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PROJECTION FROM SITUATIONS

1 TWO APPROACHES TO DONKEY ANAPHORA

Sentences like the following contain anaphoric relations that are not amenable to standard semantic analyses:

(1) Every man who owns a donkey pays taxes on it.

(2) Always, if a man owns a donkey, he pays taxes on it.

Such so-called *donkey anaphora* is the subject of a long and complex literature.[1] Here we hope to advance the discussion by showing that one of the two major extant strategies for treating donkey anaphora, the e-type strategy, suffers from a serious and hitherto unexplored problem. Solving the problem is possible, but pulls the e-type strategy much closer to its main competitor, the dynamic strategy.[2]

The e-type strategy, our critical focus, can be characterized by the following assumptions:

i) Definite descriptions have Fregean/Russellian semantics according to which 'the F is G' is true if and only if there is exactly one F and all Fs are Gs.

ii) The uniqueness and existence implications of definite descriptions are semantic presuppositions.[3]

iii) Donkey pronouns, such as 'it' in (1) and (2), are, semantically speaking, definite descriptions whose descriptive content is recovered in some way (pragmatically, syntactically, or both, on which more below) from context.[4]

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[1]Dating from Walter Burley's medieval *De puritate artis logicae tractatus longior*, which gave the class of sentences their name and set the topic for example sentences ever since, and including Geach (1962), Evans (1977*b*), Parsons (1978), Cooper (1979), Heim (1982), Kamp (1981), Neale (1990), Heim (1990), Ludlow (1994), Büring (2004), Elbourne (2005).

[2]The e-type and the dynamic strategy are not the only two, but are perhaps the most prominent approaches to donkey anaphora. 'E-type' is sometimes, confusingly, also used as a name for the phenomenon which we are calling 'donkey anaphora'; to be clear, we are using it here rather as the name for a particular theory of that phenomenon.

[3]The idea that definite descriptions triggers presuppositions goes back to Frege and Strawson, but see Heim (1991) for an authoritative statement of it. While we assume the presuppositional view here, the data we consider also strongly support the presuppositional view of descriptions.

[4]There are some variations on this view on which pronouns are a special kind of definite description, as in Evans (1977*b*).

The e-type view contrasts with the rival dynamic view according to which definite descriptions and pronouns have a common variable-based semantics, differing only in their presuppositions.[5] On the dynamic view, both definite descriptions and pronouns behave like indexed variables and sentences such as (1) and (2) include co-indexed variables which are in effect bound without c-command. To achieve this, the dynamic view (the internal working of which will remain mostly beyond the scope of our discussion) comes with a structured view of context on which contexts contain information about variables in addition to propositional information.[6]

2 UNIQUENESS

A serious *prima facie* obstacle to the e-type treatment of donkey anaphora is that, according to the e-type theory, every definite description and every donkey pronoun gives rise to a uniqueness presupposition; but such presuppositions are intuitively often not satisfied. To give a flavor of the problem, consider the following plausible ways of spelling out the descriptive content of the pronouns in (1) and (2):

(3) Every man who owns a donkey pays taxes on the donkey he owns.

(4) Always, if a man owns a donkey, the man pays taxes on the donkey he owns.

On the e-type view, (1) and (2)—as well as (3) and (4)—should trigger a uniqueness presuppositions that every man who owns a donkey owns exactly one donkey.[7] But it has long been observed that they do not seem to have this presupposition. To make this especially clear, consider a sentence like Heim (1982)'s (5):

(5) Everyone who bought a sage plant bought eight others along with it.

If (5) presupposed that everyone who bought a sage plant bought exactly one sage plant, then it would be contradictory (assuming someone bought a sage plant); but (5) is clearly not contradictory.

One natural thought at this point is that the indefinite 'a donkey' filters the presupposition of 'the donkey'.[8] It is well known that material in the restrictor of quantifiers can filter presuppositions in their nuclear scope. A little reflection, however, shows that this response doesn't help: on e-type theories, 'a donkey' has the standard semantics of an existential quantifier, and so while it may filter existence presuppositions in the nuclear scope, it cannot filter uniqueness presuppositions.

[5] Importantly, therefore, both dynamic and e-type views assimilate donkey anaphora and e-type descriptions, predicting similarities in their behavior. For this reason it would be misleading to characterize the e-type view simply as the view that donkey pronouns have the semantics of definite descriptions, because that commitment is common to both views; what is crucial to the e-type view is that it gives a Fregean/Russellian semantics for descriptions, and, hence, donkey pronouns.

[6] Heim (1982) and Kamp (1981) independently developed the classic version of this view. See Beaver (2001) and Nouwen (2003) for some more recent developments of the view. Dekker (1994) and Rothschild (2017) provide close alternatives that hew more closely to standard semantic assumptions.

[7] For now the distinction between a presupposition and entailment is not important: what is crucial here is that for the sentences to be true for the e-type theorist, every man who owns a donkey needs to own exactly one donkey.

[8] The 'filter' terminology comes from Kartttunen's (1973) classic discussion of presupposition projection.

One solution suggested by Davies (1981) and Neale (1990) is to treat the descriptions in (3) and (4) as 'numberless' descriptions (optionally plural rather than singular). We can easily see, though, that many of the readings of donkey anaphora are not, in fact, equivalent to what we get with a plural description. Compare, for instance, these two sentences:

(6) Every man who owns a donkey and pays tax on it avoided arrest.

(7) Every donkey-owner who pays tax on the donkeys he owns avoided arrest.

For (6) to be true everyone who pays tax on at least one donkey he owns needs to avoid arrest, while for (7) to be true it seems we only need every donkey owner who pays tax on *every* donkey he owns to avoid arrest.[9]

A more promising approach in the e-type literature is to treat the uniqueness implications of donkey anaphora as relative to situations (as in Heim (1990) following Berman (1987)), or as relative to events (as in Ludlow (1994)), rather than relative to whole worlds. The gist of the idea is most natural in examples with adverbs of quantification such as (2), which could be rephrased as follows in situation-speak (following Heim):[10]

(8) Every minimal situation s in which a man owns a donkey, can be extended into a larger situation s' in which the man in s' pays taxes on the donkey he owns in s'.

Heim, using the situation-semantic framework of Kratzer (1989), sketches a semantics which yields meanings like (8) for sentences with donkey anaphora. For the rest of this paper we will focus our attention on this situational e-type approach, as it is the best developed version of the view (Büring 2004, Elbourne 2005, 2013).[11]

3 SITUATION E-TYPE SEMANTICS

We'll start by giving a more detailed sketch of how a situation semantics deals with the core data of donkey anaphora. We begin with our baseline semantic assumptions. We take as primitive a set S of situations with respect to which sentences are true (1) or false (0) (or in cases of presupposition failure, undefined, #). We will assume a partial order $\leq$ over situations, and we assume that every set of situations contains at least one minimal element with respect to $\leq$.[12] We assume sentences are uttered with respect to some situation, which we call the *topic situation*, which can be the entire world or some part of it depending on context. Semantic denotations are relativized to a situation as well as an assignment function provided by context.

[9] Other powerful arguments against the numberless view can be found in the literature (e.g., Kanazawa 2001).

[10] References to Heim can be a bit confusing since Heim both developed one of the original dynamic system (1982) *and* developed a prominent version of the e-type theory that we discuss here (1990). For this reason we adopt the convention that unless we explicitly refer to Heim's work from the 1980s when we discuss her views we are discussing her version of the e-type theory.

[11] We see no reason why the basic points we make would not also apply to the event-based approach advocated by Ludlow (1994) and Schein (1993).

