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Pronouns as Definites

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1. Introduction*

Pronouns have very little descriptive content, yet they are definite. Because they are definite, they participate in a web of anaphoric relations in discourse, relations mediated by the structured information which competent interlocutors control as they converse. An anaphoric expression harkens back not to another expression, such as a noun phrase (NP) in prior discourse, but to a discourse referent, an element of that structured information. If a pronoun seems to refer deictically, or to be bound by a quantificational operator, or to borrow the descriptive content of another NP, this is because of the relationship between the corresponding discourse referent and the entity picked out deictically, the quantificational operator, or the other NP.

In this paper, I will first spell out in more detail the view just sketched, which emerges from the theory of definite noun phrases proposed in Roberts (2003). Then I will compare it to a prominent class of proposals in which it is claimed that pronouns are ambiguous, and that one interpretation of a pronoun is that of a disguised definite description, with the interpretation of Russell (1905). I will argue that such an interpretation is neither necessary to explain the relevant uses of pronouns, nor sufficient to capture certain restrictions on when a pronoun may apparently have such a use. Further, I will argue that the uniqueness associated with the Russellian interpretation is too strong for pronouns, as well as for definites more generally. With the simpler theory of pronouns as anaphoric on discourse referents, we have improved empirical coverage with greater simplicity, while preserving the valid intuitions underlying the proposal that pronouns may be interpreted as definite descriptions.

2. Definites in Information Structure

The idea that semantic interpretation is mediated by the structure of discourse is a relatively new one, which can be traced in the formal semantics literature to Stalnaker (1979), Lewis (1979), Gazdar (1979), Kamp (1981), and Heim (1982). The basic idea is that the interpretation of an utterance is not directly a proposition, but a function from the context of utterance to an updated context, which latter in turn serves as the argument of the next utterance. Informally, we can think of the content of an expression of a natural language like English as the additional information it contributes to the growing common ground of information that the interlocutors share. In the simplest version of such

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theories, known as dynamic theories of interpretation because of the way they model the growing context, the information structure of discourse is characterized formally as a set of propositions, each proposition a set of worlds or situations. But recent theories of discourse information structure (Heim 1982, Kamp & Reyle 1993, Groenendijk & Stokhof 1990, Chierchia 1995, Roberts 1996b, Asher & Lascarides 1998a,b) include other kinds of information besides the propositional. For example, Roberts (1996b) assumes that the fundamental organizing principle of discourse is the set of questions under discussion, with the underlying intentions they realize; information structure is a tuple consisting of the structured set of questions under discussion (a push-down store), the propositions in the common ground, the familiar discourse referents, and other types of information. In all these theories, the truth conditional, propositional content of a set of utterances can be retrieved straightforwardly, but meaning cannot be reduced to propositional content.

From this perspective, the conventionally given semantic content of any given expression has two main facets: its presupposed content and its proffered content. The latter corresponds roughly to what we think of as its contribution to the truth conditional, propositional content of an utterance in which it occurs. The presupposed content constitutes the conventionally given constraints that utterance of the expression places on context: In order for an utterance containing the expression to be felicitous in a given context, these requirements on the context must be met.

What is the semantic content of a pronoun, then—say English *he, it*, *she*, or *they*? These NPs are abbreviated ways of saying something about some entity that's already familiar and salient to the interlocutors. In actual discourse, we determine what a competent speaker intends to refer to in using a pronoun by considering the context. Within the formal theory of semantic interpretation in information structure, we use a fairly simple mechanism to model how this works. The proffered content of a pronoun is just a variable whose semantic value in a particular context is always given in the same way, via a contextually specified function assigning values to variables. In a model-theoretic interpretation, these values will be entities in a model for the language. As in Kamp (1981) and Heim (1982), if it appears that a pronoun is sometimes bound by a quantificational operator, while at other times it is demonstrative or is coreferential with a proper name or other referring expression, this is because there are many ways in which the assignment functions that we use for the interpretation of variables can be constrained by the discourse context. One of these parallels Tarski's use of assignment functions for the interpretation of quantificational expressions, yielding a bound variable interpretation. But unlike their use in classical standard Tarskian semantics, assignment functions may be constrained in other ways, and accordingly, there are other ways to constrain the values assigned to the variables which are the proffered content of a pronoun besides varying over the domain of an operator.

One of the most striking features of theories of dynamic interpretation is the uses of assignment functions to encode the interlocutors' discourse referents. Karttunen (1976) pointed out that we keep track of information in discourse about a number of individuals other than those we take to be actual entities in the world: for example, hypothetical

individuals, or instantiations of quantificational statements. And we may keep track of information about someone we believe to be real, not knowing whether this individual is the same as some other with whom we are familiar, perhaps later merging information about the two. To distinguish these bundles of information from actual entities in the world, he called the former **discourse referents**. Heim (1982) and Kamp (1981) gave technical expression to this notion by modeling discourse referents as constraints on the assignment functions interlocutors can use to interpret variables at a given point in discourse. We assign an "address" to each bundle of information we take to be about a single (actual or hypothetical) individual, the address being a particular variable, say x_{28}. Then we require that any assignment function we use to interpret utterances at that point in the discourse be such that whatever it assigns as the value of x_{28} be an individual which satisfies all the information we have about that (actual or hypothetical) individual discourse referent. Hence, instead of assignment functions being arbitrarily chosen, they are used to encode the information about discourse referents, permitting a continuity of reference.

Across discourse, these discourse referents, in the technical form of the set of permissible assignment functions, are managed dynamically to reflect the way that information changes: If we add more information about a particular discourse referent, the permissible assignment functions will be further constrained. If the discourse referent is merely an instantiation of a generalization or, say, hypothetical, triggered by information under the scope of a modal or other operator, then once the hypothetical mode has been closed off, outside the scope of that operator, the discourse referent is no longer available for reference, and accordingly, the relevant constraints on assignment functions no longer hold. This is the key to interpretation of donkey pronouns in these frameworks, as in (1):

(1) Every man that owns a donkey beats it.

The discourse referent whose introduction into the information is triggered by utterance of *a donkey* in (1) will be available only under the wider scope of the universally quantified subject. Hence it can bind the pronoun *it* (often called the "donkey pronoun") in the predicate, but normally is not available for reference after that. For example, we cannot felicitously continue (1) with *I thought it looked miserable yesterday*.[1]

Since the proffered content of a pronoun is a variable, the value assigned will be constrained by any information associated with that variable by the interlocutors at that point in the discourse. Moreover, utterance of a pronoun presupposes that there *is* already a discourse referent corresponding to that variable in the information structure. This is what Heim (1982) called the **familiarity presupposition** associated with a pronoun. A

[1] Note that the above does not assume that quantifiers are unselective, as was the case in Kamp (1981) and Heim (1982). This facet of these early theories of dynamic interpretation has been discredited as leading, in the general case, to the wrong interpretation, though there still may be a sense in which it is appropriate in the cases for which it was originally proposed in Lewis (1975). See (Kadmon 1987,1990; Chierchia 1995) and references cited therein, and the discussion of the proportion problem below. As Groenendijk & Stokhof (1990) and Chierchia (1995) illustrate, dynamic theories are perfectly compatible with more classical, selective binding by operators.

speaker cannot just walk in out of the blue and say *She wants a new car*. To be felicitous, this would have to be the continuation of some conversation we were having about some particular female individual. This is in keeping with our fundamental intuition that a pronoun is anaphoric: It carries us back to information presupposed to be already in discourse, and its presupposed content puts constraints on where to look for this information, thus giving clues to what the speaker intends. In this sense, the true antecedent of a pronoun is the corresponding discourse referent, an element in the information structure of the discourse.

The pronoun's person, number and gender put additional constraints on where we should look for an antecedent (Dowty & Jacobson 1989). If the speaker uses, say, a third-person feminine singular pronoun, the addressee would look for a discourse referent not associated with the speaker or addressee, and about whom there is information in the common ground which is compatible with using the feminine grammatical gender and singular grammatical number. This compatibility does not require that the entity referred to be sexually female or semantically singular: We may refer to a boat or plane with *she*, a dog of unknown gender with *it*, and we often use *they* as a gender-neutral alternative to *he or she*, etc. And even apart from gender-neutral plurals, the rules for using number are notoriously rather complex, as will be briefly discussed below. However, the person, number and gender of a pronoun impose constraints which help the addressee to identify the familiar discourse referent to which the speaker intends to refer. These constraints constitute the complete descriptive content of a pronoun. As argued in Heim (1982), Kadmon (1987,1990), and Roberts (2003), this content, like the descriptive content of a definite description, is presupposed, not proffered.

But there is more to the presupposed content of a pronoun. It has often been argued in the semantic literature that pronouns may have the interpretation of a disguised definite description, with the existence and uniqueness argued for definite descriptions in Russell (1905). And in a sense that is true. Roberts (2003) argues that all definites, including definite descriptions, personal pronouns, and demonstratives, have both familiarity presuppositions and uniqueness presuppositions. The familiarity presupposition of a definite corresponds to the existence clause of a Russellian definite description, except that the 'existence' in question is only that of a discourse referent in the information structure of the discourse. As with Russellian definites, this may or may not turn out to be a claim about existence in the actual world, depending on the force and scope of other operators in the discourse, intensionality, and other factors. The uniqueness presupposition is informational as well, unlike the Russellian requirement of semantic uniqueness, and hence it too is weaker than Russell's.

Russell's uniqueness is semantic in that it requires that the intended referent be unique in the actual world in bearing the property in question. In contrast, informational uniqueness is a requirement that there be no more than one discourse referent in the interlocutors' common ground which satisfies the definite's descriptive content. But of course, though there is only one such discourse referent in the common ground, this still leaves open the possibility that there is more than one entity of the relevant sort in the

world that the interlocutors just aren't (mutually) familiar with. So informational uniqueness does not guarantee semantic uniqueness.

Here is the informal statement of the presuppositions associated with definite NPs in general, from Roberts (2003):[2]

(2) **Informational Existence and Uniqueness of Definite NPs**:
Given a context C, use of a definite NP_i presupposes that it has as antecedent a discourse referent x_i which is:
a) weakly familiar in C, and
b) unique among discourse referents in C in being contextually entailed to satisfy the descriptive content of NP_i.

There is more to say about the presupposed content of pronouns. But first, let us consider in more detail the evidence that they are definite, so that they carry the presuppositions in (2). In 2.1, we will consider the claim in (2a) that definites are weakly familiar, defining that notion and showing that it applies to pronouns as well as to definite descriptions. In 2.2, we will consider (2b), exploring how the uniqueness required differs from the uniqueness clause in the Russellian truth conditions for definite descriptions. Then in 2.3, we will turn to the respects in which pronouns differ from definite descriptions, motivating additional presuppositions for pronouns.

2.1 Weak Familiarity

(2a) requires that a definite NP be only *weakly* familiar. What this means is that the relevant discourse referent need not have been explicitly introduced into the common ground through the utterance of an NP. Instead, it need only be the case that the common ground entails existence. We see some examples in the following:

(3) To a stranger at a bus stop: The sun is really hot today!
(4) To a stranger at an auction, when a new drawing has just been brought up to the block: It's really unusual for a Rubens, don't you think?

(5) At a coat check, as the clerk hands an umbrella to the preceding person in line: That umbrella belongs to me!
(6) Same situation, as the clerk prepares to hand a laptop computer case to the preceding person: That belongs to me!

(7) Joan was murdered. The murderer was probably an acquaintance.
(8) Each apartment has a large bay window in the living room. In this one (pointing to a unit on a blueprint), it looks out over the golf course.

[2] Please see that paper for a formal statement, and a great deal more detailed argument for the proposed familiarity and uniqueness presuppositions than space permits here.

(9) Suppose Joan had been murdered. If the murderer had taken her Rolex, he would probably have pawned it.

