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Coreference and Meaning[*]

N. Ángel Pinillos
Arizona State University

ABSTRACT: I investigate the phenomenon of "de jure" coreference (a pervasive and important feature of natural language closely connected to anaphora). I argue that in order to fully explain this notion, we must posit a relation that must be taken as a primitive from the perspective of a theory of meaning: we cannot fully understand the notion in terms of familiar concepts. I introduce four axioms that give the primitive relation content and allow easy incorporation in traditional semantic theories.

1. Introduction

How does a sign manage to represent an object? This is one of the central questions of philosophy. I want to ask a related question. How do several signs manage to represent the very same object? It is tempting to think there is little to this question beyond what can be said about the first. Why not just say that X and Y represent Z whenever X represents Z and Y represents Z? Saying just this misses out on a particular way that representation can occur. Consider anaphors. If I say in an ordinary context 'Bill is visiting. He is taking the train', then 'Bill' and 'he' in that discourse co-represent Bill in a way that makes that very fact evident to competent conversational participants who fully understand my speech. In roughly this sense, we say that co-representation or coreference (if I may help myself to talk of 'reference' here) can be 'de jure'. Compare this with a

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case of ‘de facto’ coreference. If I say to you ‘Hesperus is Phosphorus’, the names corefer but this fact is not always evident: you may fully understand my speech while maintaining that the names refer to different planets. This would happen if you think that what I said is false.

Several authors have explored the phenomenon of de jure coreference (though not always under that name). Robert Fiengo and Robert May (1994, 1998, 2006), for example, have argued for its significance in topics as seemingly unrelated as the theory of anaphora and a priori inference. Kit Fine (2003, 2007) has claimed that the phenomenon motivates a radical departure from standard semantics, and is the key to solving philosophical problems related to direct reference theory. I am in general agreement with these authors about these and related applications of the notion. However, the focus of this paper will be more about uncovering the nature of the phenomenon and, as a consequence, shedding light on the contours of linguistic representation.

As I have indicated, de jure coreference is closely connected to the phenomenon of anaphora. How then does this paper connect to the vast literature on that topic? Much normal research on anaphora, like work on Binding Theory, investigates the (structural) constraints on the interpretation of anaphoric elements, including pronouns. The present project does not directly address that issue. As I mentioned above, much of what I say is concerned with elucidating the nature of de jure coreference including anaphoric relations. In particular, I argue for the unorthodox claim that the fact that an occurrence of a pronoun gets its interpretation from another expression in a discourse will often be a fact that involves the instantiation of a primitive semantic relation linking the pronoun and that other expression. Establishing this claim is somewhat independent from the

quest of determining the constraints under which the primitive relation is instantiated in the first place.

An analogy from the theory of linguistic reference can help to elucidate the general point (though it is not a perfect analogy). An investigation into the nature of linguistic reference might involve a debate as to whether reference in general must always be mediated via a Fregean sense. But the resolution of this debate is somewhat independent from figuring out some details about *when* linguistic reference takes place. For example, it is somewhat independent from the question of whether complex demonstratives are referring expressions as opposed to quantificational devices.

These remarks suggest that questions into the nature of de jure coreference (including anaphora), like questions into the nature of linguistic reference, concern foundational issues in language. They bear some similarity to philosophically oriented investigations into the nature of consciousness, time, color and other natural phenomena. Accordingly, I see this paper as having something in common with those sorts of projects. Having said this, it should not be surprising if there is an important overlap between foundational issues and "normal" linguistic research.

The organization of this paper is as follows. First, I describe what I believe are the three core semantic properties of de jure coreference. Second, I argue that many existing theories cannot in fact account for how these properties arise. Third, I offer a novel explanation of de jure coreference. The explanation involves the positing of a primitve semantic relation and four axioms that give the relation content. The axioms make it clear how the relation can be easily incorporated in standard semantic theories.

2. Three Phenomena

Consider the following sentence uses. [1]

(1) The Prime Minister personally invited *Smith*, but *he* didn't show up.

(2) The Prime Minister personally invited *Smith*, but *Smith* didn't show up.

(3) The Prime Minister personally invited *Smith*, but *the invitee/the inconsiderate jerk* didn't show up.

(4) The Prime Minister personally invited *Smith*, but *that inconsiderate jerk/that invitee* didn't show up.

Each of the sentences displayed here admits of varying uses or interpretations. For example, in the right context, the pronoun in (1) can be used to refer to someone other than Smith. But I want to focus on the interpretations in which the second italicized occurrence in each construction is intended to be co-valued with the first italicized occurrence (*Smith*). Some theorists might describe the target readings as ones in which the relation between the occurrences concerns anaphora or dependence.[2] Using a helpful notion borrowed from Kit Fine (2003, 2007), one might instead say that the occurrences are related in such a way that they represent a single object "as the same".[3] I argue below that the relation is associated with the following three properties: "A prioricity", "Attitude Closure", "Knowledge of Conditional Coreference".

2.1 A Prioricity

[1] (1-4) are understood as "sentence uses" intuitively understood. More formally, a sentence use can be identified with a sentence type of a language relativized to a context of utterance where a "context of utterance" is taken in a sufficiently broad way to possibly include implicatures and presuppositions. In describing a linguistic phenomenon that is to be explained, it is often important to make as little theoretical commitments as possible. My hope is that we can understand de jure coreference at the natural level of "sentence uses" without having to make hard decisions at the outset about syntax, semantics and pragmatics. This strategy has precedence. For example, we can accept Keith Donnellen's (1966) distinction between referential and attributive *uses* of definite descriptions without first being committed to whether the distinction is to be found in the semantics or pragmatics.

[2] Outside of Philosophy it is common to speak of proper names, descriptions and complex demonstratives as having anaphoric or dependent uses (von Heusinger 2002; Huang 2002; Mitkov 2002).

[3] As Fine emphasizes, representing *as the same* is different from representing to be the same. For example, the identity sentence 'Hesperus is Phosphorus' represents Hesperus and Phosphorus to be the same.

Any linguistically competent and rational agent who fully grasps (2) and (5) is in a position to see that (5) follows from (2):

(5) The Prime Minister invited someone who didn't show up.

Similar remarks apply to (1), (3) and (4). Anyone who fully understands any of these sentence uses and (5) is in a position to see that any one of the former entails the latter (as the reader may verify for herself).[4] The phenomenon displayed here can thereby be summarized as follows: Existential generalization on the two italicized terms in (1-4) is an "a priori" deduction.[5]

2.2 Attitude Closure

The second phenomenon concerns the behavior of (1-4) and related constructions when they are embedded within the scope of certain attitude verbs. (1) so embedded yields (1)' which entails (5)'[6]

(1)' Pecos thinks that although the Prime Minister personally invited *Smith*, *he* won't show up.

(5)' Pecos thinks that the prime minister invited someone who won't show up.

