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Semantics of Common Noun Phrase Anaphora

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1 Introduction

This paper analyzes the semantics of common noun phrases—i.e., \( N \)—anaphora in English. Even though this is not a common subject for theoretical investigation, the construction is varied and commonly used:

Who are Ahab's supervisors?... Who are Brown's?...
Are Ahab's accounts in domestic?... Which ones are hers?...
Who are the managers in printing?... Whose? are these?...?
Did GM order software?... Whili are in California?...
Did GM order printers?... Will they order any (more)?...
How many did they order?...

They tried two systems... Did they order the same?...
They've tried several systems... Did they order more than a thousand?...
but none have worked out.  

The paper is structured as follows: we first articulate background and linguistic assumptions, then review the best known previous treatments (because \( N \) anaphora is a relatively unfamiliar theoretical topic, the literature review section will also serve to introduce the main analytical problems in this field). We turn to a presentation of the situation semantics apparatus required for the analysis, and then the analysis it itself. Finally, we examine the theory of anaphora which emerges from this treatment, especially in comparison to Grewon and Peter's (1960) treatment of VP ellipsis in Situation Semantics, and the distinction between "surface" and "deep" anaphora drawn by Hamburger and Sag (1970).

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1Stanley Peters suggested a substantial improvement in this paper, and Mark Grewon, David Berlin, Tom Sgall, and Ira Sgall have made other useful suggestions. Remaining problems are ours.

2The analysis was developed and fully implemented for use in a natural language processing system, and it has been used in an experimental setting for over eighteen months.
2 Background Assumptions

2.1 Grammatical Preliminaries

Nerbonne, Iida, and Ladusaw (1989) provide extensive lexical and syntactic analysis justifying very standard grammatical structure for N-anaphora, even those with null heads. Semantics processing must then compute meaning representations for syntax trees e.g. of the following form:

```
[Det] [N] [Rel]

several made in China
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There are therefore no idiosyncratic forms requiring "special interpretation". This simplifies the presentation of the semantics below, but does not restrict its generality. That is, we claim that a less pedantic syntactic structure would complicate the rules mapping syntax into semantics, but the semantics itself could stand. The syntactic analysis tree serves only to vivify the analytical task in semantics.

2.2 Assumption of Anaphora as Reuse

Gawron and Peters (1990:211) (citing Dahl, 1978) nicely formulate what has been an unarticulated, but a very standard assumption in dealing with VP ellipsis.

(2) Elliptical VP Hypothesis: The described object of an elliptical VP is the described object of some other VP in the discourse.

It will be useful to distinguish two issues: One requirement of the elliptical VP hypothesis—there is a linguistic, not contextual, antecedent that shares content with an anaphor—may clearly not be transferred to the case of N-anaphora, as we note below (cf. Section 3.1); we must allow for deictic binding.

But the elliptical VP hypothesis has the further import that the relation between the semantics of antecedent and anaphor be identity, not some more complex relation. This is a standard—though, as Gawron and Peters note, hardly unassailable—assumption in linguistic semantics. One import of this is that one NOT attempt to specify the semantics of N-anaphors as the value of some function applied to antecedents. Anaphor and antecedent must have the same content. We shall follow Gawron and Peters therefore in accepting the hypothesis of Anaphora as Reuse:

(3) Anaphora as Reuse: The described object of an anaphor is either (i) the described object of its antecedent; or (ii) provided contextually.

2.3 Restriction to Extensional Semantics

N-anaphors can bind nominal senses, and not merely nominal extensions:

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Jone's had a real gun, and Smith had a fake one. Jones is a fool, and ought to be regarded as one.
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Cf. Westerfield (1984:51-52) for a technique of deriving appropriate restricted determiner meanings from sets which restrict the range of elements which determiners (and therefore, quantifiers) range over.

3 Previous Work on Semantics of N Anaphora

We examine two theories of the interpretation of N-anaphora, a "textual" hypothesis due to Holiday and Hasan (1975), and defended in Webber (1978:3-1), and a "set" hypothesis due to Webber (1983:360-70). We use this examination to note properties of N-anaphora which we shall be concerned to account for.

