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Ghosts, Murderers, and the Semantics of Descriptions

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It is widely agreed that sentences containing a non-denoting description embedded in the scope of a propositional attitude verb have true *de dicto* interpretations, and Russell's (1905) analysis of definite descriptions is often praised for its simple analysis of such cases, cf. e.g. Neale (1990). However, several people, incl. Elbourne (2005; 2010), Heim (1991), and Kripke (2005), have contested this by arguing that Russell's analysis yields incorrect predictions in non-doxastic attitude contexts. Heim and Elbourne have subsequently argued that once certain facts about presupposition projection are fully appreciated, the Frege/Strawson analysis of definite descriptions has an explanatory advantage. In this paper, I argue that both Russell's analysis and the Frege/Strawson analysis face a serious problem when it comes to the interaction of attitude verbs and definite descriptions. I argue that the problem observed by Elbourne, Heim, and Kripke is much more general than standardly assumed and that a solution requires a revision of the semantics of definite and indefinite descriptions. I outline the conditions that are required to solve the problem and present an analysis couched in dynamic semantics which can provide a solution. I conclude by discussing some further issues related to propositional attitude verbs that complicate a fully general solution to the problem.

1 Introduction

Suppose Bertrand falsely believes that there is a king of France and that the king of France is bald. If so, a speaker can truly and felicitously report Bertrand's belief by asserting (1).

- (1) Bertrand believes that the king of France is bald.

The gospel among proponents of Russell's (1905) analysis of definite descriptions is that Russell's analysis provides a straightforward way of assigning adequate truth conditions to sentences such as (1), viz. sentences with non-denoting descriptions embedded in the scope of a propositional attitude verb. This assignment of truth conditions relies on two important assumptions. First, the assumption that definite descriptions *assert* the existence of a unique individual satisfying the descriptive

content, i.e. ‘the F is G ’ is analyzed as an existentially quantified formula, namely the formula below.¹

$$\exists x[F(x) \wedge \forall y[F(y) \rightarrow x = y] \wedge G(x)]$$

Second, the assumption that *de dicto*—*de re* ambiguities, which arise when modal and quantificational expressions interact, are *scope* ambiguities; when a modal takes scope over a quantificational expression, the resulting interpretation is *de dicto* and when the embedding order is reversed, the resulting interpretation is *de re*. Hence, in the context where Bertrand falsely believes that there is a bald king of France, the true reading of (1) is captured by analyzing the definite description as embedded in the scope of the propositional attitude verb, cf. (2). This yields an interpretation where the existence of a unique French king is part of Bertrand’s belief.²

$$(2) \text{ BEL}_b[\exists x[\text{king-of-France}(x) \wedge \forall y[\text{king-of-France}(y) \rightarrow x = y] \wedge \text{bald}(x)]]$$

The Russellian analysis thus predicts that the sentence in (1) is true if and only if Bertrand believes the following conjunction: there is a (unique) king of France and he (the king of France) is bald. That is, relying on a minimal number of fairly uncontentious assumptions, the Russellian analysis succeeds in explaining why some sentences containing non-denoting descriptions have straightforwardly true interpretations.³

But against this often emphasized virtue of Russell’s theory, Heim (1991), Kripke (2005), and Elbourne (2005; 2010) argue that Russell’s analysis makes correct predictions only when the propositional attitudes in question are doxastic. That is, when the definite description is embedded under a *non-doxastic* attitude verb, the Russellian predictions are intuitively incorrect. Consider the example below.

$$(3) \text{ Hans wants the ghost in his attic to be quiet tonight.} \quad (\text{Elbourne 2005; 2010})$$

(3) has both a narrow scope (*de dicto*) and a wide scope (*de re*) interpretation, yet neither interpretation appears to provide the correct truth conditions.

$$(4) \text{ DES}_h[\exists x[\text{ghost-in-attic}(x) \wedge \forall y[\text{ghost-in-attic}(y) \rightarrow x = y] \wedge \text{quiet}(x)]]$$

¹ I assume that propositions are the objects of assertion, but in order to avoid excessively convoluted language I will often talk about what e.g. *the description asserts* and about *the asserted content of the description*. This is to be understood only as shorthand for what the description standardly contributes to the asserted content of the sentence in which it occurs. Similarly, I sometimes talk about particular expressions triggering presuppositions. This is to be understood in the following sense: When these expressions occur in a sentence S , S expresses a proposition only if some other proposition (the presupposition) is common ground.

² I abbreviate ‘ a believes/wants that ϕ ’ as ‘ $\text{BEL}_a\phi$ ’ and ‘ $\text{DES}_a\phi$ ’ respectively. I leave the semantics of these attitude verbs unspecified for now and focus instead on the semantics of the complement clauses. I will assume throughout that propositional attitude verbs are modals, in particular quantifiers over possible worlds.

³ See e.g. Neale (1990, 27) and Ludlow (2007, 3.2)

On the narrow scope analysis above, the Russellian analysis predicts that (3) is true if and only if Hans desires the truth of the following conjunction: there is a (unique) ghost in Hans' attic and the ghost is quiet. However, this is intuitively inconsistent with the most natural interpretation of (3). The truth of (3) is compatible with Hans having no desire that there be a ghost in his attic.

But now consider the wide scope interpretation.

$$(5) \quad \exists x[\text{ghost-in-attic}(x) \wedge \forall y[\text{ghost-in-attic}(y) \rightarrow x = y] \wedge \text{DES}_h[\text{quiet}(x)]]$$

Here the Russellian analysis predicts that (3) is true if and only if there *is* a ghost in Hans' attic and he wants it to be quiet. The problem is that the truth of (3) does not appear to saddle the speaker with such a spurious ontological commitment. The speaker can truly report Hans' desires using (3) even if there, as a matter of fact, are no ghosts.

Now, the meaning of the definite is analyzed above in terms of the unary quantifiers of first-order logic and it is well known that these are inadequate for analyzing a whole range of determiners of natural language. And since Russell's original analysis of 'the F is G ' is syncategorematic (i.e. no constituent in Russell's proposed logical form corresponds to either 'the' or 'the F '), most proponents of Russell's analysis now maintain that the analysis should be cast in terms of generalized (or rather restricted) quantifiers.⁴ Neale (1990) thus adopts the notation in (6) to represent the 'logical form' of 'the F is G ' and its (Russellian) truth conditions are then stated as in e.g. (7). The definite determiner is now analyzed as a relation between two sets.

$$(6) \quad [\text{The } x: F(x)](G(x))$$

$$(7) \quad [\text{The } x: F(x)](G(x)) \text{ is true if and only if } |F| = 1 \wedge |F \cap G| \geq 1$$

In other words, 'the F is G ' is true if and only if the cardinality of the set F is exactly one and the intersection of F and G is greater than, or equal to, one.

What is important to emphasize is that the notation in (6) serves only to indicate that the definite article is analyzed as a restricted quantifier. This notational convention is supposed to better reflect that 'the F ' and 'the' are now treated as proper syntactic and semantic units.⁵ In other words,

⁴ For the now standard analysis of generalized quantifiers in natural language, see e.g. Barwise and Cooper (1981) and Keenan and Stavi (1986).

⁵ With this notation, the logical form now reflects the syntactic structure of a determiner combining with a sister node to form a determiner phrase (DP) which is then combined with a verb phrase (VP) to form a sentence (S). And using restricted quantification, both the determiner and the determiner phrase can now be given the following semantics:

$$\text{i. } \llbracket \text{The } F \rrbracket = \lambda G_{\langle e,t \rangle} \cdot |F| = 1 \wedge |F \cap G| \geq 1$$

$$\text{ii. } \llbracket \text{The} \rrbracket = \lambda F_{\langle e,t \rangle} \cdot \lambda G_{\langle e,t \rangle} \cdot |F| = 1 \wedge |F \cap G| \geq 1$$

[...] this is not to propose an alternative to Russell's theory; it is just to find a more congenial method of stating it. [the $x: Fx$](Gx) is *definitionally equivalent* to $(\exists x)((\forall y)(Fy \equiv y = x) \ \& \ Gx)$. (Neale, 1990, 45).

In other words, if definite descriptions are analyzed in terms of restricted quantifiers, then when the truth conditions of the complement clauses of (1) and (3) are computed, the Russellian analysis continues to make the right prediction for (1), but it also continues to make incorrect predictions for (3). And so, if one favors the restricted quantifier analysis of definite descriptions (which one arguably should), one still faces the same dilemma, namely that the analysis yields correct predictions for doxastic attitude verbs but incorrect predictions for non-doxastic attitude verbs. In conclusion, this problem is a problem about the predicted truth conditions and since the restricted quantifier analysis simply generates the standard Russellian truth conditions in a different way, the predictions in these cases are identical.

The problem outlined above now prompts the following question: Why is there this divergence in the predictions of the Russellian analysis as regards doxastic and non-doxastic attitude verbs? The answer seems to be the Russellian analysis' failure to distinguish between the meanings, i.e. the truth conditions, of sentences such as (8) and (9).

- (8) The ghost is quiet.
- (9) There is a unique ghost and it is quiet.

Since definite descriptions are assumed to *assert* the existence of a unique individual satisfying the description, the Russellian analysis treats (8) and (9) as having the same meaning, i.e. as having the same truth conditions. And this appears to be unproblematic in standard extensional cases since (8) and (9) are true in precisely the same contexts, viz. contexts that contain exactly one (perhaps maximally salient) ghost which is quiet. Moreover, in intensional contexts of the doxastic variety, the putative difference between (8) and (9) again seems inessential. Since it is a precondition on the truth of (1) that Bertrand *believes* that there is a unique king of France, then if c is a context where (1) is true, c is also a context where (10) is true.

- (1) Bertrand believes that the king of France is bald.
- (10) Bertrand believes that there is a unique king of France and that he is bald.

However, it is not intuitively clear that sentences such as (1) express existential beliefs on the part of their subjects. It might seem more natural to understand (1) as *presupposing* something about Bertrand's existential beliefs rather than as asserting it. But when the report in (1) is de dicto, this presupposition is a precondition on the truth of (1), and so building the presupposition into the asserted content of (1) helps output the correct truth conditions.

The problem arises when definite descriptions are embedded in the scope of attitude verbs that do not express beliefs, i.e. non-doxastic attitude verbs. While a sentence such as (3) also appears to presuppose an existential belief on the part of the subject, for example that Hans *believes* that there is a ghost in his attic, such an existential belief cannot be captured by assuming that the definite description asserts

existence. Instead, when the attitude in question is non-doxastic, e.g. a desire, a hope, or a fear, the relevant sentences are predicted to express that the subject of the attitude verb *wants*, *hopes*, or *fears* that there *exists* a particular individual satisfying the description. And this is the cause of the incorrect predictions.

To further illustrate the problem, if a speaker intended to communicate that Hans *wants there to be* a (unique) ghost in his attic and for it to be quiet, it seems implausible that the speaker would succeed by simply asserting (3). Instead, the speaker would have to use a sentence such as (11).

- (3) Hans wants the ghost in his attic to be quiet tonight.
- (11) Hans wants there to be a unique ghost in his attic and for it to be quiet.

This problem concerning assertions of existence is however not exclusive to cases where a definite description is embedded under a propositional attitude verb. The problem also arises with definite descriptions in conditionals. To illustrate, consider (12) and (13) below.

- (12) If the ghost in my attic is quiet tonight, I might finish my thesis.
- (13) If there is a unique ghost in my attic and it is quiet tonight, I might finish my thesis.

