

## Definiteness and the Processing of Noun Phrases in Natural Discourse

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### Abstract

Definiteness is commonly seen as the watershed between those noun phrases (NPs) that introduce new referents and those that refer to referents already familiar. Furthermore, for definite NPs, the anaphoric use is taken to be the paradigm case, while other, so-called first-mention uses are regarded as secondary. The aim of the present paper is to challenge this view, and to argue for a more complex picture of the role of definiteness in the processing of NPs.

The paper consists of two parts. The first part presents a corpus-based study of the co-referential properties of definite and indefinite NPs in natural, unrestricted texts. The data bring into light several issues with regard to co-referentiality in unrestricted discourse and the possible referential functions of indefinite and definite NPs. Particular attention is drawn to the fact that the most common function of definite NPs is not anaphoric but different types of first-mention uses. This is the point of departure for the second part of the paper, in which three different approaches to first-mention definites are discussed, and some preliminaries to an alternative model of the processing of first-mention definite NPs are presented.

### 1 INTRODUCTION

In this paper I want to question some assumptions that have commonly been made in recent work on the interpretation of noun phrases (NPs) in discourse; more specifically, with regard to the role of definiteness in text comprehension.

According to one popular view, text comprehension consists of the construction of a **discourse model**, containing among other things a set of **discourse referents** (also called for example 'discourse entities') which represent the things we are talking about. An NP may either introduce a new discourse referent, or else 'refer back' to one already established. Most treatments of noun phrase interpretation attribute a decisive role to definiteness here: it is assumed that indefinite noun phrases, e.g. *a man* in (1) below, trigger the establishment of a new discourse referent in the discourse model, while definite NPs, e.g. *the man* in (1), trigger the search for, or the retrieval of, a suitable prior discourse referent:

(1a) A man entered a pub.

(1b) The man ordered a beer.

Although it is often acknowledged that there are definite NPs that refer to entities that have not been introduced by another NP in the preceding text, such **first-mention** cases tend to be treated as in some sense secondary relative to the anaphoric use of definite NPs, or even as deviations from the norm. In line with this, it is often implicitly or explicitly assumed that the understanding of first-mention NPs involves additional or more difficult processing than anaphoric definites.<sup>1</sup>

As an illustration of this view, we may take Heim's idea of 'file card semantics'. In Heim (1982: 276), the processes triggered by indefinite and definite NPs are described metaphorically as follows:

For every indefinite, start a new card; for every definite, update a suitable old card.

The cards here correspond to discourse referents in the discourse model, referred to as 'the file'. If for some definite NP no old card can be found, an accommodation process is started which is described as

an adjustment of the file that is triggered by a *violation* of a felicity condition and consists of adding to the file enough information to *remedy* the infelicity (*ibid.*: 371 f., my italics)

This accommodation process is assumed to apply uniformly to all first-mention definites.

In psycholinguistic literature (e.g. Clark & Haviland 1977; cf. note 1), the processing of first-mention definite NPs has sometimes been described as a 'bridging inference', potentially time-consuming and giving rise to processing difficulty. In an analogous way, computer algorithms for definite NP resolution (e.g. Sidner 1979; Carter 1987; but cf. Bosch & Geurts 1989<sup>2</sup>) always contain a search for an antecedent match as their first step. Other alternatives are considered only after the search has failed. Although it is not clear what such a rule ordering should be taken to imply in terms of processing assumptions, the idea that first-mention NPs are more difficult to process is discernible. This is illustrated in the following quotation from Sidner's discussion of the judgements involved in the interpretation of such NPs:

Perhaps because there is additional processing time associated with these judgements, it is not possible to extend the judgements to the focus stack. (*ibid.*: 112)

Commenting on the text in (1) above, Bosch & Geurts (1989) ask: 'Why should there be a problem of finding referents for definite NPs and not for indefinite NPs?'

The question is legitimate, but I think it carries a more fundamental implication than Bosch and Geurts seem to be aware of, judging from their answer that this is part of the understanding of the definite NP: instead of taking for granted that NPs are processed in the way they mention, we should, in my opinion, question the assumptions that (i) definiteness is the primary deter-

minant in the NP interpretation process, and (ii) first-mention uses of definite NPs are secondary relative to anaphoric uses. In the following section, I will argue for this by providing some data obtained in a corpus-based study of noun phrases in unrestricted texts. I will subsequently deal with the theoretical issues involved.