3.1 A "Text" View

Holiday and Hasan view the antecedent as supplying a "text" (or in Webber's formulation a "description"), on the basis of which the anaphor is interpreted. Under this hypothesis, a phrase of the preceding text provides a restricting predicate for the anaphor. This view is interesting as a kind of "null hypothesis" because it postulates no abstract entities whatsoever, and it turns out also to be wrong for much the same reason. Dahl (1985:9) pinspoints the central theoretical flaw in the text hypothesis: N-anaphora is sensitive to word sense identity, not textual identity. Her example:

(4) Bill broke his leg falling over a log, and Lois entered it in her daily one.

Second, it is clear that the textual hypothesis cannot be a general account of the relation, since the relation need not be textual at all: in a sufficiently rich context, no textual antecedent whatsoever has to be found (cf. I'll take one at a food vendor—Hankamer and Szy's "deictic binding"; Hankamer and Szy, 1970). Deictic binding is fabulous even in the absence of appropriate linguistic material.

A third reason for rejecting this textual theory is seen in examples such as the following:

```
Some friends of mine are coming over on Saturday

—Which ones?
```

The N-anaphor ones is understood as "friends of yours", which simply is not available in the text. We take this to be further evidence that some processing (interpretation) has been done to the text. These considerations move us to the unsurprising conclusion that some more abstract (semantic) relationship between antecedent and anaphor must be postulated; we turn now to a more promising candidate.

3.2 A "Set"-Reference View

The "set" hypothesis is introduced by Webber (1983:360), who aims to reduce the problem of N-anaphora interpretation to the problem of identifying the possible realizations of definite plural anaphors (i.e., them); these refer to sets "evoked" by the context. Under the "set" hypothesis, we find a set in the discourse context and use it (or its characteristic predicate) to restrict the anaphor's range. It is worth noting that this view overcomes the difficulties which

...
confounded the textual hypothesis: it allows abstract entities to intervene between textual antecedent and anaphor; and it allows that those entities be provided by extralinguistic elements or computations on linguistic elements. Under the "set" view, the interpretation of anaphoric one should be the same as the interpretation of one of them. Webber (1983:307-74) demonstrates these parallels in a number of cases.

For our purposes, the view that $N$ anaphors make reference to sets available in context is tied to an important observation about $N$ anaphors, which is illustrated in (6):

(6) Ten students attended the meeting. Three $\exists$ spoke.

We normally understand the $N$ anaphor in (6) as referring not to the entire set of students, but rather to those who attended the meeting. Notice that the $N$ antecedent students doesn't refer to the right set; Webber (1983) therefore allows that $N$ anaphors refer to sets "evoked" by the discourse. We refer to this reading of the $N$ anaphor as RESTRICTED, which we contrast with an UNRESTRICTED reading, e.g. the only reading available in (7):

(7) Most deliveries were on time, but some $\exists$ weren't.

The reference to some in the second conjunct is clearly NOT understood as referring to "some of the deliveries that were on time." We shall accommodate the unrestricted reading, but not focus on it because it is theoretically less problematic.

Webber's "set hypothesis" would require generalizing in order to handle the case of mass nouns (cf. the software examples in (1)). Our proposed generalization from "set to nonatomic individual" will handle these cases. Webber's attempt to reduce N-bar interpretation to the interpretation of they/them would also find the "identity of some" cases mentioned above problematic. We shall claim as an advantage of our treatment that it can EXPLAIN the possibility of the restricted reading of (6) as a consequence of the semantic distinction between general and nongeneral NPs in situation semantics (Barwise and Perry, 1982; Barwise, 1987; and discourse representation theory) and thereby partially systematize Webber's notion of "evoking." 8

4 A Situation Semantics Proposal

Our contribution to the semantics of $N$ anaphors is to refine Webber's "set" hypothesis, to make it more precise, and to ground the insight about the restricted readings of $N$ anaphors in the contemporary anaphoric theories of Kamp (1981), Heim (1982), and Barwise (1987). Semantics is responsible for specifying the information carried by $N$ anaphors as well as the information in antecedents.