If definite descriptions assert existence, as the Russellian analysis maintains, and hence are shorthand for complex quantificational statements, one should be able to effectively paraphrase (12) with (13). But this is intuitively incorrect. If a speaker asserted (12), it would be natural to assume that she is *presupposing* (rather than asserting) that there is a ghost in her attic. That is, it would *not* be possible to interpret the speaker as simply contemplating a hypothetical scenario where there happens to be a ghost in her attic. And, as Elbourne (2010) observes, this intuition is further supported by the infelicity of (14) and the felicity of (15).

- (14) #I'm not sure there are any ghosts in my attic. If the ghost in my attic is quiet tonight, I might finish my thesis.
- (15) I'm not sure there are any ghosts in my attic. If there is a unique ghost in my attic and it is quiet tonight, I might finish my thesis.

Now, one might be inclined to defend the Russellian analysis by arguing that the definite description in (12) is naturally read as taking wide scope. This would straightforwardly explain why (14) sounds contradictory. But there are at least two significant problems with this explanation. First, given the Russellian analysis, one would think that both wide and narrow scope readings of (12) should be available, but this is not consistent with the data.⁶ There just does not seem to be any narrow scope reading of the definite description in (12), i.e. (13) is not a possible

⁶ An anonymous referee notes that one needs not assume that a reading is available simply because it can be generated by the syntax. For example, one could supplement the syntax with filtering mechanisms which would then eliminate the unavailable readings. While I agree with the referee's point here, I do think that it leaves an explanatory gap. The

interpretation of (12). The Russellian would therefore have to maintain that definite descriptions take *obligatory* wide scope in conditionals.⁷ Second, it is widely accepted that antecedents of conditionals are so-called *scope islands*, i.e. syntactic constituents from which syntactic movement is prohibited, see e.g. May (1985) and Szabolcsi (2001). Making the assumption that definite descriptions take obligatory wide scope would therefore violate this well-established syntactic principle. In sum, it seems that there is a significant problem here for the standard Russellian analysis of definite descriptions.⁸

2 The Existence Problem

2.1 Problem and Plan

The aim of this paper is to answer the following question:

THE EXISTENCE PROBLEM

What existence commitments do definite descriptions incur and how must these be analyzed if the apparently incorrect predictions manifested by sentences such as (3) and (12) are to be avoided?

The paper is divided into two sections. In the first, I discuss whether the problematic predictions can be avoided by adopting a presuppositional analysis of definite descriptions, in particular the referential Frege/Strawson analysis (to be explicated in the following sections). Several researchers, cf. Heim (1991) and Elbourne (2005; 2010), maintain that the Frege/Strawson analysis has a significant advantage over the Russellian analysis, but I will demonstrate that it is dubious whether the Frege/Strawson analysis provides a genuine solution to this problem. In particular, I will argue that the existence problem, as it is standardly framed, is a much more general problem than normally assumed. Next, elaborating on Elbourne (2005; 2010), I will show that the existence problem is not a result of complexities introduced by propositional attitude verbs and that attempts to defend the Russellian analysis using arguments of that nature fail. I conclude by arguing that both the orthodox analyses of definite descriptions, namely the Russellian analysis and the Frege/Strawson analysis, cannot solve the existence problem, i.e. cannot generally output correct truth conditions for sentences such as (3) and other related sentences.

narrow scope readings are available with most other, if not all, quantificational expressions, so it seems to me that the proponents of Russell's analysis owes an explanation for why these readings are not available with definite descriptions. Moreover, if the syntax were supplemented with relevant constraints to filter out the undesirable readings, one should think that such constraints would need to have independent syntactic motivation in order to be explanatory. And it is not obvious what would motivate such constraints.

⁷ And for an in-depth discussion (and refutation) of this suggestion, cf. Elbourne (2010)

⁸ I discuss a range of responses on behalf of the Russellian analysis in subsequent sections.

In the second section, I outline a range of conditions that any semantic analysis must satisfy if the existence problem is to be avoided and I sketch a dynamic semantic analysis of descriptions that satisfies these conditions. I show that my proposed analysis provides a solution to the problem as it arises in conditionals and I explain what would be needed to generalize the solution to propositional attitude verbs. I also show that my analysis is more generally adequate than both of the orthodox analyses.

2.2 *The Presuppositional Solution*

As demonstrated in the introduction, the existence problem is a product of a semantic analysis that fails to distinguish the meaning of (8) from the meaning of (9). One might therefore think that an analysis which does distinguish would provide a simple solution. One such analysis is a *presuppositional* analysis.

On the standard view, presuppositions are constraints on use. For example, if an expression ϕ triggers the presupposition that χ , it is felicitous for a speaker to use ϕ in a context c only if χ is antecedently established in c , viz. presupposed. On a presuppositional analysis of definite descriptions, existence of a unique individual is therefore assumed to be a presupposition, viz. a constraint on its use rather than an asserted component of its meaning. This means that a sentence of the form ‘the F is G ’ is not analyzed as making the existential claim that there is a unique F , but rather as a sentence whose use is licensed only if the existence of a unique individual who is F is already established in the discourse context — only if it is *common ground* that there is a unique F .⁹

So, how is a presuppositional analysis supposed to provide a solution to the existence problem? The intuitive thought is that if definite descriptions are analyzed as merely *presupposing* the existence of a unique F , the existence of this unique F will not be part of the content of an attitude ascription in whose scope the description is embedded — and hence the existence problem should fail to arise. This is, crudely speaking, the view of Heim and Elbourne. However, as it turns out, matters are not quite this simple. This section is devoted to demonstrating why.

Existence Commitments, Presuppositions, and Partial Functions

There are several ways to formally explicate the existence commitments that definite descriptions incur. Let’s begin by clearly distinguishing three such ways.

- (O1) Analyze definite descriptions as *asserting* existence. For example, assume that a definite description contributes an existentially quantified expression to the truth conditions of the sentence in which it occurs. A speaker who asserts that the F is G thus effectively asserts that a (unique) F exists.

⁹ This conception of presuppositions is due, in its essentials, to the pioneering work of Stalnaker (1970; 1974; 1978).

- (O2) Analyze definite descriptions as *presupposing* existence, i.e. assume that the asserted content contains no existential quantifier and instead that an existential claim is antecedently established in the common ground. This is what licenses the use of the definite description. So, a speaker who asserts a sentence such as ‘the F is G ’ does not thereby assert that a unique F exists — the speaker presupposes that this is common ground.
- (O3) Analyze definite descriptions as both presupposing *and* asserting existence.

The Russellian analysis captures the existence commitments of definite descriptions as described in (O1). Definite descriptions are analyzed as contributing to the truth conditions an existentially quantified formula and sentences containing definite descriptions are thus analyzed as *asserting* existence. That is, existence is part of the *asserted* content. This is, as we saw earlier, the reason that the Russellian analysis yields correct truth conditions for (1) but also the reason that it runs into the existence problem.

Two different types of semantic content must be distinguished on a presuppositional analysis, namely the *presupposed* content and the *asserted* content. The challenge for a putative presuppositional solution to the existence problem is to provide a formal analysis of these contents which avoids the existence problem and which in general succeeds in outputting correct truth conditions for sentences containing definite descriptions.

Now, since presuppositions are characterized as constraints on use — in the sense that they impose a contextual requirement that the presupposition must be common ground — existence presuppositions are standardly captured using *partial functions*.

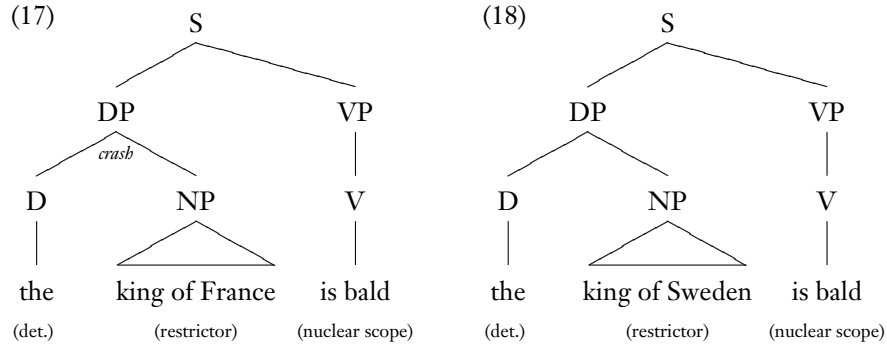
Let’s assume that the input for a semantic computation is an LF and that semantic values are computed on the basis of pairwise functional application of lexical constituents. The definite determiner is then treated as a function that is defined only if its input argument F is a singleton set — and otherwise undefined. This captures the above constraint on use since a sentence containing a definite description is predicted to express a proposition only if F has exactly one member. F is also often called *the restrictor*. In less technical terms, ‘the F is G ’ can be assigned a classical truth value only if there is a unique F . And so, treating the definite determiner as a quantificational determiner, viz. typing it as a function from two predicate sets to a truth value, we can represent this presuppositional requirement formally as in (16).¹⁰

$$(16) \quad \llbracket \text{the} \rrbracket = \lambda P: \exists! x P(x). \lambda Q. \exists x [P(x) \wedge \forall y [P(y) \rightarrow x = y] \wedge Q(x)] \quad \langle \text{et}, (\text{et}, \text{t}) \rangle$$

The expression $\exists! x P(x)$ is to be understood as a restriction on the initial λ -function. The domain of this function is the set of predicates of type $\langle \text{e}, \text{t} \rangle$ (i.e. a set of sets of individuals) but it is defined only for arguments (i.e. sets of individuals) that have exactly one member. This condition could thus also have been stated as a cardinality

¹⁰ On this analysis, the definite determiner is of type (O3), i.e. ‘the’ both presupposes *and* asserts existence. I begin by considering this lexical entry in order to highlight that a *presuppositional* analysis in itself is insufficient for solving the existence problem.

constraint, e.g. $\lceil \lambda P: |P|=1 \rceil$. The presuppositional nature of a definite description is captured in the sense that unless the restrictor set contains precisely one individual, the semantic computation of the sentence crashes. As a crude illustration, consider (17) and (18).



The restrictor set in (17) is empty and this means that the determiner is undefined for its restrictor argument. The computation of D+NP therefore fails and as a result the sentence fails to express a proposition, viz. a truth value cannot be computed for the sentence as a whole. In contrast, the restrictor set in (18) contains exactly one individual which means that the computation of D+NP succeeds and that the sentence as a whole can be assigned a truth value. What the lexical entry in (16) achieves is thus to impose the requirement on computations of definite descriptions that only if a unique individual satisfying the restrictor of the description exists will the sentence as a whole express a proposition. In other words, for a sentence such as ‘the F is G ’ to express a proposition, it is a *precondition* that a unique F exists.

However, we can now see why adopting a presuppositional analysis *in and of itself* is not sufficient for solving the existence problem. This becomes particularly clear when we consider the truth conditions generated by a computation of (18).

$$\begin{aligned}
 & \left[\left[\lambda P: \exists! x P(x). \lambda Q. \exists x [P(x) \wedge \forall y [P(y) \rightarrow x = y] \wedge Q(x)] \right] (\lambda z. \text{KoS}(z)) \right] \\
 & (\lambda v. \text{bald}(v)) \\
 \Rightarrow & \left[\lambda Q. \exists x [\text{KoS}(x) \wedge \forall y [\text{KoS}(y) \rightarrow x = y] \wedge Q(x)] \right] (\lambda z. \text{bald}(z)) \\
 \Rightarrow & \exists x [\text{KoS}(x) \wedge \forall y [\text{KoS}(y) \rightarrow x = y] \wedge \text{bald}(x)] \tag{18'}
 \end{aligned}$$

The truth conditions in (18') are identical to the truth conditions predicted by a standard Russellian analysis. In other words, if (18') is embedded under an attitude verb or in the antecedent of a conditional, we will make the same problematic predictions that Russell's analysis was previously shown to make.