## 1 A STUDY OF NPs IN UNRESTRICTED TEXT

The empirical basis for theories of definiteness is commonly confined to illustrative examples from relatively short and, often, constructed texts. The aim of the study to be presented here was thus to provide a richer empirical background for analyses of definite and indefinite NP interpretation. In particular, the investigation focused on (i) the distribution of definite and indefinite NPs with regard to their different possible uses, and (ii) the properties of those uses of definite and indefinite NPs that diverge from the alleged paradigm.

### 2.1 *Sample and classifications*

#### 2.1.1 The corpus

The corpus consists of eleven texts arbitrarily chosen from a larger corpus of professional, non-fiction, written Swedish prose.<sup>3</sup> The texts are taken from four different sources: brochures (informative), newspapers (articles), textbooks, and debate books. The total number of words is 10,355, evenly distributed between the four text types. My main reason for choosing to work with this corpus is that it is the only larger corpus of Swedish natural text which is tagged with lexical, morphological, and syntactic information. Tagged corpora are a necessary prerequisite for doing more extensive quantitative text studies on phenomena that are not restricted to word occurrences. Manual analysis is slow and inefficient, and this restricts the amount of data that can be sampled within a reasonable amount of time. And, perhaps more importantly, the human analyser will always overlook some occurrences of the categories searched for, which decreases the reliability of the results. Furthermore, if we want to make explicit exactly what kinds of information (morphological, syntactic, semantic, pragmatic) have to be used in order to identify a certain phenomenon, it seems a good idea to let the computer do as much as possible on the (well specified) information given in the corpus, and then do the rest manually. In this study I first let the computer do the main part of the work of picking out and classifying all occurrences of NPs by means of an algorithm based on the morphological

and syntactic properties of the Swedish noun phrase. An analysis of the co-referential relations between those NPs was then conducted manually.

### 2.1.2 Formal classes of NPs

The total sample contains 3,877 occurrences of constituents which were identified as NPs or, sometimes, only 'potential' NPs (see below) on the basis of morphological and syntactic criteria. These were classified as, for example, definite or indefinite NPs of different sub-types, with regard to the internal properties of the NPs (type of head, determiners, and modifiers). The principle behind the classification was to try to cover all possible structural sub-types of Swedish NPs that could be supposed to differ from other structural types with regard to definiteness and/or referential properties. In all there were 18 such formally defined sub-classes of NPs, which can be fused into different major classes for different purposes of study. Here it will suffice to mention a few major classes. The distribution of NPs over these classes is shown in Table 1.

For the reader who is not familiar with Swedish, it should be mentioned that this language has an enclitic definite article in the form of a definite suffix, *-(e)n / -(e)t*, on the head noun of the NP, e.g. *bilen* (*the car*). In addition, there is a preposed definite article, *den / det*, which is used mainly when there is an adjectival modifier, and which occurs together with the definite head, e.g. *den röda bilen* (*the red car*). A noun determined by a demonstrative or possessive pronoun or a genitive noun is non-inflected, e.g. *denna/min/mannens bil* (*this/my/the man's car*).

Thus, in the following, the term definite/indefinite **noun** should be taken to refer to the formal property of having an enclitic definite article or not. A **definite NP**, on the other hand, need not necessarily have a definite head noun, but may be rendered definite by its determiners or consist of a definite pronoun. Since this study will focus on the clear cases of full definite NPs, namely those with a definite head noun, I will not dwell here upon the controversial issue of which particular determiners make an NP with an indefinite head noun definite. In the few cases where I need to refer to the whole class of definite NPs (e.g. in Table 6), I follow Teleman's (1969) four criteria for distinguishing between definite and indefinite determiners, one being that only indefinite NPs can be the proper subject of a sentence with a formal subject (cf. there-insertion in English).<sup>4</sup>

The classes in Table 1 are defined as follows (the figures within parentheses are the number of NP occurrences belonging to each sub-class of the major class): **indefinite NPs with an indefinite head noun** consist of all full (lexical) NPs that are syntactically indefinite, with or without an indefinite article. **Definite NPs with a definite head noun** constitute a sub-class of full definite NPs. It contains those definite NPs that contain a head in the form