4.1 Representation of Plurals

Since crucial examples of $N$ anaphors involve plurals, and since our task is to make the "set" hypothesis more precise, we need a representation language which accommodates plurals. Here 9

"[Most] employees [have pc's]"

"Several $\exists$ [have printers]"

\[ N \text{ Antecedent Meaning} \]
\[ N \text{ Anaphor Meaning} \]

$N$ is just a variable over nonatomic elements of $E$, i.e. $E = D$. Of course, the $N$ anaphor can be arbitrarily complex in meaning. For example, the reduced relative example from Section

The generalization in cases involving mass reference is straightforward, but space prohibits examining it.

The quantifiers in cases involving mass reference are straightforward, but space prohibits examining it.

We might include [Generic, Mass Cases] in semantics without, as needed, anaphors on mass nouns which may not refer to mass noun antecedents (and while there is in general restrictions on mass noun antecedents, determiners such as several may require plural—and therefore count—noun antecedents).

*Note my example, but I like cold meat.*
2.1. make in China, would be represented semantically as \( \forall x \exists y \exists z [\text{make}(x, y, z, \text{China})] \).

In every case the \( \mathfrak{N} \) containing the \( \mathfrak{N} \) anaphor will be represented as a nonatomic individual containing a variable \( N' \) which ranges over \( E - D \). and which must find a binding in discourse. Where there is no modification of the \( \mathfrak{N} \) anaphor, the \( \mathfrak{N} \) meaning is exactly \( N' \).

4.2 Nongeneral NP's

**Situation Semantics** (Barwise and Perry, 1983; Gawron and Peters, 1980) distinguishes general NP's such as no logician or few students from nongeneral ("singular") NP's e. professor, two customers (Barwise and Perry, 1983:290-291; Barwise, 1987). The latter can be used both to refer to and to describe, while the former cannot be used for either purpose. Formally, this distinction is captured by translating general NP's as quantifiers and nongeneral NP's as restricted parameters, a kind of term. As terms, crucially, the nongeneral NP's refer from the reference of nongeneral NP's we obtain further properties which \( \mathfrak{N} \) anaphors may exploit.

As illustration, we provide the rule of interpretation for noun phrases consisting of the nongeneral determiner some in construction with plural \( \mathfrak{N} \)'s. Given that the \( \mathfrak{N} \) denotes a superman in the lattice of individuals, the function of the nongeneral determiner is to pick out a subelement of this superman—i.e., which exactly the nongeneral NP refers. For example, (9)

\[
\text{[(some } \mathfrak{N}, \mathfrak{N}] \mathfrak{N}) = X : \text{stem}(X) \land X \subseteq N
\]

Thus a plural NP determined by some refers to some nonatomic individual-part of the superman denoted by its head, 'X' is a parameter ranging over elements that satisfy its restriction, i.e., everything to the right of the abstraction colon. As a restricted parameter, X is a term with a denotation. This denotation may (and usually may just as well not) fall within the extension of non-logical predicates, and it may be anaphorically referred to, e.g., by the plural pronoun they.

The employment of plural terms in natural language meaning representations is desirable because it provides an account of essentially plural predicates such as meet, disperse, and be numerous. Using plural terms in pragmatics not only provides antecedents for plural pronouns (they, them), but also enables us here to give an account of the very typical interpretation of the \( \mathfrak{N} \) anaphor in (9); this anaphor uses its antecedent NP's reference (X introduced in (9)) to derive its own. Since this \( \mathfrak{N} \) has been asserted to have attended the meeting, we understand the anaphor as referring to the students who attended the meeting, and the discourse can only be satisfied if three of them spoke.

Figure 2 illustrates how the semantics of expressions involving \( \mathfrak{N} \) anaphors is calculated in exact analogy to sentences with nonanaphoric \( \mathfrak{N} \) 's. The meaning of the \( \mathfrak{N} \) anaphor is simply a variable ranging over nonatomic elements of the domain, \( E \) (before it has been supplied a binding). The antecedent of the \( \mathfrak{N} \) anaphor must denote an element in \( E - D \), and there are two candidates in the example under consideration. These are the \( \mathfrak{N} \) and NP nodes (cf. Figure 2).