[12] The literature on situations tends to take them as primitive: they are parts of worlds. For our purposes, if you want a specific model of them, something along the lines of a set of object together with a partial extension of the predicates in the language could do (as in Barwise & Perry 1983).; alternatively, they could be sets of possible worlds, as in Humberstone 1981.

Given this background, we give the following semantics to the definite description:[13]

$$[\![\text{the } (\varphi, \psi)]\!]^{f,s} = \begin{cases} \# \text{ if there is not a unique } o \text{ such that } [\![\varphi]\!]^{f,s}(o) = 1 \\ 1 \text{ if for every } o, \text{ if } [\![\varphi]\!]^{f,s}(o) = 1 \text{ then } [\![\psi]\!]^{f,s}(o) = 1 \\ 0 \text{ otherwise} \end{cases} \quad \text{(a)}$$

This entry treats 'the' as a generalized quantifier that takes two arguments of type $\langle e, t\rangle$. An essentially equivalent approach on which it is instead treated as of type e could be pursued without affecting the argument we pursue here. The relevant point is that in (a) we evaluate the restrictor φ with respect to the situation of evaluation, s, so uniqueness is relative to a situation, not a world. The idea is that this will render unwanted uniqueness presuppositions innocuous: there will still be a presupposition that there is a unique φ-thing, but that presupposition will be evaluated relative to a situation which may be arbitrarily small, making the presupposition, in turn, arbitrarily weak.

Since we will mainly deal with embeddings under generalized quantifiers we will give semantic values for some complex predicates, setting aside the compositional details of how they are formed.

$$[\![\text{man who owns a donkey}]\!]^{f,s} = \lambda x.x \text{ is a man and owns a donkey in } s \quad \text{(b)}$$

Recall that pronouns get spelled out as definite descriptions (recovering the content in some way from context). We will give the semantics of complex predicates with pronouns with their contextual material inserted as follows (assuming this predicate occurs in a context like (1) or (2)):[14]

$$[\![\text{pays taxes on it}]\!]^{f,s} = \lambda x. \begin{cases} \# \text{ if there is no unique object } o \\ \quad \text{in } s \text{ that is a donkey owned by } x \\ 1 \text{ if } x \text{ pays taxes on} \\ \quad \text{every donkey he owns in } s \\ 0 \text{ otherwise} \end{cases} \quad \text{(c)}$$

[13] In the interest of economy when we list cases with the { notation each subsequent case includes in it the proviso that all the previous cases do not hold. So for example:

$$f(x) = \begin{cases} 1 \text{ if } x \text{ is odd} \\ 2 \text{ if } x \text{ is a multiple of 3} \\ 0 \text{ if } 1 = 1 \end{cases}$$

is equivalent to

$$f(x) = \begin{cases} 1 \text{ if } x \text{ is odd} \\ 2 \text{ if } x \text{ is a even multiple of 3} \\ 0 \text{ otherwise} \end{cases}$$

We will tend to use 'otherwise' rather than '1=1', however.

[14] The details of how we get a description from context will be mainly irrelevant to our discussion. One leading account is Elbourne's NP-deletion account which we will discuss below in section 9. On this account the description in this entry would just be 'the donkey'.

This is not the only meaning 'pays taxes on it' could have but rather the meaning that situation e-type theories would give it in the context (1) or (2).

Consider now this standard entry for the generalized quantifier 'every':[15]

$$[\![\text{every}(\varphi,\psi)]\!]^{f,s} = \begin{cases} 1 \text{ if } \{o : [\![\varphi]\!]^{f,s}(o) = 1\} \subseteq \{o : [\![\psi]\!]^{f,s}(o) = 1\} \\ 0 \text{ otherwise} \end{cases} \tag{d}$$

Entry (d) in combination with our entries above for 'man who owns a donkey' and 'pays taxes on it' yields the result that (1) ('every man who owns a donkey pays taxes on it') is true in s just in case every man who owns a donkey in s owns exactly one donkey in s and pays taxes on that donkey. It follows that (1) will not be true in s if some man owns more than one donkey in s.[16] This is intuitively wrong. For (1) can be true in such situations: this intuition is especially clear if every man who owns more than one donkey pays taxes on all of them.[17]

To avoid the unwelcome uniqueness implications, Heim suggests giving a more complex definition of 'every' in which there is not just quantification over individuals but also over situations:[18]

$$[\![\text{every}(\varphi,\psi)]\!]^{f,s} = \begin{cases} 1 \text{ if for every object } o \text{ and for every minimal} \\ \quad \text{situation } m \leq s \text{ such that } [\![\varphi]\!]^{f,m}(o) = 1, \\ \quad \text{there is a situation } m',\ m \leq m' \leq s, \\ \quad \text{such that } [\![\psi]\!]^{f,m'}(o) = 1 \\ 0 \text{ otherwise} \end{cases} \tag{e}$$

Making reasonable assumptions about the structure of situations and which ones are minimal, with this entry for 'every', (1) is true in a situation s iff every man in s who owns one or more donkeys in s pays taxes on every donkey he owns. This avoids the unwanted uniqueness entailment of our first attempt: these truth conditions are consistent with some men owning more than one donkey in s. More generally, these are widely considered to be correct truth-conditions for at least one reading of (1).

Effectively what has happened is that by supplementing the objectual quantification associated with the quantifier 'every' with situational quantification, we have removed the harmful uniqueness assumption that marred our previous definition of 'every'. This move is also used by Elbourne (2005) and Büring (2004) in their development of situation semantics for donkey anaphora, so it seems an essential element in the overall situational e-type strategy.

Before moving on, we need to spell out another move needed to make the situation

[15] For simplicity, we ignore any existence presuppositions that 'every' might have in its restrictor.

[16] The present system predicts it to be false; as we discuss later, we should really treat the presupposition projection properties of 'every' in a more nuanced way to predict that the sentences are undefined in such cases, but this doesn't matter for now.

[17] Whether that is also required for the truth of (1), or whether it suffices that every man who owns a donkey pays taxes on at least one donkey he owns, is controversial; this is the difficult issue of strong versus weak readings of donkey sentences. See Heim 1990 for extensive discussion.

[18] By 'minimal situation $m \leq s$ such that $[\![\varphi]\!]^{f,m}(o) = 1$' we mean any situation m such that $[\![\varphi]\!]^{f,m}(o) = 1$, such that $m \leq s$, and such that m is minimal according to $\leq$ in the set of situations n such that $[\![\varphi]\!]^{f,n}(o) = 1$ and $n \leq s$. We will be similarly sloppy in what follows.

semantics empirically adequate. So far we have not used the assignment function f in our semantics.[19] We now will introduce a system of situational indices that quantifiers and definite descriptions interact with.[20] We assume that there are object-language situation variables. A definite description can be indexed to a situation variable; the object it picks out is then determined relative to the situation indexed. Here is the semantic entry for such an indexed definite description:

$$[\![\text{the}_i(\varphi,\psi)]\!]^{f,s} = \begin{cases} \#\text{ if is no unique object } o \\ \quad \text{such that } [\![\varphi]\!]^{f,f(i)}(o) = 1 \\ 1 \text{ if for every } o, \text{ if } [\![\varphi]\!]^{f,f(i)}(o) = 1 \\ \quad \text{then } [\![\psi]\!]^{f,s}(o) = 1 \\ 0 \text{ otherwise} \end{cases} \tag{f}$$