Table 1 Major classes of NPs in the total sample

	Count	%
Indefinite NP with an indefinite head noun	1224	31.6
Definite NP with a definite head noun	745	19.2
Other full NP	465	12.0
Pronominal NP	876	22.6
NP with an elliptical head	56	1.4
Potential NP	277	7.1
Coordinate NP	234	6.0
Total	3877	100.0

of a definite noun. **Other full NPs** consist of those with an indefinite head noun determined by a genitive/possessive determiner (171), a demonstrative pronoun (57), a totality pronoun (*all*, *every*) (57), a preposed definite article (in Swedish grammar called 'determinative' pronoun) (30), or a pronoun-like definite determiner (13); NPs with an adjectival head and a preposed definite article (13); proper noun NPs (104); and a rest class (20). Depending on the preferred definition of 'definite NP', some or all of these sub-classes of NPs can be analysed as definite or, at least, non-indefinite (cf. the remark above and note 4). **Pronominal NPs** are those with a pronoun head. The largest sub-classes were reflexive and other syntactically bound pronouns (281), definite third person pronouns (172), and a diverse group of other pronouns consisting mainly of first and second person pronouns (281). **Elliptical NPs** are those with indefinite or definite determiners and/or modifiers but no head (of which 21 were definite and 35 were indefinite). **Potential NPs** consist of constituents that could not be identified as NPs or non-NPs on the basis of morphological and syntactic criteria alone, but where the decision depends on semantic properties. These are constituents which (i) have a non-nominal head (adjective, participle or count word) and no determiners or modifiers, and (ii) occur in certain syntactic positions such as predicate complement, postposed nominal modifier or adverbial. As shown by examples such as:

(2) En riskgrupp är *gamla*. De . . .

/One risk group is *old* (people) (lit.: old + PLURAL). *They* . . . /

it is not possible to categorically exclude constituents with these properties as non-NPs. When manually analysed, 24 of these were found to be actual NPs and 253 to be adjective phrases and other non-NPs. **Coordinate NPs**, finally, are those containing more than one head, i.e. NPs composed of two or more coordinated NPs.

The present study focuses on the first two classes in Table 1, in the following called **indefNPs** and **defNPs**. This sub-sample, constituting about half of the total sample, thus contains most of the full NPs, with some exceptions that will be explained here.

My motivation for not including **other full NPs** in a larger class of 'definite NPs' was that I wanted to direct my attention to the well-defined sub-class of definite NPs with a definite head whose co-referential properties are least predictable. Among the excluded classes of full (definite) NPs, those with a demonstrative determiner are almost exclusively anaphoric, while the other classes are all good candidates for being first-mention uses (cf. 2.2.2.1 below).

**Coordinate NPs** were excluded partly because they pose difficult problems for a computational analysis and partly on the basis of semantic considerations. First of all, co-ordinate NPs can be structurally ambiguous as regards the scope of determiners and modifiers. Secondly, the semantic and referential properties of co-ordinate NPs sometimes differ from their non-co-ordinate counterparts.<sup>5</sup> The complexities involved in the processing of co-ordinate NP fall outside the scope of the present study. Thus, the co-ordinate NPs, as well as the single NPs being co-ordinated (583), have been excluded from the sub-samples of defNPs or indefNPs, and have only been taken into consideration in the manual analysis of the co-referential properties of these sub-samples.

### 2.1.3 Classification according to co-referential properties

In order to get an estimate of the distribution of defNPs and indefNPs with different discourse functions, the NP occurrences were classified with respect to whether they were preceded or followed by any co-referential NPs. Since one of the points of the present paper is that the role of co-referentiality in natural discourse has been somewhat over-estimated, a fairly generous concept of co-referentiality has been adopted in order not to 'strengthen' the argument on the basis of what could be considered doubtful evidence. Thus, anything that could possibly count as a co-reference relation between two NPs was included in the count. 'Co-referent NPs' is used as a cover term for NPs that either refer to the same referent, co-extensional NPs, or to the same concept, co-intensional NPs.

In the study of co-referential properties of indefNPs and defNPs, the total sample of NPs had to be taken into consideration. This was necessary because, for example, a defNP may have an antecedent which does not belong to the sub-samples of defNPs and indefNPs. Thus, all NPs were (manually) supplied with information regarding their participation in co-referential chains. This was done in the following, rather 'mechanical' way:

- (i) if there is one or more NPs in the *preceding* text with which the NP is co-referential, the NP is indexed by a reference to the last preceding co-referential NP and classified as a **subsequent mention**;
- (ii) or, if there is one or more NPs in the *following* text with which the NP is co-referential, it is marked as being the first in a co-referential chain and classified as **initial mention**;
- (iii) or, if the NP is a potential subsequent or initial mention but does not have any co-referential links to other NPs in the text, it is classified as an **isolated mention**.