The binding required for restricted readings binds the individual-sum variable to the denotation of the antecedent NP, \( X \mathfrak{N}'s \mathfrak{N} \)'s \( \mathfrak{N} \) \( \mathfrak{N} \) \( \mathfrak{N} \) '.

3. Few students attended. Three \( \mathfrak{N} \) worked.

In other words, the second sentence in (10) is not understood to mean that three or the students who attended worked, but rather only that three students worked. In fact, this is an old observation. Wolper (1972:2-17) suggests contrasts like the following.

\[
\text{attended}(X ; X \subseteq \mathfrak{N} \land |X| = 10) \quad \text{spoke}(Y; Y \subseteq \mathfrak{N} \land |Y| = 3)
\]

\[
X | X \subseteq \mathfrak{N} \land |X| = 10 \quad Y | Y \subseteq \mathfrak{N} \land |Y| = 3 \quad \mathfrak{N} | \mathfrak{N}
\]

\[
10 \quad \text{student} \quad 3 \quad \mathfrak{N}
\]
Figure 3: Semantics of “Few students attended.” Note that the only candidate antecedent binding for N-anaphors here is *student; the NP denotation is a quantifier, not in E – D.

\[
\text{few } z \ (x \text{ atom-}C, \ *\text{student}) \ \text{attended}(z)
\]

\[
\text{few } z \ (x \text{ atom-}C, \ *\text{student}) \ \lambda y. \text{attended}(y)
\]

\[
\text{few } * \text{student}
\]

Webber noted that the second group of determiners systematically allowed what we have dubbed the “restrained reading”, and went on to propose postulates (Webber, 1979, Chap. 2) about the ability of these determiners to “evokes” discourse entities to which reference can be made. These postulates could be extended to cover other cases, but they still would not follow from a theory of nominal denotation and logic. The situation semantics division between nongeneral vs. general NP’s systematizes some of Webber’s postulates. According to this division, there are, on the one hand, nongeneral NP’s, which denote the entities to which later references are made; and there are general NP’s, which denote generalized quantifiers, to which no later reference is possible. Moreover, there are logical differences between the two classes which interact crucially with this classification—the quantificational force of nongeneral NP’s depends on their logical context.

Let us note here that the fundamental tenet of Situation Semantics (and Discourse Representation Theory), the division of NP’s into nongeneral (normally referential) and general (quantiﬁcational), results in a correct prediction about the distribution of restrained and unrestrained readings for N-anaphors.

4.4 Partitives—Nonanaphoric Empty N’s

A notable feature of the use of empty nonanaphoric NP’s is that they are syntactically parallel (Nerbonne, Håk & Gadamer, 1980). These nonanaphoric uses of empty

45There are apparent restrained readings of N-anaphors with general NP antecedents in every case, a claim that the readings are not genuinely distinct, but merely subsets of readings we propose:

Most English know Hale’s syndromes, some & learn it by heart.

Figure 4: Semantics of the partitive “Two of the students attended.”

\[
\text{attended}(x) \ \lambda x \in Y, \ *\text{student} \ \land |x| = 2
\]

\[
\text{attended}(x) \ \lambda x \in Y, \ *\text{student} \ \land |x| = 2
\]

\[
\text{two } \ *\text{student}
\]

\[
\text{"of" } *\text{student} = \{x | x \in Y, \ *\text{student} \}
\]

\[
\sigma \ *\text{student}
\]

4.5 Parametric Objects

The Situation Semantics perspective further suggests that the meaning of the N in the case of general NP’s should not always be a simple object—a plural object, set or property—but rather that it can more generally be a parametric object—one which contains a parameter. Following Barwise (1981), Rooth (1987), and Gawron and Peters (1990a), Coad’s donkey sentence, Every farmer who owns a donkey beats it, receives an analysis in which the N-farmer who owns a donkey denotes a parametric object corresponding to the sum of farmers who meet a condition involving a parameter Y:

\[
\text{farmer } N \ (x | (x | x \in Y) \ *\text{donkey} \land |y| > 1))
\]

From the parametric N-denotation, we can derive the parametric property of being an atomic individual which is part of the denotation. The determiner every is then a relation between parametric properties; it holds between \(<x_1, y_1>\) just in case every individual in X with respect to parameters \(P\) is also in Y with respect to \(P_x \equiv P_y\).