(10) [Architects, brainstorming about a proposed project:] It would be great if every apartment had a large bay window in the living room. In some, it would look out over the golf course, in others, over the more intimate garden courtyard.

As illustrated by (3) and (4), even interlocutors who are strangers to one another can generally assume that they have certain information in common, including basic information about the world they inhabit (there is a sun) and information about the immediate situation in which they find themselves (there is a drawing on the auction block). The utterances in (5) and (6), may or may not be accompanied by pointing, but in any case pertain to an object which is made maximally salient in virtue of the type of situation and the intentions of those present.[3] In (7) and (8), presumably the murderer or the bay window in the particular apartment in question had not been previously mentioned, nor would the addressee have had reason to believe that they existed prior to the first utterance. However, the context, i.e. that first utterance, entails their existence: There is no murder without a murderer; we know that each apartment has a bay window. And (9) and (10) similarly illustrate how use of a definite can be licensed by entailment. In these cases, however, we find these entailments in irrealis discourse; they are cases of *modal subordination*.[4] The proposition that the conditional in (9) is generally taken to express requires that the modal *would* be restricted to range over worlds or situations in which Joan was murdered (the irrealis assumption urged in the first sentence); since being murdered entails the existence of a murderer, we can assume that there is such an individual in each of the relevant worlds/situations, making the murderer weakly familiar.

In examples like (8) and (10), there is clearly a preceding NP—*a large bay window*—that licenses the use of the pronoun. However, this NP is not an antecedent for the pronoun in the usual technical sense, requiring that the two NPs are coreferential or are both bound by the same operator. Coreference or co-binding would require that any operator with scope over the antecedent take scope over the pronoun as well; but this is not the case here, where *every apartment* has scope over the indefinite but not the pronoun. In examples like (8), let us call the preceding indefinite NP whose descriptive content helps to determine the interpretation of the pronoun the **licensing NP**.

Basing weak familiarity on entailment permits us to explain examples involving double negation, like (11):

(11) It is not (the case) that Mary doesn't own a car.
It is red and it is parked in front of her house.

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[3] See Roberts (2002) for detailed discussion of demonstratives, and arguments that they are definite in the sense described here.

[4] See Roberts (1987,1989,1996) for analysis of this general phenomenon and arguments that it involves accommodating a Relevant domain restriction for the modal (or other intensional operator) in the second sentence.

And entailment based on world knowledge may be combined, e.g. with deixis, to yield examples like (12):

(12) A: Can you help me get to the Central Station fast?
B: (pointing to a car) The keys are in the ignition. Help yourself.

Here, A can be expected to know that the car made familiar by deixis has both an ignition and a set of keys, since that is the default case with cars in the contemporary world.

The way that various kinds of information, including discourse referents, are introduced and managed in the information structure of discourse (Heim 1982, Kamp & Reyle 1993, Roberts 1989, Chierchia 1995) guarantees that the following principles hold, with an exception to be discussed below:

(13) Scope Principles:
a) The scope of an operator is confined to (at most) the sentence in which it is uttered, i.e. operator scope is syntactically restricted.
b) Information introduced within the scope of an operator is only accessible within that scope.

(14) exemplifies how the principles in (13) generally constrain felicity in discourse:

(14) Mary is considering getting her first dog.
#But she regrets becoming a dog-owner.

Here, the second sentence is infelicitous in this context because the presupposition of factive *regret*, that Mary has become a dog-owner, is not satisfied in the context. In fact, it is implicated to be false, due to the fact that a precondition for becoming a dog-owner, getting a dog, occurs under the scope of a future-oriented intensional predicate in the first sentence.

The important exception noted above is to Principle (13a): This holds for most operators, but within theories based on Dynamic Montague Grammar (Groenendijk & Stokhof 1990), like that of Chierchia (1995), the existential operator introduced by indefinite NPs may essentially take scope across discourse. The other theories noted do not make this exception, but instead make indefinites trigger the introduction of discourse referents whose familiarity endures across discourse. This difference should be kept in mind in what follows, but the exception in the DMG theories does not undermine the general validity of (13a).[5]

From the general principle (13b) follows the more specific instance in (15), reflected in (16) and (17):

[5] This principle *has* been called into question, e.g. in the technically ingenious work of Dekker (1993). However, it is generally regarded as valid, and I will assume it here without further argument. If we do *not* assume such a principle, with the possible exception of the existential indefinites, we will be very hard-pressed to account for most semantic judgments involving scope in discourse.

(15) Accessibility of Discourse Referents: A discourse referent which is introduced under the scope of an operator is inaccessible to serve as an antecedent beyond the scope of that operator.

(16) A: Suppose Joan had been murdered.
B: Do you think the murderer took her Rolex?

(17) [Architects, brainstorming about a proposed project:] It would be great if every apartment had a large bay window in the living room. #It looks out on a golf course.

Roberts (1989) argues that in felicitous cases like (9) and (10) above, there is an extension of the irrealis context in the first utterance via a modal (*would* in these cases). This extension, which she calls the *hypothetical common ground*, restricts the domain of the modal having scope over the pronoun, and because the hypothetical murderer or bay window is familiar in this hypothetical common ground, this licenses the use of the definite *the murderer* or the pronoun *it*. (16) and (17) show that the weak familiarity in the irrealis cases involving modal subordination is not global, but only holds in the hypothetical common ground. So use of *the murderer* in (16B) is infelicitous unless we are prepared to accommodate that the supposition proposed by *A* was, in fact, true. And the familiarity presupposition of the underlined pronoun in (17) fails because the only plausible antecedent, *a large bay window*, is under the scope of a modal, while the pronoun is in a realis context.

All this is not to deny that there are cases where a pronoun is felicitous despite the fact that familiarity fails. There are cases where the speaker requires that their addressee straightforwardly accommodate the relevant discourse referent into the common ground. In this respect, familiarity presuppositions behave like other kinds of presuppositions, as we see illustrated here:

(18) [A and B are waiting in a crowded grocery line. B is distractedly looking at the tabloids on a rack while the small child in his cart kicks A repeatedly.]
A: Please ask your child to stop kicking me.

(19) [Context: The speaker is on the phone with a bank officer who she's never talked with before:] There's a problem with my husband's checking account.

Though B in (18) apparently doesn't realize that his child is kicking A, if he is cooperative he will accommodate the factive presupposition of the verb *stop* (i.e., that the complement is true) and interpret A's utterance accordingly. In (19), though the bank officer presumably didn't know beforehand that the stranger A had a husband, he will undoubtedly conclude that she knows whether she has one, and will accommodate the familiarity presupposition of *my husband*, by adding the appropriate discourse referent to the common ground up to that point and treating the result as the context of utterance.

There are conditions on when we may accommodate a presupposition:

(20) Necessary Conditions on Presupposition Accommodation:
(a) Retrievability: what the hearer is to accommodate is easily inferable, so that it is perfectly clear what is presupposed, and it is both salient and Relevant to the immediate context, and
(b) Plausibility: the accommodated material leads to an interpretation that is reasonable and unobjectionable in the context.

The sense of Relevance here is a technical implementation of the Relevance of Grice (1967) proposed in Roberts (1996b). Briefly, to be Relevant is to address the immediate question under discussion in the information structure of the discourse. An assertion addresses a question if it contextually entails at least a partial answer to the question, while a question q_1 addresses another question q_2 if the complete answer to q_1 contextually entails at least a partial answer to q_2.

Generally, so long as a presupposition is both retrievable and plausible, the cooperative addressee will accommodate without mentioning it. But under the proposed account of familiarity, where explicit mention is not required, accommodation of familiarity presuppositions is both less common and more restricted than has often been assumed by those who have argued against familiarity presuppositions by definites.[6] See Roberts (1995,1996) for extended discussion of the ways that accommodation is restricted in these cases. Only note here that accommodation must leave the common ground consistent. For example, consider the following:

(21) a) An earthquake might hit San Francisco.
b) That would upset me. It would be frightening.

(22) a) An earthquake hit San Francisco in 1989.
b) That upset me. It was frightening.

(23) a) An earthquake might hit San Francisco.
b) That upsets me. It is frightening.

In (21), the utterance in (a) is non-factual in mood, talking about an event which is as yet only a possibility. The subject of (21b), under the scope of *would*, seems to refer to an earthquake hitting San Francisco, i.e., a nominalization of the proposition denoted by the nuclear scope of the modal *might* in (21a). In (22), the utterance in (a) is factual, describing a real event. The subjects of the factual sentences in (b) refer to an earthquake hitting San Francisco in 1989, the fact corresponding to that event. Notice that in (22b) it is acceptable to say "That fact upset me," whereas in (21b), one cannot say "That fact would upset me." In (23), after the same nonfactual utterance as in (21a), one can utter the same sentences as in (22b), and even substitute "That fact upsets me," but the meaning is not the same. (23b) means that the *possibility* of an earthquake hitting San

[6] See Fraurud (1990), Birner & Ward (1994), Poesio & Vieira (1997), *inter alia*.

Francisco (where a possibility is a kind of fact) upsets the speaker and is terrible, not the *fact* of an earthquake hitting San Francisco. In (21a) and (23a), the utterance is irrealis, so that the only salient event is a possibility, implicating that it is not yet reality. Then talking about it as if it were a reality in (b) would sound contradictory; hence, the understood antecedent of *that* and *it* in (b) is constrained to be either in an irrealis context, as in (21b) under the scope of *would*, or refer to a possibility, not a fact, as in (23b).

2.2 Informational Uniqueness and Semantic Uniqueness

(2b) requires that the discourse referent which satisfies the familiarity presupposition associated with the use of a definite be unique among discourse referents in the common ground in being contextually entailed to satisfy the descriptive content of the definite. This is, of course, a weaker requirement than the semantic uniqueness of the Russellian interpretation of definites. Is this strong enough?

With respect to semantic uniqueness, Kadmon (1990) offers a convincing argument that uniqueness (for her, semantic uniqueness) is presupposed, as opposed to proffered, based on examples like (24). (The parenthetical material is included to motivate the use of the definite description in the conditional antecedent, instead of a pronoun; without that material, we could substitute *he*.)

(24) A strange man lives here (and another one lives down the block). If the strange man who lives here sees a cat, he screams.

She points out that if we take the meaning of the definite in the antecedent of the conditional to involve entailed uniqueness, then we arrive at an interpretation which is too weak: 'if there is a unique strange man who lives here and sees a cat, he screams', where the antecedent of the conditional is only true if it happens that there is no more than one strange man living there. Instead, the use of the definite in the conditional appears to presuppose that the male referred to is unique in satisfying the description of the antecedent and its properties, and the conditional asserts that if this person sees a cat, he screams. So the appropriate comparison here is between two sorts of presuppositions, those of semantic uniqueness and those of informational uniqueness.

The following, after examples in Heim (1982), argue that semantic uniqueness is too strong:

(25) Mary is quite upset. A wine glass was broken at the party last night. The glass had been a wedding gift, and it will be difficult to replace. Actually, several others broke as well, but she only knows about the one.

(26) Everyone who bought a sage plant or a rosemary planted the sage plant with extra bone-meal or the rosemary in a well-limed soil. And if it was a sage plant, they bought a second one along with it.

The underlined definite descriptions and pronouns in these examples fail to satisfy semantic uniqueness (even under quantification, in (26)), yet there is no sense that they are thereby false or infelicitous. They do satisfy informational uniqueness at the time of utterance: Before the final sentence in (25) is uttered, there is only one broken wine glass under discussion, and we only know of one sage plant per person before uttering the final sentence of (26).

There are, of course, what Roberts (2003) calls **uniqueness effects**, where use of a definite, especially a definite description, conveys semantic uniqueness. The most famous examples, including Russell's (27), involve titles:

(27) The King of France is bald.