This classification leaves a rest class of **other** occurrences ( $n = 692$ ) including non-NPs and clear cases of NPs that could be neither initial- nor subsequent-mentions.<sup>6</sup> The NPs classified as initial mention and isolated mention NPs (ii-iii) will be collectively referred to as **first mention** NPs.

The methodological assumption behind this classification was that the properties of an NP with respect to its co-referentiality with other NPs in the text can be seen as an approximate measure of the particular aspect of its referential function that has been associated with 'typical' indefinite and definite NPs, namely whether it introduces or refers back to a discourse referent, respectively. Thus, (i) the number of first mentions represents the upper bound of NP occurrences that could be taken to introduce a discourse referent, and (ii) the number of subsequent-mentions represents the upper bound of anaphoric NP occurrences.<sup>7</sup> This approximativity does not constitute a major problem in the present context, since the primary concern in this paper are the occurrences of first-mention defNPs, which are clearly identifiable by lacking an antecedent.

## 2.2 Results

The distributions of defNPs, indefNPs, and other NPs into initial, isolated, and subsequent mentions are presented in Table 2, and will be commented on further in the following sub-sections.

The examples from the corpus are given in English translation with additional information on literal meaning when necessary.

### 2.2.1 IndefNPs

#### 2.2.1.1 First-mention indefNPs

For 115, or about 9.4%, of the indefNPs the subsequent text contained at least one co-referential NP (cf. Table 2). It is interesting to note that these initial-mention indefNPs constitute no more than 34.8% of *all* initial-mention NPs,

Table 2 Distribution of indefNPs, defNPs, and other classes of NPs over initial, isolated, and subsequent mention

Count				
Row percentage				
Column percentage				
Total percentage	IndefNPs	DefNPs	Other	Row total
Initial-mention	115	89	126	330
	34.8	27.0	38.2	100.0
	9.4	11.9	6.6	-
	2.9	2.3	3.3	8.5
Isolated-mention	929	365	585	1879
	49.4	19.4	31.1	100.0
	75.9	49.0	30.7	-
	24.0	9.4	15.0	51.8
Subsequent-mention	101	269	606	976
	10.3	27.8	62.1	100.0
	8.3	36.1	31.8	-
	2.6	6.9	15.6	22.8
Other	79	22	591	692
	11.0	3.2	85.4	100.0
	6.5	3.0	31.0	-
	2.0	0.6	15.2	17.8
Column total	1224	745	1908	3877
	-	-	-	-
	100.0	100.0	100.0	100.0
	31.6	19.2	49.2	100.0

while as much as 27.0% of the latter were defNPs. In addition, it should be mentioned that if the other full definite NPs are also taken into account (cf. section 2.1.2), 41% of all initial-mention NPs are full definite NP.

Furthermore, the status of the discourse referents established by initial-mention NPs may differ considerably. On the one hand, there are introductions of discourse referents that will play a significant role in the discourse. On the other, there are introductions of what we, with an extension of a term from Karttunen (1976), might call 'short-term' referents. These differences are partly reflected in the number of subsequent-mentions and the scope of the initial-mention NP, i.e. the number of co-referential NPs in the subsequent text (cf. Table 3) and the number of sentences from the first to the last co-referent NP (cf. Table 4). For the sake of comparison, the corresponding figures for defNPs are also presented.



Table 3 Distribution of indefNPs and defNPs according to number of subsequent mentions

Number of subsequent mentions	IndefNPs			DefNPs		
	Count	%	Cum. %	Count	%	Cum. %
1	64	55.6	55.6	56	61.5	61.5
2	22	19.1	74.8	14	15.4	76.9
3	10	8.7	83.5	12	13.2	90.1
4	2	1.7	85.2	3	3.3	93.4
5-27	17	14.8	100.0	6	6.6	100.0
Total	115	100.0	100.0	91	100.0	100.0

Table 4 Distribution of indefNPs and defNPs according to scope (where the last subsequent mention occurs in: 0 = the same clause, 1 = the same sentence, 2 = the following sentence, 3 = the 2nd following sentence, etc.)