We then have variants of donkey pronouns that contain such indices, and which spell out in the end as indexed descriptions as follows:

$$[\![\text{pays taxes on it}_i]\!]^{f,s} = \lambda x. \begin{cases} \#\text{ if there is no unique object } o \\ \quad \text{that is a donkey owned by } x \text{ in } f(i) \\ 1 \text{ if } x \text{ pays taxes in } s \text{ on the donkey} \\ \quad \text{owned by } x \text{ in } f(i) \\ 0 \text{ otherwise} \end{cases} \tag{g}$$

To make this index sensitivity of particular use to us we will give a variant of 'every' which ensures that the matrix clause is evaluated with respect to a shifted value of a special index r as follows (as usual, $f_{r\to m}$ is the variable assignment which takes r to m and otherwise agrees everywhere with f):[21]

$$[\![\text{every}(\varphi,\psi)]\!]^{f,s} = \begin{cases} 1 \text{ if for every object } o \text{ and for every minimal} \\ \quad \text{situation } m \leq s \text{ such that } [\![\varphi]\!]^{f,m}(o) = 1, \\ \quad \text{there is a situation } m' \text{ such that } m \leq m' \leq s \\ \quad \text{and } [\![\psi]\!]^{f_{r\to m},m'}(o) \\ 0 \text{ otherwise} \end{cases} \tag{h}$$

Here are two motivations for this indexed version of 'every':[22]

i) Consider first Heim's sage-plant sentence, repeated here:

(5) Everyone who bought a sage plant bought eight others along with it.

[19] Presumably we will need some kind of λ-abstraction to deal with quantificational structures as in Heim & Kratzer (1998), but we have put aside such compositional details here.

[20] In allowing descriptions and pronouns to have situational indices we follow Heim (1990) and Büring (2004). Elbourne (2005) claims they are unnecessary, but given the arguments in Heim and Büring and the later use of them by Elbourne himself (2013), it seems their need is generally accepted.

[21] Our indexing system is rather crude and simplified. Büring (2004) gives a more sophisticated (and compositional) one.

[22] For more, see Büring (2004).

If we do not use the indexing trick here, i.e. if we do not index 'it' with a situation index shifted by the quantificational structure, then we will still not be able to get a true (non-trivial) reading of the sentence. This is because in any situation in which a man buys a sage plant (any situation that satisfies the restrictor), in order to satisfy the matrix predicate, he will have to buy eight other sage plants, but then the uniqueness condition of 'it', which will spell out as 'the sage plant he bought', will fail to be satisfied in the matrix situation. On the other hand, if we index 'the sage plant he bought' to r, then, given our semantics for 'every' and indexed 'the', we will end up evaluating it with respect to minimal situations in which a man bought one sage plant (i.e. relative to minimal restrictor situations); the uniqueness condition is then automatically satisfied.[23]

In short: we want the uniqueness of 'it' to be evaluated relative to minimal situations in which a man buys a sage plant, rather than relative to the situation in which he buys nine sage plants; indexing makes such a reading possible.

ii) Another potential reason for having situational indices is to handle examples like the following, pointed out by Büring (2004).

(9) Every man loves the woman.

If we just process the truth conditions we get using the 'every' of (e) above we would predict this to be true if every situation in which there is man can be extended to one in which there is some woman that he loves. This makes it too easy for (9) to be true. (I.e., we predict that (9) is essentially equivalent to 'Every man loves a woman'; but it is not.) This problem is easy to generalize; compare, for instance, (10) with (11):

(10) Every child has the stuffed animal.

(11) Every child has a stuffed animal.

Given (e), these are predicted to be essentially equivalent; they clearly are not. Büring uses examples like this to motivate indexing by suggesting that the only possible readings of (9) are ones where the definite is indexed to the situations introduced by the quantifier, as in (12), or else the one where it is simply indexed to some contextually relevant situation (e.g. the topic situation).

(12) Every (man, loves the$_r$ woman)

If we have this stipulation—which requires an indexed semantics for 'the' like (f)—then we explain why this sentence seems to require there to be just one woman (in the relevant topic situation): this follows because the indexed reading

[23] It's worth pausing here to note the unintuitive notion of situation necessary: every situation of buying four sage plants has four sub-situations on this view each of which is a situation which only specifies that one sage plant is bought (even though it remains consistent with more sage plants being bought in extensions of that situation). It is this sort of reason that we suggest in footnote 12 modeling situations by a set of objects and a partial extension of predicates.

in (12) will clearly never be true (since minimal 'man' situations never contain a unique woman), and so we will always interpret (9) with the definite indexed to the topic situation, which will therefore be required to contain a unique woman.

The last part of our sketch of an e-type situation semantics is a semantics for conjunction. This semantics goes beyond the received word on e-type situation semantics, which is generally silent on the treatment of conjunction. We will assume that situation semantics contains a standard treatment of conjuction: for φ and ψ to be true in a situation φ has to be true in it as well as ψ:[24]

$$[\![\varphi \text{ and } \psi]\!]^{f,s} = \begin{cases} 1 \text{ if } [\![\varphi]\!]^{f,s} = [\![\psi]\!]^{f,s} = 1 \\ 0 \text{ if } [\![\varphi]\!]^{f,s} = 0 \text{ or } [\![\psi]\!]^{f,s} = 0 \\ \# \text{ otherwise} \end{cases} \quad \text{(i)}$$

Although, again, there is no discussion of conjunction in the situational e-type literature, this is presumably because a standard entry like the one above is assumed.[25] One reason to think this is that situation e-type approaches are in some sense an attempt to respond in conservative "classical" style to dynamic semantics, and so presumably (as a default) should be coupled with classical approaches to connectives.[26] We will ultimately argue, however, that this standard entry does not work, and that, in fact, an adequate situational e-type view needs to provide a non-standard conjunction which looks much like the characteristic conjunction of dynamic semantics.

4 PRESUPPOSITION PROJECTION

In this section we will add to our sketch of situation semantics a better treatment of presupposition projection in this framework. There is not to our knowledge any developed treatment of presuppositions in quantified donkey sentences such as (1).[27] This leaves a substantial predictive lacuna for e-type situation theories, making a direct comparison with dynamic semantics difficult. In this section we will try to rectify this situation by spelling out what an empirically plausible theory of presupposition projection in a situational e-type theory needs to look like.

It is worth noting at the outset that the behavior of presuppositions that are triggered in the restrictor or nuclear scope of a quantifier is one of the most vexed topics in the presupposition literature.[28] Consider the following two sentences:

[24]The definedness conditions here are the strong Kleene conditions (but their use is not strictly relevant to the points we make below).

[25]It is striking that even the book-length treatments of situation semantics do not include lexical entries for conjunction. In this respect the explicit situation semantics in the literature are much less developed than their dynamic rivals.

[26]Though a classical approach to negation in a situation framework faces obvious obstacles. We will ignore negation here, but we should note that in our opinion there are unresolved issues concerning negation in an e-type framework.

[27]Heim (1990) explicitly puts the question aside. Elbourne (2013) devotes a chapter to presupposition projection, but the semantic system in the book does not make any predictions about the presuppositions of quantified donkey sentences, because the lexical entries for quantifiers such as 'every' (p. 26) do not specify what happens when the predicates they apply to are undefined.

[28]See, e.g. Heim (1983), Beaver (1994), Schlenker (2006), Chemla (2009), Fox (2012).

(13) a. Every student thinks his paper is brilliant.
b. Not every student thinks his paper is brilliant.

