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 is it that several signs can represent the very same object? It is tempting to think there is little to this question beyond what can be said about the first. But things are not so simple. A pair of representations can denote the same object in a special way. For some anaphora-antecedent pairs or for some occurrences of the same word, the signs corefer in a way that makes that very fact evident. In this sense, we may say that sometimes coreference is “de jure”.

Several authors have explored this phenomenon. Robert Fiengo and Robert May, for example, have long argued for its significance in topics as seemingly unrelated as binding theory and a priori inference. More recently, Kit Fine 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 sympathetic with these authors concerning the value of de jure coreference. I disagree, however, about how the phenomenon is ultimately explained.

I begin the paper by outlining what I think are the three core properties of de jure coreference. Once things are set up this way, we can conclude the following about the phenomenon: (i) it is ubiquitous, (ii) it plays a crucial role in communication and

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* I am especially indebted to Kit Fine, Stephen Neale, John Hawthorne and Ted Sider for their continued help and support throughout the development of the theory presented here. I also want to thank….
expression of thought, and (iii) (perhaps surprisingly) the phenomenon cannot be understood in terms of available linguistic tools.

In the last part of the paper, I offer a novel explanation of de jure coreference. My approach involves the positing of a primitive semantic relation that may “link” occurrences in a discourse. I end by indicating how (i) such a relation concerns more than de jure coreference (it also concerns variables); and (ii) how the relation can be easily embedded in standard semantics by way of a few axioms.

2. Three Phenomena

Consider the following sentence uses.

(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 is one of “anaphora” or “dependence”.

Using a helpful notion borrowed from Kit Fine, one might more accurately say that the occurrences are related in such a way that they represent a single object “as the same”.
Without settling how best to characterize this relation at this time, I claim that it is connected to the three phenomena discussed below.

2.1 A Prioricity

Any 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 and (5) is in a position to see that the former entails the latter (as the reader may verify for herself). 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.

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)’

(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, some attitudes including “thinks” are closed under existential generalization on the two italicized terms in (1-4)’.  

2.3 Knowledge of Conditional Coreference.
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 \textit{he} and \textit{Smith} that they refer to the same object if they refer at all. The claim about knowledge here is important. Anything weaker won’t do. For example, suppose that an agent witnessing (1) had only a hunch or simply guessed that \textit{he} and \textit{Smith} refer to the same thing (if it referred at all), one would suspect that something had gone wrong. Full understanding here requires knowledge.

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.\textsuperscript{9} But it is clear that these instances are defective to 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: \textit{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.}\textsuperscript{10}

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)’ \textit{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 deemed *de facto coreference*.\textsuperscript{11} Defining these terms in this way leaves no doubt that there is a genuine distinction between *de jure* and *de facto* coreference.

### 3.1 Significance of “Attitude Closure”

Humans are endowed with the sort of mind that can entertain complex thoughts. Some of these thoughts may contain parts that may be 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 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”.\textsuperscript{12}

The second point I would like to make is that the type of content just noted is important in real-time 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 explaining 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 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 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 that the relevant expression occurrences 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.

3.3 A Single Mechanism

I just said that “Attitude Closure” and “Knowledge of Conditional Coreference” serve important purposes. It makes sense then that natural language exhibits these properties.
What is not obvious is why they should be served by a single mechanism. There is no obvious reason why a sentence use …A…B… where any competent speaker who understands it must know that A and B corefer if they refer at all, often also has the property such that when it is embedded in attitude contexts, describes contents in which the A and B parts display their referents as the same. Language didn’t have to be this way.

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, then appropriately situated agents must know 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.13

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, concerns the nature of propositions. I conclude that neither intentions to corefer nor presuppositions that certain occurrences be coreferential can explain de jure coreference.  

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. 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 \textit{he} and \textit{Smith} in (1) can be explained by saying that: (a) \textit{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 \textit{Smith}.