Roberts (2003) argues that uniqueness effects arise with titles precisely because they are designed with a view to being able to uniquely pick out the bearer of the relevant social role, whatever the common ground of possible interlocutors might be at any given time. In the satisfaction-based theory of presupposition assumed here (Karttunen (1973), Stalnaker (1974), Heim (1983)), presupposition is stronger than entailment, explaining Russell's intuition that examples like (27) are false: If there fails to be a familiar discourse referent in the common ground uniquely known to be a King of France, then (27) cannot be truthfully added to that common ground. Worse, if we know there *is* no King of France, then that addition would be contradictory. And if there were two or more Kings of France, utterance of (27) would involve making a false presupposition. There is no evidence that we have direct intuitions of the difference between a presupposition and an entailment (otherwise, the theoretical argument would have been settled long ago!), so in this last case all the hearer knows is that the utterance has given rise to a falsehood.

Something similar is going on with directions, as in (28):

(28) [Directions to a tourist:] Once you're in the square, turn right at the obelisk.

Directions are designed to be used in a context in which the user will likely have perceptual access to full information about the situation in question. When the tourist enters the square, if there were two obelisks, each giving rise to a discourse referent for an obelisk in the common ground she shares with the giver of directions, the directions would fail informational uniqueness, and would thereby fail to be optimally useful. Roberts examines other types of cases where uniqueness effects arise and concludes that there are always conversational factors to which the effects can be attributed.

Hence, informational uniqueness is sufficiently weak to be compatible with the failure of semantic uniqueness in the general case, while strong enough to explain the evident constraints on definites which go beyond familiarity (Kadmon 1990, Heim 1990, Neale 1990), including both the potential for uniqueness effects and the differences between definites and indefinites. In the latter connection, note that familiarity alone does not suffice to differentiate definites from indefinites. For even if my interlocutor knows

nothing about West Virginia, including that it has mountains, I cannot describe my weekend activities using (29), but must use a definite as in (30):

(29) #Last weekend we climbed a biggest mountain in West Virginia.
(30) Last weekend we climbed the biggest mountain in West Virginia.

Superlatives and other NPs whose semantics entail that they are semantically unique can never be indefinite, because use of the indefinite article not only presupposes novelty (non-familiarity) in the common ground (Heim 1982), but also implicates that for all the speaker knows there are other discourse referents bearing the same descriptive content; see Roberts (2003) for discussion of how this implicature arises. Since this implicature would be contradictory in such cases, the definite article must be used.[7]

We also find evidence for informational uniqueness in constraints on accommodation, as seen in the difference between (31) and (32):

(31) [Spoken to a business associate who knows very little about the speaker:] So sorry to be late. I had to take the car to the garage because the gear shift was stuck.
(32) [Same context:] So sorry to be late. #I had to take the car to the garage because the tire was flat.

In (31), uttered with a minimal prior common ground involving only generic knowledge about cars, repair, and gear shifts, the definites *the car*, *the garage*, and *the gear shift* all have familiarity presuppositions which require accommodation. On the basis of the fact that people generally take care of their own cars, the addressee would reasonably assume in this minimal context that the car in question must the speaker's, accommodating a discourse referent for it, and moreover, given the default assumption that people only have one car, would take that discourse referent to be informationally unique. We also cross-reference the garage in question to the speaker, assuming that, since people usually try to frequent a single repair shop, this must be the unique garage she regularly goes to. This cross-referencing involves giving the NP an implicit relational reading (see Clark 1975, Chierchia 1995). On the basis of our knowledge of gear shifts and the assumption of Relevance, we cross-reference the discourse referent for *the gear shift* with that for the speaker's car, knowing that a given car has a unique gear shift. The accommodated discourse referents for the first two definites, as well as that for the weakly familiar (entailed) third definite therefore all satisfy informational uniqueness, and the utterance is felicitous. But in (32), we know that a given car has four tires, so informational uniqueness fails, and the utterance sounds odd. It would be preferable to say *because I had a flat tire*.

Finally, note that unlike definite descriptions, pronouns almost never give rise to uniqueness effects. There are many examples discussed in the literature where semantic

[7] The theory of conversational implicature assumed here differs from that of Grice in assuming that these implicatures are not cancelable. See Welker (1994). Hence, the robust character of this implicature.

uniqueness would yield the wrong interpretation for pronouns. For example, (33), from Rooth (1987), may be true even though many parents have more than one son still in high school:

(33) No parent with a son still in high school has ever lent him the car on a weeknight.

However, Evans (1977,1980) argued that in examples like (34), pronouns do give rise to semantic uniqueness, claiming that it is this that differentiates them from examples with relative clauses, like (35):

(34) John has some sheep. Harry vaccinates them.
(35) John has some sheep that Harry vaccinates.

First, note that in plurals, uniqueness amounts to maximality, that is to the claim that, say, the NP's denotation is maximal in containing all the individuals of the relevant sort. In these examples, it does seem that there is a difference in meaning between (34) and (35), so that (34) appears to convey something like 'Harry vaccinates all of John's sheep'. However, note that (34) can be felicitously followed by material which entails the failure of semantic uniqueness, as in (36):

(36) John has some sheep. Harry vaccinates them. John has some others in pasture at Cornwall, but Harry won't go all the way over there.

What then is the difference between (34) and (35)? The use in (35) of an indefinite with a more elaborate descriptive content implicates that John has other sheep besides those that Harry vaccinates. Otherwise, one could use the simpler *some sheep*, as in (34). (34) by itself has no such implication; so, if nothing else is said, one might assume that the sheep in question are all that John has. The fact that the entailed denial of maximality here doesn't seem like a correction or contradiction shows that semantic uniqueness would be too strong.

2.3 Salience Presuppositions of Pronouns

Pronouns differ from definite descriptions in other ways besides failing to give rise to uniqueness effects. We see this in examples like the following:

(37) A woman entered from stage left.
Another woman entered from stage right.
#The woman/√The FIRST woman/√The SECOND woman was carrying a basket of flowers.

(38) A woman entered from stage left.
Another woman entered from stage right.
She was carrying a basket of flowers, while #the woman/√the FIRST woman/#the SECOND woman led a goat.

In (37) and (38), the first two sentences set a scene in which there are apparently two women, distinguished only by which side of the stage they have entered from. We see in (37) that we cannot felicitously use the definite description *the woman*, apparently because it refers non-uniquely in the scene in question—there are two salient women, two corresponding discourse referents. The more specific NPs are felicitous; *first* and *second* may either be taken to allude to the order of a woman's entrance on the stage or the order of our mention of her and her entrance, with the same results. (38) shows that the pronoun *she*, while even less contentful than *the woman*, may be felicitously used, but it can apparently only refer to the second woman, as shown by the possible references to the other woman in the adjunct clause. Note that we cannot argue that the first woman is simply not salient by the time we interpret the pronoun; in the same relative linear position in discourse, *she* in (39) can take the first NP as its antecedent:

(39) A woman entered from stage left.
There was a basket of flowers in the middle of the stage.
She picked it up.

The difference in (38) seems to be that a pronoun takes as its antecedent the *most* salient entity in the context at the time of its utterance which is of a sort compatible with the pronoun's features. But a definite description doesn't take relative salience of potential antecedents into account in this way.

On the basis of these, plus a number of other types of examples, as well as empirical research on how we process pronouns vs. definite descriptions, Roberts (2003) argues that the central difference between pronouns and definite descriptions is that pronouns presuppose that their discourse referent antecedents are maximally salient, whereas that is not necessarily the case with definite descriptions. The additional presupposition of salience yields (40), which is a special instance of the presuppositions for definites in (2):

(40) **Presuppositions of Pronouns**:
Given a context C, use of a pronoun Pro$_i$ presupposes that it has as antecedent a discourse referent x_i which is:
a) weakly familiar in C,
b) salient in C, and
c) unique in being the most salient discourse referent in C which is contextually entailed to satisfy the descriptive content suggested by the person, number and gender of Pro$_i$.

(40) is just like (2) through clause (a). Clause (b) is added to reflect the salience presupposition; for more on what constitutes salience in discourse, see Roberts (Centering), Roberts (2003). The uniqueness presupposition in (2b) is specialized here to take into account the fact that the discourse referent for a pronoun need be informationally unique in satisfying its descriptive content only among the set of salient discourse referents, rather than, as is the case for definite descriptions, among all discourse referents. This yields an explanation for why pronouns do not generally

display uniqueness effects: The range of possible antecedents is so restricted that the uniqueness presupposition clearly only serves to pick out a uniquely intended antecedent.

(41) – (45) illustrate the importance of the salience presupposition. In each, the discourse referent antecedent for the definite is weakly familiar because entailed to exist by preceding context. The first sentences in (42)-(41) (the first two due to Barbara Partee, cited in Heim (1982)) are truth-conditionally equivalent, all entailing the existence of a missing marble. This is sufficient to license the definite description in (41), though the familiarity is merely weak. But weak familiarity doesn't guarantee salience, and this is why the pronoun is infelicitous in (43). When the missing marble is explicitly mentioned, and hence salient, in the first sentence of (42), use of the pronoun is felicitous. We see the same phenomenon in the contrast between Heim's (1990) (44), where the pronoun is infelicitous because the bicycle is merely weakly familiar, and (45), where the definite description is felicitous in the same context:

(41) I dropped ten marbles and found only nine of them. The missing marble is probably under the sofa.
(42) I dropped ten marbles and found all of them, except for one. It is probably under the sofa.
(43) I dropped ten marbles and found only nine of them. #It is probably under the sofa.

(44) *In Amsterdam, if a bicyclist isn't very careful, it'll be stolen.
(45) In Amsterdam, if a bicyclist isn't very careful, her bicycle will be stolen.

The relatively impoverished descriptive content of pronouns also makes it more difficult to accommodate a discourse referent antecedent for a pronoun than for a definite description, as we see in the following contrast:

(46) A: Can you help me get to the Central Station fast?
B: (pointing to a car) The keys are in the ignition. Help yourself.

(47) A: Can you help me get to the station, fast?
B: (pointing to a car) #They're in the ignition. Help yourself.

The underlined pronoun in (47B) fails to make the required accommodation retrievable, hence failing (20a). And, again, in such cases the intended antecedent isn't sufficiently salient to satisfy (40b), either. Hence, use of pronouns without an explicit antecedent most often requires either maximal situational salience, as we saw in (4), or deixis, as in the example in (6).

Hence, pronouns differ from definite descriptions in two important respects, both stemming from the fact that their descriptive content is so minimal: They do not generally give rise to uniqueness effects, which we find with some uses of definite descriptions, and they require maximal salience of their discourse referent antecedents, which is not required with definite descriptions. The theory outlined here makes the first

difference stem from the second. Any theory which collapses pronouns, in any of their uses, with definite descriptions, fails to capture these important distinctions.

3. Theories of Pronouns as Disguised Definite Descriptions

A number of authors have claimed that pronouns have at least one interpretation in which they are treated as disguised, Russellian definite descriptions. Different authors mean slightly different things by this, only some of them truly reducing (some) pronouns to definite descriptions. As we just saw, there is now reason to doubt whether such theories will be adequate. Though pronouns are undoubtedly closely related semantically to definite descriptions, are themselves definite, and because they are anaphoric often borrow part of their understood descriptive content from other (sometimes definite) NPs, they are quite different from definite descriptions in other respects. In this section, I will briefly consider the specific content of several of the relevant theories, and then offer additional arguments that in order to be empirically adequate, the theories would have to be modified along the lines suggested in the previous section.