Similar remarks apply to embeddings of (2-4). Let us label these (2-4)'. These also entail (5)'. More generally, I claim that some attitudes (but certainly not all or even most of them) including "thinks" are closed under existential generalization on the two italicized terms in each of (1-4)'. [7]

2.3 Knowledge of Conditional Coreference.

[4] In general, I will omit the qualification to participants who are competent and rational.
[5] I am using "A priori" in a somewhat non-standard sense. I am merely using it as a handy label for the phenomenon described there. A different label can be used if this nomenclature is objectionable.
[6] What is embedded is a sentence use and not (only) a sentence type. This should be relatively unproblematic: We may think of (1)' for example as attributing the same thought to Pecos as would an utterance of 'Pecos thinks that' where the demonstrative 'that' picks out what (1) expresses.
[7] See Scott Soames (1988) for discussion of a related phenomenon (especially as it applies to pairs of proper names).

The third phenomenon concerns knowledge of language. Any competent speaker who fully understands any one of (1-4) will know of the italicized occurrences that if they manage to refer, then they refer to the same thing.

For example, anyone who fully understands (1) will thereby know of 'he' and 'Smith' that they refer to the same object if they refer at all (that is, they will know of the occurrences that: they refer to the same object if the first refers to some object and the second refers to some object). The reason why the knowledge is of a proposition in conditional form is that the conversational participant might have doubts about whether 'Smith' has a referent at all, for example. But even in that case, the participant would still know of the expression occurrences that that if both have referents, then they refer to the same thing.

The claim about knowledge here is important. For example, suppose that an agent witnessing (1) had only a hunch or simply guessed that 'he' and 'Smith' refer to the same person (if it referred at all), one would suspect that something had gone wrong. Full understanding here requires knowledge.[8]

There may be degraded cases of communication where agents lack the relevant knowledge. Consider someone who misheard an utterance of (1) or someone who is learning how to use the English pronoun. In these cases, it may be possible to understand without having the requisite knowledge.[9] But it is clear that these uses are defective to

[8] I point out that Kit Fine (2007, pg. 40) commits to a related condition for de jure coreference: "[a pair is de jure coreferential if] anyone who raises the question whether reference was the same would thereby betray his lack of understanding of what you meant." I do not explore here interpretations of this passage that might make this test equivalent to the one I offer in the paper.

[9] For an argument that understanding doesn't require knowledge see Dean Pettit (2002).
His counter-examples include cases in which communication is defective in some sense and so it does not affect my point.

some degree. The generalization I am interested in does not concern less than full understanding.

The reader may check that similar remarks apply to (2-4) and (1-4)'. So anyone who understands any one of (1-4) and (1-4)' will know of the italicized occurrences that they refer to the same thing if they refer at all. The phenomenon may be described this way: *If a rational agent fully understands (1-4) and (1-4)', then they know of the italicized occurrences there that they refer to the same thing if they refer at all.*[10]

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[10] It might be argued that the italicized occurrences in (1-4) and (1-4)' are not referring expressions. It might be thought, for instance, that (i) 'he' should be analyzed along the lines of a definite description (Postal, 1965) *and* given a quantificational treatment (Russell, 1905). Or it might be thought that (ii) 'he' in (1) should be analyzed as an open expression containing a part, proper or not, bound by some higher operator (Kamp 1981; Heim 1982, 1983). These positions can call into doubt my claim that agents have knowledge of coreference, since it might be thought that open expressions and/or quantificational phrases are not referring expressions. Some points are in order. First, note that "Knowledge of Conditional Coreference" does not say that any occurrences in fact refer. For what I claim is simply that agents know that certain occurrences refer to the same thing *if they refer at all.* Second, concerning (i), if one thinks that the pronoun is a closed definite description and a quantificational device, then perhaps we should speak of 'denotation' as opposed to 'reference' along Russellian lines. Third, the thesis (ii) that the pronoun is open can be interpreted as saying that it is bound by an operator 'Smith' that was raised out at some level of analysis to have scope over the construction, or it can be interpreted as saying that it corresponds to a discourse referent bound by a higher

3. De Jure and De Facto Coreference

The three phenomena can be taken as criteria for distinguishing two types of coreference. I call the type of coreference displayed in (1-4) and (1-4)' 'de jure' coreference. This type of coreference will pass all three facets of the test. Cases of coreference that fail at least one condition will be called *de facto coreference*.[11] Defining these terms in this way leaves no doubt that there is a genuine distinction between de jure and de facto coreference.[12] For future reference, I summarize here the three conditions for de jure coreference in slightly more formal language: In a truth-evaluable construction D= '…A…B…' where 'A' and 'B' are coreferential and D does not contain 'x', 'A' and 'B' are de jure coreferential if and only if (i) any rational agent who fully grasps D and '∃x(…x…x…)' is in a position to see that the latter follows from the former; (ii) 'S thinks D' entails 'S thinks ∃x(…x…x…)'; and (iii) any rational agent who fully grasps D will know of 'A' and 'B' that: if they both refer, they refer to the same object.

3.1 Significance of "Attitude Closure"

Humans are endowed with the sort of mind that can entertain complex thoughts. Some of these thoughts contain parts that are directed at a single object. In some of these cases, the parts display that object as the same, in other cases they don't. For example, in the thought associated with (1), the 'he' and 'Smith' parts display the man as the same. The

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element. If this is right about (1), then it would not exhibit de jure coreference. But as I explain below, the same mechanism that gives rise to de jure coreference is also in play here.

[11] Note that the relation of de jure or de facto coreference applies to expression occurrences in sentence uses (or sequence of sentence uses). Also, de jure and de facto coreference do not apply to non-referring representations.

[12] In arguing against possible explanations for de jure coreference, I do not assume, however, that there is a unified explanation of the phenomenon.

first point I would like to make then is just this: that some thoughts may contain different parts that display the object(s) they are about as the same. We may loosely say that these thoughts are "anaphoric" or display "de jure coreference".[13]

The second point I would like to make is that the type of content just noted is important in reasoning. If an agent entertains the thought associated with (1), there is any easy inference, from her perspective, to the thought associated with (5).

Natural language and human thought are connected in a number of different ways. One such connection is that language allows humans to describe mental contents with a great deal of accuracy. Thus, one would expect that the type of content just discussed should be expressible in natural language. De jure coreference reveals that this expectation is met.

In particular, (1-4)' are attributions that describe this kind of "de jure coreferential" thought. The fact that (1-4)' entails (5)' is evidence that this is so. For why would the entailment hold except that the thoughts ascribed in (1-4)' are ones in which the invited person and the person who didn't show up are represented as the same?

I add that these features of language and mental life are contingent. It could have happened that humans are not capable of having "de jure coreferential" thoughts or that there is some other convention for describing or attributing those types of contents (or perhaps that there is no convention whatsoever).

3.2 The Significance of "Knowledge of Conditional Coreference"

Conversations often involve continually talking about the same object. The conventions of language allow this. But it is not enough. They must also allow for the speaker to make

[13] For a discussion of how de jure coreference arises for thought see John Campbell (1987) and Krista Lawlor (2001, 2002).

this evident and known to her audience. The purposes of agents would often be stifled if their audience is left to guess, assume or merely believe that their words refer to the same thing. Coreferential facts are often too important to be left to chance.