It is now clear that the lexical entry in (16) — and more generally any analysis on which existence ends up being *asserted* — will invariably retain the prediction that for e.g. (3) to be true, Hans must desire that there is a ghost in his attic and this was of course the prediction we were aiming to avoid. The upshot is this: Using partial functions to ensure that the existence of a unique F is a *constraint* on use is not, in

itself, sufficient for solving the existence problem. The analysis must also ensure that existence does not end up being *asserted*.

In conclusion, if the solution to the existence problem must rely on an analysis which distinguishes the meaning of an existential-there sentence such as (9) from the meaning of a sentence with a definite description in subject position such as (8), and if this is best achieved by a presuppositional analysis, then only a *purely* presuppositional analysis in the sense of (O2) above can work. If existence presuppositions are captured in terms of partial functions, viz. in terms of partial interpretability, the challenge is how to formally characterize the *asserted* content without using expressions that assert existence.

Presuppositions and Referential Terms: The Frege/Strawson Analysis

On the so-called Frege/Strawson analysis of definite descriptions, definite descriptions are not only assumed to trigger existence presuppositions, i.e. assumed to be constrained in their use to contexts where it is common ground that there is a unique individual satisfying the restrictor, but also assumed to be *referential*. Expressions of the form ‘the *F*’ are thus assumed to *refer* to the unique individual who is *F*. This is typically captured formally using a lexical entry such as the following.¹¹

$$(19) \quad \llbracket \text{the} \rrbracket = \lambda P: \exists! x P(x). \iota x P(x) \quad (\text{et,e})$$

Here the definite determiner is treated as a function from properties to individuals but again the function is partial: it is defined only for arguments (sets of individuals) whose cardinality equals one. The complex ι -expression is a referential term which refers to the unique member of the restrictor set *F*. Hence, a computation of the semantic value of the determiner and its argument can succeed only if the argument (the relevant set of individuals) has exactly one member. If the function is defined for its argument, the resulting ι -expression is effectively a constant which refers to this individual. Given this lexical entry, a computation of (18) now yields the truth conditions stated in (18'').

$$\begin{aligned} & \llbracket \lambda y. \text{bald}(y) \rrbracket (\llbracket \lambda P: \exists! x P(x). \iota x P(x) \rrbracket (\lambda z. \text{KoS}(z))) \\ \Rightarrow & \llbracket \lambda y. \text{bald}(y) \rrbracket (\iota x \text{KoS}(x)) \\ \Rightarrow & \text{bald}(\iota x \text{KoS}(x)) \end{aligned} \quad (18'')$$

What is important to notice is that (18'') does not *assert* that a unique individual who is a king of Sweden exists *and* that this individual is bald. Instead, (18'')

¹¹ This (or notational variants) is standard in contemporary semantics, see e.g. Elbourne (2005), von Stechow and Heim (2007), Heim and Kratzer (1998), Schwarz (2009). In some cases the lexical entries are embedded in an intensional situation semantics and thus amended to contain λ -abstractions over situation variables. This makes no difference to the points pursued here. It should also be emphasized that a referential treatment in this sense is compatible with an analysis of the definite determiner where it is typed (semantically) as a quantificational determiner, $\llbracket \text{the} \rrbracket = \lambda P: \exists! x P(x). \lambda Q. Q(\iota x P(x))$.

asserts *of* the individual who is the unique king of Sweden that this individual is bald. This means that when this formula is embedded under an attitude verb, the existence problem should simply fail to arise. Similarly, in cases where a definite description is embedded in the antecedent of a conditional, e.g. (12), the prediction is that the conditional as a whole presupposes the existence of a French king. If this presupposition is satisfied, the antecedent of the conditional will simply contain a referential term referring to this individual (whoever it may be) and the semantic value of the conditional can then be unproblematically computed (according to whatever semantic analysis of conditionals one might favor). In sum, presupposing existence and treating the asserted content of the description as a referential term allows one to effectively mimic the result of wide-scoping without relying on any dubious syntactic assumptions. Moreover, one can now straightforwardly explain the contrast noted earlier between (14) and (15) (repeated below).

- (14) #I'm not sure there are any ghosts in my attic. If the ghost in my attic is quiet tonight, I might finish my thesis.
- (15) I'm not sure there are any ghosts in my attic. If there is a unique ghost in my attic and it is quiet tonight, I might finish my thesis.

An assertion of (12) is felicitous only if it is common ground that there is a unique ghost in the speaker's attic. Hence, if the speaker declares herself agnostic as to whether this *is* common ground, it is infelicitous for her to assert the sentence. This is the reason that (14) sounds contradictory. On the other hand, asserting (15) is acceptable simply because this sentence contains no presuppositional expressions and therefore have no restrictions imposed on its use.

Since the Frege/Strawson analysis appears to provide a simple and intuitive resolution of the existence problem, Heim (1991) and Elbourne (2005; 2010) both take the existence problem as providing evidence that the Frege/Strawson analysis is the correct analysis of definite descriptions. However, one more important assumption is needed if this solution is to work for *non-denoting* descriptions too.

Presupposition Projection in Attitude Contexts

On the Frege/Strawson analysis, the existence problem now fails to arise in cases where the definite description in fact refers, but the original problem case remains problematic.

- (3) Hans wants the ghost in his attic to be quiet tonight.

Since there are no ghosts, the computation of the complement clause of (3) crashes. The problem is that the Frege/Strawson analysis predicts that an utterance of a sentence such as (3) presupposes that there is a unique ghost and this prediction seems intuitively incorrect. It seems more natural to think that (3) only presupposes that Hans *believes* that there is a ghost. In fact, it seems that when a presuppositional expression occurs inside the scope of an attitude verb, the constraint that it *generally* imposes on its use is different from the constraint imposed in standard non-intensional contexts.

This behavior of presuppositional expressions was first emphasized by Karttunen (1974) who concluded that when presuppositions are triggered in the scope of a non-factive attitude verb, the presuppositions *project* into belief contexts. That is, while an assertion of (20) triggers the presupposition that Sue smoked — and hence requires that this is common ground — this is not so for (21).

(20) Sue stopped smoking.

(21) Bertrand $\left\{ \begin{array}{l} \text{hopes} \\ \text{believes} \\ \text{wishes} \end{array} \right\}$ that Sue stopped smoking.

(21) only presupposes that Bertrand *believes* that Sue smoked. To see this, we need only observe that it is infelicitous for a speaker to continue an utterance of (20) by uttering (22a-22b) whereas these continuations are perfectly felicitous for (21).

- (22) a. # However, I'm not sure she ever smoked.
b. # But she never smoked.

The presupposition triggered by (21) is not that Sue smoked but instead that the subject of the attitude, Bertrand, *believes* that she smoked. The discourse participants must mutually accept this *doxastic* claim in order for an utterance of (21) to be felicitous.¹²

When Karttunen's generalization is accepted, (3) is not predicted to presuppose that there is a unique ghost in Hans' attic. Rather, it is predicted to presuppose that Hans *believes* that there is. And since the definite description in (3) is analyzed as a referential term (which simply *refers* to the individual that Hans believes exists), the analysis is now in a position to predict that (3) has a true interpretation without incurring any unfortunate assertions of existence.¹³

¹² This generalization is further supported by the infelicity of utterances such as (i) and (ii) below.

- (i) # Bertrand hopes that Sue stops smoking but believes she never smoked.
(ii) # Bertrand wants Sue to stop smoking but he's not sure she ever smoked.

I should emphasize that how presuppositions project in attitude contexts is a rather complicated issue that I will discuss in more detail in section 3.3.

¹³ Strictly speaking, this prediction requires both a suitable semantics for propositional attitude verbs and an account of the behavior of presuppositions in attitude contexts, see e.g. Heim (1992) for a thorough discussion. I discuss some of these problems briefly in later sections. However, if for example one accepts Karttunen's generalization and adopts Heim's (1992) ordering semantics for desire-verbs, this should suffice for making correct predictions in cases such as (3).

Interim Conclusion

The Frege/Strawson analysis might seem to completely resolve the existence problem, but I now intend to demonstrate that sentences such as (3) and (12) are simple instances of a thoroughly general problem concerning the existence commitments incurred by natural language determiners. While the Frege/Strawson analysis *is* in a position to make correct predictions for cases involving definite descriptions (when combined with the aforementioned auxiliary assumptions), this result relies on exploiting a particular feature of the meaning of definite descriptions — a feature that cannot be exploited in cases involving various other determiners. When this is acknowledged, it becomes clear that the Frege/Strawson analysis fails to get to the heart of the existence problem. It also becomes clear that much more radical changes to our semantic system are needed, if a proper semantic analysis of the existence commitments incurred by various natural language determiners is to be devised.

2.3 *Indefinite Descriptions: The Failure of the Referential Analysis*

Consider this simple scenario.

Context I Suppose that three known murderers are on trial for their crimes and suppose that Bertrand has a desire that at least one of the three murderers be convicted. Now, let's assume that Bertrand has no specific individual in mind; if either of the three murderers are convicted, Bertrand's desire is satisfied. For example, suppose that Bertrand has a bet that at least one murderer will be convicted. But, let's also assume that Bertrand is a normal and rational individual who prefers that murders were never committed. Bertrand therefore has no desire that there be a murderer. His desire that a murderer be convicted is conditional on the antecedent belief that the individuals on trial are in fact murderers. Now suppose, on the night of the trial, I report this by uttering (23). **(CI)**

(23) Bertrand wants a murderer to be convicted tonight.

In the scenario described in **(CI)** my utterance of (23) is clearly both felicitous and true. But a familiar problem now resurfaces: On the standard (Russellian) analysis of indefinite descriptions, i.e. 'an *F*' or 'some *F*', these descriptions are analyzed as complex quantificational constructions. Since the indefinite description interacts with a modal (the propositional attitude verb), (23) has both a narrow scope (*de dicto*) interpretation and a wide scope (*de re*) interpretation.

(23) a. $\text{DES}_b[\exists x[\text{murderer}(x) \wedge \text{convicted}(x)]]$

On the narrow scope analysis above, the standard Russellian analysis predicts that (23) is true only if Bertrand desires the truth of the following conjunction: There is a murderer and he is convicted. However, this is directly inconsistent with the scenario described in **(CI)** — Bertrand has no desire that there is a murderer.

But the wide scope reading in (23b) makes an equally problematic prediction.

(23) b. $\exists x[\text{murderer}(x) \wedge \text{DES}_b[\text{convicted}(x)]]$

The prediction here is that (23) is true only if there *is* a murderer and Bertrand wants that murderer to be convicted. This is problematic for two different reasons: First, the truth of (23) does not in fact require that there is a murderer. The scenario could have been described so that the existence of murderers was nothing but a figment of Bertrand's imagination and yet (23) could be true. Second, Bertrand is now predicted to entertain a *de re* desire about a particular individual, but this is inconsistent with the scenario described in (CI). Bertrand has no desire pertaining to any specific murderer, because he does not care which murderer is convicted.¹⁴

The analogy between (23) and (3) is striking. In both cases, permutations of the scope taking expressions yield incorrect truth conditions and in both cases there is a strong intuition that existence is not *asserted* and hence not part of the attitudinal content. Instead it seems that in both cases existence is *presupposed*. In other words, (23), (3) and also (12), are instances of the same (existence) problem. For example, notice that the problem with indefinites, as manifested by (23), can also arise in conditionals. Consider the following scenario.

Context II Mary wants an apple pie for her birthday tomorrow and so she asks Bertrand if he would help bake one. While Bertrand is happy to help, Mary suddenly realizes that the stores are closed and that she is unsure whether they have the required ingredients. Now suppose Bertrand utters (24). (CII)

(24) I know we have flour, sugar, cinnamon, and nutmeg. If some apples in the pantry are ripe, we should be alright.