3.1 The Theories

Among the authors who have suggested that pronouns behave like definite descriptions are Quine (1960), Parsons (1978), Cooper (1979), Evans (1980,1982), Engdahl (1986), Kadmon (1987,1990), Lappin (1989), Heim (1990), Neale (1990), van der Does (1993), Lappin & Francez (1994), and Chierchia (1995). Here I will focus mainly on the representative work of Neale, Heim, and Chierchia, though much of what I have to say about their work applies to other recent theories.[8]

Evans (1980,1982) gave the name **E-type pronouns** to pronouns interpreted as definite descriptions, differentiating them from pronouns which are "merely coreferential" with their referential antecedents, or are bound by quantificational operators. On the E-type interpretation, we retrieve the descriptive content of the Russellian logical form of the pronoun by copying the descriptive content of its noun phrase (NP) antecedent, plus any predicates on the antecedent, into the logical form of a Russellian definite description. E.g.:

(48) Barney owns a donkey. He beats it.

Assuming *a donkey* is antecedent of *it*, the latter with an E-type interpretation, the two sentences in (1) have the logical forms:

(48') $\exists x[\text{donkey}(x) \,\&\, \text{owns}(b,x)]$
$\exists x[\underline{\text{donkey}(x) \,\&\, \text{owns}(b,x)} \,\&\, \forall y[\underline{\text{donkey}(y) \,\&\, \text{owns}(b,y)} \rightarrow y=x] \,\&\, \text{beats}(b,x)]$

[8] See also Chierchia (1992), and the argument against that theory in Kanazawa (1994). And see Roberts (2003) for extended discussion of Kadmon (1987,1990).

The descriptive content of the antecedent plus the relation predicated of it in the first line occurs twice (underlined) in the second line, copied over to serve as the descriptive content of the E-type pronoun *it*. For the truth of (48), (48') requires that Barney own a unique donkey, which he beats. The counterpart of uniqueness for plural NPs is maximality (Kadmon 1990), as illustrated in Evans' (49):

(49) John owns some sheep. Harry vaccinates them.

(49') $\exists x[\text{sheep}(x) \,\&\, \text{owns}(j,x)]$
$\exists x[\underline{\text{sheep}(x) \,\&\, \text{owns}(j,x)} \,\&\, \forall y[\underline{\text{sheep}(y) \,\&\, \text{owns}(j,y)} \rightarrow y \in x] \,\&\, \text{vaccinates}(h,x)]$

I assume that *x* in (49') can be a plural individual, the counterpart of a set of sheep in a lattice-based treatment of plurals (Link 1983, Roberts 1990). Then the second conjunct in the second line of (49') stipulates that any sheep owned by John is a member of this "set" of sheep *x*. We then take *vaccinates* to be a lexically distributive predicate, so that the truth of *vaccinates(h,x)* will require that Harry vaccinate all the individuals in *x*; hence, Harry vaccinates all the sheep owned by John.

A similar proposal was made by Cooper (1979), who discussed Geach's *pronouns of laziness*, by which Geach meant those which are replaceable by a mere repetition of their definite antecedents. Besides donkey pronouns like that in (48), a central motivation for Cooper was so-called *paycheck sentences* (Karttunen 1969), illustrated by (50)-(52):

(50) The man who gave his paycheck to his wife was smarter than the one$_i$ who gave it to his mistress. [Karttunen 1969]

(51) Every woman who gave her paycheck to her broker was smarter than any woman$_i$ who gave it to her lover.

(52) Every graduate student put his paycheck in the bank.
Every professor$_i$ lost it. [David Dowty, p.c.]

In each of these examples, *it* could be replaced by *his/her paycheck, salva veritate*. Cooper proposed that we interpret such pronouns as in (53), giving them the logical form of a generalized quantifier:

(53) $\lambda P \exists x(\forall y(\Pi(y) \leftrightarrow x=y) \,\&\, P(x))$,
where Π is a property-denoting expression containing only free variables and parentheses.

One could take Π in a particular example to be a relation variable *R* and its argument, a variable *v*, each then getting their interpretations via the assignment function in a standard (static) interpretation in Montague Grammar (Montague PTQ; Dowty, Wall & Peters):

$\lambda P \exists x(\forall y(\underline{R(x_i)}(y) \leftrightarrow x=y) \,\&\, P(x))$

For (48), *R* is assigned the relation between a donkey and its owner, and x_i is assigned to Barney. For the underlined pronouns in (50)-(52), *R* is assigned the relation of being a

paycheck owned by some individual, and x_i is bound by the NP with the referential index *i*:

$$\lambda P \exists x(\forall y(\underline{\text{paycheck}(x_i)}(y) \leftrightarrow x=y) \,\&\, P(x))$$

So, for example, in (52) this will be the paycheck of some arbitrary professor, yielding the interpretation:

(52') $\forall x_i(\text{student}(x_i) \rightarrow \exists x(\forall y(\underline{\text{paycheck}(x_i)}(y) \leftrightarrow x=y) \,\&\, \text{put-in-bank}(x_i,x)))$
$\forall x_i(\text{professor}(x_i) \rightarrow \exists x(\forall y(\underline{\text{paycheck}(x_i)}(y) \leftrightarrow x=y) \,\&\, \text{lost}(x_i,x)))$

Pronoun of laziness interpretations are not equivalent to Evans' E-type interpretations, since in a theory like Cooper's it is not required that part of the descriptive content of the disguised definite description include the relation predicated of the antecedent NP. Because of the predicate requirement on Evans' theory, he cannot treat paycheck pronouns. E.g., for (52), the descriptive content on the Evans' approach would have to be 'x_i's paycheck which x_i put in the bank', which would not yield the correct interpretation for *it*.

Lappin (1989) and Neale (1990) (independently) propose an elaboration of Evans' general account, allowing for "number neutral" interpretations for E-type pronouns, as glossed informally for (1), repeated from above:

(1) Every man that owns a donkey beats it.
it = 'whatever donkey(s) the man owns'

This yields the interpretation captured by the logical form in (1'):

(1') $\forall x[\text{man}(x) \,\&\, \exists y[\text{donkey}(x) \,\&\, \text{owns}(x,y)] \rightarrow$
$\exists y[\underline{\text{donkey/s}(y) \,\&\, \text{owns}(x,y)} \,\&\, \forall z[\underline{\text{donkey}(z) \,\&\, \text{owns}(x,z)} \rightarrow z \in y] \,\&\,$
$\text{beats}(x,y)]$,
where *donkey/s* holds of *y* iff *y* consists of one or more donkeys, and
beats is a distributive predicate, so that it is true that a plural individual is beaten iff all of its atomic elements (the members of the group) are beaten

This is truth conditionally equivalent to the reading of Geach (1962), shown in (1''):

(1'') $\forall x \forall y[\text{man}(x) \,\&\, \text{donkey}(y) \,\&\, \text{owns}(x,y) \rightarrow \text{beats}(x,y)]$

Hence a man beats all of his donkeys.[9]

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[9]Moreover, we obtain this result without encountering what is generally called *the proportion problem* (Kadmon 1987,1989). Theories like those in Kamp (1981) and Heim (1982) give interpretations which are truth conditionally equivalent to (1') and (1''), by actually quantifying over pairs of a man and his donkey (unselective binding), as in (1'''):
(1''') $\forall \langle x,y \rangle[\text{man}(x) \,\&\, \text{donkey}(y) \,\&\, \text{owns}(x,y) \rightarrow \text{beats}(x,y)]$

Both Evans and Cooper assume that pronouns are ambiguous, with the E-type or pronoun-of-laziness interpretation only one possible interpretation. Neale (1990) is careful to spell out three interpretations which a pronoun can receive: as a referring expression, a bound variable, or a disguised definite (which he calls a *D-type* interpretation):

(54) Neale's (1990:166-8) interpretations of pronouns:

i. Pronouns are referring expressions when they are:
   a) non-anaphoric, i.e. fail to have an NP antecedent. These cases include demonstrative uses, as in (6) above (see his §3.3 for how he takes these to work); and examples where we refer to an entity which is discourse-new, but highly salient in the immediate context, as in (4) above.
   b) anaphoric on referring expressions. These include examples where the pronoun takes an NP like *that man* or *Jones* as antecedent. He is "neutral about how this happens" (p.168), but mentions the following possibilities:
      - (Geach's) pronouns of laziness (going proxy for their antecedents), or
      - inheritors of their referents from their antecedents, or
      - getting their referent from the most salient entity in the context of utterance, which has been raised to salience by the utterance of the antecedent

ii. Pronouns are interpreted as bound variables when they are anaphoric on c-commanding quantifiers.[10]

iii. Pronouns are interpreted as quantifiers when they are anaphoric on non-c-commanding quantifiers. In this case, they receive the Russellian, D-type interpretation.

Neale proposes the following account of D-type pronouns (1990:182):

(P5) If *x* is a pronoun that is anaphoric on, but not c-commanded by, a quantifier '[*Dx*: *Fx*]' that occurs in an antecedent clause '[*Dx*: *Fx*](*Gx*)', then *x* is interpreted as the most "impoverished" definite description directly recoverable from the antecedent clause that denotes everything that is both *F* and *G*.

The problem is that in the general case the logical form in (1'") only yields the correct truth conditions if the quantifier in question is universal. For example, consider a situation in which there are ten men, nine of whom own one donkey each, while the tenth owns ninety-one donkeys. Suppose that the rich man beats all of his ninety-one donkeys, while none of the others does. Now consider the truth of (i) in that situation:

(i) Most men that own a donkey beat it.

If we quantify over all the pairs of a man and one of his donkeys, requiring that most of these (say more than 50%) involve beating, we get the wrong truth value. But since the logical form in (1') doesn't quantify over pairs, but only over men, with the universal force of *it* coming from the maximality of the disguised definite description, it doesn't encounter this problem.

[10] C-command is a syntactic relation, which requires that the c-commanding element and that which it c-commands occur in the same sentence. Moreover, in the syntactic tree for the sentence, the first node dominating the c-commanding element must dominate the c-commanded element. There are many variations on this basic definition, but this will do for our purposes.

What (P5) means is that if the antecedent NP is itself a definite, and so in his theory denotes something which is unique (or, if plural, maximal), then the proxy interpretation of the pronoun need only contain that NP's descriptive content, not that of the predicate as well. These are basically pronouns of laziness, in Geach's sense. But if the antecedent NP isn't itself definite, then, as in Evans' account, the proxy definite contains the minimal predicate on the NP, as well as the NP's own descriptive content. Hence, though he doesn't discuss them, Neale could account for the paycheck sentences in (50)-(52), on the assumption that the antecedents are definite: NPs with a definite possessive are generally considered to be themselves definite (Barker 1991). Consider (52):

(52) Every graduate student$_k$ put his paycheck in the bank.
Every professor$_i$ lost it.

The borrowed descriptive content here (a pronoun of laziness interpretation, because the possessive *his paycheck* is definite) will be 'x_k's paycheck'. Unless $k = i$, the referential index of *every professor*, the example will fail to have the correct interpretation. When they aren't equivalent, the interpretation is non-sensical and arbitrary, because k is free in the second clause; when they are, then the desired reading results. Hence, there is no need for the theory to enforce the equivalence, nor is the resulting accidental binding a problem in natural language.

The resulting theory offers substantial improvement over Evans' in several respects.[11] Besides donkey sentences and paycheck sentences, Neale can predict the correct readings for crossing co-reference examples and “sage-plant” sentences like (26) above. Whereas Evans had argued that the E-type pronouns were interpreted as "names whose references are fixed by description," hence as rigid designators, Neale argues that they really "go proxy for definite descriptions", and hence he correctly predicts (pp.186ff) that D-type pronouns can get *de dicto* readings under the scope of intensional operators, as well as intermediate scopes where multiple operators are involved. But he doesn't take a firm stand about what it means to "go proxy for" a definite description:

> My own inclination is to see (P5) as a very reliable descriptive generalization, and perhaps also as a processing heuristic, though, as we shall see, a rather impressive array of facts can be accounted for on the assumption that (P5) is a genuine linguistic rule that operates on syntactical representations in which scope assignments have been made. (Neale 1990:184)

Heim (1990) proposes a theory of personal pronoun interpretation which is quite close to Cooper's, except that it is based on functions of variable arity, and hence does not need to posit pronoun ambiguity. She assumes a set of n-place functor variables f^n_1, f^n_2, etc., which:

[11]Actually, the central feature of Neale (1990) is an extended, very convincing argument against viewing the distinction between referential and attributive readings of definites as following from ambiguity in the definite article, arguing instead for a view of referential readings closer to that of Kripke (1977).

