Descriptions, Pronouns, and Uniqueness

Karen S. Lewis

Forthcoming in *Linguistics & Philosophy*

1 The problem of unbound anaphora

My central concern in this paper is singular discourse anaphora on indefinite antecedents. By *discourse anaphora*, I mean that the anaphoric pronoun (or definite description) occurs in a different sentence from its antecedent. For example:

(1) a. A student came to Fred's office hours.
b. She asked some questions about the upcoming assignment.

(1) is intuitively interpreted as a discourse about a single individual — the anaphoric pronoun 'she' seems to pick out the same individual as 'a student (who came to Fred's office hours)'. The problem is, our best semantics tells us that 'a student' is not a referring expression, and since 'a student' doesn't refer to a particular object, 'she' cannot refer to the same object.[1] In other ways, one might want to say that (1) is like *bound* anaphora, since whatever satisfies the existential in the first sentence also satisfies the pronoun in the second, just as 'her' co-varies with the values for 'little girl' in *Every little girl adores her first chemistry kit*. But we cannot understand 'she' as syntactically bound by 'a student', since it is outside of its syntactic scope.

[1] I will treat indefinites in the classical way — as existential quantifiers. An anonymous reviewer suggested that if indefinites are treated as *singleton indefinites*, i.e., existential quantifiers whose domain is restricted to a single object, pronouns could be treated referentially while maintaining that indefinites are not referential terms. I do not think it is plausible for all indefinites that license anaphoric pronouns to be treated as singleton indefinites because this gets the truth conditions wrong, and because there are in general insufficient contextual grounds for determining a singleton extension. These are the similar to the considerations I raise against traditional d-type theory's treatment of pronouns in §2.1.2 and §2.1.3 below.

The two main kinds of solutions to this problem are d-type theory[2] and dynamic semantics (here broadly construed to include Discourse Representation Theory). D-type theory treats pronouns as going proxy for definite descriptions, and then gives a (neo)classical (Fregean or Russellian) account of the semantics of definite descriptions. For example, 'she' in (1b) goes proxy for a description like 'the student who came to Fred's office hours'. Since classical semantics for descriptions come with a uniqueness requirement (where "requirement" is neutral between presupposition and entailment), d-type theorists take very seriously the intuition that there is a single individual under discussion in discourses like (1) — the semantics in fact requires that there is a unique individual that bears witness to the anaphoric sentence.[3]

Dynamic semantics, on the other hand, refines the classical notion of semantics, in part motivated by cases like these. The central semantic notion is not truth conditions but *context change potential*. That is, semantic contents are rules for updating the context. Furthermore, a context typically tracks not only informational content (the common ground), but *discourse information*, like the set of discourse referents modeling the objects under discussion. Discourse referents are not individuals, but stand-ins for individuals. They are a way of making as if to talk about a single object; in other words, a way of marking that certain information must be satisfied by a single witness, even though the semantic content of the discourse leaves it open as to which object in the world is the witness. They are often likened to a peg or address with which to associate predicates that belong together according to the discourse. On a typical dynamic semantics, pronouns as well as definite descriptions presuppose that there is a *familiar* discourse referent in the context (while indefinites presuppose *novelty* of discourse referent). Informally, the dynamic treatment of (1) can be glossed as follows. (1a) introduces a novel discourse referent, represented by an index like *1*, with the information that *1* is a student and *1* came to Fred's office hours. (1b) then updates that discourse referent with the information that *1* asked some questions about the upcoming assignment. More formally, this is generally captured in one of two ways. If the indefinite is treated quantificationally (e.g. Groenendijk & Stokhof (1991)'s Dynamic Predicate Logic), it semantically binds the pronoun by placing constraints on possible assignment functions. For example, assuming the relevant variable in the formalization of (1) is x, the output of (1a) is that all the assignment functions assign x to an individual who is a student who came to Fred's office hours (in fact, they output all such possible assignment functions given the input assignment functions). The pronoun is then treated as a variable that is sensitive to these

[2]I'm following Neale (1990) in this terminology. It is also often called e-type theory.

[3]See for example Evans (1977), Cooper (1979), Davies (1981), Heim (1990), Neale (1990), Elbourne (2005, 2013).

assignment functions, and places further constraints on them (i.e. after the interpretation of (1b), they must also assign x to an individual who asked some questions about the upcoming assignment). In Discourse Representation Theory (e.g. Kamp & Reyle (1993)) and File Change Semantics (e.g. Heim (1982)), discourse referents are also modeled as constraints on assignment functions, but indefinite descriptions, definite descriptions, and pronouns are all treated as variables. The existential force comes from what it takes for a discourse or a context to be true (namely that there is at least one assignment function that satisfies all the conditions). On either type of theory, since definites comes with a familiarity rather than uniqueness presupposition, unlike the d-type theory, the truth conditions of a discourse like (1) are merely existential.[4] Most dynamic semantic theories also take definite descriptions to have the same semantics as pronouns; definite descriptions are generally treated as variables with a familiarity presupposition. What is distinctive of a d-type theory is not that it gives pronouns and definite descriptions the same semantics, but that it gives pronouns the semantics of a classic, static definite description, and perhaps also that it takes the classic semantics for definite descriptions and extends it to pronouns whereas dynamic semantics does the opposite.

Thus a theory of discourse anaphora is not only of intrinsic interest, but is bound up in at least two bigger picture issues: the semantics of definite descriptions and the debate between dynamic and static semantics. Discourse anaphora has not been the central concern of recent, popular d-type theories, with the focus being rather on the intra-sentential cases of unbound anaphora (which I will explain shortly).[5] Looking at these cases of discourse anaphora that have largely been recently ignored reveals problems for existing versions of d-type theory. My focus in this paper is on *the best way to be a d-type theorist* in light of these considerations. I am not arguing against competing dynamic semantics theories, though I make some arguments against them where relevant, and occasionally indicate where I think the theory argued for has an advantage over dynamic semantics. I do not, however, purport to have fully argued that the view in this paper is better than the dynamic semantic alternatives. When considering d-type theory, I consider it as a static alternative, as it has been traditionally conceived, i.e. as a static solution to the problem of unbound anaphora. I will argue that the best implementation of a (static) d-type theory is one that is

[4]See, for example, in addition to the citations in this paragraph: Kamp (1981), Muskens (1991), Chierchia (1995), Groenendijk et al. (1996), Beaver (2001).

[5]Though it does feature in, for example, Evans (1977) and Neale (1990), it is entirely absent from Heim (1990) and the most well-developed recent view, that of Elbourne (2005), which does not contain a single example of this sort of discourse anaphora (nor is there one in his book on descriptions, Elbourne (2013)).

integrated with a dynamic pragmatics. While I think this is the right way to go, arguing for this is beyond the scope of this paper. So a reader might construe some of my arguments as naturally leading to the conclusion that the best way to be a d-type theorist (and perhaps the best way to account for anaphora, period) is to be a dynamic d-type theorist. I return to this issue in the conclusion.

I will argue that for d-type theory to be viable, it has to incorporate discourse referents in the view. This takes seriously the intuition that speakers are *making as if* there is a single object under discussion in discourse like (1) without going as far as existing d-type theories do in requiring there to actually be a unique object. I will argue for an ambiguity theory of definite descriptions in which both anaphoric and non-anaphoric definite descriptions are treated as restricted existential quantifiers, but while non-anaphoric definite descriptions presuppose ordinary worldly uniqueness, anaphoric definites presuppose discourse uniqueness, namely uniqueness of discourse referent rather than referent in the world.[6] The ambiguity view accounts for what I will argue is a truth-conditional difference between anaphoric and non-anaphoric definites that existing views (both d-type and dynamic) cannot account for; it is further supported by cross-linguistic evidence. I implement the view in a static semantics that employs quantifier domain restriction in the style of Stanley & Szabo (2000). Thus one thing this paper does is show how a dynamic pragmatics that tracks discourse referents can be fruitfully combined with a static d-type theory, with the quantifier domain restriction being the locus of the interaction between the pragmatics and the semantics.

§2 argues that the uniqueness requirement in standard d-type theory is too strong for anaphoric definites, but is correct for non-anaphoric definites. It also introduces the concept of discourse uniqueness. In §3, I turn to the positive semantic and pragmatic proposal. In brief, I argue that discourse referents restrict the domain of anaphoric definites (treated as existential quantifiers) in two ways: they provide the descriptive information for the domain restriction in the semantics and they work as pragmatic pseudo-singular domain restrictors. I argue that non-anaphoric definites are singleton existentials, that is, (when felicitous) their domain always has a cardinality of one. In §4 I turn to the formal implementation of discourse anaphora, further extending the theory to account for *bridging definites* such as (2) and *donkey sentences* (the intra-sentential cases) such as (3) and (4):

(2) a. Fred tried a new restaurant last night.
b. The salmon was divine.

[6] I use "anaphoric definites" as a term that includes both anaphoric pronouns and anaphoric definite descriptions.

(3) Every farmer who owns a donkey vaccinates it.

(4) If a farmer owns a donkey, he vaccinates it.

In §5 I address some objections and show how the theory can account for pronouns without antecedents, pronominal contradiction and other cases involving false information, licensing predictions, and weak definites. I conclude with some brief thoughts about the relationship between the d-type account in this paper and dynamic semantics.

2 Uniqueness in definites

2.1 The problem of non-uniqueness in anaphoric definites

As mentioned in the previous section, d-type theories of pronouns treat pronouns as going proxy for definite descriptions. For example, the pronoun in (1) is treated as having the same semantics as 'the student who came to Fred's office hours' (or simply 'the student', in the case of Elbourne (2005, 2013)). The definite description is then treated in either the Russellian (e.g. Neale (1990)) or Fregean tradition (e.g. Heim (1990), Elbourne (2005, 2013)). While exact treatments differ, a Russellian semantics treats 'The F' as a quantifier; a sentence 'The F is G' is true iff there is an F, there is at most one F, and whatever is F is G. On the other hand, for Fregeans, 'The F' presupposes that there is exactly one F and refers to the unique individual that satisfies the description. Different d-type theories differ as to whether pronouns are like definite descriptions at the level of syntax or merely at the level of semantics, and how the descriptive material is recovered, that is, whether it is recovered by some rule that is applied to previous linguistic material in the discourse, the contextual salience of the descriptive material, or some combination of both. Regardless of whether descriptions are treated in the Russellian or Fregean traditions, definite descriptions in these traditions comes with a uniqueness requirement. General problems with uniqueness for d-type theory are familiar, but the recent literature has focused on the problems for uniqueness in quantified and conditional donkey sentences. That is, it is a well-known problem that sentences like (3) and (4) are well-defined (and potentially true) even if some farmers own more than one donkey. What has received considerably less recent attention is that there is a uniqueness problem for those cases in which d-type theory is supposed to be at its best, that is, in the cross-sentential case.[7]

[7]Aspects of this problem have been raised in one form or another in the past (beginning with Evans himself), though it was to my knowledge first raised as an objection to Evans' theory by

The problem for existing d-type theory is that there is not in general a way to secure (contextual) uniqueness that gets the truth conditions right — this problem plagues all existing d-type theories. Furthermore, it applies to anaphoric definite descriptions and not just pronouns, so even those who are convinced that d-type theory is wrong but want to maintain a uniqueness theory of definite descriptions need to worry about this problem. Call this *the problem of non-uniqueness*. The problem of non-uniqueness in anaphoric definite descriptions is *not* the same as the problem of incomplete descriptions. The problem of incomplete descriptions is that ordinary uses of definite descriptions don't seem to require uniqueness, e.g., (5) doesn't imply that there is only one table in the entire universe:

(5) The table is covered with books.

The standard solution to this problem is that definite descriptions like 'the table' are contextually completed in some way; e.g. in a particular context of utterance 'the table' is short for a complete, uniquely denoting description like 'the table in Fred's office' (without making any claims, in this intuitive gloss, about where that material comes from or whether it shows up in LF or the proposition expressed). I am going to assume for our purposes that the problem of incomplete descriptions has been solved; furthermore, I assume a quantifier domain restriction account in the style of Stanley & Szabo (2000).

The problem of non-uniqueness for anaphoric definites is not that many of them are incomplete. Rather it is that a) many are incomplete such that there is no general way in which they can be completed that gets the truth conditions right and b) the truth conditions of sentences containing anaphoric definites are merely existential. This problem hasn't been adequately acknowledged by more recent d-type theorists (such as Neale (1990) or Elbourne (2005, 2013)). I will present a version of the argument that is novel in the following ways. In §2.1.1, I provide an argument in favor of the non-uniqueness intuitions that Heim, Roberts, and others have had by showing which discourse continuations are felicitous. In §2.1.2, I argue that domain restriction cannot solve the problem. In §2.1.3, I argue against a somewhat popular solution that appealing to who the speaker has in mind solves the problem. Then I present a minimal pair of an anaphoric discourse and a non-anaphoric sentence to show that no uniqueness theory is on the right track and which presents a problem for d-type theory and dynamic semantics alike (§2.1.4). Finally, I argue that employing a situation semantics and appealing to minimal situations, a strategy that is popular for d-type accounts of donkey sentences, will also not help (§2.1.5).

Heim (1982) pp.28-33. It is also mentioned in Kadmon (2001) and Roberts (2003).

2.1.1 Discourse continuations

Consider (1), repeated here. I have included both the pronoun and explicit description versions to emphasize that this is a problem for anaphoric definites generally and not just theories that treat pronouns as going proxy for definite descriptions.[8]

(6) a. A student came to Fred's office hours.
b. She/the student asked some questions about the upcoming assignment.

(6) is compatible with there being many (female) students who came to Fred's office hours on the day in question; in fact it is compatible with there being many who came and asked questions about the assignment. This is supported by the fact that (6) can be felicitously followed up with things like the following:

(7) c. In fact, she/the student was one of many students to come to Fred's office hours today with questions about the assignment. (I guess his assignment instructions were unclear!)[9]
c'. In fact, she/the student was one of many students to come to Fred's office hours today, though she was the only one with actual questions about the assignment. (The rest were all arguing for higher grades on a previous assignment.)
c". She/the student was the fifth student to come today to ask about the assignment.

[8]This is one problem with the context dependent quantifier (CDQ) view defended by King (1991, 1994, 2004). King treats pronouns as going proxy for quantifiers; exactly which quantifier is context-dependent. This is all well-motivated, but the same truth-conditional considerations that motivates the treatment of pronouns anaphoric on indefinite antecedents as themselves indefinite motivates thinking of anaphoric definite descriptions as having indefinite truth conditions. But I don't think there are good reasons to treat definite descriptions as context dependent quantifiers. So King needs a different treatment of two things that appear to be very similar phenomena.

[9]Some might protest that 'the student' sounds odd here. This is not due to uniqueness restrictions, but rather the oddity of using the full definite where one is not required. To see this, note the felicity of the following:

(8) a. A student and a professor came to Fred's office.
b. The student asked questions about the upcoming assignment while the professor took notes.
c. The student was one of many students to come to his office that day, but the professor was the only professor to come.

c”’. She/the student was the fifth student to come to Fred’s office hours, but the only one who asked about the assignment.[10]

2.1.2 Against domain restriction

Aside from appealing to who the speaker has in mind (which I will address momentarily), there is no way, in general, to fill in the missing descriptive information from the context to pick out a unique student. That is, there is no linguistic or non-linguistic contextually supplied restriction that guarantees uniqueness. An example of a contextually supplied domain restriction is that it might be clear from the context that I am talking about students from Fred’s Introduction to Philosophy class, or that I’m talking about majors that he advises, or that I’m talking about students from his upper level classes, etc. But in general, for this case, and for others like it (there is nothing special about this case), nothing like this will guarantee a uniquely denoting description to substitute for ‘she’.[11] Suppose three students in fact came to Fred’s office hours on the day in question, and (6) occurs discourse initially. There is no fact of the matter about the context (aside from who the speaker has in mind) that could restrict the domain to one student rather than another. This is true whether we are looking for extra descriptive information to supplement the description to make it unique, or whether we are restricting the definite description to a particular situation, as in Elbourne’s d-type theory. Nothing about the context chooses a situation that picks out just one of the students any more than the context picks out uniquely identifying descriptive information.

2.1.3 Against speaker intentions

A natural thought is that these discourses require the speaker to have a particular individual in mind, and that the domain is restricted to pick out who the speaker has in mind (or, perhaps, that the speaker has a particular situation in mind and the domain is restricted to that situation). On the one hand, this is a natural thought — it is in most cases odd to say something like (6) and not have a particular student

[10]Continuations (c’) and (c”’) are evidence against any kind of homogeneity requirement for multiple witnesses for an anaphoric definite.

[11]Of course, sometimes the descriptions will happen to be complete, e.g. (6) in a context in which only one student came to Fred’s office hours (on the day in question). Or, e.g. if context makes it clear that I’m talking about Fred’s Introduction to Philosophy students and only one Intro student came to Fred’s office hours that day. My claim is just that this is not universally or even standardly true of such discourses.

in mind. Perhaps in many cases it is even some sort of pragmatic requirement.[12] On the other hand, it's odd for d-type theory to have to appeal to who the speaker has in mind, since if d-type theory depends on who the speaker has in mind in this way, one might wonder why one can't adopt the simpler view that pronouns refer to the speaker's referent (following e.g. Kripke (1977) and Stalnaker (1998)). In any case, appealing to who the speaker has in mind is the wrong solution to the non-uniqueness problem for two reasons: 1) It yields the wrong truth conditions for the anaphoric sentences and 2) there are cases in which anaphora is perfectly fine and the speaker need not have any particular individual in mind. Let's take each point in turn.

Suppose I have Elissa in mind when I uttered (6) (or a situation that contains Elissa — I will stop adding this caveat in what follows). According to the view on the table, (6a) is true iff at least one student walked in to Fred's office during office hours today, and (6b) is true iff *Elissa* walked into Fred's office during office hours and asked questions about the upcoming assignment.[13] Now suppose I am mis-remembering; Elissa didn't come to Fred's office today (that was yesterday) but another female student came to Fred's office hours today and asked questions about the assignment. I haven't said something false in asserting (6b), but the view on the table would have it that I did.

Moreover, the information in (6) is truth-conditionally complete without reference to what I have in mind at all; it gives you everything you need to know to go out into the world and find out whether what I said is true. You have to find out whether at least one female student came to Fred's office during office hours today and asked question about the upcoming assignment. That is to say, the truth-conditions for both sentences of (6) are *existential*. This is something that dynamic semantic accounts capture nicely. One way to see that (6) is truth-conditionally complete is to compare it with something that (arguably) does require knowing something about the speaker's intentions or mental states to know the truth conditions: suppose I say, discourse initially "that student came to see Fred again". Here you don't have everything you need to know the truth conditions; you need to know something about my mental states. Or consider a classic case of quantifier domain restriction, e.g. I say "every student got an A". You need to know something about the context or my intentions to interpret this as well; e.g. am I talking about the students in a

[12] See Cumming (2015), Hawthorne & Manley (2012), Kadmon (2001), and van Rooij (2001) for relevant discussion.

[13] I am making no claims here about logical form, just truth conditions. The d-type description might be "the student who came in during Fred's office hours who the speaker had in mind just now", "the student x... s.t. x = Elissa", restricted to a situation in which Elissa is the only student, or something else.

particular class? All my classes? The students that came to the review session? etc. These examples contrast significantly with (6).[14]

The second point is that anaphoric pronouns are licensed in cases in which the speaker has no individual in mind and there is no contextually supplied unique individual that the anaphoric expression denotes. So even if one was unconvinced by the foregoing arguments; this is still a problem for the hypothesis that descriptions are restricted to who the speaker has in mind. Suppose I know on statistical grounds that in our neighborhood, a dog is kidnapped every five minutes. I am speaking at our meeting for establishing a neighborhood watch:

(9) a. In the last 5 minutes, a dog was kidnapped.
b. The owners are probably frantically searching for it/the dog.
c. It/the dog is scared.
d. It/the dog would be safe at home if we had a neighborhood watch in place.

In this case, I clearly have no particular dog in mind — my belief that a dog was kidnapped in the last 5 minutes is statistically based. But the anaphora is perfectly fine. Furthermore, the truth conditions for the discourse are perfectly clear, and again the truth conditions are existential — it is compatible with multiple dogs having been kidnapped in the previous 5 minutes.

2.1.4 Anaphoric and non-anaphoric definites: a minimal pair

One important way of thinking of the non-uniqueness problem is to note the contrast in truth conditions for the following minimal pair.