Scope	IndefNPs			DefNPs		
	Count	%	Cum. %	Count	%	Cum. %
0	4	3.5	3.5	6	6.6	6.6
1	13	11.3	14.8	9	9.9	16.5
2	34	29.6	44.3	24	26.4	42.9
3	13	11.3	55.7	6	6.6	49.5
4	7	6.1	61.7	3	3.3	52.7
5-10	23	20.0	81.7	21	23.1	75.8
11-66	21	18.3	100.0	22	24.2	100.0
Total	115	100.0	100.0	91	100.0	100.0

Given these measures, we see that most initial-mention indefNPs only introduce short-term referents. For example, more than half of the initial-mention indefNPs have only one subsequent mention, and about three-quarters of them have no more than two. And the scope of more than half of the initial-mention indefNPs does not exceed the second following sentence.

Since it was not deemed possible to formulate any absolute syntactic and/or lexical criteria for excluding indefNPs that could not even potentially be antecedents of a following anaphor (cf. note 6), such an analysis had to be done manually by looking at each NP. The clearest cases of 'impossible-antecedent' indefNPs in the present sample are those occurring in certain idiomatic expressions. In a handful of other cases the borderline was hard to draw, but it is nevertheless clear that the overwhelming majority of indefNPs must be

considered *potential* introductions in the sense that they could be referred back to by an anaphoric pronoun or definite NP. As seen in Table 2, most (75.9%) of the indefNPs were isolated-mentions, i.e. what can be described as potential but not actual introductions.

Thus, from the point of view of modelling NP processing, one major problem with indefinites is the discrepancy between, on the one hand, the vast number of entities that the text makes available for anaphoric reference and, on the other, the small number of entities actually referred back to. In connection with anaphor resolution, it is often suggested that the syntactic position of an NP determines its ranking among possible antecedents. The most popular candidate for signalling the introduction of a new discourse referent is maybe the proper subject NP of 'there-insertion' sentences (e.g. Sidner 1979). The present sample of indefNPs contains 27 proper subjects in the Swedish equivalent to there-insertion sentences. Only one of these NPs was actually referred back to later in the text, however.

### 2.2.1.2 Subsequent-mention indefNPs

A quite substantial number of indefNPs (101, or 8.3%), referred to something that had already been mentioned in the preceding text.

A smaller number of these were similar to some cases already familiar from discussions of (in)definiteness. Here only a brief mention of some of the relevant literature will be given.

Ushie (1986) provides an interesting analysis of subsequent-mention indefinite NPs, which 'serves to present an already identified referent in a new light and from a different perspective', a use which is quite common especially in narratives. Wald (1983) presents some examples of co-referential indefinite NPs from oral discourse, where 'the inanimate specific referents are reintroduced as if they were new', a function of indefinite NPs which he shows to be highly dependent on the discourse structure. In her attempt at establishing a functional taxonomy of givenness, Prince (1981) also touches upon a closely connected problem, although in her study it turns up with definite NPs. She discusses subsequent-mentions of referents that have been 'introduced' by NPs in 'capsule statements' or 'abstracts'. These NPs, she says, are 'ambiguous as to whether they represent Evoked or Inferrable entities', which, in our terms, is synonymous with whether they should be interpreted in relation to the first mention or independently of that. In the present study of written texts, indefNPs, as well as defNPs, presenting the same problems as those discussed by Wald and Prince, turn up as subsequent-mentions of referents that have already been mentioned in headlines or preambles of, for example, newspaper articles.

Most of the subsequent-mention indefNPs in the present study were *generic* NPs. Thus the relatively large number of subsequent-mention indefNPs is

mainly due to the general high frequency of generic NPs in the texts, a feature which is quite common in many types of non-fiction prose, for example:

- (3) Psychiatry is the science of psychical disturbances . . . On the whole, the human mind, with its complexity and sensitivity, is exposed to many kinds of strains, and *psychical pains* are also very common. The science which is concerned with *these* is psychiatry . . . As has earlier been emphasized, *psychical disturbances* can emerge from external strains . . . In some cases *psychical disorders* may emerge without there being any external cause to be found.

As far as I know, the problem of how to treat 'chains' of co-referential generic NPs has not been discussed in the literature on anaphora. One might of course choose to regard these syntactically indefinite NPs as semantically definite, due to their genericity. But this does not provide an immediate solution to the problems of (i) how to recognize that a particular indefNP is generic and thus potentially co-referent with a preceding one,<sup>8</sup> and (ii) how to model the interpretation of such instances of indefNPs. It should also be noted that the latter problem also turns up with definite subsequent-mention generic NPs.