In both cases there is a presupposition trigger in the nuclear scope of the quantifier: the possessive description 'his paper', which triggers an existence presupposition.[29] The critical question is what the presupposition of the entire sentence is. The standard hypothesis, following Heim (1983), is that (13-a), and thus also its negation in (13-b), gives rise to the universal presupposition that every student has a paper. The fact that both sentences in (13) seem to communicate that each student has a paper supports this hypothesis in this case. By contrast, Beaver (1994, 2001) gives a semantics according to which both these sentences have only an existential presupposition that at least one of the students has a paper; this is *prima facie* at odds with judgments about sentences like (13-b),[30] though can be motivated on other grounds. We will follow Heim's universal tack here, which, as we will see, is essential to accounting for projection out of situations.

Since we have both quantification over situations and quantification over objects in our situation theoretic entry for 'every' in (h), we need to describe the projection behavior with respect to both of these. A natural extension of Heim's universal presupposition strategy to our semantics goes as follows:

$$[\![\text{every}(\varphi,\psi)]\!]^{f,s} = \begin{cases} \# \text{ unless for every object } o,\ [\![\varphi]\!]^{f,s}(o) \neq \# \\ \quad \text{and for every object } o, \text{ for every minimal} \\ \quad m \leq s \text{ such that } [\![\varphi]\!]^{f,m}(o) = 1,\ [\![\psi]\!]^{f_{r\to m},s}(o) \neq \# \\ 1 \text{ if for every object } o \text{ and for every minimal} \\ \quad \text{situation } m \leq s \text{ such that } [\![\varphi]\!]^{f,m}(o) = 1, \\ \quad \text{there is a situation } m',\ m \leq m' \leq s \\ \quad \text{such that } [\![\psi]\!]^{f_{r\to m},m'}(o) = 1 \\ 0 \text{ otherwise} \end{cases} \tag{j}$$

We will now give some considerations in favor of an entry along these lines.

To begin with (j) explains the infelicity of (9), repeated here, in a straightforward way, without any further stipulation.

(9) Every man loves the woman.

Let us assume that the semantic entry for 'loves the woman', is as follows:

$$[\![\text{loves the woman}]\!]^{f,s} = \lambda x. \begin{cases} \# \text{ if there is no unique woman in } s \\ 1 \text{ if } x \text{ loves a woman in } s \\ 0 \text{ otherwise} \end{cases} \tag{k}$$

Then, given (j), we can see that the entire sentence (9) is undefined when there is more than one woman in the topic situation. We cannot avoid this undefinedness by

[29] It's worth mentioning that while possessive descriptions trigger existence presuppositions, they do not seem to trigger the same kind of uniqueness presuppositions that definite descriptions do.

[30] Of course, Beaver, like anyone else, takes (13-a) to *entail* that every student has a paper.

trying to index 'the woman' with the quantifier 'every' since the restrictor situations (all man-situations) do not include any women; the only way to avoid undefinedness would be by indexing 'the woman' to the topic situation, in which case (9) will be defined just in case the topic situation includes a unique woman, matching intuitions. Büring's example (9) thus either triggers the presupposition that there is a unique woman in the topic situation, or else the obviously false presupposition that in every situation in which there is a man there is a unique woman. This explains the intuitions about Büring's case, and in a simpler way than Büring does, as it requires no stipulations about how definite descriptions can be indexed. (Dialectically, this is only a weak point in favor of the entry in (j): the point is that this entry gives a less stipulative explanation of Büring's data than Büring does. Stronger points in favor of our entry will come.)

Before proceeding, let us sum up the predictions of (j) when we have definite descriptions in the nuclear scope of 'every'. There are two salient possibilities, depending on how the definite is indexed:

– First, if we index the definite in the nuclear scope to our designated variable r, then for every object o, the presuppositions of the definite must be satisfied (relative to o) in every minimal part of the topic situation which witnesses the restrictor (relative to o).

– Second, if the definite description is unindexed (so that it gets the semantics in (a)), or is indexed to the topic situation, then the presuppositions of the definite need to be satisfied in the topic situation.

Now let us turn to the key arguments for an entry along these lines. First, this account rightly predicts that an indefinite in the restrictor will filter a definite in the nuclear scope. For instance, (14) will have no presupposition, since the presupposition of 'the$_r$ woman' will always be satisfied, since every minimal restrictor situation has exactly one woman in it:

(14) Every man who met a woman liked the$_r$ woman he met.

So far this just matches the predictions of our entry in (h). The crucial advance is our prediction that, when we don't have a restrictor which ensures that uniqueness and existence are satisfied in every minimal restrictor situation, those presuppositions must be satisfied in the topic situation. Thus consider (15):

(15) Every man liked the woman he met.

On our account, the presuppositions of 'the woman he met' cannot be satisfied if it is indexed with r, since not every man-situation contains a unique woman that man met. Assuming that the salient alternative indexing is to the topic situation, then on either a reading on which the definite is indexed to the topic situation or a reading on which it is unindexed, we predict that the existence and uniqueness presuppositions of the definite must be satisfied in the topic situation: i.e. it must be that every man met exactly one woman. By contrast, a more standard entry like that in (e) or (h) predicts that (15) has only an existence implication (that every man met at least one woman): on those

semantics, (15) will be true just in case every man met at least one woman and liked every woman he met.

That (15) triggers not just an existence presupposition (that every man met at least one woman), but also a uniqueness one (that every man met only one woman), can be seen by the infelicity of the following example:[31]

(16) Every man met one or two women. ??Every man liked the woman he met.

The infelicity of (16) is straightforwardly explained on our account, but not on an account on which the second sentence has only an existence implication.

We could also explain the infelicity of (16) by keeping Büring's hypotheses that definite descriptions must be indexed to the restrictor situations or a contextually salient one. This explanation, however, fails to explain why the examples such as (15) trigger a *presupposition* that persists when they form part of a question or a conditional, as in the following:[32]

(17) Did every man like the woman he met?

(18) If every man likes the woman he met, we should all go out together.

A presuppositional approach along the lines of the one in (j) therefore seems crucial to capture the projection of uniqueness presuppositions out of the matrix of universal quantifiers.

Before continuing, we should set aside the tempting idea that the badness of (16) should instead be explained by a competition between plural and singular definite descriptions. This is because the different forms actually differ in truth-conditions on the semantics in play. Consider the plural variation on (16) below:

(19) Every man met one or two women. Every man liked the women he met.

(19) is felicitous and (therefore) doesn't trigger a uniqueness implication. But for (19)

[31] It is worth noting that Elbourne (2013, pp. 59–64) gives a different explanation of the badness of Büring examples, suggesting that the presupposition might be impossible to accommodate, following Kripke's observations about accommodation with 'too'. However, it is easy to show that this not the (only) problem with Büring example. Here one need not accommodate any new information to make the example work if we have a our old definition of 'every', that of (e). But the examples is still infelicitous, so Elbourne's solution does not work. We can also give a Beaver-like (2001) existential presupposition to 'every' as in:

$$[\![\text{every}(\varphi,\psi)]\!]^{f,s} = \begin{cases} \# \text{ if for every object } o,\ [\![\varphi]\!]^{f,s}(o) = \# \\ \quad \text{or for every object } o, \text{ for every minimal} \\ \quad m \leq s \text{ such that } [\![\varphi]\!]^{f,m}(o) = 1,\ [\![\psi]\!]^{f_{r\to m},s}(o) = \# \\ 1 \text{ if for every object } o \text{ and for every minimal} \\ \quad \text{situation } m \leq s \text{ such that } [\![\varphi]\!]^{f,m}(o) = 1, \\ \quad \text{there is a situation } m',\ m \leq m' \leq s \\ \quad \text{such that } [\![\psi]\!]^{f_{r\to m},m'}(o) = 1 \\ 0 \text{ otherwise} \end{cases}$$

This would give (15) the very weak presupposition that some man met some woman, and so also fails to explain the data.