[14]Kadmon (2001)'s uniqueness requirement is a unique individual or uniquely identifying property that doesn't have to be available to the hearer, so the comparison with quantifier domain restriction and demonstratives would not be an apt one on her view. However, this raises the question why the restrictor on anaphoric definite descriptions works so differently from these other kinds of context-sensitivity. Furthermore, Roberts (2003) makes the point that such a uniqueness criterion is too weak:

> For any object I could imagine and intend to refer to by uttering some definite description, there seems to be some (possibly complex) unmentioned property of it that I could have in mind which would make the NP semantically unique relative to my private information, but which, because it was not mentioned, would not be in the common ground of the interlocutors in the conversation. If this is adequate to satisfy the uniqueness condition, then the condition seems too easy to satisfy, leaving it unclear how any examples could be infelicitous because of a failure of uniqueness. (p. 293-4)

(10) A student came to Fred's office hours. She/the student asked for a higher grade.

(11) The student who came to Fred's office hours asked for a higher grade.[15]

Imagine both (10) and (11) occur discourse initially. (10) is compatible with there being multiple students who came to Fred's office hours on the day in question; as I've been arguing, it seems to have existential truth conditions. By contrast, (11) is not compatible with there being more than one student who came to Fred's office hours on the day in question. It is infelicitous to follow it up with "In fact, she was one of many students to come to Fred's office hours today" or any of the other continuations in (7). Keep in mind that the completed description (on most accounts) that is substituted for the anaphoric expressions in (10) is the same as the complete description in (11). Thus the d-type theorist — and those who give a static, classical semantics for descriptions more generally — owe an explanation of this contrast. In fact, this is not just a challenge for d-type theory, but for any theory that treats anaphoric descriptions, anaphoric pronouns, and regular definite descriptions as having the same semantics, including many dynamic semantic theories. This is not to argue that this can't be explained by them, but to point out it is in fact not explained. Furthermore, anyone who wants to defend a domain restriction to who the speaker has in mind for examples like (10) has to explain why the same domain restriction strategy is not available for (11), since (11) is not compatible with there being any other students who came to the speakers office hours who the speaker does not currently have in mind.[16]

[15]Heim (1982, p.28) raises a related worry (the complementary one) about whether there is actually the contrast d-type theory predicts between anaphoric and *existential* sentences like (12 and (13)

(12) A wine glass broke last night. It/the glass that broke had been very expensive.

(13) A wine glass which had been very expensive broke last night.

[16]Mandelkern & Rothschild (2020) discuss this kind of contrast extensively, showing that time and again, the presence of an indefinite as an antecedent to an anaphoric definite results in there being no uniqueness requirement on the definite, whereas in cases that lack an antecedent, as in (11), there is a uniqueness requirement. They call this phenomenon *definiteness filtering*. One way they argue for it, which makes a similar point to mine here, if that examples like (10) are fine if the context explicitly sets up that there are (possibly) many students who came to Fred's office hours but examples like (11) are not.

2.1.5 Against minimal situations

A popular solution to d-type theory's uniqueness problems in quantified and conditional donkey semantics is to adopt a situation semantics. On a situation semantics, propositions are sets of truth-supporting situations, where situations are parts of possible worlds that contain one or more individuals, properties, or relations. In the course of treating donkey sentences, d-type theories evaluate a definite *the F* relative to a very small situation, so small that it only contains one F, thus satisfying the strong uniqueness presupposition even if there are many Fs in the world.[17] For example, a quantifier like 'every' quantifies over sub-situations, i.e. (roughly speaking) 'every F is G' is true iff for each individual x, for each minimal situation s_1 such that F(x) is true in s_1, there is an extension of that situation s_2 such that G(x) is true in s_2. A minimal situation is the smallest situation that verifies the truth of a sentence (i.e. that is a member of the proposition the sentence expresses). For example, the minimal situation that verifies 'a farmer owns a donkey' is the one that contains just a single farmer, a single donkey, and the owning relation; anything smaller would be too small and anything larger would contain something superfluous. Situations have a part-whole structure; extensions of situations contain all the elements of the situation they extend, plus something else. In part, the definition I gave for 'every' is incomplete because it doesn't specify one thing: anaphoric definites in the nuclear scope have to somehow be restricted to the restrictor situations, so that there is no presupposition failure that results from extra (say) farmers and donkeys in the extended situation. This can be done by associating them with situation variables that inherit values from the restrictor situation (Heim (1990), Mandelkern & Rothschild (2020)) or by restricting the kinds of extensions permissible to *minimal* extensions (Elbourne (2005)). Thus there is no problem treating 'every farmer who owns a donkey vaccinates it' even if some farmers own multiple donkeys, since 'every' quantifies over each minimal situation that verifies the restrictor (and similarly for conditional donkey anaphora). The question at hand is whether this solution can be extended outside of quantified and conditional donkey anaphora.

Mandelkern & Rothschild (2020) tentatively suggest this possibility for d-type theory, offering the following denotation for conjunction in terms of minimal situations:

(14) $[\![\text{p and q}]\!]^{g,s} = 1$ iff $[\![\text{p}]\!]^{g,s} = 1$ and for some minimal situation $s' \leq s$ s.t. $[\![\text{p}]\!]^{g,s'} = 1$, $[\![\text{q}]\!]^{g_{[s' \to r]},s} = 1$

Mandelkern & Rothschild are assuming that anaphoric definites are associated with

[17] E.g. see Heim (1990), von Fintel (2004), Büring (2004), Elbourne (2005, 2013, 2016).

variables that quantifiers and operators can manipulate. What (14) says is that a conjunction is true just in case the left conjunct is true at the topic situation s and there is some minimal situation s_1 that is part of s such that the left conjunct true at s_1 and when the anaphoric definites in the right conjunct are restricted to s_1, the right conjunct is true at s.[18] Assuming for simplicity our topic situation is the entire world, a conjunction 'a woman walked in and she sat down' is true just in case some woman in the world walked in, and there is at least one minimal situation s_1 containing just a woman and the property of walking in such that when 'she' denotes the unique woman of s_1, it is true in the actual world that this individual sat down. Since we have existential quantification over minimal situations here (and depending on the context there may be many such minimal situations), we get existential truth conditions for anaphoric sentences, while also satisfying the uniqueness presupposition of definites. Non-anaphoric definites, on the other hand, are accompanied by situation variables that get their value from the topic situation; thus the contrast described in the previous subsection is explained.

I think Mandelkern & Rothschild provide the denotation for conjunction that is the best hope for d-type theory. We need the requirement that the left conjunct is true in the topic situation in addition to it being true in some minimal situation, and we likely also need manipulable variables on anaphoric definites because otherwise the truth conditions of conjunctions containing something other than the indefinite/anaphoric pair are too weak. While there could be alternative ways to write the situation semantics clause for conjunction here, the extension of minimal situations to conjunction cannot be done in terms of the same straightforward clauses involving minimal situations and their extensions as in the case of donkey sentences, as one might think at first glance.[19]

Mandelkern & Rothschild raise their own serious doubts about the plausibility of the definition of conjunction they suggest; the interested reader should look at their discussion for more details. I share their worries, but here I present my own objections. The first worry is the lack of independent motivation for this definition of conjunction. As I will argue in §4.3.1 below, using minimal situations is very much

[18]Propositions are evaluated relative to *Austinian topic situations*, that is, the situation that is of concern in the discourse. This doesn't really matter for our purposes, and we could very well think of *p and q* as being evaluated relative to a whole world (in fact, sometimes the actual world is the topic situation).

[19]Some (but not all) problems with a simpler definition could potentially be avoided if a *persistence* condition (for everything but anaphoric definites) was built into the theory, that is, that propositions true in a situation s are also true in all larger situations that contain s. See Zweig (2006) for an interesting examination of the complications inherent in persistence, situation semantics, and donkey sentences.

independently motivated when it comes to conditionals and other sentences involving adverbs of quantification. In these constructions, we have to count situations correctly, and because of the part-whole structure of situations, there is a worry about double-counting. Using minimal situations solves this problem and it so happens to *also* solve the uniqueness problem for d-type theory. Arguably, though less obviously, there are also independent counting related reasons to use minimal situations when it comes to quantifiers. In the case of conjunction there is no analogous independent consideration. The added complication in the definition of conjunction is motivated solely by uniqueness problems in anaphoric definites.[20]

Another problem for using minimal situations here is how to extend it to cross-sentential cases.[21] We have to assume that distinct sentences in a discourse are connected by conjunction. In general, so long as there are anaphoric definites in a discourse, it is not sufficient to just think of any two sentences as a conjunction; we need to include the sentence that has the antecedent, e.g., on this definition we need to think of the following three sentence discourse of being of the form ((A and B) and C) for the definition to work:

(15) a. A woman walked in.

b. She sat down.

c. She took off her hat.

(15b) alone cannot serve as the right conjunct for (15c) because it contains a free situation variable. Treating the sequence (15a) and (15b) as a conjunction serves to bind that variable, but it does not give it a particular value to carry on. So without (15a) acting as the left conjunct, there is nothing to bind it. So we have to think of discourses as a series of left-embedded conjunctions. Perhaps this is not fatal — though it remains to work out a lot of details of how thinking of discourses in this way would pan out — but it is nevertheless an unwelcome result. We need to treat entire discourses as the input to our semantic clauses, which strikes me as tantamount to giving up the static game.

In sum, it is not so easy to employ minimal situations when we get to the cross-sentential case. I think if we want to be a d-type theorist, we should look elsewhere.

[20]This is not the same as, but perhaps related to, Mandelkern & Rothschild's own worry that this mechanism for definiteness filtering (as they call it) is completely distinct from any general method of presupposition filtering. So again, it requires its own mechanism and is not independently motivated.

[21]Mandelkern & Rothschild see this as the most serious challenge to the proposal. They do not consider the possibility of treating discourses as consisting of a series of conjunctions.

In the next section, I argue that that anaphoric definites do presupposes a sort of uniqueness, *discourse uniqueness*. I take this as further motivation for moving to a different sort of d-type theory.

2.2 Discourse Uniqueness

I've been arguing that anaphoric definites have existential truth conditions, but this is only part of the semantic story. I don't think it is true that anaphoric definites lack a uniqueness requirement. Rather, they have a different sort of uniqueness requirement. They require there to be a unique object *under discussion*, or, in other words, a unique *discourse referent*. Versions of discourse uniqueness as the presupposition for definites has been argued for by, e.g. Birner & Ward (1994), Roberts (2003, 2004), and Barker (2005). One of the differences between their theories and mine is that they think discourse uniqueness is the kind of uniqueness required by *all* definite descriptions. I will argue that discourse uniqueness is required by anaphoric definites, while a stronger form of uniqueness is presupposed by non-anaphoric definites.

Theories that capture the existential truth conditions of anaphoric discourses (including most, but not limited to, dynamic semantic theories) generally reject uniqueness and accept familiarity as the presupposition on definites. But mere existence in conjunction with familiarity is generally insufficient to license anaphoric definites. For example, consider that the following discourses are infelicitous, even though (assuming the antecedent sentences are true), both existence and familiarity are satisfied.

(16) Two students came to my office hours today. #She/#the student asked questions about the upcoming assignment.

(17) A woman and another and another came to my office hours. #She/#the woman sat down.[22]

(16) shows that existence plus familiarity is insufficient to license definites. However, a familiarity theorist might object as follows. Most familiarity theories are cashed out in terms of discourse referents, that is, a definite presupposes that there is a familiar discourse referent to update. In (16), there is no singular discourse referent for 'she' or 'the student' to update. But familiarity theories can't get out of this problem so easily. They have to allow for accommodation in many cases. In

[22]Example due to Shane Steinert-Threlkeld, comments handout, Meaning as Action conference. Related examples are discussed in Roberts (2003) and Bumford (2015).

order to explain why we so often use definites *without* prior introduction of a discourse referent (as in the plethora of different types of novel definites and bridging cases, some of which are discussed below), familiarity theorists have to posit that the familiarity presupposition on definites triggers presupposition accommodation. A discourse referent shouldn't be hard to accommodate in this example; since there is no distinguishing information between the women, we can't go truth-conditionally wrong by introducing a discourse referent that has the information *is a student* and *came to Fred's office hours today* on it. This discourse referent would be equivalent to one introduced by "one of the students who came to Fred's office hours today".[23] Note that a discourse that includes the latter is just fine: *Two students came to Fred's office hours today. One of the students sat down. She/the student asked questions about the upcoming assignment.* If a familiarity theorist wants to maintain that an explicit antecedent like 'one of the students' is required for felicity here, especially for the case of the explicit definite, then she owes us an explanation of why an explicit antecedent is not required in bridging cases and cases of novel definites. Furthermore, many theorists think that definite descriptions (though not pronouns) presuppose only weak familiarity, that is, that the context *entails* the existence of an object that satisfies the description. Weak familiarity is satisfied in all the above examples, but the explicit definite description is still not felicitous.

(17) demonstrates that existence, familiarity, and an explicit singular antecedent are also insufficient for licensing an anaphoric definite. Heim (1982) addresses such issues by arguing that Grice's maxim of manner yields an implication of uniqueness (within the discourse), because a rational, cooperative conversational participant would not use a definite expression if it was unclear what discourse referent to resolve it to. But this doesn't follow from a view that accepts the following things: a) that definites presuppose only existence and familiarity b) that familiar discourse referents can be accommodated or that only weak familiarity is presupposed and c) that expressions of the form "one of the Fs" suffices to introduce a discourse referent for one of the Fs (among the relevant Fs). On such a view, a cooperative participant who uses a definite expression as in (16) or (17) should be interpreted as picking up on *one of the familiar students (women).* Choosing between the discourse referents introduced by the indefinites 'a woman' and 'another woman' is a false choice — it doesn't make a truth conditional difference. Even the difference in dynamic effect is only technical, since the association with different indices is arbitrary. The accommodation of a neutral discourse referent, one equivalent to that introduced by the

[23]It satisfies the two generally agreed upon constraints on accommodation, as noted by Roberts (2003), *retrievability* (the hearer has to be able to easily infer the accommodated material) and *plausibility* (the accommodated material is unobjectionable).

explicit 'one of the women', expunges even the problem of this arbitrary choice in resolution, since resolving to the neutral discourse referent prevents us from having to make the arbitrary choice. In fact, if familiarity theorists were right, (16) and (17) would be efficient ways of exploiting presupposition accommodation in conversation.[24] I return to this point in §2.4 below when I consider the question of how to tell the difference between a failure of discourse uniqueness and a pragmatic problem with anaphora resolution.

I think the right diagnosis of what is going on in these examples is that what the definite requires is a unique (accessible) discourse referent in the context. Recall that discourse referents are a way of representing that conversational participants are making as if there is a specific object under discussion. Discourse uniqueness does justice to this intuitive way of glossing things. In each of the above examples, we cannot construe the conversational participants making as if to discuss a particular object under discussion in using the anaphoric definites, because there are multiple equally good antecedents. Discourse uniqueness doesn't reject familiarity, rather it includes the property of being *strongly familiar* (in the sense of Roberts (2003)) or *discourse-old* (in the sense of Prince (1992)), that is, there must be an explicitly introduced antecedent in the context. Discourse uniqueness is strictly stronger than these notions, since it requires that there is a *unique* strongly familiar/discourse-old antecedent.

2.3 Uniqueness in non-anaphoric definite descriptions

Discourse uniqueness is the wrong requirement for non-anaphoric definites. The uniqueness requirement is too weak and the familiarity requirement too strong. I've already given one argument that non-anaphoric definites require genuine, worldly uniqueness in discussing the contrast between (10) and (11). (11), as I argued, cannot be felicitously followed up with anything that entails that there is more than one student who came to Fred's office hours on the day in question. While (10) requires that there is a unique student who came to Fred's office *under discussion*, (11) requires that there is a unique student who came to Fred's office hours *period*. I take this to be an important contrast any theory of definites must account for. There are other reasons to think discourse uniqueness is the wrong requirement. Many arguments in the literature that support a uniqueness rather than familiarity requirement for definites also speak against a discourse uniqueness requirement for non-anaphoric definites.

[24]The infelicity of examples like (16) and (17) is also unexpected on a theory that treats definite descriptions as merely existential, as in Ludlow & Segal (2004) and Szabo (2000).

For example, Birner & Ward (1994), Abbott (2008), Hawthorne & Manley (2012), and Elbourne (2013) argue that examples like the following tell against familiarity and in favor of uniqueness:

(18) If you're going into the bedroom, would you mind bringing back the big bag of potato chips that I left on the bed? I bet you didn't think I was the kind of person who would leave a bag of potato chips on the bed.

(19) Since you don't know much about MSU, I'm sure you haven't heard of the new curling centre there. It's pretty amazing. I'll bet you didn't even know there was a curling centre in Michigan.

The felicity of such examples is surprising on a familiarity account, even with accommodation, because accommodation is a matter of tacitly treating the discourse or the context as being a certain way that it isn't. In this case, that would be treating it as though there is already a familiar bag of potato chips/curling centre under discussion. But then it should sound quite jarring to overtly contradict the familiarity presupposition — if the presupposition is that we are both familiar with a curling centre at MSU, then it shouldn't sound good to say "I'll bet you didn't even know there was a curling centre". On the other hand, uniqueness does seem to be a feature of these examples — they can't be followed up with things like "Actually, bring me all the big bags of potato chips that I left on the bed" or "In fact, I bet you haven't heard of the 3 other new curling centres at MSU either". This also tells against discourse uniqueness as being an adequate presupposition for non-anaphoric definites; as we saw in §2.1.1 above, anaphoric definites that are discourse unique can be followed up with such statements.

The definite article is generally obligatory in superlative constructions such as 'the tallest tree in my backyard', even when the audience is not expected to be familiar with the denotation of the description. For example, if I know that my audience doesn't know whether I have any trees at all in my backyard, a familiarity theorist — and likewise a discourse uniqueness theorist — predicts that the locution 'a tallest tree in my backyard' should be felicitous, if not preferred. But the indefinite article is (almost) never felicitous in superlative constructions. This is easily explained on a theory of definite descriptions that includes a uniqueness requirement — 'the' is generally required with superlatives because there is a unique object involved ('a tallest tree' implicates there is more than one tallest tree). Similarly, Lyons (1999) (p.8-9) also points out that the definite article is obligatory with well-known uniquely denoting nouns like 'pope', 'sun', 'universe', etc.

Finally, when definite descriptions are stressed, it is uniqueness and not familiarity that is emphasized:[25]

(20) A: You seem to be working very hard for the colloquium committee.
B: Yes, well the problem is I am not (just) A member of the colloquium committee but THE member of the colloquium committee.

(21) Did you meet AN owner of the restaurant or THE owner? (Abbott (2000))

(22) Max is not THE owner (... he is one of the owners). (Fara (2001))

In these cases, what is emphasized is not that there is a unique colloquium committee member or restaurant owner *under discussion* as would be predicted by discourse uniqueness, but that there is a unique one in the world.

Furthermore, I don't think it is plausible to argue, as Roberts (2003) does, that this stronger, worldly uniqueness can somehow be derived from some version of discourse uniqueness plus pragmatic considerations. Without going into all the details of Roberts' own view, the central idea is this. Suppose all definites presuppose discourse uniqueness. For non-anaphoric definites, discourse uniqueness would have to be accommodated. But accommodating discourse uniqueness would be trivial — of course there is a unique discourse referent for, for example, the student who came to Fred's office hours if we've just accommodated a discourse referent for one. Why would a speaker use a definite description where the presupposition is not satisfied just to have something trivial accommodated? This seems to violate Grice's maxim of quantity. However, worldly uniqueness is informative and, together with familiarity, entails discourse uniqueness. (Recall that familiarity is built into discourse uniqueness; familiarity would need to be accommodated in these cases.) Speakers tacitly know this and exploit it.[26]

As Roberts readily admits, these Gricean implicatures are quite robust — they aren't cancelable, as we've seen that non-anaphoric definites can't be followed up with claims that contradict the uniqueness of the witness to the description. I have no in principle problem with thinking that certain kinds of implicatures are indeed very hard to cancel, but it is surprising that quantity implicatures would not be able to be canceled. Many of the paradigmatic examples of cancelable implicatures are

[25]See also Coppock & Beaver (2015) p.393, in addition to the sources cited below.

[26]For Roberts, definite descriptions presuppose weak familiarity (that the existence of the object has to be entailed by the context) and informational uniqueness (that there is a unique discourse referent among both the strongly and weakly familiar ones that is contextually entailed to satisfy the description). The Gricean explanation is given for definites where both weak familiarity and informational uniqueness fail.

quantity implicatures. Speakers might have lots of good (and cooperative) reasons for not being maximally informative. As Roberts herself points out, definite descriptions for unfamiliar referents are often employed in narratives, to make the person listening to the narrative feel as though they are drawn into the middle of a story. Furthermore, there are similar cases, such as possessives, which contextually fail to satisfy discourse uniqueness which do not implicate worldly uniqueness:

(23) Sorry I was late. I had to take my cat to the vet.

(24) The daughter of a wealthy banker disappeared under mysterious circumstances.