Consider now the following. \textit{Mark Twain\textsubscript{1} is bigger than Samuel Clemens\textsubscript{2} so he\textsubscript{1} would often bully him\textsubscript{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, \textit{him} refers to a certain object that is made salient by \textit{Mark Twain}. But since those occurrences are not de jure coreferential, the proposal makes the wrong prediction.

5. Unsatisfactory Explanations—Syntax and Semantics (“Third Object” Strategy)
In this section, I consider several attempts at explaining de jure coreference. All of them are positions that theorists have held, and some of them constitute important milestones in the study of language. 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 inadequate.

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 certain 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.

The basic insight behind the “third object” strategy is ubiquitous and can be easily spotted. 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.\(^{17}\)

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, then 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) and (4). Arguably the italicized pairs in each construction are not 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. On that view, coreferential names mean the same thing. But coreference does not entail *de jure* coreference, as true informative uses of *Twain is Clemens* reveals. Hence, the strategy is not available to the Millian. 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 in pieces 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 \textit{Smith} would have to be occurrences of the same syntactic type as the occurrences of \textit{he}, \textit{the invitee} and \textit{that jerk}. And this seems hard to believe. However, I will just focus on the strategy as it applies to (2).

The theorists who come the closest to endorsing this strategy are Robert Fiengo and Robert May.\textsuperscript{21} I argue that they are mistaken.

\textbf{5.2.1 Syntactic Identity and “Knowledge of Conditional Coreference”}

Consider (2) again. It might be thought that agents know that the occurrences of \textit{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 \textit{Smith}. 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. Concerning the second, they think that this is tantamount to the thesis that natural language is formal:
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. It is precisely through this thesis that the authors account for de jure coreference.

I now present an argument that shows 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. 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 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. 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.

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). If this is right, then there must be some theoretical object that *John*
and him in (6) are assigned to. Suppose that this object is \(x\). Similarly, there must be a distinct object that is assigned to Mary and she. Suppose that this is \(y\). It is natural, therefore, to assume that there is 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 \(\lambda x\) Mary \(\lambda y\) (\(x\) loves \(y\) \& \(y\) doesn’t love \(x\) back)

(8) John \(\lambda y\) Mary \(\lambda x\) (\(y\) 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 an unsolvable 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.\(^{26}\)

One way of solving the problem is to simply eliminate variables, indices and discourse referents.\(^{27}\) Another way, which is less extreme, is to provide a reduction that corresponds to a very natural way of understanding these objects. Focusing on variables, the “bonding notation” in (9) captures all the linguistically relevant information (7) or (8) encodes.\(^{28}\)
Although my remarks here will have to be brief, let me suggest that the bonding notation indicates that variables in discourses or formulas can be understood as structural devices. In particular, the lines may be seen as representing the instantiation of a certain “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 discourse then may simply be identified with one such class.\textsuperscript{\textdegree} This yields the correct result that (9) contains exactly two variables.\textsuperscript{\textdegree}\textdegree

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

(9) $\lambda x (\lambda y (\text{loves } \& \text{doesn't love } y \text{ back}))$
are associated with the same discourse referent, variable or index says nothing more than 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.

Defenders of the third object strategy must hold that de jure coreference is transitive. Here are some examples that indicate it is not. If this is right, then no third object strategy, including appealing to Fregean senses, could succeed.
(10) We were merely contemplating conquering both Hesperus\textsubscript{1} and Phosphorus\textsubscript{2}. But when we discovered their true identity, we immediately sent ships there\textsubscript{1,2}.

(11) You didn’t know that my neighbor John\textsubscript{1} was Professor Smith\textsubscript{2}? You will get to meet (the real) John Smith\textsubscript{1,2} tonight.

(12) The president\textsubscript{1} and the CEO\textsubscript{2} are the same person\textsubscript{1,2}.

