $c \in C$ is a linguistic context as defined above, namely a syntax tree paired with a node in the tree. We assume a range of semantic types based on our models. We let e and t be types, and for any types i and j, $\langle i, j\rangle$ and $\langle s, i\rangle$ are also types. The semantic domain for each type is as follows:

$$D_e = D,$$
$$D_t = \{0, 1\},$$

[15] The terminology (without the attached theory) of "endophor" versus "exophor" is adapted from Halliday and Hasan [8], where they use these to mean roughly reference within versus reference outwith the text.

$D_{\langle i,j\rangle}$ = the set of all functions from D_i to D_j, for any types i and j,
$D_{\langle s,i\rangle}$ = the set of all functions from C to D_i, for any type i.

We can then assign each expression a semantic value, which will be a function from linguistic contexts to an appropriate type, e.g.,—for sentences we will define a function from linguistic contexts to D_t.

Importantly, we must do this in a compositional manner, and in order to do so we must track how the linguistic context of a complex expression relates to the linguistic contexts of its constituents. The linguistic context of each constituent is systematically determined by the syntactic rules and the linguistic context of the complex expression. To specify these relations it is useful to define some operations on linguistic contexts. These operations will map a tree with a highlighted node to the same tree with a different highlighted node. We can define the required transitions in terms of our traversing operations, down ($\downarrow$) and over ($\Rightarrow$). In fact, to keep the notation simple let the symbols $\downarrow$ and $\Rightarrow$ do double duty—they represent transitions from nodes to nodes, and they represent the corresponding updates on contexts. For a linguistic context $c = \langle \Gamma, \sigma \rangle$, using postfix notation with the arguments to the left, let $c\downarrow = \langle \Gamma, \sigma\downarrow \rangle$, and let $c\Rightarrow = \langle \Gamma, \sigma\Rightarrow \rangle$. So, for example, $\langle \Gamma, \downarrow\downarrow\rangle\downarrow = \langle \Gamma, \downarrow\downarrow\downarrow\rangle$.

With this in place we can then provide the semantics (relative to a model $\mathfrak{A}$, suppressed). We have the following base clauses for nouns, verbs, and quotes:[16]

- $[\![[_N\ \beta]]\!] = \lambda c_s.V(\beta)$
- $[\![[_{VP}\ \text{is}\ \pi]]\!] = \lambda c_s.\lambda x_e.\begin{cases} 1, \text{ if } x \in V(\pi) \\ 0, \textit{ otherwise.} \end{cases}$
- $[\![[_Q\ \text{QUOTE}]]\!] = \lambda c_s.\lambda m_i.$ the expression at $c\Rightarrow$ (for any type i)

For complex expressions we also have the following clauses concerning semantic composition via functional application:

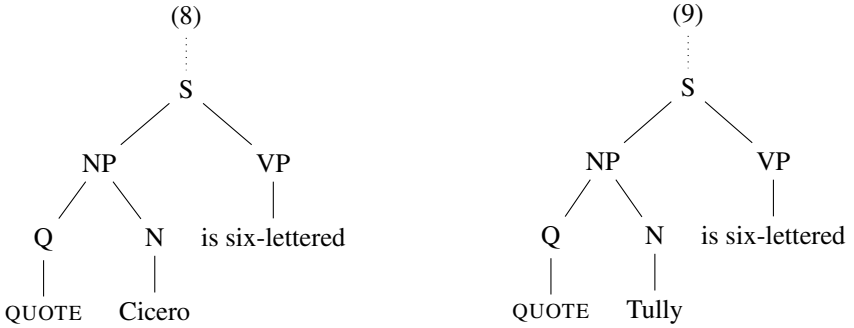
- If χ is a complex noun phrase $[_{NP}[_Q\ \text{QUOTE}][_N\ \beta]]$, then $[\![\chi]\!] = \lambda c_s.[\![[_Q\ \text{QUOTE}]]\!]^{c\downarrow}\left([\![[_N\ \beta]]\!]^{c\downarrow\Rightarrow}\right)$.
- If χ is a sentence $[_S[_{NP}\ \beta][_{VP}\ \gamma]]$, then $[\![\chi]\!] = \lambda c_s.[\![[_{VP}\ \gamma]]\!]^{c\downarrow\Rightarrow}\left([\![[_{NP}\ \beta]]\!]^{c\downarrow}\right)$