Neither (23) nor (24) have robust worldly uniqueness implicatures. This is surprising if a Gricean story like the one above plus a discourse uniqueness presupposition is supposed to yield robust, uncancelable worldly uniqueness implicatures.[27]

2.4 Indistinguishable participants

The problem of indistinguishable participants seems to be a counterexample to the claim that definites presuppose any form of uniqueness (be it discourse uniqueness or worldly uniqueness). These are (famously) examples like:

(25) Everyone who bought a sage plant here bought another one along with it.[28]

[27]Roberts deals with 3 different cases of strong uniqueness effects: titles and directions, those in which weak familiarity is satsified (but strong familiarity fails), and those in which weak familiarity fails. The Gricean explanation just applies to the last case, but I take it to cover most of the non-anaphoric cases. In cases of bridging definites and other weakly familiar definites, worldly uniqueness is implicated because if it is well-known that there are multiple objects that satisfy the descriptive material, informational uniqueness automatically fails. I think bridging definites are more complicated than this, and deal with them in §4.2 below. In any case, I find it difficult to accept both that Gricean considerations lead to robust worldly uniqueness implicatures in the cases described above and that cases in which weak familiarity but not informational uniqueness is satisfied are so robustly infelicitous. Gricean cooperativity and quantity considerations in particular would lead one to expect that informational uniqueness could be accommodated, i.e., hearers could accommodate that there is some distinguished witness among the possible witnesses for the description. Roberts explains the titles and directions cases epistemically: they involve definite descriptions that are meant to be employed in a variety of environments in which hearers may have a lot of information. So the only way to ensure informational uniqueness is to have worldly uniqueness. I have nothing to say against this.

[28]Thanks to an anonymous reviewer who suggested this version of the sage plant sentence as more problematic for my view than Heim's original one.

(26) If a bishop meets a bishop, he blesses him.

The problem is that when we get to 'it' in (25), there are two identical referents (sage plants bought by someone), whether conceived as actual referents or discourse referents. Similarly for (26), since *meeting* is a symmetric relation, there are two identical bishop referents, or two discourse referents each of which records the information *is a bishop* and *meets a bishop*. For now, I leave open the question of whether the pronouns in these sentences presuppose discourse or worldly uniqueness (or possibly sometimes one and sometimes the other). In §4.3, I give my account of sentences with intra-sentential anaphora (i.e. donkey sentences), and there I explore both options. Since indistinguishable participants are a problem for both notions of uniqueness, and my proposed solution applies to both notions of uniqueness, I do not distinguish between them here. I will simply write "uniqueness" to stand for either discourse or worldly uniqueness.[29]

While these are *prima facie* problematic for any theory with a uniqueness requirement, there are similar examples (first raised by Elbourne (2005)) that are *prima facie* problematic for any theory that has *no* kind of uniqueness requirement.

(27) #If a bishop and a bishop meet, he blesses him.

(28) #If a bishop and another bishop meet, he blesses him.[30]

On the one hand, one might want to explain the infelicity of (27) and (28) on syntactic grounds. The verb 'meet' requires a plural entity as its argument, so the conjunction is syntactically plural and therefore cannot provide an antecedent for either singular pronoun, as discussed by Barker & Shan (2008). However, as Barker & Shan also point out, there are cases in which the conjuncts in these constructions can serve as antecedents for singular pronouns:

(29) If a woman and a man meet, she asks him for his number. (Barker & Shan (2008, 34))

[29]There are two other technicalities I am glossing over here which will become clear in §4.3. One is that one of the theories I propose for quantified sentences like (25) involves situation semantics, and like in classical d-type treatments, quantifiers then quantifier over individual/minimal situation pairs, which solves the uniqueness problem for examples like (25) (following Heim (1990)). This doesn't directly help with bishop sentences though. The second is that I employ quantification over minimal situations for conditional donkey sentences like (26) in all versions of my theory of conditional donkey sentences. Uniqueness of referents and discourse referents is relative to minimal situations.

[30]Examples from Elbourne (2005). His judgments are that these are ungrammatical, not infelicitous. I do not share the ungrammaticality judgments, for reasons that will soon become clear.

(30) If a bishop and a nun meet, he blesses her. (Elbourne (2009, 4))

These seem to show that (27) and (28) are not ungrammatical after all. Furthermore, the data is just as we'd expect on a d-type theory. (27) and (28) are infelicitous because uniqueness is not satisfied, while in (29) and (30), uniqueness is satisfied. However, Barker & Shan go on to argue that the badness of (27) and (28) is due to ambiguity in *anaphora resolution*, that is, there is no way to resolve the pronouns in these examples to specific antecedents, similarly to the following examples, which involve perfectly distinguishable participants:

(31) a. #If John and Bill meet, he falls asleep.

b. #If a butcher and a baker meet, he pays him.

c. #If a man walking a dog and a woman walking a dog meet, it barks at it. (Barker & Shan (2008, 34))

This raises two related questions. First, are they right that the problem with (27) and the sentences in (31) are both pragmatic problems of anaphora resolution? Second, and more generally, this again raises the question of whether the felt requirement for discourse uniqueness is really just a problem of anaphora resolution, as Heim surmised in her Gricean maxim of manner explanation.[31] No matter what one's theory of anaphoric definites, one also needs a theory of anaphora resolution, and there will be some sentences or discourses that are bad not because of syntax or semantics, but because the intended resolution is unclear. This much is a truism, so the question is how to tell when we have encountered one sort of case rather than another.

My answer to the first question informs my answer to the second. I simply don't see how (27) and (31) could both be problems of ambiguity in anaphora resolution if the good sage and bishop sentences like (25) and (26) are *not* cases of ambiguity in anaphora resolution. There is no more indication in (26) of which pronoun is supposed to be resolved to which bishop than there is in (27).[32] Furthermore, we

[31]Thanks to an anonymous reviewer for pressing me on this point.

[32]Elbourne (2009) also makes this point. Chapter 9 of Barker & Shan (2014) addresses Elbourne (2009) but doesn't say anything further about why (27) should be pragmatically unresolvable but (26) perfectly fine. One might argue that there is a preference for syntactic parallelism and so this is some indication of how the pronouns are to be resolved. Still, there is no strong parallelism requirement in these constructions, as indicated by the perfect felicity of examples like:

(32) If a woman is friendly to a man, he asks for her number.

This stands in contrast to some other constructions, such as Kehler (2001)'s (33):

could offer the same argument to the conclusion that the good bishop sentence (26) is bad. For the syntactically parallel versions of (31) are also ambiguous with regards to anaphora resolution:[33]

(34) a. #If John meets Bill, he falls asleep.

b. #If a butcher meets a baker, he pays him.

c. #If a man walking a dog meets a woman walking a dog, it barks at it.

If the explanation of why (31) is bad, i.e., ambiguity with regards to anaphora resolution, is supposed to show why (27) is bad, then the same ambiguity in (34) should predict that (26) is bad. But (26), infamously, is not bad. This establishes that the answer to the first question is *no*, the bad bishop sentences are not bad for the same reasons (31) are bad; the bad bishop sentences are not problems of anaphora resolution. This reinforces the answer I gave above to the general question of whether the felt infelicity that I attributed to lack of discourse uniqueness is actually a result of problems with ambiguous anaphora resolution. A key factor in identifying problems that result from ambiguity in anaphora resolution is whether anaphora resolution has truth-conditional import. On an account in which pronouns do not presuppose any sort of uniqueness, it is surprising that examples like (27) and (28) are bad even if there is no indication of which way the anaphora should be resolved. Choosing one of the two antecedents arbitrarily makes no truth-conditional difference, nor any difference on their dynamic effect on the discourse.[34] Furthermore, as we've already seen, the arbitrariness of the resolution gives no pause for dynamic semantics in the classic bishop case. Thus I conclude that (27) and (28) are not cases of ambiguity of anaphora resolution, and are further evidence of a uniqueness presupposition on definites. To anticipate, on my view, the infelicitous sentences in (31) and (34) are infelicitous (out of the blue) because there is ambiguity in

(33) #Margaret Thatcher admires Ronald Reagan and George W. Bush absolutely worships her.

(33) is generally judged to be bad despite strong pragmatic reasons for taking 'her' to refer to Margaret Thatcher. The point is, even if there is a preference for parallelism, both interpretations (i.e. 'he' and 'him' each picking out the subject or the object) are easily accessible. It's not clear the parallelism preference is strong enough for there to be a default interpretation that privileges it completely out of the blue.

[33]In a small informal survey, the sentences in (34) were judged to be infelicitous by those surveyed, and follow-up questions indicated there was no preference for resolving the anaphora according to syntactic parallelism.

[34]Of course, they are not strictly speaking exactly the same in their dynamic effect, as one will update one discourse referent and the second the other, but since discourse referent indices are arbitrarily assigned, this doesn't actually affect the discourse information being tracked.

anaphora resolution (absent any proper contextual set up). (27) and (28) are bad because uniqueness is not satisfied while the good bishop case, (26), is felicitous (out of the blue) because uniqueness *is* in fact satisfied and anaphora resolution has no truth-conditional import.

To explain how uniqueness is in fact satisfied in indistinguishable participants cases, I want to develop a suggestion made by Ludlow (1994). Ludlow argues that the two bishops are distinguished by their thematic roles: one is the bishop agent and the other the bishop patient of the meeting. His suggestion can be extended to account for the infelicity of (27) and (28) where the verb 'meet' is intransitive rather than transitive as in the felicitous (26). In the intransitive case, the bishops together are the agents; nothing distinguishes an agent from a patient.[35] In fact, the contrast between (26) and (27) is reminiscent of a contrast first raised by Chomsky in the context of thematic roles, that is, that there is a significant difference in meaning in sentences like (35a) and (35b):

(35) a. The drunk embraced the lamppost.

b. ?The drunk and the lamppost embraced. (Dowty (1991, 583))

Indeed, (35b) is only acceptable in the context of *Beauty and the Beast*-like scenarios. This is precisely because in (35a) the lamppost is the patient of the embrace, but in (35b) it is an agent, and lampposts are not the sorts of things that can be agents of embraces. The same roles are there when we turn to symmetric predicates like 'meet'. For example, consider a meeting between a fan (let's call him Fred) and a star like Madonna. It would be very odd to describe such a meeting by saying "Madonna met Fred last night" rather than"Fred met Madonna last night". Though meeting is symmetric, there is a real sense in which Fred is the agent and Madonna is the patient of the meeting — she is the one to be met, Fred is the one doing the meeting. Of course, it is still true that Madonna met Fred if Fred met Madonna, and this might be an accurate description from Madonna's point of view (or the point of view of someone in her circle). This is also not to say that these roles always matter — sometimes who plays the role of "meeter" and who plays the role of "meetee" can be interchanged without any change in what is communicated because who plays what role doesn't matter in the context. Nevertheless, I take these sorts of cases as evidence that the roles are still there; it explains why these differences arise when it does matter who plays the role of "meeter" and "meetee".

[35]Elbourne (2013) also suggests that Ludlow's theory can explain the contrasting data, though Elbourne (2005, 2013, 2016) argue for a different d-type solution to the problem of indistinguishable participants. Elbourne derives a distinguished and undistinguished bishop by a syntactically derived situation structure. I have nothing to say against Elbourne's solution here.

In the thematic roles literature, there is much discussion and little agreement on the different sorts of roles, how many there are, and which features they have. Here I am only concerned with defining them thinly, and in fact it only matters for my purposes that they are there and that different arguments of a predicate come with different thematic roles. The claim that all arguments come with distinct thematic roles is far from unprecedented; that each argument of a predicate is indexed with a distinct thematic role is a tenet of Chomsky's government and binding theory (the θ-criterion).[36] I am not resting my account on Chomsky's GB theory or the status of this claim within it, but it is worth mentioning that positing thematic roles everywhere in this way is hardly novel (though admittedly also controversial).

I think there is good evidence that people do interpret there being distinct thematic roles even on predicates that seem perfectly symmetric like 'in the same room as', 'lives with', or 'has the same name as'. Compare (36a), (36b), and (36c):

(36) a. Fred is in the same room as the *Mona Lisa*.

b. The *Mona Lisa* is in the same room as Fred.

c. Fred and the *Mona Lisa* are in the same room.

(36b) and (36c) are very odd ways to describe Fred's experience at the Louvre. I think this is because when we are dealing with something that *doesn't* usually move (like the *Mona Lisa*) and something that does (like Fred), one is clearly the "agent" of being in the same room and the other the "patient". Similarly, consider the difference in meaning between the following three sentences:

(37) a. I have the same name as my grandmother.

b. My grandmother has the same name as me.

c. My grandmother and I have the same name.

Though like in the previous case, there are clearly times when all of these are acceptable things to say, only (37a) is a usual way to say that the speaker is named after her grandmother.

One plausible way of thinking about things follows Dowty (1991), who argues that the most useful way to think of thematic roles is to think of them as cluster concepts or prototypes, such that the argument need not satisfy all the criteria associated with the role (and in fact may only satisfy a small part). He calls these two roles *proto-agent* and *proto-patient*, with the proto-agent role generally mapping

[36]See Chomsky (1981).

onto the subject position and the proto-patient role onto the object position. Both Dowty (1989) and Dowty (1991) speculate that these mappings help in first-language acquisition; if grammar maps onto a semantic property (the proto-thematic roles), it is easier to figure out the grammar of one's language. The thought is that children first master the class of verbs that best match the prototypes of agent and patient, and then bootstrap from there to learn the less prototypical classes of predicates. We might conclude from that that proto-agent and proto-patient (though perhaps far from the prototype) are still grammatically associated with subject and object position in the less prototypical cases (I do not mean to attribute this conclusion to Dowty). Another possibility is to follow Marantz (1984) and van Riemsdijk & Williams (1986) and posit thematic roles that are specific to each predicate; for example, 'hit' is associated with the 'hitter role' and the 'hittee role', 'meet' with the 'meeter role' and the 'meetee role', and so on. Again, what is important here is not exactly what we call these, but noticing that they are there and part of the interpretive process, thus tracked by interlocutors in conversations.

Being an agent or patient of an action is a property of the entities themselves.[37] For example, in (35a), the situation described is one in which the drunk him or herself is the agent of the embrace with the lamppost, while in (35b), the situation described is one in which both the drunk and the lamppost are agents of the embrace, which is why it sounds preposterous. With symmetric predicates, like 'meet', I don't want to say that there is a unique agent and a unique patient of the actual meeting — unlike embracing, if Fred meets Madonna, then it also follows that Madonna meets Fred, and I don't want to deny this. But I do want to say that for each meeting, there are two sub-events or sub-situations, one in which Fred is the agent and Madonna the patient and the other vice versa. These different sub-events or sub-situations are invoked by the sentences 'Fred meets Madonna' vs. 'Madonna meets Fred'. In §4.3 below, I defend a situation semantics for conditional donkey sentences, in which conditionals have a silent 'always' that quantifies over minimal situations. In the case of the good bishop sentence, it quantifies over all minimal situations in which a bishop agent meets a bishop patient. In the version that employs worldly uniqueness, this presupposition will be satisfied, because there is a unique bishop agent and a unique bishop patient in each minimal situation. Discourse uniqueness is also satisfied if we assume, as I think we should, that information about thematic roles is included on discourse referents. The first indefinite introduces a discourse referent that includes the information *is the agent of the meeting* and the second indefinite introduces a discourse referent that includes the information *is the patient*

[37] Or proto-agent and proto-patient, or meeter and meetee, or whatever the right way of thinking of these roles turns out ot be.

of the meeting. Thus the bishops are distinguished in terms of the information recorded on their discourse referents.[38] Again, this is in contrast to the bad bishop cases, (27) and (28), in which both bishops are the agents of the meeting, thus they quantify over minimal situations with two indistinguishable bishop agents and as a result neither worldly uniqueness nor discourse uniqueness is satisfied. Unlike the sentences in (31) and (34), however, it does not matter truth-conditionally how the pronouns in the consequent are resolved. Every bishop who is an agent of the meeting in one situation is the patient of the same meeting in another situation; both resolutions put the same constraints on the world. I will return to this point as well as some technical difficulties with the notion of discourse uniqueness in §5.1, after I have described the formal implementation and the account(s) of donkey sentences.

3 The semantics and pragmatics, informally

I've been arguing that the right theory of definites will capture the following features:

1. A worldly uniqueness presupposition for non-anaphoric definites.

2. A discourse uniqueness presupposition for anaphoric definites.

3. Existential truth conditions for sentences with anaphoric definites.

In what follows, I propose an ambiguity theory of definites, where the meanings of non-anaphoric and anaphoric definites, though closely related, receive distinct lexical entries. I argued in §2.3 that Roberts's way of deriving worldly uniqueness from discourse uniqueness doesn't work, but of course by so arguing I haven't shown that there is *no* way we can do so. However, I do not see a plausible way to derive one from the other (perhaps this is lack of imagination on my part). Moreover, there is cross-linguistic evidence to support the proposed ambiguity. Lyons (1999) reports that many languages have two definite articles. Languages as diverse as Lakhota (a Siouan language), Hausa (an Afro-Asiatic language spoken in Niger,

[38] I think a similar thing is going on in the sage plant sentence. Of course, there is no natural way to describe one sage plant as the agent and another as the patient, but their roles are similarly syntactically distinguished in a way that matters for what is communicated: there is the first "primary" sage plant bought and then the "secondary" one bought along with it. Compare:

(38) a. Everyone who invited a friend to come invited another friend along with her.

b. Everyone invited two friends to come.

If someone said (38a) to me, I'd want to know which friends were the afterthoughts.

Nigeria, and Sudan), and Fering (a North Frisian language) have basic definites that are mostly used non-anaphorically (though sometimes anaphorically) and another restricted to anaphoric use. For example, Lyons reports that in Lakhota there are two definite articles: *k'u*, which is reserved for anaphoric use and *ki*, which is used to express definiteness more generally. For example, he translates the phrase '*wowapi ki*' as 'the book' but '*wowapi k'u*' as 'the book (mentioned before)' (p.54). He argues that both articles are unstressed and can co-occur with demonstratives,[39] two points in favor of not treating the anaphoric *k'u* as a demonstrative rather than a definite article. Definite articles, but not demonstratives, are normally unstressed, and demonstratives do not normally co-occur, cross-linguistically. The two definite articles in the Frisian dialect of Fering were carefully documented by Ebert (1971a,b), though there is also evidence of other Germanic dialects with two definite articles (e.g. the dialects of the Rhineland, the Mönchen-Gladbach dialect, the Cologne dialect, and Bavarian, as cited by Schwarz (2009)). Fering has two definite articles '*a*' and '*di*'; the former is used non-anaphorically and the latter anaphorically, for example:[40]

(39) a. *Ik skal deel tu a /*di kuupmaan.*
I must down to the$_{NA}$ /*the$_{A}$ grocer
'I have to go down to the grocer.'

b. *Oki hee an hingst keeft. *A/ Di hingst haaltet.*
Oki has a horse bought *the$_{NA}$ /the$_{A}$ horse limps
'Oki has bought a horse. The horse limps.'

Schwarz (2009, 2013), who also proposes an ambiguity theory for the definite article, argues that German has two forms of definites. Many prepositions in German can contract with definite articles and the contracted form is used non-anaphorically, while the full form is used anaphorically, in various typical non-anaphoric and anaphoric uses of the articles, respectively.[41] For example '*vom*' is the contracted form of '*von dem*'. Only the latter is available for anaphoric uses, while only the former is available in non-anaphoric uses:

(40) Discourse Anaphora Use (Schwarz (2009, 23)):
Hans hat einen Schriftsteller und einen Politiker interviewt. Er
Hans has a writer and a politician interviewed He

[39] In many languages (unlike English) definite articles co-occur with demonstratives.

[40] Examples are from Schwarz (2009), p. 15, originally from Ebert (1971b), p.161. The English glosses are Schwarz's. Glosses of the two meanings of 'the' in terms of 'NA' for non-anaphoric and 'A' for anaphoric are mine. Schwarz uses 'weak' and 'strong', respectively.

[41] For a detailed discussion of the German and Fering data, see Schwarz (2009).

hat #vom /von dem Politker keine interessanten Antworten
has #from-the$_{NA}$ /from the$_A$ politican no interesting answers
bekommen.
gotten
'Hans interviewed a writer and a politician. He didn't get any interesting answers from the politician.'

(41) Larger Situation Use (Schwarz (2009, 28-29)):
Der Empfang wurde vom /#von dem Bürgermeister eröffnet.
The reception was by-the$_{NA}$ /#by the$_A$ mayor opened
'The reception was opened by the mayor.'