14We are following a suggestion from Gawron and Peters (1990a) about the parametricization of the restrictor set. Barwise and Rooth parametrize differently; according to them, the restrictor denotes a set of pairs of farmers and outside assignments satisfy the preserve (in particular assigning an index associated with a donkey to a donkey owned by the farmer in the pair). We use the Gawron/Peters reformulation for its simplicity. It is also worth noting that we have not followed Gawron and Peters where they suggest using every generalized quantifiers (reassessed in appropriateness condition).
Several points which require further work also deserve mention:

- intensional readings (cf. Section 2.3)
- explanation of why the only parameters which may be reused by anaphors are those which are actually used—and not merely available for use—by the antecedent. Cf. note 15 above.
- an account of "skolem individuals", i.e. references such as (cf. Webber, 1979:3-24):  

  Each boy gave Wendy a T-shirt. The red ones she found too gaudy.

5 Theory of Anaphora

We turn here to the more general question of how the present analysis of \( \tilde{N} \) anaphors illuminates the general theory of anaphora. The point in this section is to show how the application of parametric objects just proposed illuminates an influential typology of anaphoric processes proposed by Hanksamer and Sag (1972).

5.1 "Surface" and "Deep" Anaphora

Hanksamer and Sag proposed a dichotomy of anaphoric processes: *deep* anaphoric processes, on the one hand, are fundamentally contextual and thus relatively free of syntax; *surface* anaphoric processes, on the other, are quite closely tied to particular forms and constructions. We shall explicate this further below, but let us note here that, as with the dierentiation making anaphoric type a matter of information resources. **Surface anaphors** have access to the syntax module, as we see, while deep anaphors do not. We propose in this section that the surface vs. deep dichotomy may correspond more precisely to a difference in semantic content. But briefly, we propose that surface anaphora is to potentially parametric objects, while deep anaphora is to non-parametric objects.

Hanksamer and Sag take VP ellipsis as a paradigm case of surface anaphora, and sentential anaphora with it as paradigm deep anaphora. They provide three tests for the two types:

- only deep anaphora may refer in the absence of a linguistically explicit antecedent.
- only surface anaphora must meet constraints of syntactic parallelism
- only surface anaphora harbors missing antecedents

Figure 6 summarizes and illustrates these distinctions.

5.2 \( \tilde{N} \) Anaphors as Surface Anaphora

It is worth clarifying the term "missing antecedent", since we shall be concerned with the analysis of the phenomenon. For example, the antecedent of the pronoun it is missing in the example from Figure 6, reported below for convenience. In particular, the antecedent cannot be the NP a dog, since that is in the scope of negation and unable to function as antecedent:

\[ (13) \quad \text{"AI didn't buy a dog, but Be did, and it's [big]."} \]

\[ \text{AI didn't buy a dog,} \quad \text{and it's [big].} \]

We wish here to demonstrate that (12), reported here for convenience, contains an example of a "missing antecedent", i.e. a case in which the pronoun them could not have been licensed by the explicit NP several donkeys, but could only be licensed by material "missing" in the anaphor see #.

\[ \text{No farmers who own several donkeys beat them. Few # even sold them.} \]

4.6 Summary of Analysis

We have advanced the analysis of \( \tilde{N} \) anaphors here in the following points:

- generalization of one's anaphor to \( \tilde{N} \) anaphor
- systematization of some of Webber's postulates about "evoked" entities, which are analyzed as the denotations of nongeneral NP's
- discovery and analysis of \( \tilde{N} \) anaphors reusing the parametric contents of N's (12)

\[ (12) \quad \text{No farmers who own several donkeys beat them. Few # even sold them.} \]
5.4 N Anaphora as Deep Anaphora

On the other hand, the indications that N anaphora is deep anaphora were strong enough to lead Hanksamer and S&g to postulate exactly this. The sort of evidence one can marshal to buttress this claim is summarized here:

<table>
<thead>
<tr>
<th>N Anaphora—Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deictic Binding</strong></td>
</tr>
<tr>
<td><strong>Syntactic Parallellism</strong></td>
</tr>
<tr>
<td><strong>Missing Antecedents</strong></td>
</tr>
</tbody>
</table>

The unavailability of missing antecedents in the example in (15) is parallel to their unavailability in the example in note 15, and is likely explained in parallel fashion: parameters must be used to be available for reuse.