In this way we compositionally derive a function from linguistic contexts to 1 or 0 for every sentence of the language relative to a model $\mathfrak{A}$. The *truth* of a sentence in a model can then be defined in terms of that function outputting 1 relative to the sentence's own context (i.e. the root $\emptyset$ of its syntax tree): A sentence χ is true in a model $\mathfrak{A}$ iff $[\![\chi]\!]^{\langle \chi,\emptyset\rangle} = 1$. The *reference* of a noun phrase in a model can likewise be defined in terms of its semantic value relative to its own context: The referent of a noun phrase η in a model $\mathfrak{A}$ is $[\![\eta]\!]^{\langle \eta,\emptyset\rangle}$.

[16]Note that QUOTE is flexibly typed. It can take arguments of type e, or t, or $\langle e,t\rangle$. One could instead appeal to type shifting, or type ambiguity, or simply provide three different kinds of quotation, i.e. one for quoting nouns, one for quoting verbs, and one for quoting sentences. Also notice another simplification in that we are ignoring the fact that VPs are derived from Vs. This is harmless—it'd be trivial but only a distraction from our main issue to provide the internal semantics of VPs.

3 Synonymy, Co-reference, and Metatheory

With the semantics on the table its explicit that we can retain SYNONYMY—just assume that $[\![\textbf{Cicero}]\!] = [\![\textbf{Tully}]\!]$. But does the semantics abide by COMPOSITIONALITY? One might worry that it doesn't as follows. If our theory is compositional, then expressions that are derived from synonymous expressions by the same syntactic rules are themselves synonymous. But consider, again, (8) and (9):



These sentences are syntactically derived according to the same rules and on the assumption that $[\![\textbf{Cicero}]\!] = [\![\textbf{Tully}]\!]$, their corresponding constituents are synonymous. Thus, by compositionality it should follow that (8) and (9) are synonymous. But, of course, (8) should be true, while (9) should be false, since the quotation of 'Cicero' and the quotation of 'Tully' should have different referents. In other words, haven't we ended up saving the three principles but only at the cost of adequacy (i.e. haven't we violated the DIFFERENCE principle)? Haven't we just circled back to the problems we started with?

No, we haven't. We need to pay careful attention to the role that linguistic context is playing in the story. It's true that our semantics yields that $[\![\textbf{QUOTE Cicero}]\!] = [\![\textbf{QUOTE Tully}]\!]$. They both denote the function from a linguistic context c to the expression at $c{\downarrow}{\Rightarrow}$. So if the first outputs 'Cicero', at a given context, the "other" does too. But this doesn't entail that the quote phrases *co-refer*. In fact, the definition of reference given above entails that they don't, since $[\![\textbf{QUOTE Cicero}]\!]^{\langle \textbf{QUOTE Cicero}, \emptyset \rangle} \neq [\![\textbf{QUOTE Tully}]\!]^{\langle \textbf{QUOTE Tully}, \emptyset \rangle}$.

The common framing whereby any theory which vindicates DIFFERENCE must thereby abandon one of CONSTITUENCY, COMPOSITIONALITY, or SYNONYMY is built upon an implicit assumption. The assumption is that sameness of meaning entails sameness of referent (and/or truth-value). Thus, if by DIFFERENCE, quote phrases derived from distinct expressions do not co-refer, then given this assumption it'd follow that they must have different semantic values. But given CONSTITUENCY and SYNONYMY, it'd follow that there are quote phrases derived from synonymous distinct expressions that do not co-refer, and so are not synonymous. And this would violate COMPOSITIONALITY. So something has to go.