(13) Hesperus\textsubscript{1} is Phosphorus\textsubscript{2} after all, so Hesperus-slash-Phosphorus\textsubscript{1,2} would make a great vacation spot.\textsuperscript{31}

Assuming natural readings where the co-indexed occurrences corefer, they will also be de jure coreferential. However, transitivity fails. Consider (12). Anyone who fully understands it will know that The same person and The CEO must refer to the same thing if they refer at all. The same goes for The president and The same person. However, those agents don’t have to know that The president and The CEO refer to the same thing if they refer at all. Indeed, somebody who fully understands (12) might very well believe that they refer to different people. This is enough to show that those occurrences are not de jure coreferential.

Here is another example where transitivity fails:

(14) Smith\textsubscript{1} is wearing a costume, so Sally thinks he\textsubscript{1,2} is someone other than Smith\textsubscript{2}.

Here, he and the second occurrence of Smith cannot be de jure coreferential. This is because according to “attitude closure” (14) would have to entail, in effect, that Sally thinks that someone is not himself (which no one does). But 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*. I conclude that de jure coreference is not transitive so no third object strategy could possibly succeed.\textsuperscript{32}

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.

I will consider two relational accounts before I get to mine. The first account is exemplified by work of Gareth Evans and James Higginbotham.\textsuperscript{33} 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 a 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 by appealing to dependencies.

The second relational account I consider is the one recently defended by Kit Fine.\textsuperscript{34} 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.

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 how semantically required coreference comes about. In contrast with Fine, I argue below that de jure coreference must be explained by appealing to a primitive semantic relation I call “primitive linking” or “p-linking” holding between occurrences of expressions in a discourse. In sections (6.1-6.3), I look at three pieces of evidence that supports this idea.

### 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 perfectly possible for two non-referring occurrences to satisfy those three conditions. Suppose that I mistakenly think that there is a scorpion in my room that I dub “James”. “James” is a non-referring term. Consider my use of the following:

(15) James is here and he is going to sting me.
Arguably, *James* and *he* in (15) pass all three facets of the test as the reader may verify for herself. However, (15) does not exhibit de jure coreference.

What this strongly 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. 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 linguistic facts concerning a use of a sentence 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 and can also deduce that (5) follows from (1).

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:
(Axiom 2) A sentence use with p-linked occurrences expresses 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 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)

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 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 $\lambda y \; (y \; \text{thinks that:} \; \text{(only y)} \; \lambda x \; (x \; \text{loves x’s mother})).$

(21) Every cowboy $\lambda y \; (y \; \text{thinks that:} \; \text{(only y)} \; \lambda x \; (x \; \text{loves y’s mother})).$

The ambiguities found in (16) and (19) are highly related and a proper analysis must account for this. The first readings (17) and (20) capture this. In both of those readings, the complex lambda expressions after only __ are the same, capturing the idea that the property of 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) $\lambda x \; (x \; \text{loves his mother}).$
(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 and only 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.36

6.3 Reference and Customary Reference

Consider the following:

(22) Bush is visiting the university but the president won’t be making any speeches here.

(23) I have known the philosopher Moore for many years, I also happen to think Roger was the best James Bond.

With (22), suppose that unbeknownst to the speaker, Bush had just ceased to be the president and Cheney had taken over. Concerning (23), suppose that the speaker mistakenly believes that the philosopher G.E. Moore is the actor Roger Moore.

Now suppose that in fact Bush will be visiting the university and that Cheney won’t be making any speeches. Suppose also that the agent of (23) is very familiar with the philosopher Moore and that he believes that Roger Moore was the best James Bond.
A straight-forward semantics, may then assign truth to (22) and (23) under the stated conditions. This isn’t wholly satisfactory since these sentence uses are arguably defective.

Given the discussion so far, it is natural to assume that *Bush* and *the president* in (22) are p-linked and so are *Moore* and *Roger* in (23). Accordingly, by (Axiom 1), if *Bush* and *the president* refer at all, then they must refer to the same thing. Since it is not the case that they refer to the same thing, then they must not refer at all. This captures the idea that (22) and (23) are defective.