The third criterion of de jure coreference reveals just this. It says that for de jure coreferential expression occurrences, agents properly situated will know of the relevant expression occurrences that they are coreferential if they refer at all. De jure coreference therefore serves an important purpose since when it happens, agents will know the speaker must be talking about the same thing if he is talking about anything at all.

As with "Attitude Closure", this feature is contingent. Language might have been different. It might have been so that "knowledge of conditional coreference" hardly ever happens. For example, the conventions of language could have ensured belief but not knowledge of conditional coreference.

3.3 Criteria Bundled Together?

I just said that "Attitude Closure" and "Knowledge of Conditional Coreference" serve important purposes. It makes sense then that natural language exhibits these properties. One question that arises is whether or not these properties, along with "A prioricity", always come together as a bundle (the existence of de jure coreference doesn't require that they always come in a bundle, it just requires that they are bundled whenever there is de jure coreference). This is clearly an empirical question whose investigation requires, among other things, cross-linguistic research. Nonetheless, if there is a tendency in natural language for bundling, there is no obvious reason why this should be so. For example, there is no obvious reason a sentence use '…A…B…' where any competent speaker who understands it must know of 'A' and 'B' that they corefer if they refer at all,

often also has the property such that when it is embedded in attitude contexts, attributes contents such that the 'A' and 'B' parts display their referents as the same--a feature we saw explains "attitude closure"). Hence, some unifying explanation would be needed here. I aim to provide the beginnings of such an explanation below.[14]

3.4 Logic

There is an important difference between 'If Hesperus is a planet, then Hesperus is a planet' and 'If Hesperus is a planet, then Phosphorus is a planet'. Although both constructions express necessary truths, only the first is logically valid. Note, however, that only the first exhibits de jure coreference in the relevant sense. There is reason to think then that the phenomenon of de jure coreference can help explain logical validity. Much more could be said about this. Issues pertaining to logic are well beyond the scope of this paper.

4. Unsuccessful Explanations--Pragmatics

4.1 Presuppositions and Intentions to Corefer

It might be thought that what needs to be added to coreference to make it "de jure" is that in the relevant context it be presupposed that there is coreference. Alternatively, it might be thought that what needs to be added is that in the relevant context, the speaker intend that the occurrences refer to the same thing.

The problem with these proposals is that they invoke concepts that are too weak to explain the target phenomenon. Take for instance the third criterion of de jure coreference "Knowledge of Conditional Coreference": If A and B are de jure coreferential in a sentence use *S*, then competent agents who understand *S* must know

[14] I would like to thank an anonymous referee for helpful comments here.

that A and B refer to the same thing if they refer at all. But just saying that the speaker presupposes that A and B corefer isn't enough to establish that A and B are known to be coreferential if they refer at all. This is because what is presupposed in conversation, even if true, need not be known by the participants.[15]

A similar problem arises for the explanation that appeals to intentions to corefer. Someone may truthfully utter the following: 'I am only guessing that he is the murderer' while pointing at the murderer. Although the speaker successfully intends that the pronoun and the definite description refer to the same object, the speaker does not know that they do and so the occurrences are not de jure coreferential.

Furthermore, it is also puzzling how intentions to corefer or presuppositions that there is coreference could possibly explain "attitude closure" which, as I indicated earlier, require that the proposition denoted by the that-clause in the attitude ascription exhibiting de jure coreference represent an object twice over as the same. I conclude that neither intentions to corefer nor presuppositions that certain occurrences be coreferential can explain de jure coreference.[16]

4.2 Saliency

There is a certain view concerning the semantics of pronouns in which (at least in some uses) they refer to whatever object is most salient at their time of utterance (Bach 1994; von Heusinger 2002; Kripke 1977; Neale 2005). This view is meant to account for some uses of anaphoric pronouns and so may be extended to account for de jure coreference. For example, de jure coreference between 'he'

[15] Following a leading idea by Robert Stalnaker (2002) (and simplifying), what gets presupposed are propositions that are taken for granted in the conversation. Clearly, one can take things for granted for the purposes of conversation (even true things) that are not known.

[16] Gareth Evans (1980) and James Higginbotham (1985) argue in a similar way against the idea that certain principles in binding theory concern prohibitions against intentions to corefer.

and 'Smith' in (1) can be explained by saying that: (a) 'he' refers to the most salient object at the time of its utterance and (b) that object was raised to saliency by the previous use 'Smith'.

Consider now the following. 'Mark Twain$_1$ was stronger than Samuel Clemens$_2$ so he$_1$ would often bully him$_2$'. Here, only the co-indexed occurrences are de jure coreferential. However, since Mark Twain is Samuel Clemens, there is only one salient object. As a consequence, 'him' refers to a certain object that is made salient by 'Mark Twain'. But since those occurrences are not de jure coreferential, the proposal makes the wrong prediction.[17]

5. Unsatisfactory Explanations—Syntax and Semantics ("Third Object" Strategy)

In this section, I consider several attempts at explaining de jure coreference. Because the way I have described de jure coreference is new, explicit accounts are not readily available. However, it is not hard to see how various familiar positions can try to accommodate the phenomenon. I will argue that all the ones presented here are less than adequate.

I call all of the accounts I consider here "Third object" strategies. They all conform to the following pattern of explanation: Occurrences A and B in a discourse are de jure coreferential because they stand in a certain relation R to a single object X. Examples include the idea that A and B are de jure coreferential *because* they share the same meaning, they are both of the same syntactic type, or they are both assigned the same discourse referent, variable or index.

[17] The "saliency" proposal, like intentions to corefer and presuppositions that there is coreference, also falters in that it makes it puzzling why "attitude closure" should hold. What does the fact that 'Smith' makes Smith salient and consequently it is made the target of 'he' in (1)' have to do with the sort of thought that is being attributed to Pecos?

The basic insight behind the "third object" strategy is this: The third object X is a surrogate for the occurrences A and B at some appropriate level of analysis. This allows A and B to inherit their referential properties from X, thereby creating the effect that the occurrences couldn't refer to different things since they are, in effect, treated as the same object.[18]

By appealing to a "third object", the strategy provides a way of distinguishing a special class of coreferential pairs. The hope is then not just that these are the de jure coreferential pairs but that the "third objects" are explanatory of the phenomenon. Furthermore, the strategy is attractive since it only appeals to the "local" properties of the occurrences in question (and their surrogates). There is no need then to posit a special long distance linguistic relation "linking" A and B together.

5.1 Meaning Strategy

A very simple explanation of de jure coreference is this: Concerning (2), for example, there is de jure coreference among the 'Smith' occurrences because they mean the same thing or have the same content. For example, "Knowledge of Conditional Coreference" would be explained this way: since the 'Smith' occurrences mean the same thing and anyone who fully understands (2) must know what the 'Smith' occurrences mean, she must thereby know that the occurrences mean the same thing. From this, the agent concludes that the occurrences refer to the same thing if they refer at all.