The picture sketched here gives up the implicit assumption. But, one might worry, how can it be that two sentences have different truth-values but nevertheless the same

meanings? Or that two expressions have different referents but the same meanings?[17] After all, doesn't meaning determine reference (and truth-value)?[18]

To address the worry we must first point out the following: The connection between meaning on the one hand and truth and reference on the other is not straightforward when sensitivity to a parameter is involved, e.g., sensitivity to a world, or a time, or a context, or an assignment function, or a precisification, etc. (cf. [40]). Meaning does not determine reference (and truth-value) on its own—instead these are determined *relative* to some parameter. So there is optionality in the definition of truth and reference in terms of the parameter-sensitive semantic value. For example, is a sentence true just in case it is satisfied by all the relevant parameters, or some of them, or a privileged one? We are familiar with supervaluating, or subvaluating over various parameters. Or with privileging a certain parameter, e.g. the actual world, the time of the context, etc. And, of course, it is uncontroversial that a sentence can have different truth-values in different contexts, or that expressions can have different referents in different contexts. Our picture has only added to this the idea that reference and truth are tied to certain privileged contexts. This is well-motivated given the nature of quotation, and thus so is our abandonment of the implicit assumption.

In general, we must not conflate semantic value with notions such as truth-conditional content or reference. Semantic value is a notion internal to the compositional theory with two core theoretical roles to play.[19] First, the semantic value of a derived expression must be a function of the semantic values of the expression from which it derives, and, second, the truth-conditions of a sentence (and other "post-semantic" notions such as the referent of a noun phrase) must be systematically related to their semantic values. When it comes to assertion or the post-semantic definitions of truth and reference (and content) we must go beyond the pure compositional definitions.[20]

In the case under discussion, given the inherent relativity to linguistic context, truth and reference must be defined *relative* to a linguistic context. Moreover, we want to evaluate expressions relative to certain *privileged* linguistic contexts, i.e., an expression should be relativized to its *own* linguistic context. Contexts where an

[17] This assumption has been questioned in connection with token-reflexive expressions. See the discussion in Radulescu [32]. The notion of synonymy developed in Radulescu [32] (in terms of meaning-form) is consonant with the sense in which the quote phrase that refers to 'Tully' and the quote phrase that refers to 'Cicero' are synonymous. But I won't develop this connections here.

[18] Frege says: "The regular connexion between a sign, its sense, and its reference is of such a kind that to the sign there corresponds a definite sense and to that in turn a definite reference, while to a given reference (an object) there does not belong only a single sign" ([5]: 58).

[19] Here we echo Lewis: "To go beyond syntax, a compositional grammar must associate with each expression an entity that I shall call its semantic value. . . . These play a twofold role. First, the semantic values of some expressions, the sentences, must enter somehow into determining whether truth-in-English would be achieved if the expression were uttered in a given context. Second, the semantic value of any expression is to be determined by the semantic values of the (immediate) constituents from which it is built, together with the way it is built from them." ([15]: 83)

[20] The terminology of "post-semantics" is due to MacFarlane [16]. See Rabern [31] and Yalcin [40] for discussion.

expression is not even found, while formally defined by our semantic theory, are irrelevant for evaluating truth and reference—not to mention propositional content.[21]

Consider an analogy. The following sentences—the first in English and the second its translation into Spanish—are synonymous:[22]

(10) These words are English.
(11) Estas palabras son inglesas.

The sentences, of course, are context-sensitive given that they include the complex demonstratives, "these words" and "estas palabras", respectively. The complex demonstratives, being strict translations of each other, are synonymous—they have the same *character* in the sense of Kaplan [12]. But we'd normally say that (10) is true while (11) is false. In doing so we'd be tacitly assuming that the contexts relevant for the truth of (10) and (11) are different. The contextually relevant words for (10) are the words of sentence (10) while the contextually relevant words for (11) are the words of sentence (11). In this way, (10) is true (in its context), since the words in (10) are English, while (11) is false (in its context), since the words in (11) are not English—this is so, even though the sentences are strict translations of each other.

This is analogous to what is happening in the case of quotation with (8) and (9). Even though (8) is true, and sentence (9) only differs from (8) by the substitution of (the synonyms) 'Tully' for 'Cicero', it doesn't thereby follow that (9) is also *true*. Crucially, this is *not* a violation of compositionality—(8) and (9) do indeed have the same semantic value as compositionality requires, which we can confirm by calculating through the semantics (see Appendix A for details):

$$[\![(8)]\!] = \lambda c. \begin{cases} 1, \text{ if the expression at } c{\downarrow}{\downarrow}{\Rightarrow} \in V(\text{'six-lettered'}) \\ 0, \textit{otherwise.} \end{cases}$$

$$[\![(9)]\!] = \lambda c. \begin{cases} 1, \text{ if the expression at } c{\downarrow}{\downarrow}{\Rightarrow} \in V(\text{'six-lettered'}) \\ 0, \textit{otherwise.} \end{cases}$$