- range over functions whose arguments are *n*-tuples in $(A \cup W \cup T)^n$, *A* the set of individuals in the model, *W* the set of worlds, *T* the set of times. For *n*=0, an *n*-place functor variable is just a plain individual variable.
- yield values in *A*; hence, given the required argument(s), the pronoun always denotes an individual.
- may be partial, i.e. not defined for some arguments.

A pronoun is represented at LF as a term of the form in (55):

(55) $f^n_i(v_1,\ldots,v_n)$

where *f* is a free function variable of arity *n*, $n \geq 0$, and $v_1, \ldots, v_n$ are variables of the appropriate type (individual, world, or time).

Among the types of examples this theory can treat are donkey sentences like (1) and paycheck sentences like those in (50) – (52). With *a donkey* in (1) interpreted as 'exactly one donkey', the pronoun is translated as $f^1(x_k)$, where the free variable *f* is interpreted via the function assigning values to variables as the function described in (56); there, the top line describes domain and co-domain, the bottom gives *f(x)* for arbitrary *x*. This is the function assigning to each man the unique donkey that he owns. It yields the number neutral interpretation quite straightforwardly if we take the function to pick out the supremum of the set of donkeys instead of a singular donkey: Where there is only one donkey owned by a given man, that donkey will itself be the supremum of the set; otherwise, the function will pick out the individual consisting of all the donkeys owned by the man in question.

(56) **f**: {x: x is a man and owns exactly one donkey} $\rightarrow$ A

x $\mid\rightarrow$ the unique donkey that x owns

In a paycheck sentence, the pronoun is translated as $f^1_k(x_i)$, interpreted as 'paycheck of x_i', yielding the logical form we saw in (52').

In (56), the function **f** is not defined over the entire domain A. The listener has "no reason to assume that the existence of a unique association between individuals and the donkeys they own extends beyond a proper subset of the donkey-owning men. Since the function **f** is only partial, it follows that the formula *x beats f(x)* does not have a well-defined truth value for every assignment *g* that has *g(f)* = **f**. If *g(x)* is outside the domain of *g(f)*, $\|x \text{ beats } f(x)\|^g$ is undefined." (p.141)

Though superficially the variable interpretation doesn't appear to equal a disguised definite description, in fact both existence and uniqueness here are presupposed, not (just) entailed. Presupposed is whatever it takes for the function *f* to be well-defined, at least over the domain that is relevant to determine a truth value for the utterance as a whole; which is to say, since *f* is a function, that there exists exactly one value for each element in the restricted domain.

Chierchia (1995) develops a theory in which pronouns have two types of interpretations, *dynamically bound* vs. *E-type*. In general, pronouns are translated as variables over *n*-place functions from entities to entities in the manner of Heim (1990), with *n=0* yielding the standard case where pronouns are "entity-level variables" (Chierchia 1995:114). Dynamic binding is a variant of the binding of pronouns across discourse by dynamic operators first developed as an alternative to Heim's and Kamp's theories by Groenendijk & Stokhof (1990). In these theories, existential operators (e.g., those introduced by indefinite NPs) are dynamic in that they can take scope outside the sentences in which they are introduced, though their scopes are limited by the scopes of any non-existential operators with wider scope. The special variables which may be bound by such dynamic operators are called *discourse markers*, to distinguish them from ordinary variables bound by non-dynamic operators. In Chierchia's theory, binding via these dynamic operators is only possible when the pronoun's arity is *0*.

Chierchia's E-type interpretation of pronouns arises when pronouns are, instead, treated as variables over *n*-place functions, essentially as in Heim's theory discussed just above except that the *n* arguments of the function are given syntactically rather than directly as part of the pronoun's interpretation. The function's characterization is retrieved pragmatically from the context, along with the binding of the values of the *n* variables which are its arguments. As in Heim's theory, since the variable ranges over functions, the resulting interpretation of the pronoun presupposes semantic uniqueness. Chierchia's (1995:Chapter Four) general interpretation of definite descriptions involves the binding of regular variables, rather than discourse markers, and yields a Russellian interpretation via a function whose value is partly given by the descriptive content of the definite NP, partly retrieved from context (essentially as in Clark's (1975) *Bridging*; see also Roberts (2003) for extended discussion). Chierchia shows there that the E-type interpretation of pronouns is a subcase of this functional interpretation of definites.

Following Neale's interpretations of his D-type pronouns, Chierchia claims that when pronouns receive an E-type interpretation, they are unmarked as to whether they are singular or plural. Hence, Chierchia's E-type interpretation of donkey pronouns yields an interpretation which is truth conditionally equivalent to Geach's interpretation of donkey pronouns in (1"), which Chierchia calls the *universal interpretation*; while the dynamically bound interpretation leads to the interpretation we find in Pelletier & Schubert's (1989) example (57), which Chierchia calls the *existential interpretation*:

(57) Every man who had a quarter in his pocket put it in the meter.

On the interpretation of interest, a given man need put only one quarter in the meter, even if he has several in his pocket; hence, maximality is undesirable.

Chierchia claims that his theory, though it yields two kinds of interpretations of pronouns, does so without requiring that pronouns themselves be ambiguous:

> the situation is just as with variables in logic, which can have free and bound uses without being ambiguous. . .Their content is provided in essentially two ways: via

> semantic binding. . .or via contextually available information. . .In a way, the present work as a whole is simply an attempt to spell out a bit further the traditional claim that pronouns can be bound or free, by arguing on the one hand that binding is not only static (under c-command), but also dynamic and by arguing on the other hand that interpreting free pronouns through the context has its own systematicity (embodied in the E-type strategy). (p.113)

However, the claim that pronouns are unambiguous in this theory is rather misleading. There are two distinct types of variables in Chierchia's formal theory—discourse markers and other variables. The discourse markers are all of type *e*, ranging over individuals in the model; and they are given values by a special type of assignment function, associated with dynamic operators, which maps them onto such individuals. Other variables are may be of any type (among other things, allowing the *n*-place functional interpretation of pronouns), and they are interpreted by the usual Tarskian assignment functions, mapping non-discourse marker variables onto entities of the appropriate type in the model. If a pronoun is to be dynamically bound, it must be translated as a discourse marker, of type *e*, and receives its interpretation via an assignment ω of values to discourse markers; there is no uniqueness effect associated with this interpretation. But if the pronoun is to receive an E-type interpretation, it is translated as a regular variable, of the type of some *n*-place function, and receives its interpretation via a different sort of assignment function *g*, leading to a uniqueness effect. Though both sorts of pronominal interpretation are technically variables, this is still semantic ambiguity. It is crucial that one type of pronoun is a discourse marker, the other a variable over functions. The fact that discourse markers of type *e* can also technically be characterized as *0*-place functions should not obscure their essential differences from ordinary variables within the interpretive mechanism Chierchia provides.

In all of the theories in question, there is an interpretation of pronouns in which they are like Russellian definite descriptions in carrying a uniqueness requirement, whether proffered or presupposed. In all of these theories except that of Heim (1990), pronouns are treated as ambiguous, with the Russellian interpretation co-existing with a bound variable interpretation and/or a referential interpretation of some kind. I have already briefly sketched the arguments from Roberts (2003) that the semantic uniqueness requirement is not desirable for definites in general, and especially for pronouns, which do not generally give rise to uniqueness effects. And I have argued that pronouns carry an additional presupposition of salience, which none of these authors addresses. In the following section, I will present a number of other problems with these theories.

3.2 Problems with Theories of Pronouns as Disguised Definite Descriptions

If pronouns are taken to have exactly the same semantic content as definite descriptions, a number of problems arise. Two could be ameliorated fairly straightforwardly: To any of the theories discussed in the preceding section, one could add the presupposition on pronouns that there is a corresponding discourse referent in the common ground which is maximally salient. Since discourse referents are by definition familiar, this takes care of

both the requirement of weak familiarity and that of maximal salience. The resulting theory is essentially that of Kadmon (1990). Other problems, however, are not so easily addressed.

3.2.1 Semantic Uniqueness

I have already briefly sketched the argument that semantic uniqueness is too strong, for definites in general and pronouns in particular. As Heim puts it, uniqueness is the Achilles' heel of an E-type analysis. The following example, from Heim (1990), serves to re-enforce the point:

(58) If a man is in Athens, he is not in Rhodes.

Since there is always more than one man in Athens, on an E-type account of the pronoun the descriptive content one can retrieve from the antecedent of the conditional will always lead to a false interpretation. Yet (58) is obviously true and unobjectionable. Heim's response to this problem is to posit that conditionals are (roughly here, for brevity) generalizations over minimal situations—in this case, situations which contain at most a single man and the city of Athens. In each such situation there is, of course, at most one man; relativizing all arguments to that situation, then, *he* is interpreted as 'the man who is in Athens in minimal situation *s*' and hence, the problem of semantic uniqueness is avoided. However, minimal situations are notoriously difficult to define adequately, as Heim herself admits; and the solution appears to be rather *ad hoc* to the problem. Moreover, this solution leads to the re-creation of the proportion problem in conditional versions of the donkey sentences, as in (59):

(59) In most cases, if a man owns a donkey he beats it.

Here, in the situation with ten men, one them owning ninety-one donkeys and beating them all, if we range over minimal situations containing a man and one of his donkeys, we have one hundred pairs, ninety-one of them (all with the same man) involving beating. But most speakers agree that (59) should not be true when only one donkey owner in ten verifies it, since it seems to be a generalization about what it is to own a donkey, and one bad owner (even if he's rich) doesn't suffice to make it. The point is not that there might be conditionals where this type of reading arises (like *if a man meets another man, he greets him*), but that one shouldn't restrict the interpretation of conditionals in general to range only over minimal situations. See Kadmon (1990) for extended discussion of such conditionals.

In a theory like the one outlined in §2, (58) presents no problems. There is at most one salient discourse referent (strongly) familiar in the context of interpretation of the consequent; that discourse referent is appropriately referred to using a third person, singular, masculine pronoun (so that the pronoun's descriptive content is satisfied); and anaphora goes through without a hitch.

Suppose one added familiarity and salience presuppositions to an E-type account, with the semantic uniqueness presupposed instead of proffered; the resulting theory would be much like that of Kadmon (1987,1989). Then one might appeal to these new presuppositions to implicitly restrict the domain in which uniqueness must hold, in much the same way as I have done for informational uniqueness in §2. However, this would still leave one with a Russellian account of definite descriptions, which I have argued is too strong for those, as well.

3.2.2 The Scope Issue

All of the theories under consideration encounter a *prima facie* problem: They predict that the descriptive content of a pronoun which is a disguised definite description is somehow borrowed from previous context, often being the descriptive content of a previous quantificational NP plus or minus any predicates on the latter. Except in Chierchia's (1995) theory, there are no constraints on the relationship between the antecedent NP and the pronoun. In particular, this seems to predict that a pronoun could take its content from an NP which is under the scope of an operator that does not have scope over the pronoun. The following, from Heim (1990), illustrate the problem:

(60) John owns no sheep$_1$ and #Harry vaccinates them$_1$.

(61) John doesn't own a car$_1$, and #he drives it$_1$ on Sunday.

She argues that the infelicity of the second clause in these sentences derives from a presupposition failure: The definite has an existence presupposition, which fails in these cases due to the fact that the first conjunct denies the existence of the relevant entities. Hence, repair by accommodation is not possible, either, as it would lead to contradiction. Neale has much the same account of examples involving double negation, claiming that the pronoun "just makes *no practical sense* to use in these sentences" because the resulting interpretation is contradictory (p.232).