The first thing to note about this strategy is that it does not obviously generalize to either (1), (3) or (4). Arguably the italicized pairs in each construction are not

[18] This strategy gives the impression that (conditional) coreference follows from Leibniz' law since if the occurrences referred to different things, they would have distinct properties and hence be distinct. But they are really "the same".

synonymous. I put these cases aside, however, and focus on the strategy as it may apply to (2).

Consider Millianism, which is the thesis that the semantic content of a proper name is exhausted by its referent.[19] On that view, coreferential names mean the same thing. But coreference does not entail de jure coreference, as true informative uses of 'Mark Twain is Samuel Clemens' reveals. Hence, the strategy is not available to the Millian.[20] Since there are good reasons to accept Millianism, there are good reasons to reject the meaning strategy for de jure coreference.

But something stronger may be said. Even if singular terms have Fregean senses, they would still not be able to explain de jure coreference. This will be revealed below as I explore the phenomenon further.

5.2 Syntactic Strategy

According to this strategy, the explanation for why A and B in a certain discourse are de jure coreferential is that they are occurrences of the same syntactic type. Now, like the meaning strategy concerning the previous section, the scope of this strategy is limited to constructions such as (2). For syntactic identity to apply to (1), (3) and (4), the occurrences of 'Smith' would have to be occurrences of the same syntactic type as the occurrences of 'he', 'the invitee' and 'that jerk'. And this seems hard to believe. However, I will just focus on the strategy as it applies to (2).

[19] For classic defenses of Millianism see Nathan Salmon (1986) and Scott Soames (2002).
[20] One can also say that the strategy is not available to anyone who thinks that names are rigid and combines this with the familiar idea that a term's meaning is its intension, traditionally understood.

The theorists who come the closest to endorsing this strategy are Robert Fiengo and Robert May (1994, 1998, 2006).[21] I argue now that there are problems with their view.

5.2.1 Syntactic Identity and "Knowledge of Conditional Coreference"

Consider (2) again. It might be thought that agents know that the occurrences of 'Smith' refer to the same thing if they refer at all because they recognize that they are occurrences of the same syntactic type. If we understand syntactic types as the bearers of semantic value, then agents can easily deduce that the occurrences must refer to the same thing. Thus, syntax can explain "Knowledge of Conditional Coreference".

Of course, if this is on the right track, the individuation of types must be more nuanced than a simple typographical convention, for there are many distinct people with the same spelled-name S-m-i-t-h. Thus, for this strategy to work, one must assume that if two occurrences are of the same syntactic type, they must refer to the same thing.

One must also assume, however, that competent agents who fully grasp two occurrences of the same syntactic type are able to recognize that they are indeed of the same type. Both of these assumptions are endorsed by Fiengo and May (2006, pg 63). Concerning the second, they think that this is tantamount to the thesis that natural language is formal:

[21] Ken Taylor (2003) makes a distinction between explicit and coincidental coreference. He seems to think, however, that whether two tokens belong to the same type is determined by whether the tokens enter into a chain of explicit coreference. It is clear then that types cannot in turn explain explicit or de jure coreference. However, Taylor's claim is not as innocent as it might seem if explicit coreference is interpreted as corresponding to de jure coreference. I will argue later that de jure coreference is not a transitive notion, so talk of chains of explicit coreference determining types seems out of place.

> Natural Language Syntax is formal. We take it that for an account of language, including natural language to be formal, it must be possible to determine, on examination of occurrences of its symbols whether they are occurrences of the same symbol…

Here, Fiengo and May understand "symbol" to correspond to the concept of syntactic type under discussion (this concept corresponds to their use of 'syntactic expression').[22] It is precisely through this thesis that the authors account for de jure coreference.

I now present an argument that supports the idea that natural language is not formal in the intended sense. Suppose that Pecos and Smith are at a party. Earlier in the evening Smith is found praising his friend John. Pecos listens and understands everything that Smith is saying. Later on in the evening, Smith is talking about John again but this time making slanderous remarks. Pecos is also in the audience and like before, fully understands what Smith is saying. However, Pecos is perplexed. He can't tell whether the person Smith was referring to with 'John' earlier in the evening is the same person he is referring to with 'John' now.

If symbols were formal, then the scenario just described couldn't happen. To see this, note that it may be supposed that Smith has a single name for John in his idiolect (since there is nothing out of the ordinary concerning Smith's language that would prevent this possibility). As a consequence, the two occurrences of 'John' in the discourse are occurrences of the very same symbol. Now, if symbols were formal, then Pecos (who fully understood everything Smith said) should be in a position to determine

[22] This principle should be read charitably so that we assume that the agent in question makes no performance errors, has perfect memory and fully understands the symbols under consideration as symbols of her language.

that the occurrences are of the same syntactic type and so deduce that Smith was talking about the same guy all along (on our nuanced understanding of syntactic type). But the story describes an entirely plausible scenario in which Pecos is no position to make this deduction. I conclude then that natural language symbols are not formal. And what this means for the discussion is that the syntactic strategy for explaining de jure coreference is undermined.

5.3 Theoretical Object Strategy: Indices, Variables and Discourse Referents

Indices, discourse referents and variables are theoretical objects widely invoked in the study of anaphora. In a discourse where two syntactic occurrences are anaphorically related, the occurrences may be assigned the same index, discourse referent or variable.[23] Given the close connection between anaphora and de jure coreference, these objects may help explain de jure coreference in the following way: two occurrences in a discourse are de jure coreferential *because* the occurrences are assigned the same index, discourse referent or variable. Clearly, this type of explanation counts as a "third object" strategy. I provide a general argument against the use of indices, referent markers and variables in "third object" strategies. [24]

[23] It would be impossible to provide here a summary of the linguistic theories that invoke variables, indices or discourse referents. I limit myself to the following remarks (the references given are not exhaustive but merely representative of the enormous literature on the subject): (a) The claim that the occurrences are associated with the same discourse referent (Karttunen 1976; Kamp 1981) is generally understood, within a dynamic semantics framework, to concern a semantic and not necessarily syntactic level of representation. Theoretical objects that closely resemble discourse referents include file cards (Heim 1982, 1983), pegs (Groenendijk et al 1996), registers (Muskens 1996), and reference markers (Asher 1986; Kamp 1985). (b) The claim concerning indices is best understood as something that arises out of binding theory (Chomsky 1981, 1995; Higginbotham 1980; Lasnik 1976; Reinhart 1983). But it is also independently motivated by trying to come up with the right semantics for pronouns (Montague 1974; Kaplan 1989ab; Heim and Kratzer 1998; Larson and Segal 1995). There are explicit claims concerning the connection between these (Fiengo and May 1994; Büring 2005).

[24] Although I will give below general reasons why appealing to these objects won't help in third object strategies, here are some reasons to think that appealing to variables (classically construed, not dynamically) won't help. One way of thinking that 'Smith' and 'he' in (1) may be associated with the same variable is by holding that at some level of syntactic representation (such as LF) 'Smith' is "raised" out of

5.3.1 Multiple Candidates Argument

Let (6) be the most salient use of the sentence below (taken in isolation). In this use, 'John' and 'him' are de jure coreferential and so are 'Mary' and 'she'.