The result just achieved is not satisfying. For there is an intuition, which surely must be respected, that *the president* and *Bush* in (22) are in fact about two different objects. So to 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) and (23) are defective but must 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 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), *Bush* 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.

Frege, 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 at least conceptually, the concepts of reference and customary reference (as I have defined them) should be kept apart.

Keeping these concepts in mind can help to make sense of the conflicting intuitions concerning (22) and (23). 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. 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. This is accomplished through an axiom saying how the referent of an expression gets fixed in terms of p-linking and customary reference.

(Axiom 4) The referent of an occurrence is just the customary referent (if any) of every occurrence that is p-linked to it, unless the occurrence is p-linked to occurrences that
have distinct objects for customary referents (in those defective cases, the occurrence will get no referent).\textsuperscript{40}

This axiom gets it right with (22) and (23). The p-linked occurrences get no referents since they are p-linked and have distinct customary referents.

Axiom 4 has four other properties that are worth noting. First, it achieves everything that Axiom 1 was supposed to accomplish, so the latter can be dispensed with it.\textsuperscript{41} Second, consider (1) again. Since \textit{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 \textit{Smith}, then according to Axiom 4, it refers to Smith. Hence, Axiom 4 ensures that anaphoric pronouns such as \textit{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.\textsuperscript{42}

Third, the fact that customary reference and p-linking stand side by side as determinants of reference further supports the idea that p-linking should not be seen as reducible to symbol-world semantic relations (such as reference). Fourth, 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.\textsuperscript{43}
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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1 In particular, see Indices and Identity, (Cambridge: MIT, 1994), but also “Names and Expressions,” The Journal of Philosophy XCV (1998), and De Lingua Belief, (Cambridge: MIT, 2006). Fiengo and May use the locution grammatically determined coreference to capture what I call de jure coreference.


3 (1-4) are understood as “sentence uses”. More formally, a sentence use can be identified with a sentence type of a language relative to a context of utterance.

5 Fine (2003b, 2007)

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 picks out what (1) expresses.

7 It is generally believed that expressives are “non-displaceable”, D. Cruse, *Lexical Semantics*, (Cambridge; New York; Melbourne : Cambridge,1986). What that means in this context is that although the expressive *inconsiderate jerk* is within the scope of an attitude verb, it describes the speaker’s but not Pecos’ attitude. This issue will not affect my point.


9 For an argument that understanding doesn’t require knowledge see D. Petit, “Why Knowledge is Unnecessary for Understanding Language,” *Mind* 111(3): 519-550 (2002). His counter-examples include cases in which communication is defective in some sense.

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 *he* should be analyzed along the lines of a definite description along the lines of P. Postal. “On So-called Pronouns in English,” In F. Dinneen (ed.) *19th Monograph on Languages and Linguistics*. (Georgetown: Georgetown, 1965) and others. In addition, it might be thought that *he* in (1) should be analyzed as an open expression containing a part, proper or not, bound by some higher operator. These positions can call into doubt my claim that agents have knowledge of
coreference, since it might be thought that open expressions and/or definite descriptions lack reference. 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, 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 that the pronoun is open can be interpreted as saying that it is bound by an operator Smith that was raised out at some syntactic level of analysis to have scope over the construction, or it can be interpreted as saying that it corresponds to a discourse referent. I object to the former option in footnote 24. I consider the latter option in section 5.3.

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.

Following a leading idea by R. Stalnaker, “Common Ground”. *Linguistics and Philosophy*. 25(5-6) (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.


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?

This strategy gives the effect 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”.

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.

Fine (2007) considers the Fregean senses to be a competitor to his view. But it will be clear that fully coming to grips with the properties of de jure coreference reveals that Fregean senses are not the sorts of things that can explain the phenomenon.