Here it seems incorrect to analyze the indefinite description in the conditional in (24) as *asserting* the existence of apples in the pantry; Bertrand is not making the hypothetical claim that if *there are some apples in the pantry* and they are ripe, they can then bake the pie. Bertrand seems to be presupposing that there are apples in the pantry. To see this, observe the contrast in judgments about the following sentences.

- (25) #I know we have flour, sugar, cinnamon, and nutmeg, but I'm not sure we have any apples. If some apples in the pantry are ripe, we should be alright.
 (26) I know we have flour, sugar, cinnamon, and nutmeg, but I'm not sure we have any apples. If there are some apples in the pantry and they are ripe, we should be alright.¹⁵

¹⁴ I believe Hawthorne and Manley (2012) were the first to observe that the existence problem generalizes to other determiners, and they also take this to be an argument against the Frege/Strawson solution to the existence problem. However, in the most recent draft (available to me), they suggest an alternative analysis that arguably makes incorrect predictions for both definites *and* indefinites. This is demonstrated in section 2.4.

¹⁵ These cases are variants of cases discussed in von Stechow (1998). There, von Stechow presents a number of cases suggesting that weak determiners do, on occasion, trigger presuppositions.

(CII) shows that the existence problem can also arise with *indefinite* descriptions when these are embedded in conditionals and even if the consequences of treating the description in (24) as asserting existence leads to somewhat less problematic predictions than in the case of (12), it seems clear that this is not the correct analysis.

When we acknowledge that the existence problem can arise with indefinite descriptions, it is easy to see that it can also arise with many other determiner phrases, e.g. numerical determiners such as ‘three *Fs*’, ‘exactly six *Fs*’ etc. In other words, the existence problem raises a *general* problem for more or less every determiner phrase — not just definite descriptions. And because of the general nature of the existence problem, it can now easily be demonstrated that the Frege/Strawson solution fails to get to the core of the existence problem.

On the Frege/Strawson analysis, ‘the *F*’ is analyzed as referential rather than quantificational and this is a feasible assumption with respect to definite descriptions simply because these descriptions pick out a *unique* individual. One can thus more or less unproblematically assume that a definite description *refers* to the unique individual who happens to satisfy the description. The advantage is that when the meaning of a definite description is treated as a referential term, one can embed the description inside the scope of an attitude verb or a conditional without incurring any existence problems.

However, this solution to the existence problem is simply exploiting the uniqueness of definite descriptions and for this reason, it cannot be extended to cases such as (23) or (24). Even if we assume that the indefinite description in (23) does not *assert*, but rather *presupposes*, the existence of a murderer (as immediate intuitions might suggest), we cannot analyze the asserted content of the description as a referential term for the following reasons: There are several murderers in the context, i.e. there is no *unique* murderer in the context, so if the indefinite ‘a murderer’ is analyzed as a referential term, which individual is this referential term supposed to pick out? Moreover, if the indefinite description is analyzed as a referential term, we would predict that Bertrand has a desire about a specific murderer which is directly inconsistent with the scenario described in **CI**. In **CI**, Bertrand’s desire is satisfied regardless of which murderer is convicted and in order to capture this, we must allow the indefinite description to range over multiple individuals, i.e. we must treat the indefinite description as a genuine quantificational expression. Any referential analysis of indefinite descriptions is thus by its very definition incapable of capturing that Bertrand’s desire is general rather than specific.

In conclusion, the strategy underlying the Frege/Strawson solution to the existence problem, i.e. characterizing the asserted content using referential terms, is incapable of providing a *general* solution to the existence problem. This strategy fails because the existence problem generalizes to cases where there is no uniqueness to exploit and where adequate truth conditions require quantificational force.¹⁶ In

¹⁶ I should note here that the generalization problem also rules out an analysis on which the asserted content contains just a universal quantifier ranging over every individual satisfying the restrictor predicate. As regards definite descriptions, the partial function guarantees that the predicate set is singleton and as a result, universal quantification over that set in

sum, the existence problem is a *general* problem about the existence commitments of natural language determiners and it seems reasonable to assume that it has a *general* solution.

Given the above observations, it seems clear that a general and uniform solution to the existence problem, viz. a uniform analysis of existence commitments which is adequate for definites but also indefinites, is going to require significant changes to our semantic system. Summarizing what we have observed so far helps illustrate what an adequate semantic analysis of e.g. definite and indefinite descriptions must look like.

- The analysis must be capable of distinguishing existential-there sentences from sentences with descriptions or determiner phrases in subject position. This means that the *asserted* contents cannot invariably be characterized using expressions which assert existence, i.e. existential quantifiers. As shown in (3) and (23), when existence is asserted, the problem in question arises.
- The asserted contents cannot invariably be characterized using referential terms. If the asserted contents are characterized as such, this yields incorrect predictions when the descriptions or determiner phrases in question do not imply uniqueness, cf. (23) and (24).
- Even if indefinite determiners are analyzed as presuppositional, these must be analyzed as ranging over multiple individuals. If they are not, this yields inadequate predictions, cf. (23) and (24).

This raises the following question: *Is there any viable way of characterizing what these descriptions contribute to the asserted content that avoids the existence problem?* Or in other words, is there a viable analysis which can plausibly satisfy each of the conditions stated above? I think that there is and in the second half of this paper, I outline such an analysis. However, before proceeding to the positive part of this paper, I want to first discuss some possible responses on behalf of the proponents of a Russellian analysis.

2.4 *The Vagaries of Attitude Verbs*

Despite the rather serious obstacles to solving the existence problem explicated above, there are various defensive maneuvers that could be made on behalf of Russell's analysis (or variants thereof). A proponent of Russell's theory could for example attempt to reject the problem by arguing that...

the asserted content would range only over a single individual without incurring existential commitments. However, for e.g. indefinite descriptions, this strategy fails miserably, since on such an analysis an utterance of (23) would be predicted to be equivalent to asserting that Bertrand wants every murderer to be convicted.

Response 1	The putative problem posed by the existence problem relies on a mistaken logical assumption, namely that propositional attitude verbs are closed under logical consequence. Since it is widely known that they are not, there simply <i>is</i> no problem (and there never were) for Russell's analysis of definite and indefinite descriptions. (R1)
Response 2	The putative problem is not the result of an inadequate semantic analysis of definite or indefinite determiners but rather a result of complexities which it is well known that propositional attitude verbs introduce. (R2)
Response 3	If a suitably enriched notion of propositions is adopted — a notion on which propositions are structured entities that mirror the syntax of the sentences that express those propositions — the existence problem can be avoided. (R3)
Response 4	The existence problem <i>appears</i> to cause a problem for Russell's analysis <i>only</i> because the full range of technical resources at our disposal (technical resources necessary for dealing with various intensional constructions) have not yet been utilized. Once these tools are properly utilized, we are in a position to dispel the puzzle. (R4)

Elbourne (2010) has already convincingly argued that the existence problem does not rely on the incorrect assumption that propositional attitude verbs are closed under classical consequence. But since this type of response is frequently voiced, I reiterate some of Elbourne's observations here and add a couple of novel ones. This, I hope, will conclusively disarm responses of type **(R1)**.¹⁷

The response in **(R1)** starts with the following observation: the sentence in (27) logically entails that there are men, but this logical entailment fails when (27) is embedded in the scope of an attitude verb, cf. (28).

(27) There are honest men. (Kaplan, 2005)
 \models There are men.

(28) Diogenes wondered whether there are honest men. (Kaplan, 2005)
 $\not\models$ Diogenes wondered whether there are men.

Examples such as these are supposed to show that propositional attitude verbs are not closed under a classical consequence relation and from this it is concluded that from a sentence such as (11), a simple Russellian paraphrase of (3), one cannot infer (29).

(3) Hans wants the ghost in his attic to be quiet tonight.
 (11) Hans wants there to be a unique ghost in his attic and for it to be quiet.
 (29) Hans wants there to be a unique ghost in his attic.

¹⁷ This response is tentatively endorsed by Kaplan (2005, 985) and emphatically stressed by Neale (2005, 846, 2007, 89-91). It has also frequently been raised in Q&As when I have presented this material.

The problem with this response is that it simply does not address the right objection.¹⁸ The problem for Russell’s analysis raised here is not a problem about entailments, it is a problem about the predicted truth conditions and the predicted asserted content. To illustrate, suppose a speaker utters the sentence in (30) but continues her speech by uttering either (30a) or (30b).¹⁹

- (30) I am not sure there are any ghosts in my attic.
- a. I want there to be exactly one ghost in my attic and for it to be quiet tonight.
 - b. #I want the ghost in my attic to be quiet tonight.

As Elbourne rightly points out, the continuation in (30a) is consistently judged felicitous by native speakers of English whereas the continuation in (30b) is reported to sound contradictory and hence infelicitous. The problem here is that if (30a) is nothing but a paraphrase of (30b), as the proponents of the Russellian analysis maintain, both of these discourse continuations should be felicitous — yet they are not. This means that if the type of response given in **(R1)** is to be relevant to the objection raised here, it must be reformulated, i.e. it should be,

[...] the superficially similar but ultimately distinct claim that the utterance of [(30a)] is consistent with [me] being unsure that there is a ghost in [my] attic, whereas the utterance of [(30b)] is not. But [(30a)] is just a Russellian paraphrase of [(30b)]. So the Russellian paraphrase cannot be correct. (Elbourne, 2010, 6)

In other words, there are strong reasons to believe that the meaning of the complement clause of (30a) cannot be equivalent in meaning to the complement of (30b). And so, even if we assume that propositional attitude verbs are not closed under classical consequence, this cannot explain why the *truth conditions* predicted by Russell’s analysis for sentences such as (3) are intuitively incorrect.

The response in **(R2)** is a more general version of **(R1)** and the primary problem with this response (and also with **(R1)**) is that the existence problem is not restricted to cases where a determiner phrase is embedded in the scope of a propositional attitude verb. As has already been emphasized several times, the exact same type of problem arises with conditionals.

Moreover, if the existence problem is simply blamed on the complexities of propositional attitude ascriptions, it would effectively be impossible to construct an adequate semantics for various attitude verbs — at least if the semantics of definite

¹⁸ Moreover, whether the assumption that propositional attitudes are not closed under a classical consequence relation suffices to show that inferences from (11) to (29) are illicit is not completely obvious. The fact that classical entailments are not consistently preserved in propositional attitude contexts does not justify the conclusion that such inferences are *never* licensed. Ultimately, that seems to depend on what the “correct” closure conditions for attitude verbs are. Without any explicit contextual clues, if some speaker were to assert the sentence in (11), it would not seem unreasonable for an interlocutor to infer (29).

¹⁹ This argument is due to Elbourne (2010, 6) — slightly modified here.

descriptions is assumed to be the standard Russellian semantics. First, remember that the Russellian analysis is incapable of distinguishing the meanings, viz. the truth conditions, of (8) and (9) (repeated below).

- (8) The ghost is quiet.
- (9) There is a unique ghost and it is quiet.

Suppose, as is standard, that attitude verbs take propositions as their arguments. Now, if an attitude verb Σ takes as its argument a proposition p , we need $\Sigma(p)$ to output one set of truth conditions when p is the proposition expressed by (8) and to output *a distinct* set of truth conditions when p is the proposition expressed by (9). But since (8) and (9) have the same truth conditions on the Russellian analysis and thus express the same proposition, it seems that we need Σ to *take identical arguments* and *systematically output distinct truth conditions*. It is rather difficult to envision how this is supposed to be possible. And again, this simply highlights the importance of adopting a semantic analysis which can distinguish the meaning of (8) from the meaning of (9).