[21] We haven't said anything yet about about propositional content. The story has been simplified to only focus on truth and reference relative to a linguistic context parameter. But we could easily add a world parameter to the index, so that the content of a sentence is the set of worlds in which it is true. Utterances of (8) and (9) not only have different truth-values but also express different propositions. So they have the same semantic value but differ in their assertoric content. With worlds in the picture we'd give the post-semantic definitions of truth and content as follows (where $w_@$ is the actual world):

- Truth: A sentence χ is true in a model $\mathfrak{A}$ iff $[\![\chi]\!]^{\langle \chi, \emptyset \rangle, w_@} = 1$.
- Content: The content of a sentence χ in a model $\mathfrak{A} = \{w : [\![\chi]\!]^{\langle \chi, \emptyset \rangle, w} = 1\}$.

The reference of a noun phrase would get an analogous treatment (if such a definition were desired):

- Reference: The referent of a noun phrase η in a model $\mathfrak{A}$ is $[\![\eta]\!]^{\langle \eta, \emptyset \rangle, w_@}$.

There is no formal hurdle to developing the picture more by adding a Kaplanian context of utterance. But this does raise a philosophical question about the relationship between non-linguistic and linguistic contexts.

[22] This case is reminiscent of an example from Hofstadter's [11] *Metamagical Themas* (see p. 8ff.). Should the French translation of "It is difficult to translate this sentence into French" be (i) "Il est difficile de traduire cette phrase en français" or (ii) "Il est difficile de traduire cette phrase en anglais"? See also the earlier discussion in Hart [9].

But they nevertheless differ in truth status. This is because for each sentence χ there is a privileged context c_χ that matters for its truth status, and the contexts relevant for (8) and (9) differ.

- Sentence (8) is true iff $[\![(8)]\!](c_{(8)}) = 1$ iff the expression at $c_{(8)}\downarrow\downarrow\Rightarrow \in V$('six-lettered')
- Sentence (9) is true iff $[\![(9)]\!](c_{(9)}) = 1$ iff the expression at $c_{(9)}\downarrow\downarrow\Rightarrow \in V$('six-lettered')

Thus, (8) is true, iff 'Cicero' is in the extension of 'six-lettered', while (9) is true, iff 'Tully' is in the extension of 'six-lettered'. And so their truth values can differ, even though they have the same semantic value.

4 Further Data for a Theory of Quotation

The endophoric view has the apparent virtue of adhering to CONSTITUENCY, COMPOSITIONALITY, and SYNONYMY. This is not a virtue that extant theories of quotation can claim. But, of course, this apparent virtue might well be outweighed by further considerations. We ultimately need to look at how our view fares with respect to the broader set of data that theories of quotation must cover. A cost/benefit analysis is far beyond the scope of this paper, but we can quickly remark on how the endophoric view might capture—or be developed to capture—some of the other properties of quotation pointed out in the literature. Cappelen et al., [2] helpfully list six features that a theory of quotation must address:[23]

BQ1. In quotation you cannot substitute co-referential or synonymous terms *salva veritate*.
BQ2. It is not possible to quantify into quotation.
BQ3. Quotation can be used to introduce novel words, symbols and alphabets; it is not limited to the extant lexicon of any one language.
BQ4. There's a particularly close relationship between quotations and their semantic values.
BQ5. To understand quotation is to have an infinite capacity, a capacity to understand and generate a potential infinity of new quotations.
BQ6. Quoted words can be simultaneously used and mentioned.

It is clear that the endophoric view accounts for BQ1, BQ4, and BQ5, while BQ2, BQ3, and BQ6 require more discussion. Let's briefly address the easy cases (BQ1, BQ4, and BQ5) and then turn to the harder ones (BQ2, BQ3, and BQ6).

- For BQ1 simply consider our treatment of sentences (8) and (9). We assumed that 'Cicero' and 'Tully' are both co-referential and synonymous, but (8) and (9) which differ by substitution of 'Cicero' and 'Tully' have different truth values, so *veritas non salvatur*. (Notice that this is essentially DIFFERENCE.)