Fiengo and May (1994, 1998, 2006). K. Taylor, *Reference and The Rational Mind*. (CSLI Stanford, University of Chicago, 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.

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.

It would be impossible to provide here a summary of the linguistic theories that involve variables, indices and 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) 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 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 if there is variable binding in (1) then there ought be similar binding in a construction that is just like (1) except that *Only Smith* replaces *Smith*. But as is well known, “raising” *Only Smith* in a similar way delivers a reading that is not available for that sentence. Another reason the binding solution won’t work is that, as has been well known since E. Keenan “Names, Quantifiers and the Sloppy Identity Problem. Papers in Linguistics 4 (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. (b) The claim that the occurrences are associated with the same discourse referent is generally understood, within a dynamic semantics framework, to concern a semantic and not a syntactic level of representation. I point out, however, that not all theorists make use of the term “discourse referent”, which appears in L. Karttunen, “Discourse Referents.” In J. McCawley (ed.), *Notes from the Linguistic Underground (Syntax and Semantics, vol 7)*, (New York: Academic Press, 1976) and H. Kamp, “A Theory of Truth and Semantic Interpretation,” In J. Groenendijk, T. Janssen, and M. Stokhof (eds), *Formal Methods in the Study of Language Part I*, (Amsterdam: Mathematisch Centrum, University of

I am, of course, simply assuming, for the sake of argument, that reasons can be given for the reification of these theoretical entities. So much the worse for the strategy if none can be found.


and related work in combinatory logic. And of course, classic semantic accounts that aren’t “dynamic” won’t make recourse to discourse referents.


29 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 S. Shapiro, Philosophy of Mathematics: Structure and Ontology. (New York: Oxford University 1997).

30 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 Fine’s (2003a) 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. See [citation suppressed].

31 I thank Sam Cumming for drawing my attention to “slash” expressions.

32 S. Soames “Attitudes and Anaphora,” Philosophical Perspectives 8 (1994) uses a case like this to show that the anaphor in (14) cannot inherit a Fregean sense from the first occurrence of Smith. This is correct since if it did, then Sally couldn’t possibly have the thought (14) 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.


35 I. Heim, “Anaphora and Semantic Interpretation: A Reinterpretation of Reinhart’s Approach.” In U. Sauerland and O. Percus (eds.). The Interpretive Tract. MIT Working Papers in Linguistics 25 (1988) also urges for a unified treatment here. Concerning (16) and (19) she would say the pairs Pecos/his in (16) and he/his in (19) are “colinked” which in turn means that they have the same “inner” index. The reader may be referred to section 5.3 where I discuss the relation between indexing and de jure coreference. T. Reinhart, “Strategies of Anaphora Resolution,” In H. Bennis, M. Everaert and E. Reuland (eds.) Interface Strategies, (Amsterdam: Royal Academy of Arts and Sciences, 2000) following Heim, also saw a need for unification. According to her, the relevant pairs are “covalued” since the pairs in (16) corefer while the pair in (19) are assigned the same variable. However, there is only unification in name here since these pairs are “covalued” in two very different ways.

36 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).

I have benefited greatly from Salmon’s discussion concerning “occurrence” semantics, variables and Frege’s distinction in his “A Theory of Bondage” The Philosophical Review 115(4) (2006).

This reveals why p-linking is needed even if singular terms have Fregan senses. The president and Bush 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.

It will be clear below that it is an important fact that occurrences of singular terms are p-linked to themselves.

It might be thought that axiom 3 may be dispensed with as well by adopting the relational reduction of variables-in-discourses I recommended earlier (the “variable” relation can be analyzed in terms of the p-linking and some other concepts which would ensure that equivalence classes are formed). This would leave the theory with just two axioms: one concerning extension (axiom 4) and the other intension (axiom 2).

I thank Ted Sider for noting that this was a consequence of my theory.

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 reference in the first place? I wish I had an answer to either question.