[32] In any case if we maintain the Büring explanation of the data nothing in our discussion will change very much.

to be true, every man must love all the women he met.[33] But were (16) to be felicitous, its truth-conditions on the relevant semantics would be existential: every man would only have to love one woman he met for it to be true. Assuming that competition between singular and plural morphology comes into play only when two variants are truth-conditionally equivalent, it follows that this cannot be the right account of the infelicity of (16).

5 PROBLEMS WITH CONJUNCTION

We have now seen that, in order to capture the projection properties of definites in the nuclear scope of 'every', we need a semantics along the lines of that in (j). But now we will show that this semantics leads to trouble when we consider donkey anaphora across conjunctions.

First, let us see how presuppositions work in an example of standard donkey anaphora. Consider an example like (1) repeated here:

(1) Every man who owns a donkey pays taxes on it.

(1) will have no presuppositions, for exactly the reason that (14) did not. That is, using our clause entry (j) for 'every' along with a donkey pronoun indexed to r, we ensure that the sentence as a whole yields no presupposition, because when we evaluate the covert definite in the nuclear scope ('it ~~[the donkey he owns]~~$_r$'), we shift the assignment of r to a minimal restrictor situation—i.e. a situation with exactly one donkey.

However, now consider the predictions our account makes about variants of (1) like (20):

(20) Every man met a woman and liked [her/the woman he met].

(20) has an indefinite and corresponding definite distributed across a left and right conjunct in its nuclear scope, rather than distributed across the restrictor and nuclear scope, as in (1). Given our semantics, however, this makes a crucial difference. Given our semantics, 'Met a woman and liked the woman he met' will have to be either defined relative to every minimal man-situation; or else relative to the topic situation. To say more about when this is so, we have to generalize our conjunction to account for undefined conjuncts; for our present arguments, we can choose any standard way to do so. Here is the standard middle Kleene approach, which we adopt for concreteness:[34]

$$[\![\varphi \text{ and } \psi]\!]^{f,s} = \begin{cases} 1 \text{ if } [\![\varphi]\!]^{f,s} = [\![\psi]\!]^{f,s} = 1 \\ 0 \text{ if } [\![\varphi]\!]^{f,s} = 0 \text{ or } [\![\varphi]\!]^{f,s} = 1 \wedge [\![\psi]\!]^{f,s} = 0 \\ \# \text{ otherwise} \end{cases} \quad \text{(l)}$$

Given this entry for 'and', and given the uniqueness presupposition of 'the', 'Met a woman and liked the woman he met' will be undefined relative to s if the object it applies to is a man who met more than one woman in s, and otherwise defined. Given (j), then,

[33] More or less; plural definites actually have rather complex truth conditions, see Križ (2015) for a recent discussion.

[34] See Beaver & Krahmer (2001), Krahmer (1998) for discussion of this style of trivalent semantics for connectives.

it follows that (20) will be defined relative to a situation *s* just in case every man in *s* met at most one woman in *s* (a reading on which the definite is unindexed or indexed to the topic situation gives us the best chance of definedness; in that case, given this assumption, every man will either make the whole conjunction false by making the left conjunct false (if he met no women), or it will make the left conjunct true and the right conjunct either true or false (if he met exactly one woman)). So (20) is only defined if relative to a topic situation in which every man met at most one woman.

This means that we predict that (20) has the same uniqueness presuppositions as (15), repeated here:

(15) Every man liked the woman he met.

This is a bad prediction. While (15) presupposes that every man met at most one woman,[35] (20) does not. One way to see this is to contrast these two cases:

(21) a. Every man met one or two woman, and liked at least one of them. So every man met a woman and liked [her/the woman he met].
b. Every man met one or two woman, and liked at least one of them. ?? So every man liked the woman he met.

The best explanation of this contrast is that (15) (repeated in (21-b)) has a uniqueness presupposition that (20) (repeated in (21-a)) lacks. This obviously provides an explanation of the contrast. An argument that it is the correct explanation comes from the fact that we observe a parallal contrast when both sentences are embedded under negation:

(22) a. Every man met one or two woman, and some men disliked all the women he met. So not every man met a woman and liked [her/the woman he met].
b. Every man met one or two woman, and some men disliked all the women he met. ?? So not every man liked the woman he met.

This is, of course, immediately explained if what accounts for the infelicity of (21-b) and (22-b) is a uniqueness presupposition, which will project through negation, and which is lacking in (21-a) and (22-a). We get similar contrasts when we embed (15) in the antecedents of conditionals, attitude contexts, and questions; to put just one more example on the table, note the parallel contrast in (23):

(23) a. (i) Every man met one or two woman. (ii) Well, did every man meet a woman and like [her/the woman he met]?
b. (ii) Every man met one or two woman. (ii) ?? Well, did every man like the woman he met?

We have focused so far on donkey conjunctions in the nuclear scope of quantifiers, but we can make a similar point with such conjunctions in the restrictor:

[35] It also presupposes that every men met at least one woman, but this doesn't matter for our present argument.

(24) [Situation: all farmers are men, every farmer is a donkey-owner] Every farmer who cares for the donkey he owns is happy.

(25) Every farmer who owns a donkey and cares for [it/the donkey] is happy.

Again, while (24) has a clear uniqueness implication, (25) does not, contrary to the predictions of our account.

In short: the tools developed in the last section to correctly predict presupposition projection for definite descriptions under quantifiers overgenerate presuppositions when it comes to donkey conjunctions under quantifiers.

Before moving on, let us address a possible objection to this account.[36] We have assumed that our key example (20), repeated here, has its superficial scope structure at LF—that is, it has the schematic form in (26):

(20) Every man met a woman and liked [her/the woman he met].

(26) $\text{Every}_x[\text{man}(x)][(x \text{ met a woman}) \text{ and } (x \text{ liked } [\text{her/the woman } x \text{ met}])]$.

Crucially here, the indefinite 'a woman' takes scope below the conjunction. What if instead we parse (20) with an indefinite which takes scope over the conjunction, and then treat 'her/the woman he met' as simple bound variables, as in (27)?

(27) $\text{Every}_x[\text{man}(x)][\text{a}_y(\text{woman}(y))((x \text{ met } y) \text{ and } (x \text{ liked } y)]$.

Not all situation e-type theorists are happy to say that some pronouns/definites are really just ordinary bound variables. But could such a commitment allow these theories to avoid the present problem, provided we couple them with a claim that indefinites always take wide scope over conjunctions?

This parse does indeed avoid our objection in the present case. But in other cases it won't work. Consider a sentence like (28):

(28) Always when exactly three farmers pet a pig they co-own and they kiss it, they are all happy.

(28) does not have a uniqueness implication (it can be true even if in some cases, exactly three farmers pet two pigs they co-own and kiss both). To extend the present response to (28), we would have to say that the indefinite takes high scope over the conjunction, and thus over 'exactly three farmers' (which must stay *in situ* in the left conjunct if we are to get the right truth conditions). But this would involve moving 'a pig' out while leaving 'they co-own' *in situ* (since 'they' is bound by 'exactly three farmers'), a kind of stranding that is not to our knowledge attested.

A similar point can be made concerning indefinites in the scope of intensional verbs, as in (29):

(29) Every officer asked for a donkey and brought [it/the donkey] to the fair.