But what if we could assume that (8) and (9) do not express the same proposition and yet retain the Russellian semantics? Proponents of **(R3)** might propose the following: Suppose that propositions are structured entities and that their structure mirrors the syntax of the sentences used to express them. Suppose further that one can coherently bear an attitude to a proposition ϕ and not bear that attitude to another proposition ψ even if ϕ and ψ are necessarily, or definitionally, equivalent (and thus have the exact same truth conditions). Now, given that sentences of the form ‘there is a unique F and it is G ’ and ‘the F is G ’ have different syntactic structures, we can maintain that they express different propositions even if the propositions expressed are necessarily, or definitionally, equivalent. Hence, we can now also maintain that one can coherently desire the latter without also desiring the former, and so, the existence problem simply fails to arise.²⁰

For diehard Russellians, this type of response seems to me to be the most promising. Nevertheless, it comes with certain non-trivial commitments and it also faces a couple of problems. First, the viability of the Russellian semantics for definite descriptions now depends on adopting (a) a specific view of propositions (which would have to be quite comprehensive) and (b) a particular conception of natural language syntax (in which propositional structure is cashed out), see e.g. King (2007). This is not in itself problematic, but since there are multiple notions of propositions and multiple different approaches to natural language syntax (that one might favor for various purposes), this seems like a cost. Second, this kind of view would need to be supplemented with an explanation of the contrast between (30a) and (30b) above. If definite descriptions are Russellian, this contrast cannot be explained in terms of the semantics. A third worry is that since this view effectively solves the existence problem by making certain assumptions about the nature of propositions, it is not

²⁰ I thank an anonymous referee at Noûs for bringing this view to my attention. I also thank the referee for noting one of the challenges for this view.

clear how this would alleviate the problem as it arises in conditionals, cf. (12)-(13) above. In conditional cases, having different (but necessarily equivalent) propositions expressed is not obviously going to help avoid the problematic predictions. Similarly, it is unclear how such structured propositions would help solve the existence problem as it arises with *indefinites*. The problem with indefinites is that in some cases where ‘an *F* is *G*’ is embedded under ‘want’, it seems that the indefinite must be analyzed as asserting existence, but in other cases, e.g. (23), it seems that the indefinite must be analyzed as *not* asserting existence. Yet, in both cases the *syntactic structure* of the sentences is the same. And so, since propositions are distinguished in terms of syntactic structures and since there is no relevant syntactic difference, two different propositions cannot be identified. As a result, these cases cannot be explained along the same lines as cases involving existential-there sentences and definite descriptions.

In conclusion, it is not clear that this fine-grained notion of propositions is going to be enough to provide a general solution to the existence problem.

The rough idea behind **(R4)** is roughly this: Suppose we assume a Kratzerian (1977; 1981) semantics for modals where modals are quantifiers over possible worlds and modal statements depend on conversational backgrounds, namely *modal bases* and *ordering sources*. Moreover, let’s also assume that a sentence such as $\text{DES}_a(\phi)$ is true only if at the worlds determined by the modal base, the best ranked worlds are ϕ -worlds (where the rank of these worlds is determined by the ordering source). Following Heim (1992), we can assume that the modal base for DES depends on the subject of the attitude verb and that in (3) the modal base is the doxastic state of the subject, i.e. a set of worlds compatible with the beliefs of the subject. This set of worlds is then ordered according to the ordering source which is the subject’s desires.

This is supposed to yield the following truth conditions: (3) is true if and only if the best ranked worlds (determined by the modal base and the ordering source) are such that the formula embedded inside the scope of the attitude verb in (4) is true at those worlds.

$$(4) \quad \text{DES}_h[\exists x[\text{ghost-in-attic}(x) \wedge \forall y[\text{ghost-in-attic}(y) \rightarrow x = y] \wedge \text{quiet}(x)]]$$

And so, if the modal base is determined on the basis of Hans’ beliefs, every world in the modal base will be a world where there is exactly one ghost in Hans’ attic. And the best ranked worlds will be worlds where that ghost is quiet. These appear to be the correct truth conditions.

Unfortunately, this proposed analysis leaves one crucial question unanswered: In virtue of what is the set of relevant worlds restricted to include only worlds where there is exactly one ghost in Hans’ attic? If one simply assumes that the modal base is Hans’ doxastic states, then the question is this: Where in (3) do we locate the information that Hans *believes* that there is a ghost in his attic? It is difficult to see how one could plausibly answer this question without appealing to some presuppositional requirement triggered by the sentence itself. Or to state the worry differently, it remains thoroughly unclear what the role of the existential quantifier in (4) is. Since the formula in (4) expresses exactly the predicted truth conditions of (11) (repeated below), how are we supposed to predict that the truth conditions of (11) are distinct from the truth conditions of (3)?

- (3) Hans wants the ghost in his attic to be quiet tonight.
 (11) Hans wants there to be a unique ghost in his attic and for it to be quiet.

Again, the problem is the Russellian analysis' inability to distinguish existential-there sentences from sentences with a definite description in subject position. Finally, on this analysis, it is not clear how to explain the contrast exhibited by (30a) and (30b).

But now an alternative analysis might seem to suggest itself. Suppose we assume that 'the *F* is *G*' both presupposes and asserts existence. That is, we assume that uses of 'the *F*' imposes the requirement that it is common ground that there is a unique *F*, but it also *asserts* that there is a unique *F*. This would not really be a Russellian view, but it might be close enough. Would this amendment now solve the problems mentioned for the analysis above? It might seem so: If 'the *F* is *G*' triggers the presupposition that there is a unique *F*, we can now explain why the set of relevant worlds, in the case above, would only include worlds where there is a ghost — (3) is only felicitous if there is a ghost at each of Hans' doxastic alternatives. Moreover, by adding the presuppositional constraint, we can now also explain contrasts such as that between (30a) and (30b). So, this proposal combined with the analysis of attitude verbs sketched above looks like it might get the truth conditions right for both the problematic attitude cases and the conditional cases. Nevertheless, I think that this suggested analysis still faces a serious problem.²¹

With this analysis we can now distinguish between (3) and (11) in the sense that the former comes with a presuppositional requirement that the latter does not. However, (3) and (11) have the same *asserted* content, and so when the presupposition is satisfied (e.g. common ground), these sentences are going to be true at exactly the same worlds. But this seems incorrect to me. Let me attempt to illustrate. Suppose *S* asserts (31) and then continues to assert either (31a) or (31b). Moreover, let's assume that the assertion of (31) is immediately accepted by all of the discourse participants.

- (31) There is a unique *F* ...
 a. ... and I want there to be a unique *F* and for it to be *G*.²²
 b. ... and I want the *F* to be *G*.

It seems clear that depending on the continuation, *S* expresses different desires, viz. the desire expressed by (31a) is not the desire expressed by (31b). However, on the analysis suggested above, these cannot be distinguished. Here is why: After the

²¹ This is the view defended by Hawthorne and Manley (2012) and the problem I am about to sketch for this view is, in its essentials, the problem discussed in section 2.2.1.

²² It seems to me that in general when a speaker says that she wants that ϕ , she is *implicating* that she does not believe that ϕ . So, if this sounds a bit odd to you, try with a slight intonational stress on 'want'. Alternatively consider this exchange:

- A: My god, is there a carrot in your beer!?
 B: Yes, there is a carrot in my beer. And I WANT there to be a carrot in my beer. I like it that way!

Any felt infelicity is, I think, due to merely pragmatic effects.

assertion of (31), the presupposition triggered by (31b) is common ground. And since (31b)'s presupposition is common ground, we can basically ignore that aspect of its meaning. Given this, what is then asserted by both (31a) and (31b) is (32).

(32) I want: $\exists x[F(x) \wedge \forall y[F(y) \rightarrow x = y] \wedge G(x)]$

And given the suggested semantics for 'want', both (31a) and (31b) are then predicted to be true iff for each of *S*'s desired worlds, the proposition expressed by the complement clause of (32) is true at those worlds. But this is not the right result, because we can easily imagine contexts where (31) is common ground and (31b) is true, but (31a) is false. I.e. we can easily imagine a context where a speaker would accept and assert (31)+(31b) but not accept or assert (31)+(31a). Of course, this problem is just an instance of the very problem we are trying to solve, i.e. even when there is a unique *F*, I can want that the *F* is *G* without wanting that there is a unique *F* and that it is *G* — and this has nothing to do with what I or the discourse participants are taking for granted. To reiterate a now familiar point, suppose we all know there is a unique murderer and Hans wants the murderer to be convicted. Even when the existence of a unique murderer is common ground, viz. we all know it, it sounds quite odd to report Hans' desire as in (33).

(33) Hans wants there to be a unique murderer and for him to be convicted.

Only if Hans really *does* desire that *there is* a murderer would this seem OK. Yet, in this context where the presupposition is common ground, (33) is simply what 'Hans wants the murderer to be convicted' is predicted to mean.²³

In closing, if we are to capture a difference in meaning between (31a) and (31b), a presuppositional requirement is not going to be sufficient. We need to characterize the asserted content of the complement clauses such that their meanings differ.

This concludes my discussion of the existence problem in relation to the Russellian analysis and the Frege/Strawson analysis. I should emphasize that the existence problem is not a problem only for proponents of these analyses, but also for strictly speaking non-Russellian analyses, e.g. Szabó (2000), Ludlow and Segal (2004), and Hawthorne and Manley (2012). Any analysis which maintains that definite or indefinite descriptions uniformly *assert* the existence of an individual is subject to incorrect predictions in both non-doxastic attitude contexts and conditionals.

²³ Here is a different worry about this type of analysis. Typically, when a speaker *S* repeats the same assertion, the second assertion will seem redundant and infelicitous. And if definite descriptions both presuppose and assert existence, (ii)-(iii) should just be paraphrases of (i). Nevertheless, where (i) sounds perfectly fine, (ii)-(iii) sound infelicitous.

- (i) There is a unique king of France and the king of France is bald.
- (ii) # There is a unique king of France and there is a unique king of France and he's bald.
- (iii) # There is a unique king of France and there is a unique king of France who's bald.

The remainder of this paper is now devoted to outlining the requirements that a solution to the existence problem needs to meet and to sketching an analysis which succeeds in doing this.

3 Towards a Solution to the Existence Problem

In the previous section, I outlined several conditions for a solution to the existence problem. After summarizing these conditions, I sketch a semantic analysis of definite and indefinite descriptions that succeeds in satisfying these conditions. However, since this proposed analysis is embedded in a dynamic semantic framework, I digress with a short introduction. After this introduction, I explain how the proposed analysis provides a solution to the existence problem as it arises in conditionals. I then move to a discussion of attitude verbs and I demonstrate that my analysis is the way forward if the existence problem is to be avoided, but I also show that a full-fledged solution to this problem requires the development of a general dynamic semantics for attitude verbs and a systematic analysis of anaphora in intensional contexts. Such a full-fledged solution is unfortunately beyond the scope of this paper.

3.1 Three Desiderata

Here are three minimal conditions which in light of the discussion above it seems an analysis intended to solve the existence problem must meet.

Condition 1	The analysis must distinguish, or minimally be capable of distinguishing, the meaning, i.e. the truth conditions, of an existential-there sentences such as (8) from the meaning of a sentence with a definite or an indefinite description in subject position such as (9). (C1)
Condition 2	The asserted content of definite and indefinite descriptions cannot be characterized using quantificational expressions or referential terms (at least when the descriptions are embedded in the scope of non-doxastic attitude verbs or in conditionals.) (C2)
Condition 3	If an analysis of indefinite descriptions (and indefinite determiners more generally) is to be overall adequate, these determiners must be analyzed as having quantificational force, i.e. as ranging over multiple individuals. (C3)

It is *prima facie* difficult to see how *any* analysis of descriptions could plausibly meet all of these conditions. And yet, the challenge is not only to devise an analysis which meets each of these conditions (even though that certainly *is* a major challenge), the analysis must also be *generally* adequate.