[23] See also the related list in Cappelen and Lepore [1].

- The idea behind BQ4 is that an expression α is *in* the quotation of α. Or as [2] put it "'lobsters"' contains 'lobsters', whereas 'lobsters' doesn't contain lobsters. Since the endophoric theory retains CONSTITUENCY this is accounted for.
- On BQ5: Given that the endophoric theory retains COMPOSITIONALITY it accounts for the productive nature of quotation.[24]

Turn to the more challenging cases:

- Data point BQ2 is that it is not possible to quantify into quotation, e.g., (12) does not entail (13):

  (12) 'Cicero' contains six letters.
  (13) $\exists x$: 'x' contains six letters.

  The simple quotational language outlined above did not contain quantification or variable-binding operators. But assume we expanded it to included variables x and y, and the sentence forming operators $\exists x$ and $\exists y$.[25] Adjusting the semantics with the standard Tarskian treatment of quantification, with relativisation to an assignment and so on, it falls out that the quantification in (13) is vacuous. This is because, while the referent of a variable (x) is sensitive to the assignment, in a quote phrase (QUOTE x) the sensitivity is rendered idle (see Appendix B for the details). This would also account for why quotation blocks wh-movement, e.g. the following is not the result of wh-movement on (12).

  (14) *Who is such that 'he' contains six letters?

- BQ3 presents a challenge to the endophoric account. Since each quote phrase contains its quoted expression as a syntactic constituent, the quoted expression itself must be generated by the syntax. But then we get the unfortunate result that only expressions that can be generated by the syntax can be quoted. Thus, the endophoric view seems too constrained to account for cases such as the following (cf. [1]: 22–24):

  (15) 'The slithy toves did gyre and gimble in the wabe' is not an English sentence.
  (16) 'types loves Sam' is ungrammatical.
  (17) 'FgHj' is a not a word. ([18]: 619)

[24]Note that we also accommodate the idea that quotations are iterative. Iterated quotation is a standard objection to Davidson's paratactic view (see Saka ([35]: 119-20) on "the recursion problem" and D10 of Cappelen and Lepore [1]). For example, the endophoric view can easily account for the fact that a quoted expression is distinct from the expression itself, i.e., " "Quine" " $\neq$ "Quine". On the paratactic view this amounts to the following: the expression of which *that* is a token $\neq$ the expression of which *that* is a token. That will be true in a context where the first demonstratum is a token of " "Quine" " and the second is a token of "Quine", but it will be false if both demonstrata are tokens of "Quine". So it doesn't yield that a quoted expression is distinct from the expression itself as a logical truth, whereas the endophoric view does. Likewise with facts about iterated quotation such as this: the referent of " " "Quine" " " refers to "Quine".

[25]To be clear, this amounts to adding $\mathrm{N} \rightarrow \{x, y\}$ and $\mathrm{S} \rightarrow \{\exists x + S, \exists y + S\}$ to our phrase structure rules.

Can these be accommodated by an extension of the theory? Cases like (15) seem grammatical even though they use nonsense nouns and verbs. So we might want to treat that case differently from the cases of obviously ungrammatical strings such as (16), or the case of nonsense atoms such as in (17). But ignoring potential fine-grained differences it seems the most straightforward way to accommodate all these cases is to follow a suggestion from Maier [18]. First we'd need to add a stock of arbitrary nonsense strings to the lexicon, call these syntactic "junk" in category J. For these we'd also need a special nonsense semantic type $*$, e.g., their interpretation could be the empty set, or some other junk object ($D_* = \emptyset$). Then the rule for forming quote phrases could be expanded so that any junk string can be quoted. So for example the following would be well-formed: $[_{NP}[_Q$ QUOTE$][_J$ FgHj$]]$. And its semantic interpretation would proceed essentially as before.