(29) can be true even if some officers did not ask for any particular donkey, but instead simply demanded that some donkey or other be provided for them. But on a high-scope

[36] Thanks to X for this objection and subsequent discussion.

reading of the indefinite, (29) would get the parse in (30):

(30) $\text{Every}_x(\text{officer}(x))(\text{a}_y)(\text{donkey}(y))(x \text{ asked for } y \text{ and brought } y \text{ to the fair})$

On this parse, (29) would only be true if every officer demanded some particular donkey. So, on the most natural reading, the indefinite must take low scope. However, there is no uniqueness implication of (29): (29) could be true even if some officer asked for several donkeys and brought them to the fair.[37]

A final point to make here is that the suggested scopal configuration, in which an indefinite apparently embedded in a left conjunct takes scope over the entire conjunction, is not to our knowledge independently attested. Compare for instance (31) and (32):

(31) A donkey came in and it sat down.

(32) What came in and it sat down?

On the present line, we would have to maintain that 'a donkey' can take scope over the whole conjunction in (31), while 'who' cannot take scope over the whole conjunction in (32). While 'a' does have well-known scope properties that distinguish it from other quantifiers, we know of no independent evidence that it can scope out of a conjunction as this line of response would require.

So this line of response to our arguments does not strike us as very compelling.

6 PSUEDO-DYNAMIC CONJUNCTION

A different response to our puzzle would be to revise the definition of conjunction in the e-type theory. Like a dynamic conjunction, this revised conjunction would allow the interpretation of the second conjunct to be affected by the first conjunct in a non-pragmatic way. The way to do this is to give a treatment of 'φ and ψ' according to which when we evaluate ψ we have a dedicated index p that picks out a minimal situation in which φ is true:

$$[\![\varphi \text{ and } \psi]\!]^{f,s} = \begin{cases} 1 \text{ if there is a minimal situation } m \leq s \\ \quad \text{such that } [\![\varphi]\!]^{f,m} = 1 \text{ and } [\![\psi]\!]^{f_{p\to m},s} = 1 \\ 0 \text{ if } [\![\varphi]\!]^{f,s} = 0 \text{ or there is a minimal situation } m \leq s \\ \quad \text{such that } [\![\varphi]\!]^{f,m} = 1, \text{ and } [\![\psi]\!]^{f_{p\to m},s} = 0 \\ \# \text{ otherwise} \end{cases} \tag{m}$$

Using this conjunction, by indexing 'the' to p, we will end up evaluating the definite description in the second conjunct relative to a minimal witness situation making the first conjunct true. We thus essentially predict the possibility of dynamic binding across conjunctions; uniqueness presuppositions will fail to project from conjunctions of the form 'a φ and the$(\varphi)(\psi)$'.

[37] It should be noted that it is not altogether straightforward how to deal with sentences like (29) (in which a pronoun or definite is given its antecedent by an indefinite in the scope of an intensional verb) in dynamic frameworks. This does not, however, undermine the dialectical force of the present point.

If we do this, though, we seem to be simply recreating the dynamic treatment of the logical connectives in a situation-theoretic framework.[38] An important dialectical point to note here is that the dynamic conjunction in (m) is *not* motivated by independent properties of presupposition projection, beyond the specific behavior of definites and pronouns. If situation semanticists could argue that we need something like (m) for reasons quite independent of definites and pronouns, this might soften the blow of the present point: the idea would be that, once we fix up our connectives to deal with the properties of presupposition projection in general, the behavior of definites and pronouns follows. This would still bring situation semantics closer to dynamic semantics than it has ever explicitly been presented as being. But the entry for conjunction would at least not be tailor-made to deal with the data we've presented here. This approach, however, won't work. The behavior of presupposition projection in general might merit adopting a middle or strong Kleene semantics for 'and' like that given in (l), or nearby variants. But we have already seen that that conjunction, which we were already assuming above, does not help with our problems. The key move in (m) is not the middle Kleene system underlying it, but rather the possibility of indexing the right conjunct to a minimal left-conjunct situation, something which is not, as far as we can tell, either motivated by, or helpful in dealing with, the behavior of presupposition projection in general, beyond definites. If we want to account for uniqueness presuppositions in situation semantics, we need something like the much more thoroughly, and *ad hoc*, dynamic conjunction above, which must be motivated on the specific basis of the behavior of pronouns and definites, not general considerations about presupposition projection. By contrast, the dynamic conjunction characteristic of dynamic semantics simultaneously accounts for presupposition projection and binding across conjunctions, and can be independently motivated on the basis of each.

7 DYNAMIC ACCOUNT

The standard dynamic account of Heim (1982) does not have any trouble with the examples discussed in the previous section. For in dynamic semantics pronouns and definite descriptions can be bound across conjunctions and, thus bound, they do not lead to any presuppositions. Donkey conjunctions in the scope of quantifiers will thus not project presuppositions of any kind. Indeed, the possibility of binding across conjunctive configurations like 'A man$_i$ walked in and he$_i$ bought a drink' is a hallmark of dynamic semantics. For example, in dynamic semantics the pronoun/definite description in (20) does not lead to any presuppositions as it is bound by the indefinite. By contrast, an example like (15) does have a presupposition: it requires the context to make available a discourse referent for the definite description 'the woman he met'.

This leaves open the further question of why the latter requirement leads to the uniqueness presupposition we observe in (15). One option would be to follow Heim (1982, ch. 3), who proposes that when there are definite descriptions that are not antecedently familiar (i.e. are not bound to a discourse referent already introduced in

[38] Our point here is related to the argument in Dekker (1997). Dekker, who looks only at examples with adverbs of quantification, argues that situation semantics can only reproduce the success of dynamic semantics by mimicking it very closely. He also argue that such mimicking makes the system unappealing for fans of situations.

the conversation), they need to be accommodated. Heim notes that the process might require some non-trivial constraints. Later, Roberts (2003) proposed that unbound definite descriptions which must be accommodated give rise to uniqueness implications. There is some question of *why* this would be so, which may be challenging to answer. A different approach, following Schwarz (2009), would be to argue that there are two kind of definite descriptions in natural language, one of which is the dynamic 'the', the other of which is the classical Frege/Russell 'the'; and that "unfamiliar" definites are always interpreted in the latter way, accounting for their uniqueness implications. We won't try to decide between these options here; this is a paper mainly about situation semantics, not dynamic semantics. What is crucial is that dynamic semantics predicts a *semantic contrast* between (15) and (20), where e-type accounts predict no contrast at all, and thus that dynamic semantics has a far better chance of providing a principled explanation of the contrast.

One might wonder at this juncture whether e-type theories could also get some mileage out of a Schwarzian response, maintaining that there are two kinds of definite descriptions. But it's hard to see how to spell out this idea in a way which deals with the present issue. Without getting into too much detail, the problem is simply that, as far as we can tell, situation semantics does not predict any structural contrast between (15) and (20) which could provide a foundation for a principled explanation of why we use one kind of definite in one case and a different kind in the other.

8 INTERIM SUMMARY

The dialectic so far is somewhat tortuous, so let us briefly summarize where things stand:

- Situation e-type approaches generally say nothing about presupposition projection out of quantifiers.
- We must say something, though—partly just to have a well-developed theory, and partly to account for the uniqueness presupposition which results when a definite is in the nuclear scope of a quantifier and there is no corresponding indefinite in the restrictor.
- We gave a semantics for 'every' which accounts for these data.
- That semantics, however, overgenerates in the case of donkey conjunctions under quantifiers, wrongly predicting uniqueness presuppositions.
- We can avoid these problems by augmenting situation semantics with a pseudo-dynamic conjunction, but (i) that conjunction is tailor-made to solve the present issue; and (ii) the result ends up bringing situation semantics much closer to dynamic semantics.
- Dynamic semantics does not have these problems.