(6) John loves Mary but she doesn't love him back.

As mentioned earlier, the strategy being considered says that the occurrences are de jure coreferential because they are "assigned" the same theoretical object (index, discourse referent or variable). From this, it follows that there must be some theoretical object such that 'John' and 'him' in (6) are assigned to it. Suppose that this object is 'x'. Similarly, there must be a distinct object that is assigned to 'Mary' and 'she'. Suppose that this is 'y'. There must be some reason why 'John' and 'him' are assigned to 'x' and not 'y'. But here is the problem. Familiarity with these theories reveals not only that there is there no reason to be found, but one has no conception of what would even count as a reason.

How does this problem manifest itself in the case of ordinary first order variables? Under the hypothesis that 'John' and 'him' get mapped to 'x' and not 'y', (7) is a more accurate representation of (6) than (8).

(7) John λx Mary λy (x loves y & y doesn't love x back)

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its position and gets replaced by a trace that acts like a variable and that the pronoun is analyzed as the same variable type. I will briefly mention that such a solution isn't fully satisfactory since it requires binding across sentential boundaries. This is not possible on a classical (non-dynamic) construal of the variable. More importantly, the binding solution won't work because, as is well known (Keenan 1971), a sentence such as 'John loves his wife' is likely ambiguous between a "strict" ('John loves John's wife') and "sloppy" ('John loves his own wife') reading (This can be brought out by noting the ambiguity in the related construction 'John loves his wife and Bill does too'). Now, the bound reading interpretation I have been discussing likely corresponds to the "sloppy" reading: 'John λx(x loves x's wife)'. But note that the "strict" reading is a de jure coreference reading, so it can't be that de jure coreference reduces to the sort of binding under consideration.

(8) John λy Mary λx (y loves x & x doesn't love y back)

The problem here is that one has no conception of what would count as a reason to prefer (7) over (8). What discovery or insight could provide such a reason?

I have reached the conclusion that the reification of theoretical objects such as indices, discourse referents or variables creates a problem in the scientific study of language. For it seems that they require the existence of an in principle-unexplainable linguistic fact. Let us call this problem the "multiple candidates" problem.[25]

One way of solving the problem is to simply eliminate variables, indices and discourse referents.[26] Another way, which is less radical, is to provide a reduction that corresponds to a very natural way of understanding these objects. Focusing on variables, the Quinean "bonding notation" in (9) captures all the linguistically relevant information (7) or (8) encodes.[27]

(9) John λ Mary λ (loves & doesn't love back)

Although my remarks here will have to be brief, let me suggests that the bonding notation indicates that variables in discourses or formulas can be understood as structural devices.

[25] My use of 'multiple candidates' is derived from the locution 'multiple reductions' used by Charles Parsons (1990) in describing an analogous problem concerning set theoretic reductions of numbers. The classic formulation of the problem is due to Paul Benacerraf, (1965) and Charles Parsons (1965). In that problem, there is nothing to recommend giving a Zermelo set theoretic reduction of numbers over the von Neumman reduction.

[26] An eliminative account of indices is suggested by Noam Chomsky (1995, pp. 99-100) and James Higginbotham (1983, 1985). An account that eliminates indices from certain referential expressions but not pronouns is exemplified in Tanya Reinhart (1983) and Büring (2005). For eliminative accounts of variables see, for example, W.V. Quine (1960), Pauline Jacobson (1999), and related work in combinatory logic. And of course, classic semantic accounts that aren't "dynamic" won't make recourse to discourse referents.

[27] W.V. Quine (1979, page 70) provides a similar "bonding" notation.

In particular, the lines may be seen as representing the instantiation of a "variable" relation holding between certain syntactic positions in (9). The relation instantiated, understood as reflexive, symmetric and transitive gives rise to exactly two equivalence classes of positions in (9). A variable in a sentence or discourse then may simply be identified with the set of positions entering into the "variable" relation.[28] This yields the correct result that (9) contains exactly two variables.[29]

Just as a variable in a discourse can be identified with the set of positions being related by the "variable" relation, then an index and discourse referent in a discourse can be also identified with a set of positions being related respectively by the "index" and "discourse referent" relations.

Now this strategy solves the "multiple candidates" problem because (7) and (8) don't "disagree" as to which variable 'John' in (6) is associated with. They both agree that 'John' is associated with a variable that is just the set of positions being linked to the last pronoun.

How is all of this relevant to de jure coreference? Treating these theoretical objects as sets of positions being related in a certain way suggests the following. Any explanation of a linguistic phenomenon which appeals to the idea that certain occurrences are associated with the same discourse referent, variable or index says nothing more than

[28] It should not be surprising that just as the "multiple reductions" problem in mathematics motivates a structuralist interpretation of numbers, the "multiple candidates" problem in language leads to the structuralist suggestion given here. For a detailed structuralist account of numbers see Stewart Shapiro (1997).

[29] The proposal is tantamount to a theoretical reduction of a certain object that may be best described as a variable-in-a-discourse (or formula). It is not a reduction of the variables (x, y, z…) taken on their own. Hence, the claim may be understood as being eliminativist about the latter. Note that this strategy is not to be confused with Kit Fine's (2003) relational account of the variable. In that paper he gives a semantic account of the variable that is "relational". Here, I am proposing a scientific or a metaphysical reduction of a certain object. But this doesn't mean that there aren't important syntactic and semantic consequences to the view presented here.

at some appropriate level of analysis, the occurrences correspond to certain positions that are related in a certain way, where all mention of a "third object" drops out. I conclude then that the attempted solution to de jure coreference under consideration does not count as a genuine instance of a "third object" strategy. A fortiori, it is not a successful instance of a "third object" strategy.

The preceding discussion, however, invites the question whether perhaps these theoretical objects, thought of relationally, can explain de jure coreference. This suggestion has some merit, but it is important to see that it is already out of step with orthodox semantics, for it requires positing linguistic relations linking distant positions, even between occurrences of names.

Now, I will in fact be defending an unorthodox relational account of de jure coreference. I will argue that such a relation must obey certain axioms. Whether variables, indices or discourse referents, understood relationally, can be construed so that they satisfy these axioms (while preserving their original purpose) is a question I do not explore here.

5.4 General Argument Against Third Object Strategies—De Jure Coreference is Not Transitive.

Since identity is a transitive relation, defenders of the third object strategy must hold that de jure coreference is transitive. I will provide some examples that indicate it is not. If this is right, then no third object strategy, including appealing to Fregean senses, could succeed.[30]

[30] De jure coreference is naturally seen as a discourse-internal notion. However, there is a way of understanding the relation, or something close to it, as possibly holding across distinct discourses (and also across participants). One might then ask about whether the relation, understood as a purely discourse-internal notion, is transitive? I give an argument here that it is not. Kit Fine (2007), on the other hand, has

(10) We were debating whether to investigate both Hesperus_1 and Phosphorus_2; but when we got evidence of their true identity, we immediately sent probes there $_{1,2}$.