Similarly, '*im*' is the contracted version of '*in dem*':

(42) Covarying Anaphora Use (Schwarz (2009, 25)):
Jedes Mal, wenn mir bei einer Gutshausbesichtigung eines der
Every time when me during a mansion-tour one the
Zimmer besonders gefält, finde ich später heraus, dass eine berühmte
rooms especially like find I later out that a famous
Person eine Nacht #im /in dem Zimmer verbracht hat.
person a night #in-the$_{NA}$ /in the$_A$ room spent has
'Every time when I particularly like one of the rooms during a mansion tour, I later find out that a famous person spent a night in the room.'

(43) Immediate Situation Use (Schwarz (2009, 28)):
Das Buch, das du suchst, steht im /#in dem
The book that you look-for stands in-the$_{NA}$ /#in the$_A$
Glassschrank.
glass-cabinet
'The book that you are looking for is in the glass-cabinet.'

Lyons also summarizes research that shows there are other languages (e.g. Hidatsa, a Siouan language, and Ewe, a language from the Niger-Congo family spoken in Ghana and Togo) that have a definite article that is reserved for only anaphoric use, and non-anaphoric definiteness is marked in some other way. This brief canvassing of the data does not definitively show that we need to adopt an ambiguity theory, but it does provide considerable support for the ambiguity claim. It is generally a necessary (or at least highly desirable) condition on positing an ambiguity theory

that there be cross-linguistic evidence for it. The data shows there is indeed cross-linguistic evidence, and that the ambiguity between the two meanings falls along the anaphoric/non-anaphoric divide.[42]

I have been arguing that anaphoric definites have a discourse uniqueness requirement rather than a worldly uniqueness requirement, and have existential truth conditions. But both traditional Fregean and Russellian semantics for definite descriptions have a worldly uniqueness requirement, and neither has existential truth conditions. There is, however, a neo-Russellian view that has been defended on various grounds by different authors, which treats definites as existential quantifiers at the level of truth-conditional content, along with some other requirements (such as uniqueness or familiarity) at the level of presupposition or conventional implicature. This kind of view has several advantages over a traditional Russellian account. The biggest advantage is that uniqueness is not treated a part of the informational content. It is more or less agreed upon that uniqueness passes presupposition tests and is not part of the at-issue, informational content.[43] More to the point, it already encompasses the basic desiderata: a truth-conditional component that is merely existential, and uniqueness at the presuppositional level. It also follows in the footsteps of King (1987, 1991)'s arguments that anaphoric pronouns act like quantifiers that in some way inherit their force from their antecedents, and so singular anaphoric pronouns on indefinite antecedents are themselves existential quantifiers, but it does so without positing that definites themselves are context dependent quantifiers. It is beyond the scope of the paper to argue against a neo-Fregean view or every other possible way to implement the observations made in the previous section, though I will note that it is not obvious how to adapt a neo-Fregean semantics to presuppose discourse uniqueness and yield existential truth conditions.[44]

[42]Gray (2017) argues that an ambiguity view of definite descriptions along anaphoric/non-anaphoric lines solves a problem for the predicativist theory of names. He argues that the unpronounced definite determiner that is present in bare uses of names according to *the*-predicativists is marked as non-anaphoric.

[43]See Abbott (2008), Hawthorne & Manley (2012), Ludlow & Segal (2004), Szabo (2000) for some defenses of existential treatments of definites. Hawthorne & Manley defend an existentialist semantics given very different sorts of considerations than the ones that occupy the current paper. They argue that it is a natural and elegant position to hold once one gives up a strong acquaintance requirement, which is what they do. I take it to be some further support for the present proposal that similar ones are motivated on independent grounds.

[44]An anonymous reviewer for this journal suggested that a neo-Fregean account could be implemented if I included identity with a particular discourse referent in the semantics of definites at LF. E.g. Suppose an indefinite 'a student' introduces a discourse referent 1 into the context, then 'the student' could be treated along the lines of '[the x: (student, identical to 1) x]', which is then treated in a neo-Fregean way such that it refers to the unique individual that is a student and

Accordingly I propose that the semantics of definites are as follows.[45]

Semantics, informal version:

> An anaphoric definite description *The F* presupposes **discourse uniqueness**, that is, that there is exactly one accessible discourse referent in the context with the material 'is F' associated with it. The semantic content is that there is at least one F. If the presupposition is satisfied, a sentence of the form *The F is G* is true iff there is at least one F that is G. The sentence has no truth value if the presupposition is not satisfied.
>
> A non-anaphoric definite description *The F* presupposes **worldly uniqueness**, that is, that there is exactly one F in the world. The semantic content is that there is at least one F. If the presupposition is satisfied, a sentence of the form *The F is G* is true iff there is at least one F that is G. The sentence has no truth value if the presupposition is not satisfied.

The semantics (and associated pragmatics) requires some unpacking. Since discourse uniqueness appeals to discourse referents in the context, it will be helpful to say a little more about what I take contexts and discourse referents to be. A context is an information state modeling the state of a discourse at any given point. It contains, for our purposes, at least the common ground, modeled as a context set in the sense of Stalnaker (1978), and a set of annotated discourse referents which

identical to 1, since for any particular assignment function g in the context, only one individual is identical to g(1). This suggestion is not so straightforward to implement. The problem is that context *doesn't* provide us with a particular assignment function for the discourse referent. So although for any particular assignment function we get a referent, since we don't have a particular assignment function, what we do in fact get is a function from assignment function to referents. I suppose this is all well and fine if we want to treat propositions as functions from world/assignment pairs to truth values, and then define truth in a context as true at all possible assignment functions, but this seems to make adopting a d-type theory pointless. If we are happy with this kind of result, then we could just treat pronouns as free variables. We would then have open propositions that would be true if they were true relative to all possible assignment functions in the context. In any case, as I will argue, the account I adopt below does not require a novel view of what propositions are or an unusual definition of truth.

[45]The proposed semantics can be extended quite naturally to plural definite descriptions if we employ plural quantification and take the uniqueness presupposition to be about a maximal plurality rather than a single individual.

track the objects under discussion. By "annotated discourse referent" I mean a discourse referent (which is just the peg) along with all its associated properties. I will drop the term "annotated" when it shouldn't cause confusion. On my preferred implementation, updates to the context are determined pragmatically, construed in a broadly Gricean way; context change potentials are not semantically encoded. That is, the semantics is static while the pragmatics is dynamic; the theory takes context change seriously but explains it by appealing to general pragmatic principles rather than building it into the semantics. While static semantics and dynamic pragmatics is often associated with a context that only contains a context set, modeling discourse referents or other kinds of discourse information in the context is available on a dynamic pragmatics.[46] The main idea is that when a speaker uses an indefinite in certain contexts, it is evidence of a discourse plan to potentially go on (or to allow others to go on) and talk about the same object, whatever it may be. Since conversational participants track the objects under discussion, a discourse referent with the appropriate information is added to the context.[47] The semantics espoused in this paper complements a dynamic pragmatics that tracks discourse referents; it shows how discourse referents can have semantic effects in a static semantics.[48]

One need not adopt my preferred explanation of how context change works to accept the semantics for definites proposed here, but one does need to accept that discourse referents are *somehow* introduced into the context, since they play an important role. The intuitive idea behind the tracking of discourse referents is twofold. One, it takes seriously the idea that conversational participants keep track of what objects are under discussion. Two, it captures the idea that often conversational participants are *making as if* a single, specific individual is under discussion, even if what they say truth-conditionally leaves open the possibility that multiple witnesses satisfy the informational content. That is to say, when speakers engage in discourses like (1), they are not acting as though they are just talking about some student or other, but some specific student. Perhaps this is what led the d-type theorist to semantically encode that they are actually talking about a unique student. I've argued that this is wrong, but I don't think the intuition behind it is.

Discourse uniqueness has already been described above. I will go through examples in more detail shortly, but to anticipate, for example in (1b), it amounts to the requirement that there is a unique discourse referent in the context that has the

[46]See Dever (2013), Stalnaker (2014), and Lewis (2017) for further discussion of this point.

[47]See Lewis (2012, 2020) for further discussion.

[48]This is not to say it couldn't be implemented as a dynamic semantics — I see no obstacle to doing so.

properties *is a student* and *came to Fred's office hours*.[49] The definition of discourse uniqueness also includes the qualification *accessible*. Discourse referents, once introduced into the context are not forever accessible as antecedents to anaphoric definites. Thus this notion of accessibility leaves considerable leeway; combined with specific theories of accessibility, the theory will make different predictions. For example, it is likely that anaphoric definite descriptions and anaphoric pronouns have different accessibility criteria, with pronouns requiring more salient discourse referents. I have nothing further to say about accessibility in this paper.

The content of both anaphoric and non-anaphoric definite descriptions is the same: that of contextually restricted existential quantifiers. The contextual restriction comes from different places for anaphoric and non-anaphoric definites. For non-anaphoric definites, it comes from the context more broadly construed (i.e., insert your favorite metasemantics for quantifier domain restriction here). For anaphoric definites, it comes from the information on the annotated discourse referent to which the anaphoric definite is resolved. Such definites are always resolved to antecedent discourse referents; this is the defining feature of being anaphoric. Both the discourse uniqueness requirement and the truth-conditional content is defined over the anaphoric definite description *after it is resolved to a discourse referent*. That is to say, in the semantics above the relevant "F" in "the F is G" is not the description in the surface sentence, but the enriched description with the descriptive material from the discourse referent added to it. Informally, we can think of the restriction on both anaphoric and non-anaphoric definites working as follows: the overt material (if any) and the implicit restriction each contribute a property; the combination of overt predicate with covert material is the completed restrictor and the property it expresses is the restrictor property.[50] Following Schwarzschild (2002) and Hawthorne & Manley (2012), I use the term *singleton restrictor* for a restrictor on a quantifier that restricts the domain so that it only has one member in its extension. Felicitous non-anaphoric definite descriptions will always have a singleton restrictor since they presuppose uniqueness. Thus the truth conditions are not existential in any robust sense — the existential quantifier always ranges over a domain with a singleton extension. On the other hand, felicitous anaphoric definite descriptions may or may not have singleton restrictors. Thus they are compatible with having truly existential truth conditions — the domain will often contain multiple objects.

Hawthorne & Manley (2012) also introduce the idea of a *singular restrictor*. A

[49] I am suppressing a treatment of tense here as well as contextual restriction to a particular time for the sake of simplicity, but the discourse referent will actually contain a property like *came to Fred's office hours on March 20, 2018*.

[50] I follow Hawthorne & Manley (2012) in this simplification for presentational purposes.

singular restrictor is a kind of singleton restrictor, but one where the proposition expressed depends on a particular individual. That is, singular restrictor properties are properties like *being identical to Madeline* or perhaps *being a child who is identical to Madeline* — they are (weakly) rigid. Singular restrictors can be used to account for referential uses of definite descriptions (if one desires to capture referential uses semantically) without positing any kind of ambiguity in the semantics of descriptions to account for the referential/attributive distinction.[51] This has an immediate advantage over Elbourne (2013)'s theory, which introduces two completely different syntactic forms for referential and attributive readings (the former using restriction to particular situations and the latter situation binders).

Finally, I want to introduce the notion of a *pseudo-singular restrictor*. The pseudo-singular restrictor is the way of cashing out the idea mentioned several times already that in using discourse anaphora, conversational participants are making as if they are discussing a single, specific referent. The pseudo-singular restrictor involves a property like *being identical to 1* or *being a student who is identical to 1*, where 1 is a discourse referent. It is part of the proposition expressed as a pragmatic overlay, that is, one could either think of it as part of the semantic content that doesn't come from the syntax, or a pragmatic enrichment that is neither an element of semantics nor syntax (I will not choose between these options). It places interpretation constraints on the discourse — the same actual witness (even though it is indeterminate which one) has to witness all the properties associated with a single discourse referent.

On the proposed view, though both anaphoric and non-anaphoric definite descriptions presuppose some sort of uniqueness and have the content of existential quantifiers, while anaphoric definites can be truly existential, i.e., compatible with there being multiple witnesses to the description, non-anaphoric definite descriptions require uniqueness much in the classical way. Informally going through the examples (10) and (11) (the contrasting pair of anaphoric and non-anaphoric definites from §2), repeated below as (44) and (46), will help illustrate the way the semantics and pragmatics work. In §4, I turn to the formal implementation.

3.1 Case 1: Anaphoric definite

(44) a. A student came to Fred's office hours.
b. She/the student asked for a higher grade.

(44a) introduces a discourse referent, say *1*, and pegged on *1* is the information *is*

[51] Hawthorne & Manley (2012) and Neale (2004) make the same suggestion.

a student and *came to Fred's office hours*. Anaphoric pronouns and definite descriptions are resolved to discourse referents, not to linguistic antecedents. The intuitive thought behind this is that in conversation, anaphoric expressions are connected by interlocutors to the objects under discussion, not to a specific piece of linguistic material that came earlier. I am not giving a theory of how anaphoric pronouns are resolved to discourse referents.

Whatever the details of a theory of anaphora resolution, it is important for my theory that resolution happens at a pre-semantic level, that is, an anaphoric expression is resolved to a discourse referent before the semantic machinery is applied to it. This is a common assumption in theories of anaphora. When an anaphoric pronoun is resolved to a particular discourse referent, the discourse referent serves to restrict the quantifier in two ways: one, all the information pegged on the discourse referent supplies descriptive material, and the discourse referent itself adds the pseudo-singular restrictor property *being identical to i*, where i is the index of the discourse referent. The former provides input to the semantics while the latter supplies pragmatic interpretation constraints, as described in the previous paragraph. I will put the pseudo-singular restrictor element in brackets to indicate its status. In this case the overt material to be combined with the implicit restrictor is either nothing (in the case of the pronoun) or "student" (in the case of the definite description). In either case, the resulting restrictor property is *student who came to Fred's office hours (who is identical to 1)*. Thus (44b) is equivalent to:

(45) The student who came to Fred's office hours (who is identical to *1*) asked for a higher grade.

Since the definite is anaphoric, it presupposes that there is a unique accessible discourse referent that satisfies the descriptive information of the restrictor property (i.e. everything except the pseudo-singular element).[52] In other words, it presupposes there is not more than one accessible discourse referent in the context with the information *is a student who came to Fred's office hours* on it. The informational content is just existential, that is that there is at least one student who came to Fred's office hours and asked for a higher grade. Since discourse uniqueness doesn't guarantee the domain of the existential is a singleton domain, the truth of (44b) is compatible with there being multiple students who came to Fred's office hours. In this way, both desiderata for a theory of anaphoric definites are satisfied. We saw that a mere familiarity presupposition was too weak; on the other hand, we also

[52]Including the pseudo-singular restrictor would make discourse uniqueness trivial, since by definition there is only one discourse referent identical to 1.

saw that traditional d-type theories of pronouns and classical treatments of definite descriptions predict truth conditions that are too strong — requiring uniqueness where there is none. The present theory captures the existential truth conditions of anaphoric sentences, while requiring the stronger presupposition of discourse uniqueness. Insofar as the central goal of the paper is to argue for the best kind of d-type theory, this is it.

3.2 Case 2: Non-anaphoric definite

The non-anaphoric example from our minimal pair is repeated here:

(46) The student who came to Fred's office hours asked for a higher grade.

Since (46) involves a non-anaphoric definite, the definite presupposes that there is a unique object in the world that satisfies the (possibly enriched) descriptive information. In this case, to ensure uniqueness, the description would have to be enriched to include the time period in question (we are likely not talking about all the office hours that Fred has ever held, but office hours on a particular day or week). Suppose the we are talking about March 20, 2018. (46) presupposes that there is a unique student who came to Fred's office hours on March 20, 2018. If there is such a unique student, the presupposition is satisfied. The informational content of the definite description is the existential *there is at least one student who came to Fred's office hours on March 20, 2018*. If the presupposition is satisfied, the restrictor property has a singleton extension, that is, an extension with exactly one object in it (relative to each world). Since felicitous non-anaphoric definite descriptions always involve singleton restrictors, the truth conditions of sentences involving them are not compatible with there being more than one object that satisfies the definite description.

Some of the data that seems to speak in favor of some familiarity theories for non-anaphoric definites can be explained by an account of definites in which uniqueness is presupposed rather than entailed. It can explain why many non-anaphoric definites are hearer-old (in the sense of Prince (1992)), that is, they denote referents that the speaker expects the hearer is already familiar with. This is because if a description presupposes a unique witness, then in order to felicitously use a non-anaphoric definite description, it will often have to be common ground that there is a unique witness for the description. Hence, the referent of the description will either be hearer-old or the sort of information that is easily accommodated (i.e. it is easy for people to act as though it is hearer-old). Schwarzschild (2002)(p. 295), in arguing in favor of a familiarity theory, writes: "There are familiarity conditions on

the use of definites which do not apply to indefinites. It would be odd for me to assert out of the blue that the aluminum toothbrush is in a museum in New Hampshire, despite the fact that there is a unique aluminum toothbrush". This is right, but not because definites require some sort of familiarity. If 'the aluminum toothbrush' semantically presupposes that there is a unique aluminum toothbrush, this is an odd thing to say out of the blue, because the existence of a unique aluminum toothbrush is not generally part of the common ground and is the kind of surprising fact that is not easily accommodated (or at least not accommodated smoothly and tacitly — "whaddya mean 'the aluminum toothbrush!?"').

4 Formal implementation

I adopt a static, truth-conditional notion of semantic content and a structured context that tracks discourse referents.[53] Unlike in a dynamic semantics, semantic interpretation is not defined in terms of updates to the context. In fact, it is not defined in terms of the context at all. Context plays the same role for semantics here as it does in many static semantic systems — as determiner of semantic value for context-sensitive expressions. It also, of course, models the information that conversational participants track. This is the entire extent of the role context plays. I present the system extensionally for ease of presentation. It can be lifted to an intensional semantics in the usual way; readers who are interested in the details of how the formal system works in an intensional setting are advised to consult the footnotes included in this section.[54] The semantics is conservative in the sense that (with the exception of the presupposition on anaphoric definites) it doesn't employ non-standard semantic tools. Truth is still the central semantic notion and is also defined in the usual way (I will return to this idea after I have laid out the semantics).

Working in an extensional framework, a model is a tuple $\mathrm{M} = \langle \mathrm{D}_e, \mathrm{D}_t, \mathrm{I} \rangle$, where D_e is the domain of individuals, $\mathrm{D}_t = \{0,1\}$ and I is an interpretation function. The interpretation function I assigns individual constants to individuals in D_e, assigns one-place predicates to sets of members of D_e and n-place predicate to sets of n-tuples of members of D_e.[55]

[53] A complete theory of context tracks more than just discourse referents. Minimally, it also tracks the common ground, but perhaps also the questions under discussion, domain goals, and other things.

[54] See also the appendix of Lewis (2020).

[55] In the intensional version, the model also contains W, the set of all worlds. The interpretation function assigns a predicate to a set of pairs where the first element is a $\mathrm{w} \in \mathrm{W}$ and the second is a member or n-tuple of members of D_e, as applicable.

A context c is a pair ⟨DR, G⟩. DR and G together represent the annotated discourse referents. G is a set of partial assignment functions from indices to individuals. DR is a set of indices, i.e. the discourse referents themselves. It is the domain of the assignment functions in G.[56] Introduction and update of discourse referents are modeled as change to DR and G. For example, if a new discourse referent for a student is introduced, then a new index, say *1*, is added to DR, and the set G is changed such that the new set is all the *1*-variants of the input assignment functions, such that *1* is now assigned to an individual in I(*student*). A *1*-variant of an assignment function g is here defined as all the possible extensions of g that assign *1* to something in the relevant interpretation. Adding new information to an old discourse referent involves eliminating those assignment functions that don't satisfy the relevant properties. E.g. if we also want to add the information *that 1 is happy*, we would eliminate all those assignment functions that assign *1* to something that isn't in the interpretation of 'happy'.

The assignment functions relative to which expressions are evaluated are distinct from the assignment functions used in the context to track discourse referents. The assignment functions in the context, as I have just explained, are functions from indices to individuals, whereas the assignment functions relative to which expressions are evaluated are functions from variables to individuals or indices. I reserve 'g' for the former and 'h' for the latter, to avoid confusion.[57] Assignment functions h are determined by the context more broadly construed. Quantification is treated in the usual way, according to generalized quantifier theory:

[56]In an intensional version of the theory, the context also contains CG, the common ground, modeled as context set. While it will not play a role in the explanation that follows, it is relevant to the bigger picture of update with discourse referents and a full theory of what makes a discourse referent accessible. A necessary (but not sufficient) condition on accessibility is that the discourse referent is satisfied in every world in the context set. And of course it is necessary to model how the context tracks informational content. Furthermore, on the intensional version, instead of G, there is WG, the set of all possible pairs $\langle w, g\rangle$, where $w \in$ W and g is one of the possible assignment functions for the elements of DR in w. Note that w are the elements of W and not restricted to CG. This is because the information G encodes are the properties associated with the discourse referents; this has nothing to do with which worlds are still considered open according to the conversation. Of course, if certain assignments to individuals are only associated with worlds that have been eliminated from the CG, they won't be live possibilities as witnesses for the discourse referent. But that doesn't matter because the set of pairs $\langle w, g\rangle$ is not supposed to track live possibilities (that is the job of the CG). It is supposed to track properties that are associated with discourse referents. Keeping these separate is helpful in maintaining the ordinary notion of truth at a world in the system. E.g. Sentences will still have truth values relative to worlds which have been eliminated from the CG. This is particularly helpful if the actual world has been eliminated from the CG, which in practice, it often is.