One weak point of our argument, as this presentation makes clear, is that we did not show that our semantics for 'every' is the *only* way to account for the uniqueness presuppositions in question. We cannot show this decisively. But it is hard for us to see

how we could account for these otherwise than with something very much like what we have proposed. Given that, we take our argument to show that, if situation e-type approaches are to capture both (i) the projection of uniqueness for definites under quantifiers and (ii) the failure of projection of weakness for donkey conjunctions under quantifiers, they must adopt the pseudo-dynamic conjunction sketched here.

9 COMPARISON WITH DYNAMIC SEMANTICS

The lesson of the paper so far is a conditional one. *If* situation e-type semantics is to capture the data we have presented here, it must adopt a dynamic 'and', one very much like the 'and' advocated from the start in dynamic semantics, but never to our knowledge advocated in situation semantics (call this a 'dynamic situation semantics').

Some may take this to be the end of the line for situation semantics. First: the whole point of situation semantics was to capture the dynamics of anaphora without encoding those dynamics semantically. The idea was that we could account for anaphora in a more parsimonious, and fully classical, semantic framework than dynamic semantics offers. Our dynamic situation semantics obviously abandons this ambition.

A second worry with this approach is that the pseudo-dynamic 'and' is hopelessly *ad hoc*.

A final worry is that it may look as though the dynamic situation semantics we have given here just *is* dynamic semantics. If we have shown that the only viable version of situation semantics is equivalent to dynamic semantics, then there would indeed be nothing more to say in its favor.

The first and second of these reactions strike us as worth taking seriously. We will leave it to readers to decide how decisive these worries are for situation semantics.

But the third reaction is too quick. The dynamic situation semantics we've sketched is very close to dynamic semantics, but is *not* exactly equivalent to dynamic semantics. It differs from dynamic semantics in two important ways: first, situation semantics uses a licensing principle of some kind (like NP-deletion) to spell out pronouns, instead of spelling them out as indexed variables as in dynamic semantics. Second, in situation semantics, definites presuppose uniqueness; apparent counterexamples are explained away by using suitably small situations. By contrast, in dynamic semantics, definites requires familiarity, not uniqueness. In this section, we will discuss a few areas where these differences matter.

9.1 THE FORMAL LINK

The first difference we'll focus on between our dynamic situation e-type semantics (henceforth just 'situation semantics', but we have in mind in particular the dynamic variant developed above) and dynamic semantics is in how pronouns and (in)definites are spelled out. In dynamic semantics, of course, these are all just variables (in the case of definites, variables together with certain definedness conditions). By contrast, in situation semantics, pronouns are spelled out as definite descriptions, which have classical uniqueness presuppositions which must be satisfied in minimal situations. Each of these approaches has more flexibility in some respects than the other. We will argue that the flexibility of situation semantics leads to problematic overgeneration.

It's well known that some licensing requirement on how we spell out pronouns in situation semantics is needed (this is known in the literature as 'the problem of the formal link'). The motivation for this is minimal pairs like Elbourne (2005)'s (33):

(33) a. Someone who has a guitar should bring it.
b. ??Someone who is a guitarist should bring it.

According to situation semantics, we interpret the 'it' in (33-a) as 'the guitar', getting us the intended interpretation. The puzzle is why we can't also spell out the 'it' in (33-b) as 'the guitar', rendering them both equivalent (and equally felicitous). Dynamic semantics, of course, has no parallel problem, since standard dynamic systems immediately predict the contrast between (33-a) and (33-b): only the former contains an indefinite to license the use of the pronoun 'it'.

There are different proposed solutions to the problem of the formal link. We cannot address all of them here, nor show that there is no possible solution to this problem. But we will argue that two popular solutions to this problem do not work at all; we'll discuss in particular Elbourne's attractively simple NP-deletion proposal, and a slightly more complex proposal of Heim. On Elbourne's theory, 'it' is always interpreted as 'The NP', where 'NP' is a noun phrase that, in the absence of sufficient deictic contextual information, *must have a linguistic antecedent*—i.e. that is copied from preceding linguistic material. This accounts for the contrast between (33-a) and (33-b): in the former case, 'it' can be spelled out as 'the guitar', since 'the guitar' appears in the preceding linguistic material; not so in the latter case. And what is nice about this approach is that NP-deletion is, of course, already an attested phenomenon in natural language, as in (34):

(34) I have a guitar, and John has one ~~[guitar]~~ too.

So Elbourne's account reduces the problem of the formal link to an independently attested phenomenon, making it an admirably simple and testable account.

But an NP-deletion account of the formal link does not seem empirically adequate to us. Consider Partee's famous marble example:

(35) a. I dropped ten marbles and found all of them, except for one. It is probably under the sofa.
b. I dropped ten marbles and found only nine of them. ?? It is probably under the sofa.

According to an NP-deletion story, (35-a) will be acceptable because the 'it' will be spelled out as 'the marble', picking up 'marble' from the previous sentence. But what can account for the infelicity of (35-b)? The previous sentence is truth-conditionally equivalent to the first sentence in (35-a). And, crucially (unlike in (33)), an appropriate antecedent NP *is* accessible in (35-b), namely, once more, 'marble'. So why can't we interpret the 'it' in (35-b) as 'the marble', rendering it felicitous, and equivalent to (35-a)?

One possible response here is that there is something independently wrong with (35-b), even given the appropriate spell-out. An argument for this comes from the observation that (36) still sounds quite weird:

(36) I dropped ten marbles and found only nine of them. ? The marble is probably under the sofa.

But the question is *why* this is so. One should not be tempted by the thought that situation semantics can account for the contrast in (35) just because there is a parallel contrast between (35-a) and (36): again, *both* situation semantics and dynamic semantics assimilate pronouns and definites; but dynamic semantics has an account of these contrasts,[39] while the situation semantics, together with an NP-deletion account of the formal link, does not seem to be able to.

We can easily multiply cases like this, and further refine our argument that something goes wrong with the NP-link story. Consider (37):

(37) a. John doesn't have a baby. But Theo has a baby, so Theo brought it to John's house to show everyone.
b. John doesn't have a baby. But Theo is a new father, so ?? Theo brought it to John's house to show everyone.

The issue for the NP-deletion story is that the first sentence in each of (37-a) and (37-b) contains the noun 'baby'. In (37-a) (according to that story) we use 'baby' from the first part of the second sentence as the anteceddent for 'it', giving us the intended reading of (37-a). So why, in (37-b), can't we use the 'baby' from the *first* sentence as a linguistic antecedent which will allow us to spell out the 'it' in the second sentence as 'the baby'? I.e. why can't we interpret (37-b) so it is equivalent to (38), which in turn should be equivalent to (39)?

(38) John doesn't have a baby. ? But Theo is a new father, so Theo brought the baby to John's house to show everyone.

(39) John doesn't have a baby. But Theo has a baby, so Theo brought the baby to John's house to show everyone.

From the point of view of dynamic semantics, the contrast between (37-a) and (37-b) is, of course, straightforward to explain. Dynamic semantics can likewise explain why (39) is completely acceptable, and why (38) is marginally better than (37-b) (while we have to accommodate a definite ('the baby'), there is enough descriptive material in the definite that we can do so with relative ease; whereas in (37-b) we have to accommodate a pronoun ('it') but we lack any descriptive material to help us do that.). By contrast, it looks like the NP-deletion story doesn't have much to say about how to distinguish these sentences: on that story, there should be a prominent parse of (37-b) on which it is equivalent to (37-a), (38), and (39).