(11) As a matter of fact, my neighbor John_1 is Professor Smith_2, you will get to meet (the real) John $\text{Smith}_{1,2}$ tonight.

(12) Hesperus_1 is Phosphorus_2 after all, so Hesperus-slash-$\text{Phosphorus}_{1,2}$ must be a very rich planet. [31]

Assuming natural readings where the co-indexed occurrences corefer, they will also be de jure coreferential. However, transitivity fails. Consider (10). Anyone who fully understands it will know of 'there' and 'Hesperus' that they refer to the same thing if they refer at all. The same goes for 'there' and 'Phosphorus'. However, people who fully understand (10) do not have to know that 'Hesperus' and 'Phosphorus' refer to the same thing if they refer at all. Imagine a person being presented with some evidence that 'Hesperus' and 'Phosphorus' refer to distinct planets so that she thereby does not count as knowing that the expressions are coreferential. This person is still able to understand someone else's use of (10), although she does not know of the 'Hesperus' and 'Phosphorus' occurrences that they refer to the same thing (if they refer at all). Hence, those occurrences are not de jure coreferential.[32] [33]

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argued that the relation understood as an inter-discourse notion is not transitive. I will not survey his arguments here, but I note that they are quite distinct from the ones I present below.

[31] I thank Sam Cumming for drawing my attention to "slash" expressions.

[32] An anonymous referee points out that another distribution of indexing might capture the target reading and yet be consistent with transitivity. They suggest that in (10), for example, 'there' should be co-indexed with one of the names, but not both. This is problematic, however, since in the natural reading 'there' and each of the names seem to satisfy the conditions for de jure coreference.

[33] Concerning (11), an anonymous referee considers a case where it is known independently that the three indexed occurrences have referents. If so, then there would be knowledge of coreference among all three occurrences (and perhaps all three occurrences would be de jure coreferential contrary to what I am saying). In response, note that what is required for de jure coreference is that anyone who fully

Here are two other examples that give further reason to think transitivity fails:

(13) $Smith_{1,2}$ is wearing a costume, and (as a result) Sally thinks he_2 is someone other than $Smith_1$. [34]

(14) $He_{1,2}$ was in drag, and (as a result) Sally thought that $Smith_1$ wasn't $Smith_2$.

In (13), for example, 'he' and the second occurrence of 'Smith' cannot be de jure coreferential. If that were the case, then according to "A Prioricity" any competent rational agent who grasps (13) and '∃x (Smith is wearing a costume, and Sally thinks x is someone other than x)' is in a position to see that the former entails the latter. But this is false since it is plausible to think that the existential claim above (with two co-bound variable occurrences in the scope of the attitude verb) commits Sally to the unusual thought that someone is not himself. Mark Richard (1987) has pointed out that this type of coordination of variables in the scope of attitudes has semantic import. Consider the following case adapted from Richard. Suppose that Bob says 'Hesperus usually shows up before Phosphorus but I hoped to see Phosphorus before Hesperus last night'. There is an intuitive difference between these imagined reports of what Bob said (suppose the reporter forgot the names Bob used): (i) 'There is a planet x and a planet y and Bob said that x usually shows up before y, but he hoped to see y before x last night'; and (ii)

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understands the use of (11) knows of the occurrences that they are coreferential if they refer. It is not sufficient for de jure coreference that some participants in fact know that there is coreference. In the case of (11), we can imagine someone understanding the speech while having personal doubts about whether the neighbor is in fact the professor.

[34] S. Soames (1994) uses a case like this to show that the anaphor in (13) cannot inherit a Fregean sense from '$Smith_1$' (assuming '$Smith_1$' and '$Smith_2$' have the same Fregean sense). This is correct. If it did, Sally couldn't possibly have the thought (13) ascribes to her. This can be seen as a more direct argument for why de jure coreference cannot be explained by appealing to the idea that the occurrences in question share the same Fregean sense.

'There is a planet x and a planet y and Bob said that x usually shows up before y, but he hoped to see x before x'. The second report doesn't appear to be correct at all because it seems to commit Bob to having said something silly. This is some reason to think that the coordination of variables at issue with (13) makes a semantic difference. That is, it is plausible to think that "A Prioricity" doesn't hold here: The existential claim '∃x (Smith is wearing a costume, and Sally thinks x is someone other than x)' does not a priori follow from (13). Similar remarks apply to "Attitude Closure": Mark Richard thinks (13), but presumably he doesn't also think ∃x (Smith is wearing a costume, and Sally thinks x is someone other than x). These considerations support the idea that the pronoun and the last occurrence of 'Smith' in (13) are not de jure coreferential. However, it seems as if the two occurrences of 'Smith' are de jure coreferential and so is the pair consisting of the pronoun and the first occurrence of 'Smith'. Therefore, de jure coreference is not transitive. And this is some evidence that the third object strategy is not on the right track.[35]

6. Towards a Relational Understanding of De Jure Coreference

In the previous section, I argued against "third object" strategies that aim to explain de jure coreference by saying that at some level of analysis, the occurrences in question correspond to the same object. But if this isn't correct then how might semantic theory achieve this task? A more direct idea (that doesn't go through a third object) is to say that the phenomenon is underwritten by a special linguistic relation "linking" the occurrences in question.

[35] I am grateful to an anonymous referee here.

I will consider two relational accounts before I get to mine. The first account is exemplified by the works of Gareth Evans (1980) and James Higginbotham (1980, 1985). On this view, 'he' and 'Smith' in (1) are de jure coreferential because the semantic value of 'he' depends on 'Smith'. 'He' and 'Smith' are "linked" by an assymetric dependency relation. Now, it is an important part of the dependency view that it cannot extend to encompass pairs of expressions, such as names, that have their referential properties fixed "on their own". This seems right, since talk of dependency among name occurrences appears out of place (as Evans and Higginbotham both emphasized). Thus, one cannot hope to explain de jure coreference (at least for pairs of names) by appealing to dependencies.

The second relational account I consider is the one defended by Kit Fine (2003, 2007). Fine agrees that there is something like de jure coreference. He thinks that the phenomenon is captured by the idea that there are cases in which it is semantically required that certain occurrences are coreferential. Semantically required facts are just those that a semantic theory for a language must explain and predict. They are also facts that capture an agent's understanding of her language. As such, semantically required facts fail to be closed under logical consequence. This is because although it might be semantically required that A refers to object X and semantically required that B refers to object X, it does not follow that it is semantically required that A and B both refer to X. Occurrences of 'Hesperus' and 'Phosphorus' exemplify this failure.[36]

[36] A full explanation of Kit Fine's views would include a discussion of logical consequence and its application to structured propositions, as well as a discussion of the notion of a semantically required fact. I point the interested reader to Fine (2006, pp. 45-65). The points of my paper, however, can be defended without utilizing these notions. For example, I give criteria for de jure coreference and an explanation of the idea without appealing to these concepts. I am grateful to an anonymous referee here.