[57]Technically, they don't have to be treated separately. But I find it more perspicuous to do so.

(47) $[\![$[every x: $\phi](\psi)]\!]^{M,c,h} = 1$ iff $\forall$d $\in$ D$_e$ s.t. $[\![\phi]\!]^{h[x\rightarrow d]} = 1$, $[\![\psi]\!]^{h[x\rightarrow d]} = 1$

(48) $[\![$[some x: $\phi](\psi)]\!]^{M,c,h} = 1$ iff $\exists$d $\in$ D$_e$ s.t. $[\![\phi]\!]^{h[x\rightarrow d]} = 1$ & $[\![\psi]\!]^{h[x\rightarrow d]} = 1$

(49) $[\![$[no x: $\phi](\psi)]\!]^{M,c,h} = 1$ iff $\neg\exists$d $\in$ D$_e$ s.t. $[\![\phi]\!]^{h[x\rightarrow d]} = 1$ & $[\![\psi]\!]^{h[x\rightarrow d]} = 1$

Conjunction, disjunction, and negation are treated in the ordinary truth-functional way. (Conditionals will be treated in the section on donkey anaphora, §4.3 below.)

Definite descriptions are treated as generalized quantifiers. The presuppositions are semantic; they are conditions on definedness. As mentioned in the previous section, this is an ambiguity theory — there are two entries for 'the', one for the anaphoric and one for the non-anaphoric version.

(50) **Anaphoric 'the':**

$$[\![[\text{The}_1 \text{ x: } \phi](\psi)]\!]^{M,c,h} = \begin{cases} \text{defined if } \exists!\text{n} \in \text{DR s.t. } \forall\text{g} \in \text{G}, [\![\phi]\!]^{h[x\rightarrow g(n)]} = 1 \\ 1 \text{ iff } \exists\text{d in D}_e \text{ s.t. } [\![\phi]\!]^{h[x\rightarrow d]} = 1 \text{ \& } [\![\psi]\!]^{h[x\rightarrow d]} = 1 \\ 0 \text{ otherwise} \end{cases}$$

(51) **Non-anaphoric 'the':**

$$[\![[\text{The}_2 \text{ x: } \phi](\psi)]\!]^{M,c,h} = \begin{cases} \text{defined if } \exists!\text{d} \in \text{D}_e \text{ s.t. } [\![\phi]\!]^{h[x\rightarrow d]} = 1 \\ 1 \text{ iff } \exists\text{d in D}_e \text{ s.t. } [\![\phi]\!]^{h[x\rightarrow d]} = 1 \text{ \& } [\![\psi]\!]^{h[x\rightarrow d]} = 1 \\ 0 \text{ otherwise} \end{cases}$$

As this is a d-type theory, pronouns have the same semantics as definite descriptions. They can be anaphoric or non-anaphoric, as expected.[58] I am suppressing treatment of gender in pronouns, but that could be easily incorporated. I am also not claiming that pronouns and definite descriptions pattern in exactly the same ways; it is well known that they don't. There are at least three ways to distinguish between them on this view. One I mentioned in the previous section: we can cash out the notion of accessibility of discourse referents such that what is accessible to

[58]Deictic pronouns are treated as non-anaphoric pronouns with singular restrictors. Deictic pronouns are not the only non-anaphoric pronouns on my view. Bound pronouns (see footnote 74), and possibly donkey pronouns (see §4.3), are also treated with the non-anaphoric clause. Some non-deictic discourse pronouns are also so treated (see for example the discussion in §5.2 below).

a pronoun is more restricted than what is accessible to a definite description. Another way of distinguishing between the two is to say that the presupposition on pronouns is slightly different from definite descriptions, i.e., they require a *highly salient discourse unique antecedent*. Third, one might explain the difference in patterning not by appealing to the semantics of pronouns and definite descriptions, but to the retrievability of the intended antecedent.[59]

Quantifier domain restriction will be modeled in the style of Stanley & Szabo (2000).[60] All quantifiers are restricted in the syntax by a variable that shares a node with the noun. The variable is of the form *f(i)*, where i is an individual variable that can either be bound or get a value from the context and f is a contextually determined function from individuals to quantifier domains.[61] Continuing with the extensional version of the theory, this means the result of this function is a set of individuals.[62] The set determined by *f(i)* is intersected with the set denoted by the overt material (if any) to determine the domain of the quantifier.[63] Stanley &

[59]An anonymous reviewer raised an example that is problematic for a view that accepts that a definite description is always licensed when a pronoun is, even if the reverse does not hold.

(52) A student came to Fred's office hours. She asked for a higher grade. In fact many students came to Fred's office hours. But she/ ??the student was the only one to ask for a higher grade.

Here the pronoun is felicitous but the overt anaphoric definite less so. I think this shows that we do need to take word choice — following Grice's Maxim of Manner — into consideration when judging for felicity. Using an overt anaphoric definite is already dispreferred to using a pronoun when one is possible. Not only do we here have an overt definite where a pronoun is possible, but it follows the use of a pronoun to pick up on the intended antecedent, as well as intervening information about other students, which makes the descriptive information associated with the definite not only superfluous, but downright confusing. I do think the example is much improved, if not perfectly fine, with 'the student' replacing the initial 'she'.

[60]The informal theory presented in the previous section could be implemented in a multitude of ways. However, this is not to say nothing rests on this choice; certainly much of the way I work out the theory rests on the formal choices made, though it is beyond the scope of the present paper to argue for all of them.

[61]Though Stanley & Szabo do not discuss this, there is no reason to think that the variable has to be limited to a function that takes only one individual variable. In principle, it can take as many individual variables as it requires (i.e. as need to be bound). von Fintel (1994, 31), who has a similar quantifier domain restriction theory to that of Stanley and Szabo, defines the QDR variable as taking an indefinite number of variables. Cooper (1979, 78-9) whose paycheck pronouns have the same structure as QDR variables also defines them as taking as many individual variables as necessary.

[62]In an intensional theory, these are properties, i.e. functions from worlds to sets.

[63]For example, consider the sentence 'every student got an A' in a particular context of use. We can represent this using the notation of generalized quantifier theory as [every x: $\langle$student, f(i)$\rangle$ x]

Szabo-style QDR variables have essentially the same form as many traditional d-type theories of pronouns (e.g. Cooper (1979), Heim & Kratzer (1998), Büring (2004)). These all treat pronouns as variables of the form f(i). There are two important differences between those theories and the present one. Those theories treat the function f as type ⟨e, e⟩, i.e. they treat them as neo-Fregean definites. The function f in the QDR variable is of type ⟨e, ⟨e, t⟩⟩. This is an important difference, as it is what allows us to have existential truth conditions for anaphoric definites. Second, the presence of a variable of this shape falls out of two independent assumptions: that definite descriptions are quantifiers and Stanley & Szabo's theory of quantifer domain restriction. They do not have to be posited specifically with regards to pronouns.[64]

I will now show how the formal theory applies to examples of anaphoric definites, including ones with multiple anaphoric elements. I will then turn to bridging cases and donkey anaphora. There is nothing particularly novel or illuminating about the non-anaphoric case (it involves the standard Stanley & Szabo quantifier domain restriction), and so I will not go through it here. In what follows, wherever quantifier domain restriction does not matter for the present theory, I will leave out *f(i)* so that the formalism is easier to read.

4.1 Anaphoric definites

Quantifier domain restriction is where the dynamic pragmatics meets the static semantics. Let's look at our central example (44). Here I present the formalization for the version with the overt anaphoric description; the pronominal version is exactly the same except with null overt content on the description instead of 'student'.[65]

(53) a. A student came to Fred's office hours.
a'. [an x: student x] (x came to Fred's office hours)
b. The student asked for a higher grade.
b'. [the x: ⟨student, $f(1)$⟩ x] (x asked for a higher grade)

(x got an A). In a particular context, f might be the function from classes to their participants, and the value for i might be Fred's Introduction to Philosophy Fall 2018 course. Hence, *f(i)* yields the set of all the participants in Fred's Intro course from Fall 2018 (perhaps including auditors, TAs), and intersecting that with the set of students, we get the students in Fred's Introduction to Philosophy Fall 2018 course as the restrictor. Thus we get the restricted universal claim that every student in Fred's Introduction to Philosophy Fall 2018 course got an A.

[64]On the other hand, Jacobson (2014, 378) posits that *all* hidden variables can have this kind of complex form, which she calls the *paycheck generalization*.

[65]i.e. 'the x: ⟨∅, f(1)⟩ x'

Consider the following toy model:

1. $\mathrm{D}_e = \{Alice, Bob, Carol, David, Emily, Fred\}$
2. I(*student*) $= \{Alice, Bob, David, Emily\}$
3. I(*came to Fred's office hours*) $= \{Alice, Bob, Carol, Emily\}$
4. I(*asked for a higher grade*) $= \{Alice, Bob, David\}$

Let's assume for the sake of illustration that we start with a fresh context: DR and G are empty. The effect of (53a) on the context is to add a new index to DR, *1*, and change G so that all the assignment functions that were previously in G are extended in all the possible ways so that *1* is assigned to an object both in the interpretation of *student* and *came to Fred's office hours* (I am treating this as a single predicate for the sake of simplicity).

Context after (53a) is asserted:
DR $= \{1\}$
G $= \{g_1$: 1 $\rightarrow$ Alice, g_2: 1 $\rightarrow$ Bob, g_3: 1 $\rightarrow$ Emily$\}$

The definite in (53b) is pre-semantically disambiguated as anaphoric and resolved to the discourse referent *1* (by mechanisms of anaphora resolution that are beyond the scope of this paper). The discourse referent *1* is the contextually salient "individual" that goes in for the variable i, and the relevant function for restricting the domain of anaphoric definites is the function that takes the index and returns the set of all those individuals assigned to the index by at least one $g \in$ G. This function does just what I described informally in the previous section: it gathers all the descriptive information associated with a discourse referent and puts it into the domain restriction, providing the descriptive material for an anaphoric definite or pronoun.[66] One important role for discourse referents is to record information that must be satisfied by a single individual according to the discourse. On the present view, this gathering of information in the context affects content by providing the quantifier domain restriction on anaphoric definites; in other words, the domain of the definite is all the possible witnesses for the relevant discourse referent.

Contextual QDR function for anaphoric definites:
Where n is an index, $\mathrm{f}(n) = \bigcup_{g \in G}\{g(n)\}$

[66] Again, in our extensional version, this is equivalent to a set of individuals. In the intensional version this would yield a property, or a function from worlds to sets of individuals.

In this case, this yields the set of all students who came to Fred's office hours. The overt material is redundant, so the intersection with the set of all students results in the same set. We thus get the restrictor property *being a student who came to Fred's office hours*. Thus the full logical form of (53b) after quantifier domain restriction is complete is equivalent to:

(54) [The x: x is a student who came to Fred's office hours] (x asked for a higher grade)

This presupposes that there is a unique discourse referent with this property associated with it. This is satisfied in the model above (trivially), as there is only one discourse referent. The informational content is existential, that there is at least one student who came to Fred's office hours and asked for a higher grade. Since there is at least one such individual according to the model (both Alice and Bob are possible witnesses), the sentence is true. To reiterate what I said about truth above, there is nothing special or dynamic about how truth is defined here. A sentence 'The ϕ is ψ' is true relative to a context c and a model M iff according to M, there is at least one individual in the extension of both the c-restricted property ϕ and ψ (where 'c-restricted' means the contextually restricted property according to context c).[67] The structured context plays its role in determining what the c-restricted property is, that is, in determining the proposition expressed.[68] But once that is done, the truth conditions make no reference to discourse referents or contexts.[69]

The dynamic effect of asserting (53b) is to eliminate all assignment functions incompatible with it:

Context after (53b) is asserted:
DR = {1}
G = {g_1: 1 → Alice, g_2: 1 → Bob}

[67] In an intensional version we would of course include reference to a world.

[68] The part of the context I have described here, DR and G, only goes so far in determining the content, because it determines the content of anaphoric definites once they have been resolved to a particular discourse referent, but it does not explain how salient QDR functions are contextually determined, or how the contextual assignment function h gets determined. The present theory is compatible with many possible answers to this question. One such possible answer is that it is determined by the common ground.

[69] Compare this to a case of a gradable adjective like 'tall'. The general statement of truth for such a sentence might be 'John is tall' is true relative to a context c and model M iff John has greater height according to M than the c-determined standard for 'tall'. A context determines the value for the standard for tallness and the LF in context is something equivalent to tall(John) ≥ 6ft, which is true or false relative to a model in a straightforward way.

This effect is purely pragmatic. Eliminating incompatible assignment functions captures the fact that conversational participants use discourse referents to track what properties hang together as satisfied by a single witness according to the discourse. The discourse referent *1* after the assertion (and acceptance) of (53b) is associated with the properties *being a student*, *coming to Fred's office hours*, *asking for a higher grade*. In this case, the assignment function g_3 has to be eliminated because Emily is not a possible witness.

The last element of the theory is the pseudo-singular restrictor; the proposition expressed at a pragmatic level is *that there is at least one student identical to 1 who came to Fred's office hours and asked for a higher grade*. Again, the force of the pseudo-singular restrictor is an interpretative constraint at the level of discourse: it indicates that whoever is being talked about is the same individual throughout the discourse. Recall that I am thinking of discourse referents as the manifestation of conversational participants making as if to talk about a specific individual. The pseudo-singular restrictor represents this aspect of the role of discourse referents.[70]

Now consider a case with multiple anaphoric expressions:

(55) a. A student and a professor were talking.
a'. [an x: student x] ([a y: professor y] (x was talking to y))
b. The student waved good-bye to the professor.
b'. [the x: $\langle$student, $f(1)\rangle$ x] ([the y: $\langle$professor, $f(2)\rangle$ y] (x waved goodbye to y))

(55a) introduces two new indices into DR, say *1* and *2*. G is updated so that it contains all the possible assignment functions g such that: g(*1*) $\in$ I(*student*), g(*2*) $\in$ I(*professor*) and $\langle$g(*1*),g(*2*)$\rangle$ $\in$ I(*talking*). The anaphoric definites work the same as in the previous example. The contextual variable is assigned to *1* in the case of 'the student', and the contextual QDR function yields the set of all students who talked to a professor. Likewise, in 'the professor' we plug in *2* and get the set of all professors who talked to a student. Thus we get something truth-conditionally equivalent to:

[70]Since the theory of anaphoric definites crucially employs discourse referents, it can account for the data from sign languages like American Sign Language (ASL) and French Sign Language (LSF). In ASL and LSF, anaphoric connection works by setting up a locus in the signing space the first time an object is introduced. Anaphoric links are achieved by pointing subsequently to the same locus. Schlenker (2010, 2011, 2013, 2015) has argued that this is evidence for needing indices or discourse referents in a correct semantics of anaphora, since loci are overt realizations of indices. On the present view, discourse referents are not ordinary indices in the semantics, but the loci of sign language can be construed as an overt realization of the quantifier domain restriction (where the discourse referents do appear at LF) or the pseudo-singular restrictors.

(56) A student who talked to a professor waved goodbye to a professor who talked to a student.

Adding in the pseudo-singular restrictor, we get:

(57) A student (who is identical to *1*) who talked to a professor (who is identical to *2*) waved goodbye to a professor (who is identical to *2*) who talked to a student (who is identical to *1*).

The pseudo-singular restrictor rules out any possible interpretations in which the individual who bears witness to the student (professor) in (55a) is not identical to the individual who bears witness to the student (professor) in (55b). So while the output of the compositional semantics yields the truth conditions in (56), the content of the proposition (pragmatically) expressed is that of (57), which has stricter truth conditions than (56).

4.2 Bridging cases

Let's turn to bridging cases. While it has been previously noted in the literature that bridging cases require uniqueness,[71] to my knowledge it has not been noted that bridging cases have a sort of mixed reading in terms of the type of uniqueness they require. That is, they have an element of discourse uniqueness and an element of worldly uniqueness. Consider the following examples of typical bridging cases:

(58) a. Fred tried a new restaurant last night.
b. The salmon was divine.

(59) a. A bus crashed on I-95.
b. The driver was texting.

(58) presupposes that there was a unique salmon dish at the new restaurant Fred tried. The uniqueness in question is worldly uniqueness — it is infelicitous to follow up (58) with "In fact, all the salmon dishes Fred tried were divine" or "In fact, Fred had 3 salmon dishes, but only one was divine". However, there is nothing about the discourse (58) that requires Fred to have only tried one new restaurant the previous night, or had salmon at only one of the restaurants. It *is* felicitous to follow up (58) with "In fact, Fred went to three new restaurants last night and had the salmon at each one..." The kind of uniqueness invoked by the bridging definite, then, is

[71] E.g. see Barker (2005) and Horn & Abbott (2012).

worldly uniqueness of salmon relative to discourse uniqueness of restaurant. This nicely reflects the fact that bridging definites by definition are partly anaphoric on old information and partly introduce new information. The same holds true of (59). (59b) requires that there is a worldly-unique driver of the bus (whichever one it is) introduced by (59a). But there's nothing about the discourse that requires that only one bus crashed on I-95 on the relevant day/time interval and thus that there is only one driver of a crashed bus on 1-95 in the world on the current day (or even at a contextually specified time). It is compatible with there being multiple such crashes, with (possibly multiple) drivers (or not — it is compatible with some buses being driverless) of those buses texting (or not). (59) is true so long as there is a least one bus that crashed on I-95 that had a unique driver, and that driver was texting.

How to capture this mixed reading? Suppose that bridging cases contain an elided anaphoric definite, e.g. 'at the restaurant' for (58b), i.e. 'the salmon at the restaurant was divine', and that at LF, 'at the restaurant' takes wide scope over 'the salmon'.[72] I will defend this assumption momentarily, but let's see how the example works first. The logical form is roughly as follows.

(60) a. [an x: new restaurant x] (Fred tried x)
b. [at the x: $\langle$restaurant, $f(3)\rangle$ x] ([the: y $\langle$salmon, $g(x)\rangle$ y] (divine y))

Since 'the restaurant' is an anaphoric definite, QDR works according to the formula above. (60a) will have introduced a new discourse referent, say *3*, and assigning the individual QDR variable to *3* in (60b) yields the set of all restaurants that have the property of having been tried by Fred the previous night. It presupposes discourse uniqueness, which is satisfied. I treat bridging definites like 'the salmon' as non-anaphoric, which mean the QDR function is not related to the set of discourse referents. The contextually salient function is a function from restaurants to dishes consumed by Fred at that restaurant, intersected with the set of things denoted by the overt material, we get the salmon dishes consumed by Fred at that restaurant. The individual variable is bound by the existential quantifier 'the restaurant', which doesn't yield a specific domain, but one relative to whatever restaurant bears witness to the existential. Since 'the salmon' is non-anaphoric, it presupposes worldly uniqueness of salmon dishes (but relative to whatever restaurant satisfies the existential, since it is bound). Since there is a discourse unique restaurant under discussion, there is also a pseudo-singular restrictor (*is identical to 3*) restricting 'the restaurant' and also, in effect, restricting 'the salmon' since the latter denotes the worldly unique salmon dish consumed by Fred at the restaurant identical to *3*.

[72]Thank you to Shane Steinert-Threlkeld for suggesting this idea.

Why think that the elided material is present? None of the options on my table or anyone else's yield the right truth conditions: positing that 'the salmon' presupposes familiarity or discourse uniqueness yield truth-conditions that are too weak and positing that it presupposes worldly uniqueness yields ones that are too strong. Furthermore, the need for some sort of bound quantifier domain restriction seems to be not an issue about definites at all, but a more general issue involving quantified expressions that are not typically treated as anaphoric. For example:

(61) a. I tried a new restaurant yesterday.
b. Every dish was divine.

(61b) is interpreted as *every dish at the new restaurant I tried was divine.* But this does not seem to involve a specific contextually provided restaurant, since I can follow this up with "Then I tried another new restaurant. Every dish was awful." So some account of providing this type of quantifier domain restriction needs to be given independently of an account of anaphoric expressions. And it seems that positing the elided material does the job quite well.