A possible response on behalf of an NP-deletion story is that 'a baby' in the first sentence of (37-b) is just too far away from the 'it' in the last sentence of (37-b) to license NP-deletion. It is obviously true that, in general, the linguistic anaphor for NP-deletion needs to be relatively close to the deleted material. But in this case, such a response won't

[39]The basic idea is simple: 'except for one' introduces a discourse referent which can be picked up by the subsequent 'it' or definite. To spell this out, we would of course need to say more about the semantics of 'except'.

work, because the NP-deletion theory has to say that 'a baby' *can* license NP-deletion across a distance like this in some cases, as the minimal variant in (40) shows:

(40) John has a baby. And Theo loves babies, so John brought it to Theo's house to show him.

Given an NP-deletion account of the formal link, we can only account for the felicity of (40) if the 'it' in the second sentence is spelled out as 'the baby'. But then the 'it' gets its linguistic anaphor from across exactly the same distance as it would have to in (37-b), meaning that we cannot rule out the relevant parse in (37-b) on the basis of distance alone.

A different possible response would be that the problem is not the distance *per se*, but the fact that the antecedent in our key (37-b) is in particular embedded under a negation. If NP-deletion were generally impossible when the antecedent is under a negation, this would give Elbourne a straightforward response (it would leave open the question why NP-deletion is impossible in such an environment, but this would be a question for everyone). The problem is that NP-deletion is *not* generally impossible when the antecedent is under negation. Consider (41):

(41) John doesn't have a baby. But Theo has one ~~[baby]~~.

A final response would combine the last two, claiming that NP-deletion is not possible in general when the antecedent is under a negation *and* a sentence intervenes. But, once more, we can show that this is false with examples like (42):

(42) John doesn't have a baby. But Theo is totally overwhelmed, because he does have one ~~[baby]~~.

Here NP-deletion clearly *is* possible, with the antecedent under a negation and separated from the deleted material by an intervening sentence. So the present response is not promising. We think that examples like this show that an NP-deletion story doesn't work.

We also think that the formal link story spelled out in Heim 1990, based on stories in Evans 1977*a*, Parsons 1978, won't work either. Heim's story *can* account for the infelicity of (37-b). It requires the material copied from an antecedent NP to be of the form ⌜NP S⌝, so that (37-b) would be spelled out as (43) or (44), both of which are absurd on truth-conditional grounds:

(43) John doesn't have a baby. But Theo is a new father, so ?? Theo brought *the baby John has* to John's house to show everyone.

(44) John doesn't have a baby. But Theo is a new father, so ?? Theo brought *the baby John doesn't have* to John's house to show everyone.

But a parallel problem can be spelled out in Heim's framework on the basis of sentences like (45):

(45) John has a baby and loves the baby. ?? Theo is a new father too, so Theo brought it to John's house to show everyone.

In Heim's framework, as far as we can tell, we should be able to spell out the 'it' in (45) as *the baby* (thanks to Heim's rule that 'If the antecedent is definite (i.e., a name, pronoun, demonstrative or definite description), the pronoun is replaced by a copy of the antecedent'). Then (45) should be interpreted as (46):

(46) John has a baby and loves the baby. Theo has a baby too, so Theo brought the baby to John's house to show everyone.

Once more, we cannot argue that the 'it' in (45) is simply too far from its antecedent, since examples like (47) show that there is no problem in general licensing anaphora across this kind of distance: in (47), the 'it' must have 'the baby' as its antecedent.

(47) John has a baby and loves the baby. Theo likes babies too, so John brought it to Theo's house to show him.

We cannot argue that there is no solution to the formal link. What we can say at this point is that the most prominent approaches do not work. This is at least suggestive that the formal link is a problem which it is better not to have in the first place.

9.2 MINIMALITY AND NUMBER

As we discussed above, e-type theories have a well-known *prima facie* problem with uniqueness. If 'the φ' or 'it ~~[the φ]~~' presupposes there is a unique φ, then what do we make of sentences like Heim's (48)?

(48) Everyone who bought a sage plant bought eight others along with it.

The issue, again, is that we could not possibly accept (48) together with a presupposition that everyone who bought a sage plant bought a unique sage plant.

This problem initially led Heim and others to reject the e-type approach. But, as we discussed above, later work showed that e-type theories have the resources to deal with this problem by working with an ontology of *minimal situations*. The thought is that the uniqueness presupposition of a definite 'the φ' (and therefore also of a pronoun) must be satisfied, but it can be satisfied by a *minimal* situation—one in which we are essentially ignoring all the other φ things there are. So (48) ends up meaning: 'Every minimal situation x in which someone bought a [single] sage plant can be expanded into a situation y in which that person bought eight others along with *the unique sage plant in x'*.

So far so good. But this move to minimal situations creates a problem which to our knowledge hasn't been observed. Consider the following:

(49) ??Usually when one or more dogs is in the house, the dog slobbers all over me.

(49) sounds quite weird. But, because of its reliance on minimal situations, (49) is predicted by e-type theories to be semantically equivalent to (50):

(50) Usually when a dog is in the house, the dog slobbers all over me.

This is because according to e-type theories, when we evaluate (49), we only care about

minimal situations that contain one or more dog. But any such situation will of course contain just one dog. And those are just the situations that matter for the evaluation of (50). So what could explain the intuition that there is something off about (49)?

One possibility is that, even though (49) and (50) are indeed semantically equivalent, there is some mismatch between the number features on the NP in the restrictor of (49) ('dogs') as compared with the definite in the consequent ('the dog'). This mismatch would have to be syntactically driven, since, again, these two sentences are predicted to be semantically equivalent. Maybe there is a story to tell here, but we don't know of one.

Dynamic semantics, of course, has no problems along these lines, because dynamic semantics eschews uniqueness altogether, and so does not need to say anything about minimality: according to dynamic semantics, 'one or more' does not introduce a singular discourse referent (we won't get into what exactly dynamic semantics *should* say about this contrast, which is not an easy question; our point is just that dynamic semantics is not locked into treating these as equivalent).

9.3 OTHER POINTS OF COMPARISON

This does not exhaust the possible comparisons between dynamic situation e-type semantics and dynamic semantics. The most important two missing points of comparison are, first, the problem of *indistinguishable participants*: the question of whether and how situation semantics can account for sentences like (51).

(51) When a bishop meets a bishop, he blesses him.

The second point of comparison is how dynamic semantics can account for *paycheck pronouns* like Karttunen (1969)'s (52):

(52) The man who gave the paycheck to his wife was wiser than the man who gave it to his mistress.

E-type theories have no trouble accounting for the salient interpretation of (52); dynamic theories struggle to do so.

For reasons of space—and because we don't have much new to say here—we will not get into either of these problems. Let us note briefly, however, that while Elbourne (2005) argues that the constraints of situation semantics in handling indistinguishable participants are actually welcome, subsequent work (CITATION NEEDED) has undermined these arguments.

10 CONCLUSION

Thus, even once we adopt a dynamic conjunction in a situation framework, there are still important differences between situation semantics and dynamic semantics. We have given some reason to think that at least some of these differences favor dynamic semantics: the latter avoids two problems for the former, the well-known problem of the formal link, and the less known problem of minimality and number. But our deeper goal here is not to argue conclusively against a situation semantics approach to donkey anaphora, but rather to get clearer on what that approach must look like. We have addressed two issues which have remained in the background in the situation

literature: first, the question of how presuppositions project out of quantifiers in situation semantics; second, the (closely related) question of what conjunction should look like in situation semantics. We have argued that, given a defensible answer to the first question, situation semantics must adopt a conjunction which is strikingly similar to the sequential-update conjunction characteristic of dynamic semantics. This means that, as far as their treatment of connectives goes, situation semantics and dynamic semantics are much closer than has previously been recognized. It also means that there is no major extant theory of anaphora which can maintain a classical approach to conjunction.

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