But the possibility of deictic binding is absolutely clear. If this is symptomatic of deep anaphora, then some N anaphora is deep. On the other hand, if the ability to harbor missing antecedents is critical, then some N anaphora is surface anaphora.

Since we have no indication that there are two distinct N anaphoric processes, we should make the overall distinction suspect. If there were two N anaphoric processes, we would expect to find subtle differences between them, especially since the N construction is associated with elaborate lexical and syntactic conditions (cf. Hanksamer, Lida, and Ladusaw, 1988). But there is empirical justification—lexical, syntactic, semantic, or pragmatic—for the postulation of distinct constructions. It seems therefore more promising to try a different tack.

5.5 What is the Surface vs. Deep Distinction?

Before attempting to recast the Surface vs. Deep distinction in a way more congenial to the N anaphora facts, it is worth reviewing the grounds for the distinction critically.

The parallelism differences are unconvincing. First, the sort of "syntactic parallelism" which Hanksamer and S&g noted is partially reflected in unattracted semantically. They noted the following pair:

10 "The kids asked to be squirted with the hose, so we did 0.
   The kids asked to be squirted with the hose, so we did it.

The Hanksamer and S&g account of the infelicity of the VP ellipsis example is that it fails to be syntactically parallel—the antecedent is passive, while the anaphor "wants" to be active (to be parallel to the sentential it case). But there is semantic differentiation as well: the passive antecedent is associated with a described content of being squatted, while the anaphor "wants" a content of squatting—and those properties are not identical.17

Second and more generally, the parallelism distinction is too weak given Hanksamer and S&g's characterization of surface anaphora as anaphora with access to syntactic information. If surface and deep anaphora were really distinguished by information resources, and only surface anaphora was allowed access to the syntax module, then we would expect to find syntactic conditioning only surface anaphora, and never on deep anaphora. But nothing of the sort holds. In fact, we find some syntactic conditions on all anaphoric constructions, we must know how paradigmatically "deep", for example, the deject reference condition on VP anaphora seems syntactic (Binding Theory).

Turning to the distinction involving missing antecedents, we note that we have already proposed a purely semantic and nonmodular account of this.

14 Thoroughly counterfactual uses of N anaphora similarly allow missing antecedents:

- We elected Tom president, and we know he'll be a good one.
- We didn't make Tom clerk of a committee, but we made Sue one, and it'll improve under her.

17 The failure of semantic parallelism here may be less important than the fact that the VP ellipsis must be [+EIV] in order to combine with dit, while the passive antecedent is [+EIV], since it contains the passive IV.
Only Anaphors with parametric contents may harbor "missing antecedents". This goes beyond Bankoamer and Sag's GENERALIZATION about missing antecedents to a proposed MECHANISM about how they are interpreted. There probably should be a single mechanism general to account for missing antecedents whether they appear in VP ellipses, or within parametric N's, since, after all, the two interact:

(17) Every small college that has a football field will allow it to be used for frisbee.

but no large university that does will [allow it to be used that way].

Finally, let us consider why some anaphors require linguistic antecedents while others allow deictic binding. Here again, for anaphor is instructive: some N anaphors allow deictic binding (cf. (16)), while others require surface antecedents. To appreciate the latter point, consider how difficult it would be to deictically bind the following null N anaphor to the same content one can nondeictically bind it to:

No farmers who own several donkeys beat them. Few 0 even scold them.

The required explanation should therefore not postulate distinct classes of anaphoric processes (for it should show why N anaphors are really two processes). The required distinction, which must crosscut the surface vs. deep distinction, may be as simple as this:

There are no parametric objects available for deictics.

This formulation does not explain why nonparametric VP contents are unavailable for deictics; this could remain an unexplained restriction on VP ellipsis.

5.6 Semantic Account of Surface vs. Deep Account

Our critical review of the Surface vs. Deep distinction leaves rather little for the distinction to explain. Still, if one wished, one could reinterpret the distinction in the light of our investigation of N anaphors in the following way: Rather than view the surface vs. deep distinction as a distinction in the nodal resources of anaphoric processes, we could view it as a primarily semantic distinction.