A natural objection is that dynamic binding of the QDR variable would more elegantly account for the data. I have nothing to say against this kind of account. If someone agrees with everything I have said, but in the end thinks it is better to incorporate some amount of dynamic binding into such an account, that is fine. As I said earlier, I don't think my formal implementation is the only possible one given the informal insights. But it is important to note that dynamic binding of 'the salmon' itself doesn't explain the data; the truth conditions would be too weak, and it wouldn't explain cases like (61). One would still need a Stanley & Szabo style quantifier domain restriction. The difference would be that the QDR variable is dynamically bound instead of bound by elided material in the same sentence.

4.3 Donkey sentences

Donkey sentences are cases of sentence-internal unbound anaphora.[73] They come in two varieties, quantified (as in (62)) and conditional (as in (63)).

(62) Every farmer who owns a donkey vaccinates it.

(63) If a farmer owns a donkey, he vaccinates it.

[73]That is, the pronoun is not in the syntactic scope of its antecedent.

These kinds of sentences have been the (exclusive) focus of recent work on unbound anaphora on indefinites. One of the central purposes of this paper is to bring to light the problems that d-type theory faces in its account of discourse anaphora rather than donkey anaphora. Beginning from the cross-sentential rather than the intra-sentential cases has led us to a very different sort of d-type theory. This raises the question of how the present theory deals with donkey anaphora. My aims in this section are somewhat modest; it is first to show the basics of how the semantics and pragmatics of donkey anaphora works (or how it can work) on my account and second to make the case that the gaps left open by the discussion in this section can plausibly be filled in.

Since definites in the present account are ambiguous, the first question is whether pronouns in donkey sentences have the semantics of anaphoric or non-anaphoric definites. I do not think there is an obvious answer to this question, and one possible answer is *both*, i.e., there are readings of donkey sentences that take anaphoric definites and ones with non-anaphoric definites. I will go through both options, noting their respective advantages and disadvantages.

Some observations: donkey sentences are different from their discourse anaphora cousins. When I discussed the role of discourse referents in §3 above, I noted that tracking them in the context captures two intuitive ideas, that conversational participants keep track of the objects under discussion and that conversational participants are making as if a single, specific individual is under discussion. Unlike the case of discourse anaphora, the indefinites in donkey sentences do not intuitively introduce single, pseudo-specific individuals under discussion. Compare (62) and (63) with (64):

(64) A farmer buys a donkey. He vaccinates it.

Though (64) has existential truth conditions, it is naturally understood as a narrative about some particular farmer and donkey. By contrast, (62) and (63) are not naturally understood as a statement about a particular donkey (in (62)) or a particular farmer and donkey (in (63)). This is unsurprising, especially given the overt quantification in (62), but worth noting for what it means for the present view. It means one of two things. Either indefinites in donkey sentences don't introduce discourse referents at all, or there is some difference in kind or structure in the discourse referent(s) introduced by such indefinites (that is, we have to think about what discourse referents in quantified contexts look like). A natural pairing with the hypothesis that they do not introduce discourse referents is that the definites are non-anaphoric, and the natural pairing with the hypothesis that they do introduce discourse referents, albeit of a different structure, is that the definites are anaphoric.

It is possible also that under the hypothesis that donkey sentences sometimes involve anaphoric and sometime non-anaphoric definites that discourse referents are *always* introduced, but they are inert in the non-anaphoric reading which does not interact with the dynamic context. I begin with the non-anaphoric option in the next subsection, and then move on to the anaphoric option in the subsequent subsection.

4.3.1 Non-anaphoric version

Let's begin with quantified donkey anaphora. The non-anaphoric version more or less replicates classical (pre-Elbourne) d-type theories. This is unsurprising, given that, as I've already pointed out, the QDR variable is similar in structure to the d-type theories of Cooper (1979), Heim & Kratzer (1998), and others. The central idea is that the individual variable in quantifier domain restriction is bound by a higher quantifier, as in (65):

(65) a. Every farmer who owns a donkey vaccinates it.
b. [every x: farmer x & [a y: donkey y] (x owns y)] ([the$_2$ z: $\langle \emptyset, f(x) \rangle z$] ($x$ vaccinates z))

The QDR variable x is bound by *every farmer*, and the salient function f is the function from farmers to the set of donkeys they own. The existence of bound QDR variables falls out of the assumptions that pronouns are quantifiers and domain restriction is in the style of Stanley & Szabo. One of their central motivations in positing the variable at the level of syntax is evidence that it can be bound, from examples like (66) and (67):

(66) Everyone answered every question. (Stanley (2007, 114))

(67) In most of his classes, John fails exactly three Frenchmen. (Stanley (2007, 114))

As Stanley (2007) argues, in a particular context, (66) can express the proposition *that everyone x answered every question on x's exam.* Similarly, (67) means that *in most of his classes x, John fails exactly three Frenchmen in x.*[74]

However, given that the above analysis is equivalent to classic d-type analyses of quantified donkey sentences, it also inherits all the problems of these types of

[74]We also find cases of bound QDR variables in pronouns in the form of ordinary in-scope binding. In the case of in-scope binding, the non-anaphoric definition for the pronoun is typically in play, as discourse referents play no role. The higher quantifier binds the individual QDR variable and the QDR function is the identity function.

analyses. I take the central problems to be twofold. First, the uniqueness assumption is too strong. It requires each farmer to own no more than one donkey. If the uniqueness presupposition is satisfied, the semantics above yields that (65) is true iff every farmer beats the unique donkey they own; if it is not satisfied, the sentence is undefined. This is clearly not the right result.

Second, it encounters what is commonly known as *the problem of the formal link*, that is, following Heim (1982, 1990), it is commonly accepted that examples of the first sort are felicitous whereas ones of the second sort are not:

(68) Every man with a wife sat next to her.

(69) #Every married man sat next to her.

But of course, the function that takes a man and returns the person he is married to is made salient by (69), and so by the sort of the theory I have just proposed, (69) should be perfectly fine. I don't have a solution to the problem of the formal link here. On this score, Elbourne (2005)'s NP deletion theory does much better. However, it's unclear whether the formal link is as stringent a requirement as orthodoxy takes it to be. Consider the following example from Jacobson (2001, 48):

(70) Every Siberian Husky owner needs to give it lots of exercise.

This kinds of example lends some support to the idea that we may not want a semantic solution to the problem of the formal link.

The deeper problem is the former one; as long recognized in the donkey literature, sentences like (62) do not presuppose that every farmer who owns a donkey owns exactly one donkey. Here we can follow recent work in d-type theory in employing situation semantics to make the quantifier more fine-grained, so that it quantifies not directly over individuals, but individuals in minimal situations, which contain just one farmer and one donkey. We will need to introduce situations in the course of accounting for conditional donkey sentences, and it is arguably natural to include them in the denotations of quantifiers as well. I will now turn, then, to conditional donkey sentences and the role of situations and return to the situation semantics version of the quantified sentences at the end of the subsection.

Treating conditional donkey sentences is partly a matter of deciding on an account of adverbs of quantification, and then on how that account interacts with pronouns anaphoric on indefinites. Conditional donkey sentences either have overt adverbs of quantification as in (71) and (72) or include the silent variant of 'always' present in multi-case conditionals, as in the traditional (63).

(71) If a farmer owns a donkey, he always/usually/sometimes vaccinates it.

(72) When a farmer buys a donkey, he always/usually/sometimes vaccinates it before bringing it to the farm.

Following Kadmon (1987) and Berman (1987), multi-case conditionals like (63) are treated as having a covert 'always' at LF:

(73) [[always [if α]] β]

Accounting for adverbs of quantification and multi-case conditionals is more general than donkey sentences. For example, the salient reading of (74) is that in every case in which Madeline sees her mother, she is happy:

(74) If Madeline sees her mother, she is happy.

Therefore any account of conditional donkey anaphora cannot be *too* specific to the case of pronouns anaphorically dependent on indefinite antecedents. Any solution to conditional donkey anaphora has to work for cases like (74) and the like.

I will follow the recent literature in treating adverbs of quantification as quantifying over situations, where situations are parts of possible worlds. Adverbs of quantification quantify over something smaller than whole worlds; situations are a fruitful way of modeling this. However, if it turns out that events, or times, or world/time/location triples, or something of the like is a better model, these can easily be incorporated on my account, as I will show shortly. Nothing in the account of conditional donkey anaphora relies on it being a situation semantics per se.[75]

Situations are parts of worlds, they consist of one or more individuals that have one or more properties or stand in one or more relations. Since situations have this part-whole structure, there is difficulty counting them. For example, the situation containing Farmer Bob, Wonkey the donkey, and the owning relation is a distinct situation from the one containing all those things plus Bob's son Max, but we don't want to count those as two distinct situations in which a farmer owns a donkey. Similarly, we don't want to count things like the situation containing Farmer Alex, his donkey Eeyore and Farmer Bob, his donkey Wonkey, and their respective owning relations as a single situation in which a farmer owns a donkey; this will miss the fact that the sentences we are analyzing treat each of the owning relations and their relata

[75]The theory of adverbs of quantification that does not mesh well with this account, however, is treating them as unselective quantifiers, as first suggested by Lewis (1975). DRT theories of donkey anaphora employ this account of adverbs of quantification.

as separate cases. This is again a problem for all multi-case conditionals and sentences containing adverbs of quantification, and not just donkey sentences. We want, for example, to have a way of counting each distinct situation in which Madeline sees her mother without over- or under-counting situations. The solution to this has been to use minimal situations, that is, the situation that contains the smallest number of particulars, properties, and relations that verifies a proposition. 'Always' says that every minimal situation that supports the restrictor is such that it is extendable to a situation that supports the nuclear scope. An extension s_2 of a situation s_1 (written $s_2 \geq s_1$) is any situation that contains s_1 as a part, that is, it contains all the same particulars, properties, and relations as s_1 (and possibly more).Unlike the worry I raised for situation semantics in §2.1.5 above, namely that way situations are used in the definition of conjunction is not independently motivated, here use of situations is warranted by the presence of an adverb of quantification, which requires quantifying over cases, and they are implemented in a straightforward way. Furthermore, the worry I raised for conjunction about it forcing us to treat entire discourses as a series of left-embedded conjunctions also does not arise here.

Thus far the semantics and associated context has been extensional; introducing situations brings us into the realm of the intensional (sort of). I say "sort of" because the situations we will be concerned with are only the situations that are parts of the actual world. As a result, while our semantics will look intensional, we can keep on with our extensional treatment of the context. The model now also contains a set S, the set of all actual situations, assignment functions h, in addition to assigning individual variables to elements of D_e also assign situation variables to elements of S, and the interpretation function is intensionalized in the expected way. We can then treat 'always' as a generalized quantifier over situations:

(75) $[\![[\text{always}_{s_1}\text{: } \phi]_{s_2}(\psi)]\!]^{M,c,h,s} = 1$ iff for all minimal situations $\mathbf{s}_1 \in$ S s.t. $[\![\phi]\!]^{h[s_1 \rightarrow \boldsymbol{s_1}]} = 1$, there is a situation $\mathbf{s}_2$ s.t. $\mathbf{s}_2 \geq \mathbf{s}_1$ & $[\![\psi]\!]^{h[s_1 \rightarrow \boldsymbol{s_1}, s_2 \rightarrow \boldsymbol{s_2}]} = 1$

We now need situation variables at LF, and so (63) is treated as the following:

(76) [always$_{s_1}$ [an x: x is a farmer in s_1] ([a y: y is a donkey in s_1] (x owns y in s_1))]$_{s2}$ ([the$_2$ x: $\langle \emptyset, f(s_1) \rangle$ x in s_2] ([the$_2$ y: $\langle \emptyset, g(s_1) \rangle$ y in s_2](x vaccinates y in s_2)))

The QDR variable is now a situation variable that is bound by *always*; specifically it is the minimal situation variable in the restrictor. The salient function is the function from situations to the set of farmers in that situation and the function

from situations to the set of donkeys in that situation, respectively.[76] Since the situation variable introduced by the restrictor is by definition a minimal situation, this will yield a singleton set containing just one farmer and one containing just one donkey, thus satisfying the worldly uniqueness presuppositions, and yielding the truth conditions that each minimal situation s_1 in which a farmer owns a donkey is part of a larger situation s_2 in which the unique farmer of s_1 vaccinates the unique donkey of s_1, which are intuitively the right truth conditions.

We are now in a position to see how the quantified sentences work within a situations semantics. Once we have situations in the semantics of adverbs of quantification, it is natural to think that quantifiers at least sometimes quantify over situations as well.[77] We can follow Heim (1990) in adopting the following sort of situation semantics for quantifiers:

(77) $[\![[\text{every}_{x,s_1}\text{: } \phi]_{s_2}(\psi)]\!]^{M,c,h,s} = 1$ iff for all pairs of individuals and minimal situations $\langle \text{d}, \mathbf{s}_1 \rangle$ s.t. $[\![\phi]\!]^{h[x\rightarrow d, s_1 \rightarrow \boldsymbol{s_1}]} = 1$, there is a situation $\mathbf{s}_2$ s.t. $\mathbf{s}_2 \geq \mathbf{s}_1$ & $[\![\psi]\!]^{h[x\rightarrow d, s_1 \rightarrow \boldsymbol{s_1}, s_2 \rightarrow \boldsymbol{s_2}]} = 1$

Now the QDR function takes an individual and a situation variable (here x and s_1), and the function f is the function that takes a farmer x and a situation s_1 and returns the set of donkeys x owns in s_1. Since s_1 is a minimal situation, the function returns (the set containing) the unique donkey of s_1, and worldly uniqueness is satisfied. The LF for (62) is then as follows:

(78) $[\text{every}_{x,s_1}\text{: } x \text{ is a farmer in } s_1 \text{ \& [a } y\text{: } y \text{ is a donkey in } s_1] \ (x \text{ owns } y \text{ in } s_1)]_{s_2}$ $([\text{the}_2\ z\text{: } \langle \emptyset, \text{f(x,s}_1)\rangle z \text{ in } s_2] \ (x \text{ vaccinates } z \text{ in } s_2))$

4.3.2 Anaphoric version

The second option for donkey anaphora is to use the anaphoric definite. The LFs for both quantified and conditional donkey anaphora look exactly the same, except for the anaphoric 'the' — *the*$_1$ — in the place of the non-anaphoric 'the'. The QDR

[76] This is more or less how Heim (1990) and von Fintel (1994) treat conditional donkey sentences. Elbourne (2005) also uses situations, but his approach is different in significant ways.

[77] Or is it? I must admit I am of two minds here. I am attracted to a modest situation semantics, in which most sentences deal only in maximal situations, i.e. worlds, while only operators that so to speak "look inside" worlds, such as adverbs of quantification, actually require smaller situations as part of their semantics (and thus require situation variables at LF). On this type of view, to think that quantifiers require smaller situations would require evidence that they look inside worlds. Elbourne (2001) argues in favor of a modest situation semantics, as well as arguing that quantifiers sometimes, but do not always, quantify over situations. I will not evaluate these arguments here.

individuals and functions are also the same as just outlined in §4.3.1 — that is, there is no difference here in the assumption on what is made contextually salient for the purposes of QDR. I repeat the LFs here for convenience; note that we return to the simple, non-situation semantics version of quantifiers.

(79) a. Every farmer who owns a donkey vaccinates it.
b. [every x: farmer x & [a y: donkey y] (x owns y)] ([the$_1$ z: $\langle\emptyset$, f(x)$\rangle z$] (x vaccinates z))

(80) a. If a farmer owns a donkey, he vaccinates it.
b. [always$_{s_1}$ [an x: x is a farmer in s_1] ([a y: y is a donkey in s_1] (x owns y in s_1))]$_{s2}$ ([the$_1$ x: $\langle\emptyset$, $f(s_1)\rangle$ x in s_2] ([the$_1$ y: $\langle\emptyset$, $g(s_1)\rangle$ y in s_2](x vaccinates y in s_2)))

Granting for the moment that the discourse uniqueness presuppositions are satisfied for the definites, (79) is true iff every farmer who owns a donkey vaccinates at least one donkey that he owns, thus yielding what is known as the *weak* or *existential* reading of the quantified sentence. The classical example of a quantified donkey sentence that saliently gets a weak reading is (81):

(81) Everyone who had a dime put it in the meter.

One of the reasons we might want both the anaphoric and non-anaphoric analyses of quantified donkey sentences is that the former yields the weak reading and the latter the strong reading. This not only captures the facts (i.e. that there are weak and strong readings) but makes sense of them. On the strong reading, we are counting individual farmers and donkeys, i.e, actual referents, but on the weak reading the donkeys owned by a single farmer are lumped together, i.e. distinguishing between donkey referents doesn't matter — this is exactly what discourse referents do.

On the assumption that minimal situations that verify the restrictor in (80) contain just one farmer and one donkey, the truth conditions are the same ones as predicted by the non-anaphoric definite, since the existentials in the nuclear scope will have singleton restrictors. However, since there are no worldly uniqueness presuppositions to be satisfied here, the truth-conditions for the conditional sentence depend on how we count minimal situations in the restrictor, as I will explain later in this subsection.

The real question for the anaphoric version of the analysis is therefore not so much about the truth conditions but about how the context evolves over the course of the interpretation of a donkey sentence so that the discourse uniqueness presuppositions

are satisfied. That is, it is really a question for the dynamic pragmatics. In quantified contexts (which includes both quantified donkey sentences and multi-case conditionals), there is a *subordinate* context which contains a discourse referent introduced for each case. A subordinate context is a temporary context that differs from the basic context either by containing elements not in the basic context, or lacking elements that are in the basic context, or both. Use of subordinate contexts is independently motivated on a dynamic pragmatics for various reasons.[78] For example, in quantified donkey anaphora, what is being quantified over is farmers who own a donkey, and so a discourse referent is introduced for a donkey owned by each farmer (i.e. for each case of a farmer owning a donkey). Similarly, for multi-case conditionals, a discourse referent for a farmer and one for a donkey are introduced for each case, where cases are minimal situations. To see why this is motivated, think of the role the set of discourse referents is supposed to play. It is supposed to keep track of the object under discussion, i.e. those properties that according to the conversation must be jointly satisfied by a single witness. Intuitively, it is like pseudo-specific individual; when speakers say things like "a woman walked in", though there is no specific woman that is referred to, they are making as if to refer to a specific woman. In the case of quantified contexts, a similar phenomenon appears at the level of each case. When someone says (62), they are making as if to talk about a single donkey for each farmer who owns a donkey, though as in the cross-sentential case, the sentence may be true even if some farmers own more than one donkey.

Consider the following toy model:

1. $\mathrm{D}_e = \{Alex, Bob, Cory, Dobbin, Eeyore, Wonkey, Kong, Brownie, Pickles\}$
2. $\mathrm{I}(farmer) = \{Alex, Bob, Cory\}$
3. $\mathrm{I}(donkey) = \{Dobbin, Eeyore, Wonkey, Kong, Brownie, Pickles\}$
4. $\mathrm{I}(own) = \{\langle$Alex, Dobbin$\rangle$, $\langle$Alex, Eeyore$\rangle$, $\langle$Bob, Wonkey$\rangle$, $\langle$Cory, Kong$\rangle$, $\langle$Cory, Brownie$\rangle\}$

When a speaker says "every farmer who owns a donkey", a discourse referent is introduced for a donkey relative to each farmer, that is, the changes to DR and G are as follows.

DR = {1, 2, 3}
G = {g_1: 1 → Dobbin, 2 → Wonkey, 3 → Kong; g_2: 1 → Dobbin, 2 → Wonkey, 3 →

[78] See Stalnaker (2014) and Lewis (2020).

Brownie; g_3: 1 → Eeyore, 2 → Wonkey, 3 → Kong; g_4: 1 → Eeyore, 2 → Wonkey, 3 → Brownie}

It is now clear how the discourse uniqueness presupposition is satisfied in (65). For each possible value for x (Alex, Bob, Cory), there is a unique discourse referent in the context for a donkey owned by that farmer. To reiterate, we end up with a weak reading of the sentence, i.e. that it is true iff each farmer vaccinates at least one donkey he owns. The anaphoric version addresses the problem of the formal link, since pronouns presuppose discourse uniqueness, and the infelicitous sentences like (69) don't introduce the relevant discourse referents. This version of quantified donkey sentences also doesn't need to employ situations in the semantics of the quantifiers, which I take to be somewhat of an advantage over the other version. Whereas situations are a natural way of analyzing adverbs of quantification, they are less natural for quantifiers unless one wants to go all in for a situation semantics (see fn. 77 for my reservations about using situations in the semantics of quantifiers).