Now, the most natural way of satisfying (C1) is to adopt a presuppositional analysis of not only definite descriptions but also indefinite descriptions. So, let's tentatively assume that definite descriptions *invariably* trigger existence presuppositions and that indefinite descriptions are *capable* of triggering existence presuppositions.

This assumption will provide us with the required resources to distinguish between the meanings of (8) and (9), but also, potentially, the meanings of (34) and (35).²⁴

- (34) There are some apples in the pantry and they are ripe.
 (35) Some apples in the pantry are ripe.

However, if we assume that the indefinite description in (35) is capable of triggering an existence presupposition, the crucial question is how we should characterize its asserted content. The second condition above, (C2), says that the asserted contents of definite and indefinite descriptions cannot be existentially bound variables or referential terms (i.e. constants or iota-terms). We saw in the previous section that these characterizations lead to incorrect predictions. This leaves very few options, but here is one: What is contributed to a sentence by a definite or a (presuppositional) indefinite description is simply an unbound variable. If we tentatively make this assumption, the challenge is to explain how this unbound variable is supposed to be assigned a semantic value.²⁵

So, let's suppose that a sentence of the form 'the F is G ' triggers the existential presupposition \mathcal{P} and asserts \mathcal{A} (cf. FIGURE 1 below).

FIGURE 1

SENTENCE	<i>the F is G</i>	\mathcal{S}
PRESUPPOSITION	$\exists x[F(x) \wedge \forall y[F(y) \rightarrow x = y]]$	\mathcal{P}
ASSERTION	$G(x)$	\mathcal{A}

Again, presuppositions are effectively constraints on interpretability. This means that \mathcal{S} can be felicitously uttered only if its presupposition is satisfied. In other words, any context in which \mathcal{S} is felicitous — and any context in which \mathcal{S} is true — must also be a context in which the presupposition, the existential formula in \mathcal{P} , is true.

²⁴ There is ample data, for example the sentences considered with respect to (CII), suggesting that the sentences in (34) and (35) are not, contrary to popular belief, invariably equivalent in meaning. And while it is not typically assumed that indefinite descriptions trigger existence presuppositions, the assumption that they *sometimes do* has been defended by several people, e.g. Strawson (1952; 1964), Milsark (1977), Partee (1989), Diesing (1992), and von Stechow (1998), see also Heim (2010). Understanding when and why indefinites trigger presuppositions is a complex issue that I for reasons of space am unable to explore here. For now, I simply adopt this assumption with the justification that it seems intuitively correct for the cases in question. I refer the suspicious readers to the papers cited above. See also the appendix in Schoubye (2011).

²⁵ The choice of unbound variables (as what is contributed by descriptions to asserted contents) is supposed to be motivated by the observation that neither quantificational expressions nor referential terms will work. However, I do acknowledge that this does not rule that there is a better alternative (even if I am not sure what that alternative would be). I discuss this briefly in subsequent sections. I thank an anonymous referee at *Noûs* for making this clear.

This means that, if we could somehow have the seemingly unbound variable in \mathcal{A} be bound by the existential formula in \mathcal{P} , we would essentially be able to mimic the effects of wide-scoping the descriptions without making any illicit assumptions about movement of syntactic constituents (since the presuppositions would not be treated as proper syntactic constituents). This then provides at least the outline of an analysis which straightforwardly and elegantly satisfies (C1)-(C3). And if this idea could be adequately explicated, this should pave the way for a general solution the existence problem.

Luckily, there are many well-developed semantic frameworks that provide almost exactly what we need, namely so-called dynamic semantic systems.²⁶ In the next few subsections, I provide a short introduction to a specific dynamic framework. This framework will serve as background for the remaining discussion. I then introduce a dynamic analysis of definite and indefinite descriptions which, as I demonstrate, satisfy the three conditions described above.

3.2 *Meaning as Update Potentials*

Following Stalnaker (1970; 1974; 1998; 2002), let's assume that a discourse context is a set of possible worlds, *the context set*, where this set of worlds represents the mutually accepted presuppositions of the discourse participants, what Stalnaker calls *the common ground*. For example, if the discourse participants mutually presuppose that ϕ , the context set will contain only ϕ -worlds, whereas if the discourse participants are agnostic or disagree about ϕ , the context set will contain both ϕ -worlds and $\neg\phi$ -worlds. Hence, if ϕ is asserted in a discourse and accepted by the discourse participants, every $\neg\phi$ -world is eliminated from the context set.

The principal difference between dynamic semantics and standard static semantics is that on the dynamic view the meaning of a sentence is not given by its truth conditions but instead by its *update potential*, viz. its potential effect on a discourse. For example, in Irene Heim's (1983) influential implementation, sentence meaning is explicated in terms of *context change potentials* (CCPs) which informally speaking are instructions to update the current discourse context to a new revised discourse context, and formally speaking a set theoretic operation. I.e. updating a discourse context c with an atomic sentence S is formally to intersect the context set c with the set of worlds denoted by the proposition expressed by S . This set theoretic operation eliminates from the context set every world where the proposition expressed by S is not true.

The update operation for atomic sentences is however constrained by the condition that if S triggers a presupposition χ , an update of c with S is defined only if c entails χ — if the presuppositions of S are not entailed by c , the update is undefined.

²⁶ I use the term 'dynamic semantics' as an umbrella term for various types of semantic systems which share certain non-standard features, most prominently the permissibility of binding across clause-boundaries, i.e. Discourse Representation Theory (Kamp, 1981; Kamp and Reyle, 1993), File Change Semantics (Heim, 1982), and Dynamic Predicate Logic (Groenendijk and Stokhof, 1991).

For complex sentences ϕ , their CCPs are compositionally derived from the CCPs of their constituents. Furthermore, when updating a context with a complex sentence ϕ , the update proceeds in increments, one constituent at a time, and requires that each constituent of ϕ is *admitted* by its corresponding *local* context. This means that updating with a conjunction $\phi \wedge \psi$ requires that c updated with ϕ , $c[\phi]$, is defined and that the resulting context, c' , updated with ψ is also defined, $c'[\psi]$. The local context for ϕ is thus c , whereas the local context for ψ is $c[\phi]$. In contrast, the *global* context for ψ is simply c . The figure below demonstrates how the CCPs of some additional complex sentences can be defined.

FIGURE II

ATOMIC	$c[p]$	$c \cap \{w \mid w \in p\}$
NEGATION	$c[\neg\phi]$	$c / c[\phi]$
CONJUNCTION	$c[\phi \wedge \psi]$	$c[\phi][\psi]$
IMPLICATION	$c[\phi \rightarrow \psi]$	$c / (c[\phi] / c[\phi][\psi])$

A central feature of Heim's (1982) system is that indefinites are not treated as quantificational expressions but instead assumed to introduce new so-called *discourse referents* into a discourse. Heim describes the discourse context as a collection of "file cards" that represent the introduced *discourse referents* and these file cards contain information related to the discourse referents. When a sentence containing an indefinite description is asserted in a context, the context is updated by adding a new file card and writing the index (i.e. the number) of the indefinite on the card. The file card now represents this particular discourse referent and future occurrences of the index will be anaphorically linked to this discourse referent. Indefinite descriptions are thus formally analyzed as variables whose values depend on a model.

In contrast, if a sentence contains a definite NP (i.e. a pronoun), the information associated with the definite must be added to an already existing file card, namely the card whose index corresponds to the index of the definite. Uses of definite NPs require that the NP, in Heim's terminology, is *familiar* (that it has a file card associated with it) whereas uses of indefinite NPs require the opposite. This essentially means that definite NPs (NPs with a *+def* feature) are analyzed as anaphors which are *bound* by a previously introduced discourse referent.

Dynamic Semantics

In formal terms, Heim's file card metaphor is explicated using variable-assignments. So, instead of treating contexts as simple sets of worlds, we define contexts as sets of pairs of worlds and variable assignments.²⁷ But first some basic structure.

²⁷ Here I follow loosely the exposition of Heim's system as it is presented in Roberts (2003, 309-310).

- (A1) A model $\mathcal{M} = \langle \mathcal{W}, \mathcal{D}, \mathcal{I} \rangle$: where \mathcal{W} is a set of worlds, \mathcal{D} is a set of individuals, and \mathcal{I} is an interpretation function from basic expressions to functions from worlds to extensions.
- (A2) Let \mathbb{N} be the set of natural numbers and \mathcal{G} be a set of assignment functions g such that $g: \mathbb{N} \mapsto \mathcal{D}$.
- (A3) Let **Dom** be the set of discourse referents introduced into a discourse with **Dom** $\subseteq \mathbb{N}$ and let **Dom**(g) denote the domain of an assignment function g .

We can now define a context c (relative to our model \mathcal{M}) as a set of ordered pairs $\langle w, g \rangle$.

- (A4) $c \subseteq \mathcal{W} \times \mathcal{G}$ such that $c = \{ \langle w, g \rangle : \forall i \in \mathbf{Dom}(g), g(i) \text{ is an individual which in } w \text{ verifies all the information shared by the interlocutors about } i. \}$

To illustrate how contexts, or information states, are updated, suppose we want to update a context c with the sentence in (36), analyzed as (36a).

- (36) A cat arrived.
 a. $\text{cat}(x_i^{-\text{DEF}}) \wedge \text{arrived}(x_i^{+\text{DEF}})$

Indefinite NPs are assumed to introduce new discourse referents into the discourse, so updating with the first conjunct of (36a) requires that the *domain* of discourse, **Dom**, is expanded to include i . This can be captured as follows.

$$(37) \quad \llbracket F(x_i^{-\text{DEF}}) \rrbracket = \lambda c: c \subseteq \{ \langle w, g \rangle : i \notin \mathbf{Dom}(g) \} . \{ \langle w', g' \rangle : \exists \langle w, g \rangle \in c \text{ where } g' \text{ is just like } g \text{ except that } i \in \mathbf{Dom}(g') \text{ and } g'(i) \in F(w') \text{ and } w' = w \}$$

In natural language, (37) is a partial function from a context c into a new context c' which is defined only if the numerical index on the indefinite is not already included in the domain of the variable assignments. If defined, the function maps the current context c into a new context c' where the domain of discourse is extended to include i , and g maps i to an individual who is a member of the set F at all worlds of the context. This captures that indefinite NPs introduce new discourse referents, i.e. that a new file card must be opened. In formal terms, this simply means that the domain of the variable assignments in the context is extended to include the relevant index, i.e. the domain of discourse is *expanded*. Updating c with the first conjunct of (36) thus yields a set of worlds w where there is at least one cat at each w . This is thus equivalent to adding the information, or the proposition, to the context that there is a cat.