This may suffice for examples involving negation, but things are more complex than this. Consider, for example, the following example involving deontic modality:

(62) You should meet a nice man and get married. He has already seen you in his dreams.

If the second sentence in (62) is felicitous at all, *he* means 'the nice man you'll meet someday and marry, whoever he is'. This presupposes that the addressee will actually meet someone, a presupposition which must be accommodated here. Heim's theory could handle such an example, taking the value of the variable over functions denoted by *he* to be the one-place function from women to the men they'll meet and marry, applied to the addressee; this value is, presumably, pragmatically retrieved.[12] But the application

[12] At the end of her paper, Heim offers a different version of the theory where, as in Evans (1977,1980), the descriptive content of the pronoun is borrowed from the syntactically given descriptive content of its

of Neale's (P5) would predict something else: that *he* can mean 'the nice man who you meet', with no hint of futurity or marriage. There is no contradiction here, so no ready way to block such an interpretation. The attested interpretation, involving accommodation, can only be retrieved by considering the nature of the operator under which the licensing NP *a nice man* occurs, realizing that it is future-oriented, and understanding, moreover, that the conjunction with *and get married* implicates marrying this nice man.

Examples involving modal and temporal subordination, and other cases of anaphora in intentional contexts (Roberts '89, 9-) show that generally the explicit descriptive content of an indefinite in such contexts can only be borrowed when the irrealis mood is maintained. We saw this in (21)-(23), repeated here, where *it* can borrow the content 'earthquake that hit San Francisco' only under the scope of another irrealis operator in (21b); in (23b) the content must be a nominalized version of the possibility reported in (23a), i.e., including the irrealis mood itself.

(21) a) An earthquake might hit San Francisco.
b) That would upset me. It would be frightening.

(22) a) An earthquake hit San Francisco in 1989.
b) That upset me. It was frightening.

(23) a) An earthquake might hit San Francisco.
b) That upsets me. It is frightening.

And consider (63):

(63) Most days, John brings a bagel for breakfast.
a) Sometimes, Mary steals it from him.
it: 'the bagel John has brought for breakfast that day'
b) Mary stole it from him.

Here, *it*, with the interpretation 'the bagel John brought for breakfast', is acceptable in (a), where the mood of generalization introduced by the adverbial *most days* is continued with *sometimes*. This interpretation is not possible in (63b), where the mood of generalization is not continued. Yet all of the other theories considered require only that the function from John to his bagel on a particular day be salient, along with the day of utterance made salient by the present tense, and hence fail to predict the awkwardness of (63b). Of course, we can ameliorate (63b) by adding *Today* at the beginning, but then (on the theory proposed here) the pronoun is licensed by default entailment from the assumption that today was an ordinary day with respect to John's breakfast.

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antecedent NP. Then with respect to this type of example, the second version of Heim's theory would run into the same problems as Neale's.

Heim (1990) points out that an algorithmic approach like that in Neale's (P5) to determining the descriptive content of these pronouns on the basis of the logical form of the antecedents leads to problems with examples like her (64) and (65):

(64) Every student turned in a paper. *They* were all identical.
(65) Each time every student turned in a paper they were all identical.

The problem is that since *a paper* is under the scope of *every student*, this would lead to the prediction that *they* means 'the papers that *x* turned in', rather than the understood 'the papers that the students turned in'. Even if we attempt to deal with (64) by claiming that *they* was somehow deictic, this won't help with (65), where no single incident or set of students or their papers was involved.

The problem that all these examples reflect is that the theories in question depend on mere salience for retrieval of the descriptive content of a pronoun that is a disguised definite description. Note the following difference between the distribution of felicitous uses of the pronoun *it* and that of the anaphoric indefinite *one*:

(66) Either John has a new car, or else #Mary has it.
(67) Either John has a new car, or else Mary has one.

(67) argues that the descriptive content of *a new car*, though it isn't accessible in the second disjunct, is sufficiently salient to license anaphora. However, outside the first disjunct, there is no weakly familiar discourse referent for a new car, i.e. no existential entailment, and hence *it* is infelicitous in the absence of any other plausible discourse referent antecedent.[13] Salience of the descriptive content of a recently uttered NP is simply not sufficient to license the corresponding interpretation of a pronoun.

Chierchia (1995) avoids several of these problems when the E-type pronoun has an overt NP antecedent by requiring that the pronoun's logical form contain a variable which must be anaphorically coindexed with the head of the antecedent, thereby determining "the range of the function" (p.231), though he doesn't specify how this would be done. If there are operators with scope over the antecedent that do not have scope over the pronoun, this would yield infelicity. However, he doesn't discuss how he would handle examples of modal subordination and other cases of anaphora in intensional contexts, as in (9) and (63a), where there is a lack of accessibility to the licensing NP. And he doesn't discuss examples involving deixis or contextual salience, where there is no anaphoric antecedent NP. Moreover, he gives no motivation for the required anaphoric co-indexing with an accessible NP head, which hence appears *ad hoc*. In contrast, the scope

[13] I assume, following Chierchia (1995), that the logical form of a disjunction is roughly of the form [(¬P) → Q], as a way of capturing both the inaccessibility of indefinites inside the two disjuncts and the fact that this inaccessibility changes if the first disjunct is negated, as in Partee's:
(i) Either there's no bathroom in this house, or it's in a funny place.
In terms of the present theory, the negation of the first disjunct entails the existence of a bathroom in the house in question, which is hence temporarily accessible from the second disjunct, though not beyond.

constraint falls out of the theory encoded in (40) directly, as a consequence of the way that discourse referents are managed in discourse.

Thus, the theories in question all fail to capture the fact that E-type readings seem to arise just when existential entailments or implicatures license weak familiarity (in the local context of interpretation) of the corresponding discourse referent. Using a dynamic interpretation to keep tabs on the familiar discourse referents at any given point in discourse permits us to capture this fact, giving improved empirical coverage across a wider range of types of examples. Of course, one might enrich an E-type account with the requirement that there be a local entailment of the sort required, e.g. that the use of the NP from which the descriptive content of the pronoun is borrowed contextually entails the existence of the relevant discourse referent. But then it seems to me that the resulting theory is very close to what I proposed in §2, modulo semantic uniqueness, familiarity and salience, as discussed above.

3.2.3 Pronominal Ambiguity, Donkey Sentence Readings, and Generic Interpretations

Any adequate theory of pronominal interpretation would have to involve an account of variants of Geach's donkey sentences which have non-universal interpretations of the E-type pronoun. Examples like these were first pointed out by Schubert & Pelletier (1989), and have since been discussed extensively in the literature; see Barker (1993), Kang (1994), Kanazawa (1994), Chierchia (1995), Yoon (1996) Kanazawa (2001), and Geurts (2002), among others. The existence of the two types of readings for donkey pronouns is problematic for most theories of pronoun interpretation. For example, Neale (1990) predicts two readings, as shown, neither of which is the preferred reading:

(57) Every man who had a quarter in his pocket put it in the meter.
- Neale's readings:
  - Singular: 'Every man who had a quarter in his pocket put the (unique) quarter he had in his pocket in the meter.'
  - Number neutral: 'Every man who had a quarter in his pocket put all the quarters in his pocket (whatever quarters he had) in the meter.'
- Preferred reading:
  - 'Every man who had a quarter in his pocket put one of the quarters in his pocket in the meter.'

Chierchia (1995) argues that the existential interpretation of pronouns in such examples is licensed by the fact that natural language quantifiers are *conservative*, in the sense of Barwise & Cooper (1981); in their relational terms, where a quantificational operator is a relation between two sets:

conservativity: if $A,B \subseteq E$, then $D_E AB \leftrightarrow D_E A(A \cap B)$

That is, if a quantificational operator D_E (the interpretation of a determiner) is conservative, taking two arguments A (the denotation of the common noun) and B (the

interpretation of the predicate), with both of these taken to be sets (extensional interpretation) yields the same interpretation as taking as arguments A and the intersection of A and B. Equivalently, taking a quantificational determiner as a restricted generalized quantifier, restricted by its Common Noun phrase, this encodes the same property as van Benthem's (1986) *lives-on*:

lives-on: $X \in ||D||(A)$ iff $(X \cap A) \in ||D||(A)$

Generalized quantifiers (in the extensional sense) are sets of predicates. If some predicate X is in the denotation of D with argument A, then the intersection of X with A is also in that denotation. The test for conservativity, which all English quantificational determiners pass, is:

test for conservativity:: Det CN VP $\leftrightarrow$ Det CN is a CN who VP
Many men run $\leftrightarrow$ Many men are men who run
Every woman smiled $\leftrightarrow$ Every woman is a woman who smiled

Hence, when considering the properties that every man who has a quarter in his pocket has, we can be assured that one of them is that of being a man who has a quarter in his pocket. In terms of the theory proposed in §2, the quarter is weakly familiar under the scope of the quantificational determiner *every* because its existence is entailed by the conservativity of that determiner. But this theory doesn't require semantic uniqueness, so the interpretation we get is closer to that suggested by the logical form in (57'):

(57') $\forall x[man(x) \& \exists y[quarter(y) \& has\_in\_pocket(x,y)] \rightarrow$
$\exists y[quarter(y) \& has\_in\_pocket(x,y)] \& puts\_in\_meter(x,y)]$

Of course, this isn't the actual logical form of (57) on the theory proposed here, because the existence of the quarter is presupposed, not proffered. And the pronominal variable is not bound by a second existential quantification. Rather, the discourse context at the time of interpretation of the VP will be such that (temporarily, while under the scope of the universal quantifier) all the assignments of values to variables which capture the information the interlocutors share will assign to *y* a quarter in the pocket of *x*.

Krifka (1998) offers quite a different account of the basic difference between universal and existential interpretations of quantificational donkey sentences, based on an observed difference between upward- and downward-entailing quantificational operators which he calls Rooth's generalization:[14] Basically, if the head quantificational determiner is monotone decreasing (e.g. *no, few, at most n*), we expect the existential interpretation, while if it is monotone increasing, (e.g. *all, any*), we get the universal. But Kanazawa (2001) argues convincingly that this generalization is not sufficiently nuanced to reflect all the facts about different types of monotonicity in quantifiers; based both on judgments

[14]after Rooth 1987, though Kanazawa (2001) points out that only part of this is properly attributed to Rooth. For definitions and discussion of monotonicity and persistence in generalized quantifier theory, see Barwise & Cooper (1981), and the very helpful Gamut (1991).

of her own informants and on work by Jackson (1994), it seems that monotone increasing quantificational determiners with existential interpretations (e.g., *some, several, at least n, many*) tend more often to lead to existential interpretations than *every* or *any*, the difference in generalized quantifiers theory terms being that the class with existential entailments is also persistent (or left-monotone increasing), while those without are anti-persistent (or left-monotone decreasing). Moreover, she argues that when Rooth's generalization holds true, it seems to hold only for plural donkey pronouns, not for singular. We see instances of this in examples already cited above, where a pair of donkey sentences with singular donkey pronouns and the same quantificational head *every* display the two different readings: (57) has a preferred existential reading, (1) a universal:

(1) Every man that owns a donkey beats it.
(57) Every man who had a quarter in his pocket put it in the meter.

What is the difference between examples with preferred universal interpretations, like (1) and (68), on the one hand, and those with preferred existential interpretations, like (57) and the final sentence in (69), on the other?:

(68) If a farmer owns a donkey, he beats it.
(69) The farmers in this area are friendly and generous, even though they're quite poor. Suppose your car breaks down in the neighborhood, and you need to go for help. If a local farmer owns a donkey, he'll loan it to you to ride back into town.