Before I turn to the conditional case, I want to address some questions that this analysis raises. What is the relationship between these subordinate contexts and the local contexts of dynamic semantics? Relatedly, why should we think that a dynamic pragmatics has this sort of sub-sentential dynamics occurring? The local contexts of dynamic semantics are grammatical — they are contexts created by the semantic interpretation of an expression. By contrast, though the subordinate contexts in this system might be created as a result of (partially) interpreting what a speaker says, they are not grammatical. They are still a result of reasoning about a speaker's plans. Furthermore, this means that they can stick around so long as they are needed, over multiple clauses or sentences (thereby providing a nice theory of modal and quantificational subordination). This leads to the second question — why think it is possible that pragmatic reasoning leads to this kind of sub-sentential update? Following Simons (2010, 2011) call the two challenges for sub-sentential pragmatics *the calculation problem* and *the compositionality problem*. The calculation problem is that following in the Gricean tradition, pragmatic reasoning works off what is said, but sub-sentential components are not asserted, and so do not have propositional content that give rise to traditional pragmatic inferences. The compositionality problem is that even if we can answer the calculation problem, we have to give an account of how implicatures or other results of pragmatic reasoning are incorporated into the truth-conditional content of a sentence.

The compositionality problem is straightforwardly answered on the present view. First of all, the pragmatic reasoning is not directly about additional content, but rather about the introduction of a discourse referent in the context. There simply is

no compositionality problem regarding updating the context mid-sentence (that is a calculation problem). Second, unlike in cases of embedded implicatures or pragmatic modulation, the way in which pragmatic information is incorporated into truth-conditional content is already provided by the semantics, i.e. there is a quantifier domain restriction variable at the level of logical form that needs to be saturated. This is just regular, syntax-driven context-sensitivity; nothing novel happens at a compositional level here.[79]

So the calculation problem is the real challenge to be addressed. There is good evidence that pragmatics does not have to work off what is said, and can work in tandem with semantics.[80] There has historically been too much emphasis placed on Grice (1989)'s claim that reasoning about implicatures begins with what is said. Speakers can and do reason about the communicative intentions of speakers based on sub-sentential expressions. Simons (2010) offers support for this claim by pointing out that interlocutors can naturally respond to embedded parts of whole sentences rather than the proposition expressed by the whole sentence, e.g.:

(82) a. A: If Jane comes later, we can fill her in.

b. B: She won't be coming. (Simons' example (14) on p.147)

While Simons is concerned with more traditional Gricean implicatures, the same is true of the introduction of discourse referents. An interlocutor can naturally respond to (62) and (63) with "none of the farmers around here own donkeys". The reply would be an equally appropriate interjection if the hearer cut off the speaker before she could finish her sentence. The pragmatic reasoning on which the introduction of a discourse referent is based in the cross-sentential case is the same here; just as an assertion of *a farmer owns a donkey* indicates a plan to potentially go on and say something about a farmer and a donkey, so does supposing a farmer owns a donkey or explicitly restricting talk of farmers to those who own a donkey. There is no reason one has to get to the end of the sentence to process this, as supported by the interjection point.

Returning to conditional donkey sentences, these work similarly to quantified ones, except that discourse referents are introduced for farmers as well as donkeys,

[79]This is the kind of pragmatic contribution that King & Stanley (2005) call *weak pragmatics*.

[80]For some recent empirical work demonstrating that particularized quantity implicatures are calculated incrementally rather than at the end of the sentence, see Breheny et al. (2013). There are relevant parallels between the sort of quantity implicatures tested in the experiment and my preferred account of the introduction of discourse referents; both are involve quantity reasoning based on alternatives determined by a Hirschberg set (see Hirschberg (1985)). See Lewis (2020) for more about my preferred account.

and the quantificational element is an adverb of quantification, and so the cases are defined in terms of the situations introduced by the restrictor on the adverb, rather than quantification over individuals. The way in which discourse referents get introduced depends on what situations are under consideration, or in other words, how situations are being counted. That is to say, interlocutors are making as if, for each situation under consideration, there is one farmer under discussion and one donkey under discussion. In the definition for 'always' I gave above, I assumed that it quantifies over minimal situations that satisfy the restrictor, and so we have as many minimal situations as there are farmer/donkey pairs. Discourse referents here become as fine-grained as the referents themselves. Keeping the same toy model as the previous case, we therefore have ten discourse referents introduced into the context, one for each farmer and one for each donkey, relative to the five possible minimal situations.[81]

One might wonder then, what the point is in having discourse referents at all in the conditional case. The benefits of this view come out when we consider the fact that how to count minimal situations is flexible.[82] Borrowing a suggestion from Berman (1987) on how to account for asymmetric readings, we can account for both asymmetric and weak readings of donkey conditionals. Asymmetric readings (also known as the proportion problem) are as follows. The original donkey sentence (63) seems to quantify over farmer/donkey pairs, at least on its default reading. This is brought out by considering an adverb of quantification like *usually*:

(83) If a farmer owns a donkey, he usually vaccinates it.

In a model in which there are nine farmers, each of whom have one donkey and vaccinate that donkey, and a tenth farmer who owns 50 donkeys but doesn't vaccinated any of them, (83) is judged to be false. But other sentences have a salient asymmetric reading, in which the same sort of model renders the sentence true, as in (84):

[81]There is a problem here in the extensional version of the view. Since farmers with multiple donkeys appear in more than one situation, there is more than one discourse referent with exactly the same possible witnesses. For example, if situation 1 contains Alex and Dobbin and situation 2 contains Alex and Eeyore, then we also have 2 distinct discourse referents in the (subordinate) context that have Alex as their only possible witness and discourse uniqueness is not satisfied. But this is just an artifact of the extensional system. The discourse referents associated with farmers in situations 1 and 2 have different properties associated with them, and the possible witnesses will differ across worlds (e.g. consider a world in which Alex has only one donkey).

[82]If one preferred that the term *minimal situation* be defined in a way that larger situations could never count, we could alternatively define adverbs of quantification as quantifying over relevant situations, where what situations are relevant is context dependent.

(84) If a farmer owns a donkey, he is usually rich.

In a model in which the nine farmers who own one donkey are rich and the one farmer who owns 50 donkeys is poor, (84) is judged to be true, i.e. it doesn't quantify over farmer/donkey pairs.

Berman argues that what counts as a minimal situation is pragmatically determined. Sometimes the minimal situation that satisfies *a farmer owns a donkey* is the situation containing nothing but a single farmer and a single donkey he owns but other times the context makes it such that we don't need to distinguish between the donkeys a farmer owns, i.e., the context treats them as a group that shouldn't be further divided. In this sort of case, the minimal situation that satisfies the same sentence is a single farmer and all the donkeys he owns. Heim (1990), Kadmon (1987), and von Fintel (1994) show that it is not just the presence or absence of the anaphoric element in the consequent that determines whether we have an asymmetric reading. Topic-focus structure as well as general contextual clues influence the what readings are made salient or available at all. Often context can be manipulated to make an asymmetric or symmetric reading available. Kadmon's generalization is that in a conditional donkey sentence, the adverb of quantification can quantify over the the first indefinite, the second indefinite, or both (pairs). von Fintel (2005) lends more support to Berman's claim that how to count situations is pragmatically determined, in general, and not just for donkey sentences.

> Imagine that Jones sip (sic) some water from his cup, and again without putting the glass down, and then a minute later one (sic) more sips. How often did Jones sip water? Probably not once, either twice or three times, and seems up to us how we want to count. Do we count the two immediately adjacent sips as one sipping situation or not?
>
> Now, zoom out from the scene and scan Jones' entire day. As his doctor, who has told him that he should drink a lot of water, you want to know how often during the day Jones drank water. The intuitive answer now seems to be *once* (at least, it's a legitimate answer). (p.6-7)

So discourse referents will not always be as fine-grained as the referents themselves. The description of how we are pragmatically treating all the donkeys a farmer owns as one indivisible lump matches nicely onto the intuitive use we've made for discourse referents in this system: there is one discourse referent introduced for a donkey owned by each farmer, even if that discourse referent may have multiple witnesses.

When this is combined with the semantics for definites, it predicts that in these situations, if there in a definite anaphoric on the "lumped" indefinite, we get the *weak* reading of donkey conditionals. For example, consider (85), whose salient reading is weak.

(85) If a woman has a credit card, she uses it to pay for dinner.

(85) is true if every woman who owns a credit card uses at least one of her credit cards to pay for dinner; there is no requirement that she use them all to pay for dinner. On the current view, the minimal situation that satisfies the antecedent is one which contains a woman and all her credit cards; correspondingly, a discourse referent for a woman and one for her credit card is introduced for each case. Since the cases (minimal situations) are fine-grained with respect to women (they contain one woman each) but coarse-grained with respect to credit cards (they contain all the credit cards she owns), the corresponding discourse referents introduced for women are as fine-grained as the referents themselves, but the discourse referents for the credit cards are not and can have multiple witnesses. Since the content of the definite is existential, we get that (85) is true iff each minimal situation s_1 that contains a unique woman and all her credit cards can be extended to one in which the woman of s_1 uses one of the credit cards of s_1 to pay for dinner, or in other words, if each woman who has a credit card uses at least one of her credit cards to pay for dinner, which is intuitively the right truth conditions.

I haven't here given a pragmatic story of how to predict how the readings and the associated fine-grainedness of cases is decided. It might involve all sorts of pragmatic reasoning possibly including Gricean reasoning, the question under discussion, the domain goals, and world knowledge. I take a full story of this kind to be beyond the scope of the present paper. One thing to note is that it sometimes involves the consequent, and so part of this account is that pragmatic interpretation (including the introduction of discourse referents) happens in tandem with semantic interpretation (i.e. one might have to get to the end of the sentence before one can figure out what discourse referents are introduced by the antecedent).

Which account(s) of donkey sentences is (are) right? One consideration in favor of the non-anaphoric version is that it avoids the whole tangle of sub-sentential dynamic pragmatics. On the other hand, the anaphoric version allows us to capture more readings, taking advantage of the existential content of definites on the view, as well as addressing the problem of the formal link. The anaphoric version also avoids introducing situations in the semantics of quantifiers. One of the advantages of the view is that it can capture a large range of readings by positing that either

the anaphoric or non-anaphoric definite can be in play. Cross-linguistic data is one piece of evidence that could help decide which account is right.[83]

5 Odds and ends

5.1 Indistinguishable participants revisited

I want to return now to some loose ends from §2.4. The first is to work through the truth conditions of the bishop sentence to show that the choice of anaphora resolution does not have truth-conditional import. The second is to discuss a difficulty with discourse uniqueness that I had foreshadowed but could not fully make clear until the formal implementation was described. (86) is the LF of our classic bishop sentence in the non-anaphoric version of conditional donkey sentences:

(86) [always$_{s_1}$ [an x: x is a bishop$_{agent}$ in s_1] ([a y: y is a bishop$_{patient}$ in s_1] (x meets y in s_1))]$_{s2}$ ([the$_2$ x: $\langle \emptyset, f(s_1)\rangle$ x in s_2] ([the$_2$ y: $\langle \emptyset, g(s_1)\rangle$ y in s_2](x blesses y in s_2)))

Consider a toy model in which we have only 3 bishops, Greg, Howie, and Isaac (and they all meet each other). The following minimal situations are in the domain of quantification:

- s_1: Greg the agent meets Howie the patient[84]
- s_2: Howie the agent meets Greg the patient
- s_3: Greg the agent meets Isaac the patient
- s_4: Isaac the agent meets Greg the patient
- s_5: Howie the agent meets Isaac the patient
- s_6: Isaac the agent meets Howie the patient

Suppose that 'he' is resolved to the bishop agent and 'him' to the bishop patient. Then (86) is true iff each of situations 1-6 can be extended to a situation in which the agent of the situation blesses the patient, in other words, in which, respectively, Greg blesses Howie, Howie bless Greg, Greg blesses Isaac, Isaac blesses Greg, Howie

[83]For example, (42) seems to be a case of the anaphoric definite in a donkey construction in German. But this is just one example. More extensive cross-linguistic data would have to be examined.

[84]Technically, the situation containing Greg, the property of being the agent of the meeting, Howie, the property of being the patient of the meeting, and the meeting relation.

blesses Isaac, and Isaac blesses Howie. It is easy to see that the exact same conditions apply if we resolve the anaphora the opposite way.

But what about the anaphoric version? Discourse uniqueness is not satisfied. The discourse referent introduced for the agent in one minimal situation will always have the same possible witness as the discourse referent introduced for the patient in the "paired" situation, and discourse referents are defined in terms of their possible witnesses. Going intensional, as suggested in footnote 81, does not help here. If each bishop who participates in a meeting is an agent in one situation and a patient in another, the possible witnesses for the discourse referents for the bishop agent and the bishop patient will be the same across worlds. I see no way out of this problem in the present system. It comes from the idealization of discourse referents in terms of their possible witnesses, which is a popular way of making sense of discourse referents. But this was never quite right, as it is well known that we can have discourse referents for witches and unicorns, even though they (arguably *necessarily*) don't exist. There is different information associated with the discourse referents for a bishop agent and a bishop patient; there is certainly a *conceptual* difference in the way in which objects under discussion are being tracked when one is tracked as the agent of a meeting while the other is tracked as the patient, even if the tools I've described here do not capture that. One potential solution is that discourse referents should be treated hyperintensionally, perhaps with reference also to impossible worlds and impossible objects (to account for the unicorns and witches). This would allow us to continue using the familiar tools of worlds and assignments to individuals, though in a more complex way. I think this an interesting idea to pursue in future work. I take it to not be a conceptual problem with the theory — there are distinct, unique discourse referents with different information recorded on them — but rather a limitation of the proposed implementation.

5.2 Pronouns without antecedents

One thing that d-type theory normally does very well is account for pronouns without explicit linguistic antecedents. This is often seen as one of the central benefits over a dynamic semantic account (e.g. see Elbourne (2005)). For example, in many contexts, discourses like (87) are perfectly felicitous:

(87) a. Harry is married.
b. She's nice.

Furthermore, there are well-known cases of antecedent-less pronouns with covarying interpretations (known as *paycheck pronouns* after the most famous examples).

(88) John gave his paycheck to his mistress. Everybody else put it in the bank. (Cooper (1979))

(89) *A new faculty member picks up her first paycheck from her mailbox. Waving it in the air, she says to a colleague:* Do most faculty members deposit it in the Credit Union? (Jacobson (2000))

Dynamic semantic accounts require linguistic antecedents for felicitous anaphora and thus have a difficult time with these. D-type theories generally have an easy time explaining these (though it depends on their theory of how the descriptive material is recovered), since the description 'Harry's wife' is made salient by the first sentence of (87) and the function 'the paycheck of' is made salient in (88) and (89). One might worry that by requiring discourse uniqueness on anaphoric pronouns, I've taken away one of the best advantages that d-type theory had.

I don't think this is the case. I argue in Lewis (2012, 2020) that a dynamic pragmatics is needed to account for when pronouns without antecedents are felicitous. In brief, I argue there that when the intended denotation of the pronoun is clear, and there are easily identifiable reasons for the speaker saying what she does (i.e. a change in discourse plans is expected or at least understandable), such pronouns are licensed. From this, we should also expect, as we do in fact find, that the felicity of such cases is not an all-or-nothing matter, but rather a spectrum of felicity, with total infelicity on one end and total felicity on the other. The explanation of felicity in the cited works involves accommodating a discourse referent when the identified conditions hold, thus employing a limited, principled sort of accommodation. I no longer think this is quite right. On the present view, these antecedentless pronouns are best classified as non-anaphoric. We still need the dynamic pragmatic account to explain when these are felicitous and when they are not, but we don't need any accommodation; pronouns (and other definites) without antecedents are not anaphoric. In terms of discourse dynamics, this means they introduce novel discourse referents rather than pick up familiar ones. In terms of truth conditions, this means they presuppose worldly uniqueness and express singleton existentials. And in terms of where the descriptive information comes from, it means it is contextually supplied in the same way it is for non-anaphoric definites, and not from the set of discourse referents in the context. Thus 'she' in (87b) is just equivalent to the non-anaphoric description 'Harry's wife' and the pronoun in (89) 'the paycheck of x'. Treating these as non-anaphoric is not supposed to be stipulative; I do not think of the labels of 'non-anaphoric' and 'anaphoric' as related to the absence or presence of a linguistic antecedent by definition, though it is certainly a nice feature that they thus far so line up. Rather, I take treating them as non-anaphoric to reflect the data:

(90) Harry has a dog. She's friendly. Actually, he has a lot of dogs, but his other ones aren't so friendly.

(91) Harry is a dog-owner. She's friendly. ???Actually, he has a lot of dogs, but his other ones aren't so friendly.

5.3 Pronominal contradiction and false information

A problem for pretty much everyone (d-type and dynamic semantic theorist alike) are pronominal contradiction cases. First raised by Strawson (1952), these cases are as follows:

(92) a. John: A man jumped off the bridge.
b. Mary: He didn't jump, he was pushed.

The problem with these cases is that Mary's pronoun picks up on the same person John is talking about, but denies some of the properties John ascribed to that individual. This presents a *prima facie* problem for any dynamic semantic theory, since the indefinite with all its associated information semantically binds the pronoun, and for any d-type theory that recovers a description like 'the man who jumped off the bridge' from the previous sentence. These cases also present a problem for my theory, since (92a) introduces a discourse referent with the properties *is a man* and *jumped off the bridge*, and these properties contribute to the restrictor property in the pronoun in (92b). But clearly (92b) does not have the contradictory meaning that *there is a man who jumped off the bridge and didn't jump and was pushed.* So we need some notion of accepting the introduction of a discourse referent, picking up on the discourse referent, but denying some of the properties ascribed to it. In principle, there's no problem incorporating such elements into a dynamic pragmatic account of discourse dynamics. If we take seriously, as I have been, the idea that conversational participants keep track of the objects under discussion as pseudo-singular referents (i.e. making as if to talk about a particular individual), it also makes sense, given the nature of conversation, that they might accept such a referent but disagree on what properties it has. My theory has the conceptual advantage of a pragmatic account of discourse referents, and so has the resources to describe how Mary can accept John's introduction of a discourse referent, employ it as a pseudo-singular restrictor, but still reject part of John's assertion in a perfectly sensible manner.

However, pronominal contradiction cases still present a technical problem for the theory at hand. Provided that we accept the picture just described, then the pronoun in (92b) might not satisfy discourse uniqueness. The only property left

on the discourse referent will be *is a man*, but (92b) is still felicitous in contexts in which more than one man is under discussion. There are at least two possible ways to resolve this problem, though I will not thoroughly defend either option here. One is cashing out the notion of accessibility. Recall that the discourse uniqueness presupposition requires that there be a unique *accessible* discourse referent. There being a unique accessible discourse referent with the property *is a man* on it is compatible with there being other discourse referents for men that were previously introduced in the conversation but not accessible. A second option is to say, following the lead of Neale (1990) that the description in question is something like 'the man who "jumped off the bridge"'. In terms of the current theory, that would ascribe to the discourse referent in question the property of *being believed/claimed by John to have jumped off the bridge*. I leave further consideration of these options for future work.

A related objection is that according to my account, as soon as you have a bit of false information recorded on a discourse referent, all subsequent anaphoric sentences will either be false because there is no witness to the discourse referent, or coincidentally true, but not true of the individual speakers have in mind. For example, suppose I met someone at a party who was actually a linguist, but who I thought was a philosopher, and the following discourse occurs:

(93) a. I was talking to a very interesting philosopher at the party last night.
b. She was telling me about the work she does at a local animal shelter.

(93b) is true iff there is at least one very interesting philosopher who the speaker was talking to at the party and was telling the speaker about the work she does at a local animal shelter. Supposing there was no other person that satisfies this description, (93b) is false, even if the woman the speaker has in mind did in fact tell the speaker about her work at a local animal shelter, since she is a linguist, not a philosopher. Many people take this to be the wrong result.

This is a problem that many (though not all) dynamic semantic and d-type theories share.[85] I don't actually think this is the wrong result. As far as the discourse is concerned, something false *has* been said. There is no very interesting philosopher who talked to the speaker about the work she does at a local animal shelter. Of course, that doesn't mean that nothing true succeeds in being pragmatically communicated.

False information cases divide into two types of subcases. The first is like the one described, where the discourse referent has not been anchored (in the discourse) to

[85]For example, Heim (1982), Groenendijk & Stokhof (1991), Neale (1990), to name but a few.

a particular individual in the world. In this case, the speaker pragmatically communicates something true (the person she was talking to at the party told her about her work at a local animal shelter) but fails to semantically express any truths. The pseudo-singular restrictor helps explain how the speaker manages to pragmatically communicate something true: i.e. she pragmatically communicates that the individual under discussion has the properties expressed. Should it comes to light that the person she was talking to is a linguist rather than a philosopher, it is a straightforward pronominal contradiction case, like the ones discussed earlier in this section. The second type is one in which an anchor to a particular individual has been introduced, e.g., suppose the speaker also said "it was Jodie's friend Sarah". Then one could argue that the subsequent truth conditions are singular, that is, they include the descriptive information *is identical to Sarah*. Depending on how the details are worked out, these are still semantically false (since there is no philosopher identical to Sarah), but here it is even easier to see how a truth is pragmatically communicated (we have a singular restrictor rather than a pseudo-singular restrictor and so speakers are attributing properties to particular individuals in the world).