In order to interpret the second conjunct, we need an update rule for variables with the *+def* feature, i.e.

$$(38) \quad \llbracket F(x_i^{+\text{DEF}}) \rrbracket = \lambda c: c \subseteq \{ \langle w, g \rangle : i \in \mathbf{Dom}(g) \} . \{ \langle w, g \rangle : g(i) \in F(w) \}$$

Since definite NPs require that their referents are *familiar*, viz. antecedently introduced into the discourse, (38) is treated as a partial function that is defined only if for every world-variable assignment pair in the context, the domain of the variable

assignment includes the numerical index i . If defined, the update instruction is simply to eliminate every world/variable assignment pair from the context that fails to verify the relevant conditions on $g(i)$. I.e. every world w where $g(i)$ is not in F at w must be eliminated from c . Updating c with the second conjunct of (36) thus yields a set of worlds where the individual i , who is a member of the set of cats, is also a member of the set of individuals who arrived.²⁸

Presuppositional Definites

In Heim's system, updating a context with a sentence of the form 'the F is G ' does not require that the referent of the F is the *unique* F , i.e. that there are no other individuals who are F . However, I propose, for reasons to be explained, to treat 'the F ' as imposing the additional requirement that no other individual in the relevant context is F .²⁹

We are now in a position to define a CCP for sentences of the form 'the F is G ', a CCP that captures the constraints outlined in conditions (C1)-(C3) above.³⁰

$$(39) \quad \llbracket [\text{The } F]_i \text{ is } G \rrbracket = \begin{array}{l} \lambda c: c \subseteq \{ \langle w, g \rangle : |F(w)| = 1 \wedge g(i) \in F(w) \} . \\ c \cap \{ \langle w, g \rangle : g(i) \in G(w) \} \end{array}$$

²⁸ As the CCP is defined in (38), it imposes the same constraint on every definite NP. But, it is clear that different definite NPs impose different further requirements on a discourse context; pronouns impose the semantic constraint that the intended referent satisfies the number, gender, and person features of the pronoun (the so-called phi-features) and definite descriptions impose the semantic constraint that their referents satisfy the descriptive content. And there are arguably more important differences between pronouns and definite descriptions, for example how salient their intended referents must be. This is an issue largely ignored in this paper, but for illuminating discussion, see Roberts (2003). It does however raise the following question: how should these additional features be formally captured? For example, must such features be assumed to be given at logical form (similar to the *+def* feature)? These are difficult questions and to avoid an excessive and possibly exegetical discussion about logical forms, I henceforth make the simplifying assumption that occurrences of e.g. pronouns and definite descriptions can be distinguished as different inputs for semantic interpretation, and hence can be assigned different CCPs.

²⁹ Here I am essentially proposing a proper uniqueness constraint on definite descriptions (rather than Heim's less strict familiarity-constraint). Whether definite descriptions trigger uniqueness presuppositions is a much debated issue, but nothing crucial to my main points in this paper depends on this. For arguments in favor of a uniqueness assumption, cf. Roberts (2003). The purpose of the uniqueness constraint here is to maintain a clear difference between definite descriptions and presuppositional indefinite descriptions.

³⁰ This CCP is defined at the sentence level and I ignore issues related to its composition. This is but a convenient short cut, and not something which I believe is in any way problematic. One could, I suppose, convert (39) into a lexical entry for just the definite determiner by abstracting over both predicates and this would make it quite similar to the standard semantics for quantificational determiners (only it would output a CCP rather than a truth value). But, I remain agnostic as to what is the most optimal strategy here.

The CCP in (39) is a partial function that is defined only if the set F has exactly one member at every world w , and g maps i to that individual at w . If the function is defined, the context is updated by eliminating every world/variable-assignment pair where the individual denoted by $g(i)$ is not a member of the set G at w .

The predictions of the CCP proposed in (39) are in standard extensional contexts more or less equivalent to the predictions of a Frege/Strawson analysis. The CCP in (39) predicts that an assertion of ‘the F is G ’ is felicitous only when it is antecedently established that there is exactly one individual who is F . This prediction mimics the predictions of the Frege/Strawson analysis where ‘the F is G ’ fails to express a proposition when the presupposition is not satisfied. When the presupposition is satisfied, the Frege/Strawson analysis predicts that ‘the F is G ’ is true only if the referent of ‘the F ’ is G . On the dynamic analysis, if the update is successful, that is if the update leaves a non-empty set of world/variable-assignment pairs, then for each world w in c , the unique individual who is F at w is also G , viz. the same truth conditions.

Presuppositional Indefinites

We have already seen how indefinite descriptions are generally analyzed in the Heimian dynamic framework sketched above, namely as expanding the domain of the variable assignments in c , viz. the domain of discourse. This would also be the analysis we would employ for sentences with existential-there sentences, i.e. ‘there is a/some F ’. However, now the question is how we should treat the special, and perhaps less frequent, occurrences of presuppositional indefinite descriptions? Here I propose a treatment similar to the treatment of definite descriptions but with one exception: presuppositional uses of indefinite descriptions do not require uniqueness.

Thus, we define the CCP for *presuppositional* uses of ‘an F is G ’ or ‘some F is G ’ as follows.

$$(40) \quad \llbracket [A^{\text{ps}}/\text{Some}^{\text{ps}} F]_i \text{ is } G \rrbracket = \lambda c: c \subseteq \{ \langle w, g \rangle: |F(w)| \geq 1 \wedge g(i) \in F(w) \} . c \cap \{ \langle w, g \rangle: g(i) \in G(w) \}$$

As before, (40) is a partial function that is defined if and only if for every $\langle w, g \rangle$ in the context c , F has *at least one* member at w , and g maps i to an individual who is F at w . And again, if the function is defined, updating c means eliminating every world/variable-assignment pair where the individual $g(i)$ at world w is not a member of the set G at w . This makes presuppositional indefinite descriptions look very much like definite descriptions, but this is not surprising because they are the same in at least one sense — both trigger presuppositions. However, they are also importantly different, because uses of ‘some F is G ’ do not presuppose that there is *exactly one* individual who is F . This analysis captures this fact.

However, the most important feature of this analysis is that on the presuppositional interpretation of indefinite descriptions, these do not *assert* existence. A presuppositional indefinite description is treated as an anaphor and not as introducing a new discourse referent. This should be sufficient to avoid the problematic assertions of existence without assuming that an indefinite description *refers* to a

particular individual and yet retaining the quantificational force of the indefinite: Even though an indefinite description such as ‘an F ’ will be anaphorically linked to a particular discourse referent, this discourse referent can be mapped to different individuals across the worlds of the context as long as there are multiple individuals who are F .³¹

³¹ An anonymous referee raised the following question: Does the existence problem force to us to adopt an analysis where the asserted component is analyzed as a variable? I.e. could we not analyze a sentence such as (1) as having roughly the logical form in (2) instead?

- (1) [A murderer] is convicted.
 (2) Something _{i} is a murderer and [the thing] _{i} is convicted.

As regards presuppositional occurrences of indefinite descriptions, I take it that the idea here would be to analyze the first conjunct in (2) as the presupposed component and the second conjunct as the asserted component, cf. (4).

- (3) [A^{pres} murderer] is convicted.
 (4) \mathcal{P} : Something _{i} is a murderer. \mathcal{A} : [the thing] _{i} is convicted.

With this analysis, the question is how to explicate the meaning of the definite description, i.e. ‘the thing’. That is, as we attempt to compute the truth conditions for (1) and (3), what should we assume that ‘the thing’ contributes to these truth conditions? Or in other words, what do we put in place of the blank lines in (5) and (6).

- (5) $\exists x_i[\text{murderer}(x_i) \wedge \text{convicted}(\text{_____}_i)]$
 (6) $\mathcal{P}: \exists x_i[\text{murderer}(x_i)]$ $\mathcal{A}: \text{convicted}(\text{_____}_i)$

If we assume that ‘the thing’ contributes to the truth conditions of (1) an existentially quantified formula, i.e. a Russellian definite description, we will make incorrect predictions in attitude contexts and certain conditionals, i.e. (23) and (24). On the other hand, we cannot assume that ‘the thing’ contributes a specific individual to the truth conditions of (1), i.e. that ‘the thing’ is a referential term such as $\iota x \text{Thing}(x)$, because uniqueness is not guaranteed — that is, there might be more than one thing in the context. And in cases where multiple individuals could make the sentence true, a referential analysis is going to yield incorrect truth conditions, because it will predict that the sentence is true only if one particular individual is convicted. Since we get incorrect truth conditions when ‘the thing’ is analyzed as contributing either a quantificational expression or a referential term, what term of the language used to state the truth conditions should we use? Here, I think, variables are a natural choice, because these are already part of that language. By using variables, we immediately avoid problematic assertions of existence. And so, if a proper mechanism for assigning semantic values to these variables can be identified — i.e. a mechanism that supplies the proper quantificational force — this then provides exactly what appears to be needed. And such a mechanism is precisely what the dynamic system described above is intended to provide.

Solving the Existence Problem for Conditionals

It should now be fairly straightforward to see that the analysis sketched above solves the existence problem as it arises in the cases involving conditionals. That is, using the CCP for ‘the F is G ’ given in (39) and the CCP for ‘if ϕ , ψ ’ given in section 3.2, the existence problem simply fails to arise. Consider the abbreviated version of (12) below.

(12) If [the ghost in my attic] _{i} is quiet tonight, then ψ .

In order to update a context c with a sentence of the form ‘if ϕ , ψ ’, $c[\phi][\psi]$ must be defined and this means that $c[\phi]$ must also be defined. In this case, since ϕ is ‘the ghost in my attic is quiet tonight’, $c[\phi]$ is defined only if the following holds:

$$c \subseteq \{\langle w, g \rangle : |\text{ghost-in-attic}(w)| = 1 \wedge g(i) \in \text{ghost-in-attic}(w)\}$$

That is, if the context fails to satisfy this constraint, the computation crashes. And if satisfied, the update then proceeds by intersecting c with the following set:

$$\{\langle w, g \rangle : g(i) \in \text{quiet-tonight}(w)\}$$

This yields a set of world/variable-assignment pairs where the individual denoted by $g(i)$ at world w is a member of the set of ghosts and the set of individuals who are quiet tonight. Next we update $c[\phi]$ with ψ and then we take the relevant complements (cf. the CCP for ‘ \rightarrow ’ in FIGURE 1). This now leaves us with a set of worlds where either the antecedent is false or the consequent is true.³²

We also avoid the prediction that (12) is equivalent in meaning to (13).

(13) If there is a unique ghost in my attic and it is quiet tonight, then ψ .

The reason is that updating c with (13) will not require that the context satisfies the constraint described above, because this sentence triggers no existential presupposition. Once again, this highlights that the lexical entry in (39) is more or less explanatorily equivalent to the Frege/Strawson analysis of definite descriptions.

The real strength of my proposed analysis is that it works in precisely the same way with presuppositional uses of indefinite descriptions. The difference lies only in the presuppositional constraint imposed by *definite* descriptions on the ingoing context, viz. that the cardinality of the restrictor set is exactly one. We are therefore in a position to avoid the existence problem even as it arises with *indefinite* descriptions, cf. (24) and we thus have a uniform solution to the existence problem as it arises for conditionals.

³² This lexical entry for the conditional is thus equivalent to material implication and I do not mean to suggest that this is an even remotely plausible semantics for conditionals. However, it suffices for making the point that the lexical entry in (39) resolves the existence problem, since the mechanism employed to avoid the existence problem here could also be employed with a more sophisticated analysis of conditionals, e.g. the Kratzerian analysis of conditionals proposed in Heim (1992).

3.3 *Propositional Attitudes*

The next question is whether my proposed analysis suffices to make correct predictions in the problematic cases involving propositional attitude ascriptions, e.g. (23) (repeated below).

(23) Bertrand wants a murderer to be convicted tonight.

I have suggested that the indefinite description embedded inside the scope of the desire verb in (23) should be treated as triggering an existence presupposition and given my proposed analysis, this means that it should be analyzed as a variable with a *+def* feature, i.e. it should be interpreted semantically along the lines suggested in (40).

However, I have also argued in favor of the assumption that presuppositions triggered in the scope of an attitude verb project, in general, to belief contexts. So, it would not be correct to assume that a sentence such as (23) requires that a discourse referent x_i who is member of the set of murderers at w has already been introduced into the context. What is presupposed by (23) is not that there is a murderer, but that Bertrand *believes* that there is. So, we might conclude that the logical form of (23) should look something like (41) and that the context must verify (42) in order for (41) to be interpretable.