More generally, I agree with Fine that de jure or semantically required coreference between two occurrences is not to be explained by appealing only to their intrinsic or local semantic properties. I disagree with Kit Fine, however, about its ultimate explanation. In contrast with Fine, I argue below that the notion must ultimately be grounded in a primitive semantic relation I call 'primitive linking' or 'p-linking'. In my view, de jure coreference happens when two occurrences are coreferential and they instantiate that relation. Fine believes it suffices to say that the coreferential fact is semantically required. Hence, Fine does not posit a primitive semantic relation. In the next sections I offer reasons for why I think we need such a relation. Along the way I posit four axioms that govern p-linking.

6.1 Non-Referring Terms

De jure coreference happens whenever a pair of occurrences corefer *and* they satisfy the three key properties given in section 2 ("A Prioricity", "Attitude Closure" and "Knowledge of Conditional Coreference"). But it is arguable that two non-referring occurrences can satisfy those three conditions. Suppose that I mistakenly think that there is a scorpion in my room. Consider my use of the following:

(15) The scorpion in my room/that scorpion is angry and he is going to sting me.

Arguably, 'The scorpion in my room'/ 'that scorpion' and 'he' in (15) pass all three facets of the test as the reader may verify for herself (None of the three features require that the occurrences in question actually refer). However, (15) does not exhibit de jure coreference (because the occurrences do not refer).

What this suggests is that whatever explanatory mechanism is responsible for de jure coreference in the standard cases is also responsible for the non-referring cases such as (15). I conclude then that in both types of cases, the occurrences in question are p-linked. It is just that when the occurrences happen to refer, the occurrences are de jure coreferential. Note that Kit Fine will have some difficulty explaining how (15) has the central features associated with de jure coreference. Recall that on his view, de jure coreference is just explained by saying that coreference is semantically required. There is nothing like that going on in (15) since there is failure of reference.

Now the first axiom governing p-linking is as follows (note that in these axioms talk of "reference" should always be taken relative to the discourse or context in question):

(Axiom 1) If two occurrences in a discourse refer and are p-linked, then they corefer.

Going back to (1-4), one can see how this fact can help explain "A prioricity" and "Knowledge of Conditional Coreference". To see this, consider (1) again. By hypothesis, 'Smith' and 'he' are p-linked. Assuming that p-linking facts concerning a use of a sentence, like many other semantic facts, are known by agents who fully understand that sentence use, then one who fully understands (1) will know that the occurrences of 'Smith' and 'he' are p-linked. Given knowledge of Axiom 1, such an agent can then deduce that the occurrences in question refer to the same thing if they refer at all ("Knowledge of Conditional Coreference"). Having this knowledge also explains how agents can see that that (5) follows from (1) ("A prioricity").[37]

[37] I am assuming that knowledge of p-linking will be tacit in the way that knowledge of other semantic facts involving highly theoretical notions are also assumed to be tacit. Yet this tacit knowledge can explain

Now what is not yet accounted for is "Attitude Closure". How is it that (5)' follows from (1-4)'? This is captured by the following axiom covering the intensional component:

> (Axiom 2) A sentence use with p-linked occurrences may express a proposition with parts corresponding to the occurrences in question. These parts are about the referent of the occurrences (if any) and they represent that referent as the same.

If the propositions denoted by the complement clauses in (1-4)' are as Axiom 2 says, then anyone who believes those propositions will also believe their existential closure in virtue of thinking of the target object as the same.

6.2 Variables

Consider sentence (16). It is ambiguous between two readings. In one reading, Pecos is the only person that has the property of loving one's own mother. In the second reading, Pecos is the only person who loves Pecos' mother. The readings may be displayed as (17) and (18) respectively.

(16) Only Pecos loves his mother.

(17) Only Pecos λx(x loves x's mother)

(18) Only Pecos λx(x loves his [referring to Pecos] mother)

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knowledge that is accessible to consciousness. For a discussion of this general point as well as its connection to issues in cognitive science see Larson and Segal (1995).

In reading (17), the pronoun is analyzed as a bound variable. Hence, 'Pecos' and 'his' are not de jure coreferential for the simple reason that they are not coreferential. In (18), 'his' is de jure coreferential with 'Pecos'. This means that those occurrences are p-linked.

Now, (16) bears a similarity to the following construction.

(19) Every cowboy thinks that only he loves his mother.

Like (16), (19) is also ambiguous in an analogous way. In one reading, (20), every cowboy thinks that he is the only person that has the property of loving one's own mother. In the second reading, (21), every cowboy thinks that he is the only person that loves that very woman who is his mother.

(20) Every cowboy λy (y thinks that: (only y) λx (x loves x's mother)).

(21) Every cowboy λy (y thinks that: (only y) λx (x loves y's mother)).[38]

The ambiguities found in (16) and (19) are highly related. We would like an account that unifies them as as Irene Heim (1988) and Tanya Reinhart (2000) have pointed out.[39] The first readings (17) and (20) help in unification. In both of those readings, the complex lambda expressions after 'only __' are the same, capturing the idea that the property of

[38] Strictly speaking, the lambda operators are the binders here, and not expressions like '(only y)'. In (21), for example, the open expression '(only y)' can be thought of denoting (relative to an assignment of objects from the domain to variables) a function of type <<e,t>, t>.

[39] Heim finds unification by appealing to "colinking" which in turn means is explained by (inner) indexing. The reader may be referred to section 5.3 where I discuss the relation between indexing and de jure coreference. According to Reinhart, the occurrences in question are "covalued" since the relevant occurrences in (18) corefer and in (21) they are assigned the same variable. However, there is only unification in name here since these pairs are "covalued" in two very different ways. Furthermore, something needs to be said about how "covaluing" differs from de facto coreference.

loving one's mother is involved in both. In particular, in both constructions 'his' is analyzed as a bound variable bound by the lambda operator following the 'only __' expression.

The second readings, however, seem difficult unify. For in (18), the salient property concerning 'his' is that it is de jure coreferential with 'Pecos'. But this is missed in (21), since 'his' is treated as a bound variable and hence not de jure coreferential with anything. However, unification is achieved by hypothesizing that occurrences of variables bound by the same binder are p-linked. Concentrating on the relevant parts, (18) and (21) give way to the following (where p-linking is displayed with lines):

(18)' (only Pecos) λx (x loves his mother).

(21)' …(only y) λx (x loves y mother)).

The fact that (18)' and (21)' are structurally identical captures what (18) and (21) have in common. This insight is described by the following axiom:

(Axiom 3): Two variable occurrences in a discourse are p-linked if they are bound by the same binder.

The unification, although hardly constituting conclusive proof, is nonetheless a further indication that de jure coreference is a special case of a much broader notion and that we

need to go beyond Kit Fine's claim that the notion just is semantically required coreference.[40] [41]

6.3 Reference and Customary Reference

Consider the following:

> (22) Obama is visiting the university but the president won't be making any speeches here.