- $[\![[_{NP}[_Q$ QUOTE$][_J$ FgHj$]]\!]^c$ = λm_* (the expression at $c\downarrow\Rightarrow$) ($\emptyset$) = 'FgHj'

- Finally to address BQ6 we must consider the prospect of extending the endophoric theory to cases of quotation beyond pure quotation. Case of mixed quotation are cases such as the following:

  (18) Quine said that quotation "has a certain anomalous feature." [4]
  (19) Bill Watterson said that reality "continues to ruin my life." [18]
  (20) The dean asked that a student "accompany every professor." [3]

  In these cases the quoted expressions seem to be both *used* and *mentioned*. The quoted expressions are used to, e.g., say what Quine said, but also mentioned to say how he said it. Its not at all clear how to handle this dual nature. For an overview on what is now the large literature on mixed quotation see Maier [19]. Given that according to the endophoric theory quoted expressions are in some sense both used and mentioned there is some hope of extending the theory to cover the mixed cases. The quoted expressions are used in the sense that they are constituents of the quote phrase and have their standard semantic value. And they are mentioned in the sense that they are pointed to by the quotes.[26] But the syntax we've provided for pure quotation is inadequate for the syntax of mixed quotation. With mixed quotation the quote phrase and the quoted expression are the same syntactic category. Notice that the mix-quote phrase in (18) is not an NP but instead a VP. Thus, while the story about mixed quotation might appeal, in part, to the story about pure quotation, a further theory needs to be added on. In principle, various views about mixed quotation could be spliced onto the endophoric theory of pure quotation, e.g. the view developed by Potts [26] in

[26] Another possible application of the general syntactic and semantic tools developed here is to attitude reports. In attitudes reports the expressions in the that-clause are clearly used, but they also seem to be mentioned, insofar as substituting synonyms can make a difference to the truth value of the report. The endophoric approach opens up the possibility that (i) compositionality reigns, and (ii) 'Hesperus' and 'Phosphorus' are completely synonymous, nevertheless (iii) 'Hesperus' and 'Phosphorus' can't be substituted for each other *salva veritate* in attitude reports.

terms of conventional implicature or the view developed by Maier [17] in terms of presupposition. But doing so is beyond the aims of this paper.

5 Conclusion

Recall the two related and moderate aims of this paper. The first was to put an alternative theory of quotation on the table—one that has the apparent virtue adhering to the three principles. This virtue might well be outweighed by further considerations such as those in the previous section. For example, some version of the paratactic view might be the best theory overall, even though it gives up the intuitive principle that a quote expression contains a quoted expression. This may not count for much in the ultimate cost/benefit analysis. It would be a misreading of this paper to come away with the idea that the standard views, insofar as they give up one of the three initial principles, are dead in the water. The point instead is just that there is an overlooked live possibility that vindicates them all: the endophoric view. This view also fares quite well in connection to the broader considerations that a theory of quotation is sensitive to.

The second aim was metatheoretical: use the distinctive features of the endophoric theory to raise some methodological issues in the philosophy of language and formal semantics. The way in which the endophoric theory appeals to linguistic context forced us to consider the relationships between semantics and post-semantics. In this case, the relationships between meaning and reference (and meaning and truth). The implicit assumption that sameness of meaning determines sameness of reference and truth-value, was uncovered, scrutinized, and eventually rejected. Liberated from the implicit assumption we were able to chart a compositional semantic theory whereby the quoted expression is a constituent of the quoting phrase and there are distinct but synonymous expressions in the language. Thus, we seem to have found path out of the labyrinth. Or have we again gone down a false trail with impending dangers?

Appendix A: Derivations of the Semantic Values of (8) and (9)

$$
\begin{aligned}
[\![(8)]\!]^c &= [\![[_S [_{NP} [_Q \text{ QUOTE}][_N \text{ Cicero}]][_{VP} \text{ is six lettered}]]]\!]^c \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow}\left([\![[_{NP}[_Q \text{ QUOTE}][_N \text{ Cicero}]]]\!]^{c\downarrow}\right) \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow}\left([\![[_Q \text{ QUOTE}]]\!]^{c\downarrow\downarrow}\left([\![[_N \text{ Cicero}]]\!]^{c\downarrow\downarrow\Rightarrow}\right)\right) \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow}\left(\lambda s.\text{ the expression at } c\downarrow\downarrow\Rightarrow\left([\![[_N \text{ Cicero}]]\!]^{c\downarrow\downarrow\Rightarrow}\right)\right) \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow}\,(\lambda s.\text{ the expression at } c\downarrow\downarrow\Rightarrow (V(\text{`Cicero'}))) \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow}\,(\text{ the expression at } c\downarrow\downarrow\Rightarrow) \\
&= \begin{cases} 1, & \text{if the expression at } c\downarrow\downarrow\Rightarrow \in V(\text{`six-lettered'}) \\ 0, & \textit{otherwise.} \end{cases}
\end{aligned}
$$