The difference, I contend, lies in what we know about the types of situations being described, and about the basis on which gnomic generalizations about such situations can be made. We know that one quarter is a standard parking meter fee, so we don't expect a person who has more than that to put them all in the meter: The generalization in (57) is not about men or quarters, but about parking meters and their limited requirements, hence about sufficiency. Similarly, (69) is about the generosity of the farmer in helping the stranded motorist back to town; but for the purpose, the loan of at most one donkey would suffice. On the other hand, universal maltreatment of animals could have to do with the nature of the owners, the nature of the animals (how harshly one would have to behave to control them, for example), or both. Barker (1993) is a useful discussion of other factors that may bear on how we know which reading of a donkey sentence is preferred in a particular context. Whatever the basis of generalization in (1)/(68), it would suggest that if men and donkeys were of such a character to lead to beatings, non-beating would be the exception, not the rule. Hence, it seems that the universal cases could be viewed as pragmatically strengthened versions of the weaker existential.

There is at least one other reading for unbound pronouns which seem to have a quantificational antecedent in prior discourse, besides the ones discussed above. Chao (1983) noted that generic interpretations of plural pronouns do not require bare plural antecedents, as illustrated in her (70):

(70) Many women from the village came to the fair. They like that sort of thing.

Here, we understand that it is women from the village in general who like fairs, and not just those who actually came to the particular fair in question; hence, the subject of the first sentence is clearly only a licensing NP, not an anaphoric antecedent in the classic sense. Chao conjectured that such readings are available whenever we use a plural common noun, like *women* in (70). However, in other examples a singular NP, like *Sam's dog* in (71), will serve to license these readings, as well:

(71) Sam's dog got into my compost pile last night. They love rotten stuff.
['dogs love rotten stuff']

Nor does the NP which appears to trigger the salience of the kind have to entail existence of stages of that kind, as we see in (72), due to Webber (1978), where *few* is generally taken to be a downward entailing operator without existential entailments:

(72) Few linguists smoke. They know it causes cancer.
['linguists know that smoking causes cancer']

(I note that the pronoun *it* in (72) illustrates yet another respect in which pronominal anaphora depends more on pragmatic factors like salience and plausibility than on explicit mention (strong familiarity). Here, it arguably refers to a nominalization of the preceding predicate, *smoke*.)

Apparently, mention of an instance of a kind or quantification over stages of a kind are generally sufficient to make the kind itself salient. The kind is already familiar in the common ground due to interlocutors' general world knowledge that such kinds exist. And kinds are, by nature of what they are, semantically unique, and hence informationally unique to interlocutors who know what a kind is. In these examples, it is clear that it is a kind that is referred to by the pronoun from the predicate in question (both its content and its tense and aspect) and the context in which it occurs. In (71), there is no salient group of individuals, and the property of loving rotten stuff is plausibly predicated of dogkind, so we take it that way as an explanation of Sam's dog's behavior. This is all pragmatics.

We find this generic reading of pronouns in some donkey sentences, as well:

(73) Every farmer that owns donkeys breeds them.

(73) as generally understood doesn't require that any given farmer breed all of his donkeys—some are surely too young or too old or otherwise unsuitable—but only some of them; though generally he would breed more than one, in fact as many as would be profitable to him. The simplest, most plausible way to interpret (73) is to take *them* to have a generic interpretation: 'every farmer that owns donkeys breeds donkeys'.

How do these generic interpretations arise from a technical point of view? Carlson (1977) offers an extended argument that bare plural NPs have a generic interpretation,

denoting the relevant natural kind. When such NPs appear to have an existential interpretation, this is because they occur as arguments of a verb or complex predicate that he called *stage-level*. E.g., in *Firemen are available*, the stage-level predicate *be available* takes the generic-denoting *firemen* and says of it that there stages of that kind—roughly, spatio-temporal instances, individual people—that are available. He notes that plural pronouns can be anaphoric to generically interpreted bare plural NPs, and that one of these pronouns can appear to have either a generic or a stage-level interpretation, depending on the predicate that takes it as argument, whether that predicate is stage-level or kind-level, and its tense and aspect. In (73), though *breeds* is a stage-level predicate, it appears here in the bare present tense used in non-stative verbs to indicate the habitual or generic interpretation, as opposed to pertaining to particular situations. Carlson also shows that kind interpretations of bare plurals are not equivalent to those of universally quantified NPs: we would expect exceptions, sometimes systematic ones, as with the systematic exception of the young and old or infirm from breeding.

Carlson's account of the generic interpretation of bare plurals makes one more prediction. This is that when such plurals, denoting kinds, occur with a stage-level predicate and without the bare present tense driving a habitual interpretation, the stage-level predicate takes the generic as argument and "lowers" it, entailing that the predicate holds of stages of the kind. This interpretation is equivalent to an interpretation of the plural as an existentially quantified NP, an indefinite. If plural pronouns have such an interpretation, they should be susceptible of this lowering, and (74) argues that they are:

(74) A: Few teenagers are responsible.
B: I know what you mean. They tore up my garden at Halloween!

They in (74) seems to mean 'some teenagers'. We can derive this in Carlson's theory by taking the pronoun to denote the familiar, salient and informationally unique natural kind 'teenagers'. This serves as argument to a stage-level predicate, 'the property of being a kind *x* such that there exists a (possibly plural) stage of *x* which tore up my garden at Halloween', combining to give the reading 'there is a (plural) stage of teenager-kind which tore up my garden at Halloween.' Though apparently indefinite, the interpretation of the pronoun itself is definite, and the indefiniteness arises from the meaning of the stage-level predicate.

It seems that we can find this type of reading in donkey pronouns, as well:

(75) If one of my neighbors likes dogs, he generally seems to breed them, and they end up running around in packs, terrorizing the neighborhood cats, and getting into the garbage.

In (75), the first donkey pronoun, *them*, is directly anaphoric to the kind-denoting bare plural *dogs*, and hence has a generic interpretation itself. But the second pronoun, *they*, though interpreted in the same fashion, due to the lowering triggered by the conjoined stage-level predicates seems to denote a non-kind existential interpretation, indefinite: 'dogs that have been bred by the neighbor in question'.

What the generic examples show us is that the theories which treat pronouns as definite descriptions have overlooked a whole class of examples where a pronoun is licensed by quantificational NP in prior discourse, but where the pronoun apparently has either a generic or an indefinite, rather than a definite, interpretation. Note also that in most of these examples, there is no accessible NP antecedent; rather, the licensing NP makes the kind salient, it is already weakly familiar in the common ground, and this suffices to make the pronoun felicitous.

The existence of donkey pronouns with existential and generic interpretations argues that neither E-type nor D-type pronouns alone, nor Heim's functional variables, would suffice to cover the range of interpretations we find in pronouns. Any theory which includes an E-type interpretation of pronouns, with the associated uniqueness/maximality, must treat pronouns as ambiguous, as in Neale's and Chierchia's theories. Chierchia (1995, Chapter Two) offers additional arguments that ambiguity is required if we take one reading of pronouns to be that of definite descriptions.

But there is a marked lack of attested ambiguity in particular examples, including those involving donkey pronouns. Rather, it seems that in general either the bound variable or the E-type reading or the generic reading is plausible, but not more than one. For example (57) has only the existential interpretation, not requiring of the men in question that they empty their pockets of quarters; while we seem to prefer the universal interpretation of (76), where we might expect for any given dog-owner that all his dogs will be vaccinated:

(57) Every man who had a quarter in his pocket put it in the meter.
(76) Every Lancaster resident who has a dog had it vaccinated for rabies last year.

This lack of ambiguity in particular examples suggests that what's really at issue in deriving the reading for a pronoun in a given utterance are contextual, pragmatic factors, triggered by the implications of the content of the sentence, as discussed above. For with lexical ambiguity generally, we would expect that there should be single examples which display the ambiguity truth conditionally. And where lexical ambiguity is in question, I see no principled way to constrain the ambiguity so that certain readings only arise in certain contexts. This suggests that it isn't that pronouns themselves are ambiguous. Rather, there are several different ways of using a combination of syntactic, semantic (scope) and pragmatic factors to fix the intended discourse referent antecedent for a pronoun. In turn, this suggests that Neale's (P5) and its counterparts for retrieving the descriptive content of pronouns in other theories are at best "processing heuristics", as Neale puts it.

3.2.4 Number Neutral Pronouns

A number of recent authors have claimed that pronouns can have number neutral readings, where their semantic number needn't correlate with their overt, syntactically

marked number. These are generally theories which give pronouns the semantic content of a disguised definite description, and number neutrality is appealed to to explain readings like the universal reading of donkey sentences. In addition to the theory in Neale (1990) discussed above, this view has been promoted by Davies (1981), Lappin (1989), Lappin & Francez (1994), Kang (1994), Yoon (1996), Krifka (1996), and Larson & Segal (1995).

A recent article by Kanazawa (2001) gives both a good overview of what she calls the Number Neutrality Thesis and a convincing and thorough argument that this thesis is "not well-motivated, makes wrong predictions, and does not do the job it is intended to do in some cases" (p.383). Kanazawa points out, contra the claim that syntactic number is merely a marker of agreement with an antecedent, that syntactic agreement is not necessary, or even always preferred. (77b) is at least as good as (77a), and (78b) is preferable to (78a) for most speakers:

(77) a. Every farmer who owns at least one donkey beats it.
b. Every farmer who owns at least one donkey beats them.

(78) a. #Every farmer who owns more than one donkey beats it.
b. Every farmer who owns more than one donkey beats them.

Moreover, as discussed and illustrated in the previous section, what Krifka (1998) calls "Rooth's generalization" regarding the distribution of universal vs. existential readings of donkey sentences holds, when it holds at all, only of plural donkey pronouns, not of singular ones.

Neale (1990) had pointed out that treating donkey pronouns as numberless, interpreted as denoting the maximal sum of the individuals satisfying the relevant description, permitted him to account for the “sage-plant” sentences of Heim, like (26) above. However, in order to obtain the attested interpretation, it was necessary to stipulate that the predicate over the pronoun be distributive. If not, his (79) would mean (79’), which is contradictory. But with distributivity, we get the attested meaning in (79”):

(79) Every man who bought a beer bought five others along with it.
(79’) For every man *x* who bought a beer, and for the maximal amount of beer *y* that *x* bought, *x* bought five other beers (non-identical with *y*) along with *y*.
(79”) For every man *x* who bought a beer, and for each beer *y* that *x* bought, *x* bought five other beers (non-identical with *y*) along with *y*.

Not only is the stipulation that the predication be distributive *ad hoc*, but Lappin & Francez (1994) point out that it fails to predict the correct interpretation for other examples where the donkey pronoun is plural. (80) is understood to entail (80'), but Neale would predict that *them* denotes the sum of all beers bought by a man and is interpreted distributively, yielding the incorrect interpretation in (80"):

(80) Every man who bought two beers bought four others along with them.

(80') Every man who bought at least two beers bought at least six beers.
(80'') Every man who bought at least two beers bought at least five beers.

Moreover, Kanazawa shows that singular donkey pronouns lack the collective and cumulative interpretations and the narrow scope readings that one would expect if they have a semantically plural interpretation. Hence, the unacceptability of her (81b), compared to (81a), despite the fact that in (81a) there may be only one donkey!; and the lack of cumulative reading in her (82a), as opposed to (82b):

(81) a. Every farmer who owns one or more donkeys rounds them up at night.
b. #Every farmer who owns more than one donkey rounds it up at night.
(82) a. Every thief who stole a painting from the museum earned at least one million dollars by selling it.
b. Every thief who stole any paintings from the museum earned at least one million dollars by selling them.

I know of two more types of cases that bear on this question, where minimal pairs can be adduced to show that pronominal number is semantically significant. First, number in pronouns is semantically important in giving rise to the generic interpretation discussed in the previous section. For example, the most available interpretation of the plural pronoun in (83), the generic interpretation, is not available for the singular pronoun in the otherwise identical (84):

(83) Every farmer that owns donkeys breeds <u>them</u>.
(84) Every farmer that owns a donkey breeds <u>it</u>.