With (22), suppose that unbeknownst to the speaker, Barack Obama has ceased being the president and Joe Biden has taken over.

Now suppose that in fact Obama will be visiting the university and that Biden won't be making any speeches anywhere. A straight-forward semantics, may then assign 'truth' to (22) under the stated conditions. Saying just this isn't wholly satisfactory since arguably there is something defective about this use of the sentence in the imagined circumstance. In what follows, I describe how the mechanism of p-linking can help explain this.[42]

Given the discussion so far, it is natural to assume that 'Obama' and 'the president' in (22) are p-linked. Accordingly, by Axiom 1, if 'Obama' and 'the president'

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[40] This is further reason to think that Fregean senses cannot explain the phenomenon at hand. There is little hope in saying that co-bound variables share the same sense since they do not appear to have denotations (traditionally conceived).

[41] An anonymous referee brings up the following very interesting example: 'Mary told John that he wasn't John, Mary told Bill that he wasn't Bill, Mary told Dick that he wasn't Dick. In short, Mary told each man that he wasn't that man'. The referee points out that a natural way to analyze the last sentence is as follows: '[For all x: Man x] (Mary told x that x wasn't x)'. But if so, it would seem to commit Mary (given axiom 3 and other plausible assumptions) to having told people absurd things. An alternative analysis which avoids this problem involves the use of two variables and generalized quantifiers along the following lines: '[Every man] λxλy[Mary told x that x wasn't y]'. Here, the lambda expression would be of type <e,<e,t>> and the quantifier would be type-raised to <<e,<e,t>>,t>. I note that the challenge the referee raises is not one that uniquely applies to my theory. Rather, it applies to any view which accepts that coordination of variables in attitude contexts has semantic import in the manner discussed earlier.

[42] For the sake of continuity with the positive proposal, I hope the reader may allow me to discuss the phenomenon here without considering competing accounts.

refer at all, then they must refer to the same thing. Since we don't want to say that they refer to the same thing, then the occurrences must not refer at all. And this captures the idea that (22) is defective. One way of working out this idea in detail is to say that the Russellian proposition expressed by (22) has no constituents corresponding to the 'Obama' and 'the president': the proposition is "gappy" and hence defective.

The result just achieved is not satisfying. For there is an intuition, which surely must be respected, that 'Obama' and 'the president' in (22) are in fact about two different people. So to simply say that they don't refer at all seems to get that wrong. Yet, it must also be acknowledged that there is another intuition pulling in a different direction: that the occurrences are related in such a way that they must be about the same thing. Linguistic theory needs to not only say that (22) is defective but must, ideally, also capture the two conflicting intuitions. I now turn to this.

Following a Fregean line of thought, I will use the term 'customary referent' for the familiar relation holding between a singular term and an object in the world (relative to a context): In the case of names, the customary referent of a name is what it conventionally names, in the case of a demonstrative it is the object demonstrated with that demonstrative, and in the case of a definite description 'The N' it is the object satisfying 'N'. For example, in (22), 'Obama' and 'The president' have distinct customary referents.

Now, one must distinguish the notion of a customary referent, as defined here, from the notion of what an *occurrence* of a singular term in a sentence contributes to the truth conditions of that sentence relative to the context of utterance (or the Russellian proposition expressed by that sentence--relative to a context). This is the object that

enters into the corresponding thought and the truth conditions of what is said. I reserve the term 'reference' for this notion, although no claim is made that this is the correct analysis of the ordinary concept. Thus, I am distinguishing reference from customary reference.

Frege (1892), of course, famously defended a similar distinction. On his view, the referent of an occurrence of a name may be different from the name's customary referent. When a name is singly embedded in an attitude context, its occurrence refers not to the name's customary referent but to its customary sense. Now, one need not be a Fregean to appreciate that the concepts of reference and customary reference, as I have defined them, should be kept apart.[43]

Keeping these concepts in mind can help to make sense of the conflicting intuitions concerning (22). The intuition that the relevant occurrences are about different things is due to their having different customary referents. The intuition that they must be about the same thing is due to the fact that they are p-linked.[44] As I will explain now, the intuition that there is something defective is captured by the idea that the occurrences don't refer to anything at all (hence the sentence use expresses a gappy proposition). This is accomplished through an axiom saying how the referent of an expression is determined by the p-linking facts plus customary reference.

Here's the set up for the axiom. I assume that p-linking is a symmetric and reflexive relation. Some notation: call an occurrence of an expression in a discourse

[43] I have benefited greatly from Nathan Salmon's (2006) discussion concerning "occurrence" semantics, variables and Frege.

[44] This reveals why p-linking is needed even if singular terms have Fregan senses. 'The president' and 'Obama' should have different senses (since they refer to distinct objects). So one can't explain the intuition that they must refer to the same thing by saying that they have the same sense. Note that Kit Fine will also have some difficulty explaining the intuition that these occurrences must be about the same thing. This is because they are not semantically required to corefer (since they do not corefer).

'improper' if it is either linked to occurrences with distinct objects for customary referents or if none of the occurrences it is linked to have customary referents. Improper occurrences will involve a defective discourse and so fail to refer. This will lead to the expression of incomplete or gappy propositions. This is precisely what is happening with (22). Now, our next axiom concerns non-improper or 'proper' occurrences:

(Axiom 4) If a proper occurrence X is p-linked to an occurrence with customary referent O, then X refers to O.

Axiom 4 has three properties that are worth noting. First, it achieves everything that Axiom 1 was supposed to accomplish, so the latter can be dispensed with it. Second, consider (1) again. Since 'he' is used anaphorically and not as a demonstrative, it can be regarded as having no customary referent. Since it is only p-linked to itself and 'Smith', then according to Axiom 4, it refers to Smith. Hence, Axiom 4 ensures that anaphoric pronouns such as 'he' in (1) "pick up" their referents from their antecedents. But it does so without having to posit a special asymmetric dependency relation along the lines of Higginbotham and Evans.[45] Third, from the perspective of deriving the truth conditions of a sentence in a context, p-linking is minimally intrusive. For given a sentence use or a sentence in a context, once the linking facts and customary referents of each occurrence are fixed, the referents of each of these occurrences are deduced through axiom 4. And now the truth conditions of the whole can be derived in the usual manner.[46]

[45] I thank Ted Sider for noting that this was a consequence of my theory.
[46] An important question is this: what determines whether two occurrences in a discourse are p-linked in the first place? I believe that this issue is on par with the problem of saying what determines customary

7.Conclusion

De Jure coreference, I have argued, is a genuine phenomenon of some importance. Perhaps surprisingly, it resists reduction to familiar terms. Instead, I urged that the notion must be explained in terms of a much broader concept, p-linking, that must be understood as a primitive relation from the perspective of a semantic theory. This concept not only plays a role in determining the truth conditions of utterances, but it also plays a crucial role in our understanding of content and communication.

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reference of a simple expression in the first place? Although these questions are important, a compositional semantics can be developed without answering them.

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