(41) $DES_b[\text{convicted-tonight}(x_i^{+DEF})]$

(42) $BEL_b[\text{murderer}(x_i^{-DEF})]$

So, *intuitively*, one could for example say that if a context verifies (42), it would then be a context where there is at least one murderer, x_i , at each of the worlds that are compatible with Bertrand's beliefs. If this context is then updated with (41), we should then predict that the update is successful if and only if the worlds where x_i is convicted are among the worlds that Bertrand desire. That is, we cannot update with (41) if there is some world where x_i is convicted and this world is not among Bertrand's desired worlds.³³ Since the indefinite description is treated as a *+def*-variable, we avoid a problematic assertion of existence and since x_i is treated as a discourse referent, this discourse referent can be mapped to different individuals across Bertrand's belief worlds. And given that the individual convicted

³³ This presupposes that the ordering on the worlds will provide at least a partition of the worlds into those that are desired and those that are not desired by the subject. But for this type of semantics to work, i.e. a semantics where desire-claims are evaluated in terms of doxastic alternatives, the doxastic alternatives must be restricted to rule out various far fetched epistemic possibilities. Heim (1992) uses a similarity relation to do this and we could in principle do the same. There are more complex cases which might require further modifications, so I acknowledge that the semantics sketched above is unlikely to be entirely adequate. Ultimately the right semantics will depend on the closure conditions for the attitude verb and determining what those are is beyond the scope of this paper. Finally, let me stress that while this semantics for desire follows, in its essentials, Heim's (1992) proposal, I do not mean to suggest that a Heim-style analysis of desire-verbs *must* be used. I am grateful to a referee from *Noûs* for some critical but helpful comments on this issue.

across Bertrand's belief worlds differs, we capture that Bertrand's desire is *general*, not specific.

While this analysis might seem simple and intuitively correct, it faces two immediate problems which are general and quite complex. These are therefore not problems that I am in a position to properly address in this paper. However, I want to stress that there is no *prima facie* reason to believe that these problems *cannot* in principle be solved. And ultimately, I claim that (a) when these problems are solved, my suggested analysis of definite and (presuppositional) indefinite descriptions should provide a full-fledged solution to the existence problem, and (b) even if these problems are solved, the currently available analyses will not be in a position to provide a *unified* solution to the existence problem, i.e. a solution that captures the conceptual similarity between definites and indefinites.³⁴

The first problem is the technical difficulty of extending the dynamic system above to intensional constructions such as propositional attitude ascriptions. While Heim (1992) does provide an analysis of certain attitude verbs, her analysis builds on Hintikka's (1969) semantics for attitudes which is founded on propositional modal logic. But to deal with sentences where variables are embedded in the scope of an attitude verb, we need a more expressive system. We need a system where we can characterize an agent's *existential beliefs*, i.e. beliefs such as 'there is a murderer'. And while we would normally capture such existential statements using world/variable-assignment pairs, it is not immediately clear to me how to extend this to e.g. beliefs. That is, it is not clear to me that an agent's beliefs can be sensibly described using world/variable-assignment pairs.³⁵ Solving this problem would require not only technical ingenuity but also a rather lengthy discussion of propositional attitudes and the more intricate details of the dynamic framework.

The second problem is, I think, more complicated, but again a thoroughly general problem not related specifically to my proposed analysis. The problem is that in order for the semantic system to make correct predictions *in general*, it must be determined which constraints modals, i.e. propositional attitude verbs, impose on various anaphoric relations. Consider again (3) (repeated below).

³⁴ To clarify, it would obviously be possible for a proponent of the Frege/Strawson analysis of definite descriptions to propose a novel analysis of e.g. indefinites where, let's suppose, these were not treated as quantifiers—although I do not know what form such an analysis could take. It is also possible that the existence problem could then be generally avoided. But such a solution would sever the connection between the meanings of definites and indefinites. And if one is attracted to the idea that there should be a tight correspondence between syntax and semantics, this would not be a happy result. In contrast, the analysis proposed here maintains that these determiners share an essential component of meaning; they either introduce discourse referents or are anaphorically linked to discourse referents.

³⁵ Interestingly, there is, it seems, a somewhat limited amount of research on the interaction of variables and propositional attitude verbs in Heim's File Change Semantics. However, in the related dynamic system of Discourse Representation Theory, it seems that some steps towards an analysis of anaphoric expressions in attitude ascriptions has been taken, cf. e.g. Cumming (2007), Geurts (1998), Kamp *et al.* (2011, 326-387), see also van van Rooy (2006).

- (3) Hans wants the ghost in his attic to be quiet tonight.

For reasons mentioned above (Karttunen's generalization), the system should predict that a context can be updated with (3) only if the context is such that Hans *believes* that there is a ghost in his attic. But it should also predict that while (3) *does* trigger a presupposition about Hans' beliefs, (43) does not.

- (43) Hans believes that there is a ghost in his attic and he wants the ghost in his attic to be quiet tonight.

The reason is that the first conjunct of (43) *asserts* what is presupposed by the second conjunct. But since I propose to analyze these descriptions as variables, this means that the system should predict that when a discourse referent is introduced under a belief verb — as 'a ghost in his attic' is in (43) — it can then function as an anaphoric anchor for a variable embedded under another attitude verb, e.g. 'the ghost in his attic' embedded under 'want' in (43). In other words, a discourse referent embedded under one attitude can *sometimes* function as a *binder* for a variable embedded under another different attitude verb. This should already be fairly obvious. However, the problem is determining *when* it can have this function. To illustrate, consider the sentences below.

- (44) Hans hopes that there is [a ghost in his attic]_i and he wants [the ghost]_i to be quiet tonight.
 (45) Jan expected to get [a puppy]. She intended to keep [the puppy]_i in her back yard.
 (46) John wants to catch [a fish]_i. He plans to eat [the fish]_i for supper.
 (47) Alice fears that there is [a squirrel in her kitchen cabinets]_i. She hopes to trap [the squirrel]_i alive.

As in (43), we here have discourse referents introduced under one attitude which appears to neutralize the presupposition triggered by the description embedded under another attitude. In other words, the discourse referents function as anaphoric anchors and the system should predict that these anaphoric relations are licensed, i.e. that there is an anaphoric relation in (44) from the discourse referent introduced under 'hope' to the variable under 'want' and in (46) from the discourse referent introduced under 'want' to the variable embedded under 'plan' etc. However, the system should also predict that anaphoric relations are not immediately licensed in (48)-(50) .

- (48) # Hans wonders whether there is [a ghost in his attic]_i. [The ghost]_i is noisy.
 (49) # Hans hopes there is [a ghost in his attic]_i and he believes [the ghost]_i is quite noisy.
 (50) # Jan expected to get [a puppy]_i and she managed to housebreak [the puppy]_i quickly.

In order to provide a completely general solution to the existence problem, a systematic explanation of why anaphoric relations are licensed in e.g. (44)-(47) but not licensed in (48)-(50) is needed. What is *very important* to emphasize though is that

this is nothing but a manifestation of a completely general problem already widely familiar from the study of pronouns. An attentive reader will have noticed that one could replace the descriptions in (44)-(50) with suitable pronouns and generate the exact same puzzles.³⁶

- (44') Hans hopes there is [a ghost]_i in his attic and he wants it_i to be quiet tonight.
- (45') Jan expected to get [a puppy]_i. She intended to keep it_i in her back yard.
- (46') John wants to catch [a fish]_i. He plans to eat it_i for supper.
- (47') Alice fears that there is [a squirrel in her kitchen cabinets]_i. She hopes to trap it_i alive.

- (48') # Hans wonders whether there is [a ghost in his attic]_i. It_i is noisy.
- (49') # Hans hopes there is [a ghost in his attic]_i and he believes it_i is quite noisy.
- (50') # Jan expected to get [a puppy]_i and she managed to housebreak it_i quickly.

This is, in other words, a problem concerning anaphora in intensional contexts and it is a problem that any adequate semantic theory must ultimately address.³⁷ And, were it solved for the cases involving pronouns, the problem would then automatically be solved for definite and indefinite descriptions too (if these are analyzed as variables).

4 Conclusion

This might feel like a somewhat disappointing conclusion of the paper. After all, the existence problem remains unsolved for cases where descriptions are embedded in the scope of a propositional attitude verb. However, my primary aim in this paper was to demonstrate that the existence problem is a *general* problem that neither a Russellian nor a Frege/Strawson analysis is in a position to solve. I also aimed to shed light on the debate between proponents of the Russellian analysis and proponents of the Frege/Strawson analysis. I have presented arguments against both these analyses and proposed a step towards an analysis combining elements of both Russell's analysis and the Frege/Strawson analysis. On my analysis, definite descriptions presuppose, rather than assert, existence, but it also retains in spirit the quantificational nature of Russell's analysis. I.e. on my analysis, definite descriptions are not referential.

Second, I wanted to establish that a solution to the existence problem requires quite radical changes to our semantic analysis of e.g. definite and indefinite descriptions. In order to establish this, I have attempted to outline the factors that cause the existence problem and to then explicate three crucial conditions that an analysis of definite and indefinite descriptions must satisfy in order to solve the problem, viz. the conditions outlined in (C1)-(C3).

³⁶ In fact, several of the cases above are simply adapted from Roberts' (1996) paper on anaphora in intensional contexts.

³⁷ This problem is an instance of the problem of *modal subordination* first discussed by Craige Roberts in her (1987) dissertation. An overview of this and related problems is provided in Roberts (1996).

Third, I wanted to show that there is a semantic analysis which satisfies the relevant conditions, namely my proposed dynamic analysis, and that this analysis provides a uniform solution to the existence problem as it arises in conditionals, viz. a solution for both definite and indefinite descriptions.

Finally, I have attempted to show that a full-fledged solution to the existence problem relies on solutions to other complex problems. Since the existence problem arises when definite and indefinite NPs interact with propositional attitude verbs, this is not really surprising. But I hope to have convinced you that even though my solution is incomplete, this is not due to a problem with the proposed analysis, but rather the lack of solutions to these other general problems. The aim was to show that the existence problem is a problem about the semantics of descriptions and not solely a problem about propositional attitudes — and were these general problems to be solved, my proposed analysis should provide a full-fledged solution.

I also want to emphasize that while I have relied in my exposition on a Heimian style dynamic framework, nothing really essential to my proposed analysis depends on adopting this *particular* dynamic framework. What I have argued could also be argued using e.g. Discourse Representation Theory and it is certainly possible that DRT would be better suited to (a) deal with the interaction of propositional attitude verbs and variables (i.e. pronouns) and (b) to outline the proper restrictions on anaphora in intensional contexts, see e.g. Kamp *et al.* (2011).

However, I do want to acknowledge that there are several important issues which I have not addressed in this paper. For example, I have focused my discussion on definite and indefinite descriptions while acknowledging that the problem also arises for other determiner phrases. There is thus a question whether my proposed analysis could be generalized to these other determiners. While I see no reason to think that it could, I recognize this as an open question.

Moreover, the issue concerning what assumptions one must make about logical forms in order to properly distinguish definite descriptions, presuppositional indefinite descriptions, and pronouns from each other must be addressed. And there are additional questions concerning how to capture the apparently different salience requirements imposed by such expressions, cf. Ariel (2001) and Roberts (2003). While I am convinced that any plausible answer to these questions would complicate the theory that I have here advocated, I am also optimistic that plausible answers could be given.

In conclusion, with the analysis proposed here, there is the prospect of a full-fledged and uniform solution to the existence puzzle to emerge, and this is not the case for either the standard Russellian analysis or the Frege/Strawson analysis.³⁸

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