Instead, the preferred interpretation of (84) is the gnomic universal interpretation found in (1), where every donkey must be bred. To see the difference, consider that (83) is not necessarily about the relationship of any particular farmer with his current donkey possessions, but is about his tendency to breed donkeys when appropriate. But (84) says that donkey-owning farmers run something more like the donkey counterpart of a puppy-mill.

Second, in arguing that pronouns are number neutral, Neale claims that universally quantified NPs can be antecedents to both singular and plural pronouns, indiscriminantly. For example, he claims that (85) and (86) are semantically equivalent, and offers (87) and (88) as additional examples where singular pronouns may apparently refer back to universally quantified NPs:

(85) Every new recruit is armed. <u>He</u> is ready for combat at a moment's notice.
(86) All new recruits are armed. <u>They</u> are ready for combat at a moment's notice.

(87) Every Swiss male over the age of twenty-one owns a gun.
<u>He</u> is required to do so by law.
(88) Each candidate will be debriefed by Mrs. Hendrix.
<u>He</u> will be given some advice on how to tackle the press.

He does not seem to recognize that (85), (87) and (88) are examples of what Roberts (1989) dubbed *telescoping*, wherein a universal generalization is followed by an apparent universal instantiation. As discussed there and in Roberts (1996) and Poesio & Zucchi (1992), occurrence of these types of examples is tightly constrained. One of the main constraints is that all information predicated of a singular pronoun in such examples must be entirely generic, not specific to a particular instance or even pertaining to a particular event. This plays out in the difference between (89a) and (89b), on the one hand, where the plural pronoun is acceptable whether the subject of the first sentence is plural or singular, and (89c), on the other, where the same first sentence as in (89b) does not license use of the singular pronoun, contra the predictions of the number neutral theory:

(89) a. New recruits are armed. Last night, the President questioned whether they should be trusted so soon, but the Chief of Staff convinced him it was necessary.
b. Every new recruit is armed. Last night, the President questioned whether they should be trusted so soon, but the Chief of Staff convinced him it was necessary.
c. Every new recruit is armed. #Last night, the President questioned whether he should be trusted so soon, but the Chief of Staff convinced him it was necessary.

In the last example, the occasion of the discussion is so particular that it seems as if the President must have been talking about a particular recruit. And if we make the predicate on the singular pronoun sound like something that wouldn't plausibly be true of (most) all instantiations of the relevant kind, this also gives rise to infelicity:

(90) Each candidate will be debriefed by Mrs. Hendrix.
#He had a practice press conference this morning that reminded him of the trauma of his first college speech class.

In all of these examples, I would argue that the universally quantified NP is not a true antecedent, but only a licensing NP. Its use in the first sentence implicates the existence (so long as the quantification is not vacuous) of a salient group of individuals, and it is this weakly familiar group which can serve as antecedent to a plural pronoun. But there is no informationally (or semantically) unique member of that group that is made sufficiently salient or distinguished in such a way that informational uniqueness would be satisfied for a discourse referent understood to be correlated with an atomic (non-plural) individual; hence, the unacceptability of singular pronouns in the general case. Whatever the proper analysis of telescoping, it is clearly a special type of case, where the universal instantiation is reminiscent of the continuation of irrealis mood in modal subordination.

Plural pronouns often have quantificational licensing NPs which are non-universal in force: So, along with (91), we have (92):

(91) Every man went for a walk in the park. They greeted each other as they passed.
(92) No man went for a walk in the park. They're (all) staying home tonight.

Application of Neale's (P5) to the interpretation of the pronoun in (92) would predict that it meant 'the men who are walking in the park', since this is the most impoverished definite description directly recoverable from '[*no x: man(x)*](*is_walking_in_the_park(x)*]' that denotes everything that both is a man and is walking in the park. Of course, this would lead to a contradiction, so he would predict that we wouldn't say (92)—it wouldn't be reasonable. But, of course, (92) has a sensible interpretation where it means 'all the men are staying home', obtainable on the assumption suggested above, that utterance of the first sentence implicates the existence of a relevant group of men, which is hence both weakly familiar and informationally unique.

Given the problems cited by Kanazawa and the other examples just discussed, I conclude that the number neutral hypothesis regarding E-type pronouns is not viable.[15] Of course, if Neale and other proponents of the analysis of pronouns as disguised definite descriptions were to adopt the hypothesis I proposed in the previous section, and treat existential interpretations of donkey sentences as their basic meaning, the universal interpretations derived via pragmatic strengthening, then the lack of number neutral readings is not a problem. However, if we can obtain all the types of reading cited here—including the generic interpretations, sage plant sentences, and non-generic plural pronouns with non-existential quantificational antecedents—with the theory outlined in §2, why posit the E-type interpretation?

3.2.5 The Status of Rules for Pronoun Interpretation in E-type Theories

A final problem with the theories introduced in §3.1 is the question of the status of the rules that would derive the descriptive content of the disguised definite. We have already seen several examples which argue that we cannot account for all of the pronominal interpretations of interest with an algorithmic rule like Neale's (P5), based solely on the descriptive content and syntactic context of the purported antecedent NP. Moreover, algorithmic rules will not work in cases of what Neale calls *pronominal contradiction*, like the following:

(93) A: A man jumped off the cliff.
B: He didn't jump, he was pushed. (Strawson)

(94) A: Every time I was there, a man jumped off the cliff.
B: I bet that in most cases he didn't jump but was pushed.

Neale argues that we might give a referential interpretation to *he* in (93B), taking it to refer to the individual raised to salience by the utterance of the sentence containing its antecedent, here 'the man who jumped off the cliff'. And he also mentions Davies' (1981)

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[15] See Chapter 3 of Roberts (1990), §3.2.3, for a preliminary discussion of matters pertaining to number in NPs. There, I argue that while singular NPs are semantically singular, plural NPs denote elements in the supremum of the denotation of their head, so that they include atomic individuals. Whether we understand a syntactically plural NP to be semantically plural or not is then largely a matter of pragmatics. This is a complex question and deserves to be explored in much more detail. But it is almost certain that pragmatics is as important as semantics in understanding what is conveyed by nominal number.

suggestion that pronouns in such examples have an "ironical" character, captured with scare quotes: 'the man who "jumped" off the cliff didn't jump'. But (94), where the phenomenon occurs under quantification, argues that referential analysis to a particular individual does not offer a general solution to the problem. And Davies' solution seems forced, and entirely implausible under quantification, as in (94). But a more pragmatic account would permit us to understand (94B) as meaning 'the man who you said jumped' or 'the man who was seen to fall off the cliff', or the like, any of them readily retrievable, and hence accommodable, in the given context.

In conclusion, the theories in question are basically theories where we accommodate additional descriptive content for a pronoun, either algorithmically as a function of syntactic structure or through pragmatic retrieval. The algorithmic approaches fail to be sufficiently flexible to handle the full range of cases. And pragmatic retrieval, wherein it's not so much that pronouns *are* hidden definite descriptions as that they seem to *act like* them in certain contexts, leaves lots of important questions unanswered. To answer these questions, you need a pragmatic theory, one which elucidates notions like *Relevance*, *salience*, and *accessibility*, and gives an adequate and general accounting of the ways we update information in context. It is my contention that when you answer these questions, you'll come out with a theory much like the one proposed in §2.

4. Conclusion: Pronouns are Unambiguous Definites

The theory offered in §2 can handle all of the examples discussed in connection with the theories in §3. For example, the paycheck sentences in (50) – (52), repeated here, involve contextual entailments:

(50) The man who gave his paycheck to his wife was smarter than the one$_i$ who gave it to his mistress.

(51) Every woman who gave her paycheck to her broker was smarter than any woman$_i$ who gave it to her lover.

(52) Every graduate student put his paycheck in the bank.
Every professor$_i$ lost it.

We assume, at least by default, that all men receive a regular paycheck. In (50), reference to *his paycheck* in the first relative clause makes these paychecks maximally salient, so that the pronoun in the second relative clause can pick up the entailed, salient paycheck for the less wise man. (51) sounds strikingly feminist partly because of the assumption that every woman not only has a paycheck, but a broker as well. In most academic departments in the U.S. today, graduate students are also employees in some sense, as are professors, so default assumptions license the anaphora in (52), as well.

All of the problems for the E-type theories cited in §3 can be handled straightforwardly by the pragmatically-based theory in §2. The theory eschews semantic uniqueness in favor of informational uniqueness: Definites make use of facts about the interlocutors' shared common ground of information in order to differentiate quickly and accurately

particulars with whom interlocutors are familiar. Pronouns can do so even more efficiently because their potential range of interpretation is limited to those discourse referents which are maximally salient. Because pronouns pick out discourse referents, and the means of keeping track of discourse referents in dynamic theories encodes facts about scope, accessibility constraints fall out of this type of theory without the need for stipulation.

There is no need for ambiguity if we treat all pronouns as simple definites with impoverished descriptive content. Pronouns and other definites can take as antecedents discourse referents for all kinds of entities—fictional entities or abstract entities like natural kinds can be as familiar and salient as concrete individuals. This permits a unification of the account of pronouns which have true, coreferential NP antecedents with that of pronouns which are deictic, pronouns that refer to a highly salient individual not previously mentioned, pronouns in intensional (modal, temporal) subordination, generic pronouns, and pronouns whose non-c-commanding licensing NPs are quantificational, along with others whose discourse referent antecedents are merely weakly familiar. And in doing so, we can respect the semantics and the pragmatics of pronominal number. If we take these all to be separate cases, we fail to see that the same general principles govern the retrieval of the intended interpretation in all these cases, as in the retrieval of other kinds of context sensitivity in discourse. These are pragmatic principles and cannot be reduced to a purely structure-based algorithm, for they depend on context, background, and the perceived intent of the speaker, as well.

A few years ago, the type of theory of pronoun interpretation proposed here would have been taken to be too weak to be of interest, precisely because of what I now take to be its strength: It is crucially based on assumptions about the nature and operation of pragmatic factors in interpretation. Although there is not space here to present this material in any detail, note that I assume that all the pragmatic principles involved in this account are independently motivated within a general theory of interpretation in discourse (Roberts 1996b,in preparation). Moreover, the virtue of an adequately constrained, explicit formal theory of information structure in discourse is that it permits one to make predictions about when a particular reading will or will not be possible and felicitous in a particular context. Views of what context is like other than that of Roberts (1996b) are clearly possible; for example, see Asher & Lascarides (1998a,b) for a rather different approach. But this sort of theory of the role of discourse context in interpretation is the general ground on which our understanding of definites, anaphora resolution, and other types of context sensitivity must be worked out. Syntax, semantics, and algorithmic rules alone cannot suffice, because of the inherently pragmatic features of these phenomena.

Of course, throughout this paper though I have been talking about pronouns *simplicitur*, all the evidence I provided was about pronouns in *English*. It should be clear that before one can make any really sweeping generalizations about pronominal anaphora in natural language, one would have to carefully examine a wide range of types of examples in a very wide range of languages, something I have not attempted to do here. So the results are really much more limited than the discussion above might suggest. In particular, there are definitely languages, including the Slavic languages, Japanese, and many others,

which have no definite article. And there are many languages, including Spanish and Japanese, where null arguments are often (or even almost always) preferred to overt pronouns; in such languages we might expect significant additional constraints on the use pronouns, and perhaps additional implications in their meaning.

However, all the languages with which I am familiar seem to have demonstrative pronouns, and those were arguably the historical source of the definite article and of pronouns in English. I think we know enough about what pronouns *do* that we can conjecture that some combination of factors discussed in §2, ultimately constituting a cluster of properties defining definiteness, will turn out to underlie the use and meaning of pronouns, as well as null arguments, in all human languages.

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