5.4 Licensing

Dynamic semantics not only provides an account of the semantics of anaphoric pronouns, but also an account of when anaphoric pronouns are licensed (i.e. when they are felicitous). That is, the semantics of indefinites and anaphoric pronouns predicts that while (94) is felicitous, (95) is not:

(94) A man walked in. He sat down.

(95) No man walked in. #He sat down.

D-type theory builds in no such predictions. On most d-type accounts, the descriptive material is available even if the antecedent is under the scope of an operator that blocks subsequent anaphora outside its scope. D-type theorists are aware of this, and most proponents of d-type theory have tried to address it in one way or another. Evans (1977) proposes two stipulative conditions for when d-type anaphoric pronouns are licensed.[86] I'm going to put Evans aside without examining whether he makes

[86]They are:

a. The antecedent determiner must be existential in force.
b. The antecedent-containing sentence must be affirmatively embedded relative to the minimal sentence that contains the pronoun.

the right predictions, because 1) Evans's theory is a little hard to apply to d-type discourse anaphora as he was thinking of e-type anaphora within a single sentence and 2) more importantly, stipulative conditions that do not flow from the semantics or pragmatics are best avoided if possible. Heim (1990), on the other hand, attributes the infelicity of discourses like (95) to presupposition failure. Heim treats definite descriptions as presupposing uniqueness. Since the first sentence of (95) asserts that no man walked in, there is no unique individual for the pronoun to refer to, hence the presupposition failure.[87] Neale (1990) proposes an explanation in a similar vein. Neale endorses a Russellian view, and so definite descriptions don't presuppose uniqueness; they assert it. According to Neale, there is no practical use in such discourses, because they are contradictory. The first sentence asserts that no man walked in, and the second asserts that there is a unique man who walked in and sat down. This, according to Neale, explains the oddness. I agree with Heim and Neale in that licensing facts should not be built into the semantics of operators, and I do think that it is explained by presupposition failure. But their accounts can't predict the full range of cases, e.g., they both predict that anaphoric pronouns on double negated antecedents should be just fine, whereas it is often not licensed:

(96) a. It is not the case that no man walked in.

b. #He sat down.

By contrast, the present account does predict the infelicity of (96): since 'he' presupposes that there is a unique discourse referent and (96a) introduces no discourse referents, the pronoun is infelicitous (due to presupposition failure).

The definition of affirmative embedding is a little hard to apply here, because 1) Evans is only thinking about sentences rather than discourses when he defines affirmative embedding and 2) he is thinking of pronouns as referring expressions, the reference being fixed by a definite description. The definition is as follows: Let $\Sigma(\sigma,\sigma')$ be a sentence embedding an existential sentence, σ, and a sentence σ' that contains a pronoun anaphoric on the indefinite in σ. σ is affirmatively embedded in Σ relative to σ' iff when the truth of Σ turns on the truth or falsity of σ', σ is true. Intuitively, the idea is that whenever a sentence's truth turns on the truth or falsity of the pronominal sentence, there is something that the pronoun refers to. We can extend this idea to discourses by thinking of the discourses as the conjunction of the sentences within them, and we could tweak the definition to better suit d-type theories so that the requirement is that there is a unique object that satisfies the description. So, for example, the determiner "no" is not existential in force, and so there is no well-formed d-type pronoun anaphoric on sentences like "No woman walked in", and "a woman" is not affirmatively embedded under negation relative to "she sat down", hence "It is not the case that a woman walked in" also doesn't license anaphora.

[87]Elbourne (2005, 2013) doesn't talk about the licensing issues, but his view encounters the same problems. Since he also endorses a Fregean semantics for definite descriptions, presumably he would appeal to presupposition failure like Heim.

5.5 Weak Definites

There is a class of definite descriptions known as *weak definites*. These are definites that seem to act as existential quantifiers, requiring neither uniqueness nor familiarity. For example:

(97) Madeline went to the park.

(98) Madeline likes to go to the dentist.

(99) Take the elevator to the sixth floor. (Birner & Ward (1994))

(100) John drove into the ditch and had to go to the hospital. (Ludlow & Segal (2004))

(101) That's the one where Superman crashes spectacularly into the side of a Marlboro-emblazoned truck. (Barker (2005))

On my view, the proffered content of definite descriptions just is existential, which provides the ingredients for a nice account of weak definites. All one needs to explain is why the uniqueness presupposition is suspended in certain kinds of cases (like the ones above). Though it's beyond the scope of this paper to provide such an account here, I take it as further support for the view that there is a natural account of weak definites.

6 Concluding thoughts: Is this dynamic semantics?

Some people have claimed that some d-type theories are just a notational variant of dynamic semantics.[88] Some think that using discourse referents automatically makes a theory dynamic semantics, or so close to dynamic semantics that the difference is trivial. I don't think that the use of discourse referents in a theory makes the theory a variant of dynamic semantics, as I have argued elsewhere (see Lewis (2014, 2017)). I also think there are interesting philosophical questions to explore on what makes two theories notational variants of each other. Pursuing these questions here is beyond the scope of the present paper.

[88] e.g. See Dekker (2004), Schlenker (2013)

The key elements of my view are that the best way to be a d-type theorist is to adopt an ambiguity semantics for definite descriptions in which they are restricted existential quantifiers, and where the anaphoric definites presuppose discourse uniqueness and the non-anaphoric ones presuppose worldly uniqueness. If I am right that this is the best d-type theory, and if there are good arguments in favor of this being a mere variant of dynamic semantics, or arguments to the effect that it is best implemented dynamically, then the natural conclusion of my arguments is that the best d-type theory is a dynamic d-type theory, and that in the end the best solution to the problem of unbound anaphora involves a marriage of the d-type framework and the dynamic semantic one. The resulting dynamic semantics, however, would be considerably different from existing dynamic semantic treatments of pronouns and definite descriptions, in that it treats both as quantifiers presupposing uniqueness. And if I am right that the theory can be implemented statically, the foregoing theory fits nicely into a framework that incorporates a static semantics and a dynamic pragmatic account of discourse referents in the context.

Acknowledgments

Thanks are due to Chris Barker, Simon Charlow, and to two anonymous reviewers for this journal for helpful comments and questions. Thanks also to the audiences at the *Vendler Group Workshop on Reference and Pronouns* at the University of Calgary in March 2017, the *Jerrold Katz Memorial Lecture* at the CUNY Graduate Center in March 2017, the *New York Philosophy of Language Workshop* in May 2017, the *Nova Scotia Meaning Workshop* in July 2017, the *Meaning as Action Conference* at Oxford in March 2018, the Rutgers Semantics Workshop in April 2019, and philosophy department colloquia at MIT (May 2017), Notre Dame (November 2017), Northwestern (March 2018), and the University of Maryland (February 2019) whose comments and questions on parts of and predecessors to this paper helped improve it vastly.

References

Abbott, Barbara. 2000. Definiteness and Identification in English. In N. Eniko (ed.), *Pragmatics in 2000: Selected Paper from the 7th International Pragmatics Conference*, 1–15. International Pragmatics Association.

Abbott, Barbara. 2008. Issues in the Semantics and Pragmatics of Definite De-

scriptions in English. In *Reference: Interdisciplinary Perspectives*, 61–72. Oxford University Press.

Barker, Chris. 2005. Possessive weak definites. In Kim et al (ed.), *Possessives and beyond: Semantics and Syntax*, 89–113.

Barker, Chris & Chung-Chieh Shan. 2008. Donkey anaphora is in-scope binding. *Semantics and Pragmatics* 1(1). 1–46.

Barker, Chris & Chung-Chieh Shan. 2014. *Continuations and Natural Language* Oxford Studies in Theoretical Linguistics. Oxford University Press.

Beaver, David. 2001. *Presupposition and Assertion in Dynamic Semantics*. CSLI Publications.

Berman, Steve. 1987. Situation-Based Semantics for Adverbs of Quantification. *University of Massachusetts Occasional Papers* 12.

Birner, Betty & Gregory Ward. 1994. Uniqueness, Familiarity, and the Definite Article in English. In *Proceedings of the 20th Annual Meeting of the Berkeley Linguistics Society*, 93–102.

Breheny, Richard, Heather J. Ferguson & Napoleon Katsos. 2013. Taking the epistemic step: Toward a model of on-line access to conversational implicatures. *Cognition* 126. 423–440.

Bumford, Dylan. 2015. Incremental quantification and the dynamics of pair-list phenomena. *Semantics and Pragmatics* 8. 1–70.

Büring, Daniel. 2004. Crossover Situations. *Natural Language Semantics* 12(1). 23–62.

Chierchia, Gennaro. 1995. *Dynamics of Meaning*. University of Chicago Press.

Chomsky, Noam. 1981. *Lectures on Government and Binding* Studies in Generative Grammar. De Gruyter.

Cooper, Robin. 1979. The interpretation of pronouns. In F. Henry & H. Schnelle (eds.), *Selections from the Third Groningen Round Table* Syntax and Semantics, 61–92. Academic Press.

Coppock, Elizabeth & David Beaver. 2015. Definiteness and determinacy. *Linguistics and Philosophy* 38. 377–435.

Cumming, Sam. 2015. The Dilemma of Indefinites. In A. Bianchi (ed.), *On Reference*, 335–349. Oxford University Press.

Davies, Martin. 1981. *Meaning, Quantification, Necessity*. Routledge and Keegan Paul.

Dekker, Paul. 2004. Grounding Dynamic Semantics. In Reimer & Bezuidenhout (eds.), *Descriptions and Beyond*, Oxford University Press.

Dever, Josh. 2013. The Revenge of the Semantics-Pragmatics Distinction. *Philosophical Perspectives* 27. 104–144.

Dowty, David. 1989. On the Semantic Content of the Notion of 'Thematic Role'. In Gennaro Chierchia, Barbara Partee & Raymond Turner (eds.), *Properties, Types and Meaning*, 69–129. Kluwer Academic Publishers.

Dowty, David. 1991. Thematic Proto-Roles and Argument Selection. *Language* 67(3). 547–619.

Ebert, Karen. 1971a. *Referez, Sprechsituation und die bestimmten Artikel in einem Nordfriesischen Dialekt (Fering)*: Christian-Albrechts-Universität zu Kiel dissertation.

Ebert, Karen. 1971b. Zwei Formen des bestimmten Artikels. In D. Wunderlich (ed.), *Probleme und Fortschritte der Transformationsgrammatik*, 159–174. Hueber.

Elbourne, Paul. 2001. When is Situation Semantics Allowed? In R. Hastings, B. Jackson & Z. Zvolenszky (eds.), *Proceedings of SALT XI*, 152–171.

Elbourne, Paul. 2005. *Situations and Individuals*. MIT Press.

Elbourne, Paul. 2009. Bishop Sentences and Donkey Cataphora: A Response to Barker and Shan. *Semantics and Pragmatics* 2(1). 1–7.

Elbourne, Paul. 2013. *Definite descriptions*. Oxford University Press.

Elbourne, Paul. 2016. Incomplete descriptions and indistinguishable participants. *Natural Language Semantics* 24. 1–43.

Evans, Gareth. 1977. Pronouns, Quantifiers, and Relative Clauses. *Canadian Journal of Philosophy* 467–536.

Fara, Delia Graff. 2001. Descriptions as Predicates. *Philosophical Studies* 102(1). 1–42.

von Fintel, Kai. 1994. *Restrictions on Quantifier Domains*: University of Massachusetts dissertation.

von Fintel, Kai. 2004. A minimal theory of adverbial quantification. In Hans Kamp & Barbara Partee (eds.), *Context-dependent in the analysis of linguistics meaning*, 137–175. Amsterdam: Elsevier.

von Fintel, Kai. 2005. How to Count Situations (Notes Towards a User's Manual). Draft of July 2005.

Gray, Aidan. 2017. Names in strange places. *Linguistics and Philosophy* 40. 429–472.

Grice, Herbert Paul. 1989. Logic and Conversation. In *Studies in the Way of Words*, Harvard University Press.

Groenendijk, Jeroen & Martin Stokhof. 1991. Dynamic Predicate Logic. *Linguistics and Philosophy* 14. 39–100.

Groenendijk, Jeroen, Martin Stokhof & Frank Veltman. 1996. Coreference and Modality. In *The Handbook of Contemporary Semantic Theory*, 179–216. Blackwell.

Hawthorne, John & David Manley. 2012. *The Reference Book*. Oxford University Press.

Heim, Irene. 1982. *The Semantics of Definite and Indefinite Noun Phrases*: University of Massachusetts dissertation.

Heim, Irene. 1990. E-type Pronouns and Donkey Anaphora. *Linguistics and Philosophy* 13.

Heim, Irene & Angelika Kratzer. 1998. *Semantics in Generative Grammar*. Blackwell.

Hirschberg, Julia. 1985. *A Theory of Scalar Implicature (Natural Langauges, Pragmatics, Inference*: UPenn dissertation.

Horn, Laurence & Barbara Abbott. 2012. ⟨ *the*, *a* ⟩: (In)definitess and Implicature. In Willaim P. Kabasenche, Michael O'Rourke & Matthew H. Slater (eds.), *Reference and Referring*, The MIT press.

Jacobson, Pauline. 2000. Paycheck Pronouns, Bach-Peters Sentences, and Variable Free Semantics. *Natural Language Semantics* 8(2). 77–155.

Jacobson, Pauline. 2001. Variable Free Semantics (and Direct Compositionality). UCLA Minicourse May 21-25.

Jacobson, Pauline. 2014. *Compositional Semantics: An Introduction to the Syntax/Semantics Interface* Oxford Textbooks in Linguistics. Oxford University Press.

Kadmon, Nirit. 1987. *On Unique and Non-unique Reference and Asymmetric Quantification*: University of Massachusetts Amherst dissertation.

Kadmon, Nirit. 2001. *Formal pragmatics*. Wiley-Blackwell.

Kamp, Hans. 1981. A Theory of Truth and Semantic Representation. In *Formal Methods in the Study of Language*, Mathematisch Centrum.

Kamp, Hans & Uwe Reyle. 1993. *From Discourse to Logic*. Kluwer Academic Publishers.

Kehler, Andrew. 2001. *Coherence, Reference, and the Theory of Grammar*. CSLI Publications.

King, Jeffrey. 1987. Pronouns, Descriptions and the Semantics of Discourse. *Philosophical Studies* 51. 341–363.

King, Jeffrey. 1991. Instantial Terms, Anaphora and Arbitrary Objects. *Philosophical Studies* 61. 239–265.

King, Jeffrey. 1994. Anaphora and Operators. *Philosophical Perspectives* 8. 221–250.

King, Jeffrey. 2004. Context Dependent Quantifiers and Donkey Anaphora. *New Essays in the Philosophy of Language, Supplement to canadian Journal of Philosophy* 30.

King, Jeffrey & Jason Stanley. 2005. Semantics, Pragmatics, and the Role of Semantic Content. In *Semantics vs. Pragmatics*, Oxford University Press.

Kripke, Saul. 1977. Speaker's Reference and Semantic Reference. In *Studies in the Philosophy of Language*, University of Minnesota Press.

Lewis, David. 1975. Adverbs of quantification. In Edward L. Keenan (ed.), *Formal Semantics of Natural Language*, 178–188. Cambridge University Press.

Lewis, Karen S. 2012. Discourse Dynamics, Pragmatics, and Indefinites. *Philosophical Studies* 158. 313–342.

Lewis, Karen S. 2014. Do we need dynamic semantics? In Alexis Burgess & Brett Sherman (eds.), *Metasemantics: new essays on the foundations of meaning*, chap. 9, 231–258. Oxford University Press.

Lewis, Karen S. 2017. Dynamic Semantics. In *Oxford handbooks online*, Oxford University Press.

Lewis, Karen S. 2020. Anaphora and Negation. *Philosophical Studies* .

Ludlow, Peter. 1994. Conditionals, Events, and Unbound Pronouns. *Lingua E Stile* (2). 165–183.

Ludlow, Peter & Gabriel Segal. 2004. On a Unitary Semantical Analysis for Definite and Indefinite Descriptions. In Marga Reimer & Anne Bezuidenhout (eds.), *Descriptions and Beyond*, Oxford University Press.

Lyons, Christopher. 1999. *Definiteness*. Cambridge University Press.

Mandelkern, Matthew & Daniel Rothschild. 2020. Definiteness Projection. *Natural Language Semantics* 28. 77–109.

Marantz, Alec. 1984. *On the nature of grammatical relations*. MIT Press.

Muskens, Reinhard. 1991. Anaphora and the Logic of Change. In J. van Eijck (ed.), *Logics in AI*, 412–428. Springer.

Neale, Stephen. 1990. *Descriptions*. MIT Press.

Neale, Stephen. 2004. This, That and the Other. In Marga Reimer & Anne Bezuidenhout (eds.), *Descriptions and Beyond*, Oxford University Press.

Prince, Ellen. 1992. The ZPG Letter: Subjects, Definiteness, and Information-status. In William C. Mann & Sandra A. Thompson (eds.), *Discourse Description: Diverse Analyses of a Fund-raising Text* Pragmatics & Beyond New Series, 295–325. John Benjamins.

van Riemsdijk, Henk & Edwin Williams. 1986. *Introduction to the theory of grammar*. MIT Press.

Roberts, Craige. 2003. Uniqueness in Definite Noun Phrases. *Linguistics and Philosophy* 26. 287–350.

Roberts, Craige. 2004. Pronouns as Definites. In Marga Reimer & Anne Bezuidenhout (eds.), *Descriptions and Beyond*, Oxford University Press.

Schlenker, Philippe. 2010. Donkey Anaphora and Sign Language I: E-type vs. Dynamic Accounts. In M. Aloni, H. Bastiaanse, T. de Jager & K. Schulz (eds.), *Logic, Language and Meaning*, vol. 6042 Lecture Notes in Computer Science, 405–415. Springer Berlin Heidelberg.

Schlenker, Philippe. 2011. Donkey Anaphora: the view from Sign Language (ASL and LSF). *Linguistics and Philosophy* 34(4). 341–395.

Schlenker, Philippe. 2013. Anaphora: Insights from Sign Language. In S.R. Anderson, J. Moeschler & F. Reboul (eds.), *L'Interface langage-cognition. Actes du 19e Congrès International des Linguistes*, Geneva.

Schlenker, Philippe. 2015. Donkey Anaphora in Sign Language II: The Presuppositions of Pronouns. In P. Grosz, P. Patel-Grosz & I. Yanovich (eds.), *NELS 40: Proceedigns of the Semantics Workshop on Pronouns*, .

Schwarz, Florian. 2009. *Two Types of Definites in Natural Language*: University of Massachusetts Amherst dissertation.

Schwarz, Florian. 2013. Different Types of Definites Crosslinguistically. *Language and Linguistics Compass* 7(10).

Schwarzschild, Roger. 2002. Singleton Indefinites. *Journal of Semantics* 19. 289–314.

Simons, Mandy. 2010. A Gricean View on Intrusive Implicatures. In Klaus Petrus (ed.), *Meaning and Analysis: New Essays on Grice*, Macmillan.

Simons, Mandy. 2011. Dynamic Pragmatics, or Why We Shouldn't be Afraid of Embedded Implicature. In *Semantics and Linguistic Theory (SALT)*, vol. 21, 609–633.

Stalnaker, Robert. 1978. Assertion. *Syntax and Semantics* 9.

Stalnaker, Robert. 1998. On the Representation of Context. *Journal of Logic, Language, and Information* 7. 3–19.

Stalnaker, Robert. 2014. *Context*. Oxford University Press.

Stanley, Jason. 2007. Nominal Restriction. In *Language in Context*, 111–132. Oxford University Press.

Stanley, Jason & Zoltan Szabo. 2000. On Quantifier Domain Restriction. *Mind & Language* 15(2-3).

Strawson, P. F. 1952. *Introduction to Logical Theory.* Methuen.

Szabo, Zoltan. 2000. Descriptions and Uniqueness. *Philosophical Studies* 101. 29–57.

van Rooij, Robert. 2001. Exhaustivity in Dynamic Semantics: Referential and Descriptive Pronouns. *Linguistics and Philosophy* 24. 621–657.

Zweig, Eytan. 2006. When the donkey lost its fleas: persistence, minimal situations, and embedded quantifiers. *Natural Language Semantics* 14(4). 283–296.