(18) Semantics of Surface and Deep Anaphors: Surface anaphors involves parametric semantic contents; deep anaphors involves nonparametric contents.

In this view TENSE ANAPHRORS are surface or deep, not anaphoric processes. N anaphors may be parametric or nonparametric, but that is slight: there is no expectation that a given construction be either deep or surface. This may be the case—there may even be constructions whose contents are NECESSARILY PARAMETRIC: but the definition does not depend on it.

6 Conclusions

The descriptive contributions of this paper have been two: First, we distinguish two readings of N anaphors—the restrained and the unrestrained—and we systematize the account of when these readings are expected: restrained readings are expected for anaphors arising from non-general NPs (which have N's), and unrestrained readings may arise from any N whatever. Second, we show that the semantic content of some restrained N anaphors is provided by any simple set available in discourse, but that parametric objects provide a reasonable account of the required readings.

The theoretical contributions are likewise two: First, we provide further motivation for the use of parametric objects in semantics, following directly on the descriptive accomplishment. Second, we note that N anaphors seem to straddle the well-known deep vs. surface anaphora distinction of Bankoamer and Sag (1970), and we show that, given modifications required for the case of N anaphors, and exploiting the resources of parametric objects, there is a reasonable semantic account of the distinction in terms of nonparametric and parametric semantic objects.

References


18On the other hand, it is at least worth noting that VP contents normally include a parameter (or synonym) for tense. Gawron and Peters do not follow this line, however.
1. INTRODUCTION. One of the most interesting properties of natural languages is the mismatch between semantics and prosody. One illustrative example of such a property comes from the so-called 'clitic climbing' phenomenon (CC, henceforth) evidenced in some Romance languages. Observe the pair of sentences in (1) and (2) from Spanish.

(1) a. Pueden estudiarlo.
   they-can study it
b. Lo pueden estudiar.
   it-they can study
   "They can study it"

(2) a. Están leyéndose.
   they-are reading it
b. Nos lo están leyendo.
   us it-they are reading.
   "They are reading it to us."

Sentences in (1) and (2) illustrate that the clitic lo or the clitic cluster nos lo, which are syntacto-semantically linked to the complement verb in their corresponding sentences, can appear attached not only to this verb (as shown in a-sentences) but also to the matrix verb (as shown in b-sentences) exhibiting the so-called 'clitic climbing' phenomenon.

Previous accounts of CC within generative-transformational grammar involve either a movement rule (Quicoli, 1976), Strozer (1976), Lajman (1980), etc., or a restructuring operation (Riveras, 1977), Rizzi (1978), Concares (1979), etc.).

Within relational grammar, Aissen and Perlmuter (1976) propose a rule of Clause Reduction, analogous to Restructuring. The purpose of this paper is to propose an alternative analysis of CC in Spanish, using a set of syntactic calculi which eliminates altogether the transformational metaphor, i.e., either a movement rule or a restructuring operation. Our analysis is based on the extended categorial grammar as explored in Hoeksema (1989), Moortgat (1983) and Oehrle (1988). The organization of this paper is as follows. Section 2 presents more detailed data. Section 3 gives a quick overview of previous analyses of CC. Section 4 has two parts: (a) A summary of the theoretical framework adopted for the analysis and (b) a description of the Spanish categorial lexicon. Section 5 proposes our alternative analysis of CC, and Section 6 presents some conclusive remarks.

2. DATA. CC is only permitted from non-finite, i.e., infinitival or gerundive, clauses. However, it has been observed that not all verbs that take a non-finite clause complement allow clitics to 'climb' from the complement clause. Observe sentences (3a) and (4b), where the CC from an infinitival clause yields ill-formed strings.

(3) a. Esperan estudiarlo. "They hope to study it"
b. *Lo esperan estudiar.

1 Throughout the paper we will be using the term CC to refer to the syntactic phenomenon as shown in (1b) and (2b), and not the movement as postulated in some studies.
2 Quicoli's and Rizzi's studies are based on Portuguese and Italian, respectively.