$$
\begin{aligned}
[\![(9)]\!]^c &= [\![[_S[_{NP}[_Q \text{ QUOTE}][_N \text{ Tully}]][_{VP} \text{ is six lettered}]]\!]^c \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow} \left([\![[_{NP}[_Q \text{ QUOTE}][_N \text{ Tully}]]]\!]^{c\downarrow}\right) \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow} \left([\![[_Q \text{ QUOTE}]]\!]^{c\downarrow\downarrow} \left([\![[_N \text{ Tully}]]\!]^{c\downarrow\downarrow\Rightarrow}\right)\right) \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow} \left(\lambda s.\ \text{the expression at } c\downarrow\downarrow\Rightarrow \left([\![[_N \text{ Tully}]]\!]^{c\downarrow\downarrow\Rightarrow}\right)\right) \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow} (\lambda s.\ \text{the expression at } c\downarrow\downarrow\Rightarrow (V(\text{`Tully'}))) \\
&= [\![[_{VP} \text{ is six lettered}]]\!]^{c\downarrow\Rightarrow} (\ \text{the expression at } c\downarrow\downarrow\Rightarrow) \\
&= \begin{cases} 1, & \text{if the expression at } c\downarrow\downarrow\Rightarrow \in V(\text{`six-lettered'}) \\ 0, & \textit{otherwise.} \end{cases}
\end{aligned}
$$

Appendix B: Demonstration of Vacuous Quantification in (13)

$$
\begin{aligned}
[\![(13)]\!]^{g,c} = 1 \ \text{ iff } & [\![[_S\ \exists x\ [_S[_{NP}[_Q \text{ QUOTE}][_N\ x]][_{VP} \text{ is six lettered}]]]\!]^{g,c} = 1 \\
\text{iff } & [\![[_S[_{NP}[_Q \text{ QUOTE}][_N\ x]][_{VP} \text{ is six lettered}]]\!]^{g',c} = 1, \\
& \text{for some } x\text{-variant } g'
\end{aligned}
$$

But the sentence that (13) embeds is insensitive to the assignment:

$$
\begin{aligned}
& [\![[_S[_{NP}[_Q \text{ QUOTE}][_N\ x]][_{VP} \text{ is six lettered}]]\!]^{g,c} \\
= \ & [\![[_{VP} \text{ is six lettered}]]\!]^{g,c\downarrow\Rightarrow} \left([\![[_{NP}[_Q \text{ QUOTE}][_N\ x]]]\!]^{g,c\downarrow}\right) \\
= \ & [\![[_{VP} \text{ is six lettered}]]\!]^{g,c\downarrow\Rightarrow} \left([\![[_Q \text{ QUOTE}]]\!]^{g,c\downarrow\downarrow} \left([\![[_N\ x]]\!]^{g,c\downarrow\downarrow\Rightarrow}\right)\right) \\
= \ & [\![[_{VP} \text{ is six lettered}]]\!]^{g,c\downarrow\Rightarrow} \left(\lambda s.\ \text{the expression at } c\downarrow\downarrow\Rightarrow \left([\![[_N\ x]]\!]^{g,c\downarrow\downarrow\Rightarrow}\right)\right) \\
= \ & [\![[_{VP} \text{ is six lettered}]]\!]^{g,c\downarrow\Rightarrow} (\lambda s.\ \text{the expression at } c\downarrow\downarrow\Rightarrow (g(x))) \\
= \ & [\![[_{VP} \text{ is six lettered}]]\!]^{g,c\downarrow\Rightarrow} (\ \text{the expression at } c\downarrow\downarrow\Rightarrow) \\
= \ & \begin{cases} 1, & \text{if the expression at } c\downarrow\downarrow\Rightarrow \in V(\text{`six-lettered'}) \\ 0, & \textit{otherwise.} \end{cases}
\end{aligned}
$$

Declarations

Competing Interests The author has no competing interests to declare that are relevant to the content of this article.

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