For the moment, it cannot be excluded that certain occurrences of indefinite NPs are anaphoric in the sense that the interpretation of the NP involves the identification of an already established discourse referent. Consider the following case of generic indefinites. One of the texts in the corpus is from the year when the zip code was introduced in Sweden. The first mention of the zip code could thus be seen as an instruction to the reader to establish a new, generic discourse referent, which is then subsequently referred to by definite as well as indefinite generic NPs.

## 2.2.2 DefNPs

### 2.2.2.1 First-mention defNPs

Of the 745 defNPs in the present sample, as many as 454 (89 + 365), or 60.9%, turned out to be initial or isolated mentions, i.e. first-mention uses.

This large number of defNPs constitutes a syntactically and semantically diverse class of defNPs, which have up till now merely been defined in the negative sense of not allowing anaphoric reference due to the 'lack' of an antecedent. In order to get a picture of the frequencies of different types, it would thus be desirable to make a functional sub-classification of the first-mention defNPs in the sample, according to, for example, Hawkins' (1978) criteria for distinguishing between different uses of definites. However, such a classification raises a number of methodological and theoretical problems. A qualitative analysis of the present first-mention data was instead taken as a

point of departure for some considerations regarding the characterization of the differences among first-mention definites, which I will return to in section 3.

Here we will instead take a look at the syntactic complexity of the defNPs, which at least gives a hint about one difference in the ways defNPs can be interpreted. Common to many first-mention definites is that the definite NP is interpreted by means of *relating* the referent to, for example, another referent. One difference among first-mention defNPs that might be assumed to have processual implications is whether the defNP contains a mention of such a referent, in other words, whether the relation is explicit in the defNP. The typical way of *explicitly* signalling the relation is by using a genitive/possessive construction of the form 'the X's Y' or 'the Y of X' (cf. Brodda 1975; Fraurud 1986). As already mentioned, this was also one reason for excluding from the main study the sub-class of NPs with a preposed genitive/possessive modifier, which accordingly were predicted to occur more often as first-mentions, a prediction which turned out to be correct; 85% of the genitive NPs were first-mentions. But a relation to another referent may also be explicitly signalled by other types of modifiers, such as postposed prepositional phrases or (less commonly) restrictive adjectival modifiers. If most of the first-mentioned defNPs were of this 'self-contained' type, this would be reflected in the overall syntactic complexity of defNPs.

In order to get an approximate estimate of the frequency of defNPs where this possibility is at hand, the number of defNPs consisting of a single definite noun (a noun with the enclitic definite article) was computed, as was the number of those containing any kind of modifiers, here referred to as **simple** and **complex defNPs**, respectively (cf. Table 5).

If we consider the possible role that certain modifiers may play in the interpretation of defNPs, it might be expected that complex defNPs are more often used as first- than as subsequent-mentions. This also turns out to be the case. Looking at the column percentages, we see that 75.1% of the complex defNPs are first-mentions.

In general, however, simple defNPs are more common than complex ones. And, as shown by the row percentages for first-mention defNPs, a considerable number of them (58.8%) are simple. It is interesting to note that for a large part (36%) of *all* defNP occurrences, the interpretation appeared to involve a relation to contextual elements outside the defNP itself.

#### 2.2.2.2 Subsequent-mention defNPs

A little more than a third of all defNPs (269, or 36.1%) were considered to be co-referent with a NP in the preceding text. Of these 217, or 80.7%, were simple defNPs (cf. Table 5).

That a NP is co-referent with another NP in the preceding text does not

Table 5 Distribution of simple and complex defNPs over first- and subsequent-mention defNPs

Count			
Row percentage			
Column percentage	Simple	Complex	Row total
First-mention	267	187	454
	58.8	41.2	100.0
	53.8	75.1	—
Subsequent-mention	217	52	269
	80.7	19.3	100.0
	46.3	20.9	—
Other	12	10	22
	54.4	45.5	100.0
	2.4	4.0	—
Column total	496	249	745
	66.6	33.4	100.0
	—	—	—

mean that it is necessarily anaphoric (cf. note 7). For the lack of a strict definition of anaphoricity, let us tentatively characterize an anaphoric NP as one that in some sense *relies* on a previous NP. In other words, the interpretation of an anaphor would necessarily involve an identification of a discourse referent in the discourse model which has been introduced by a previous mention. Obviously, this loose definition of anaphora does not provide us with any operational criteria for classifying all occurrences of subsequent-mention defNPs as anaphors and non-anaphors. But in order to get some idea of the proportion of defNPs that seem to 'rely' on a previous mention, we may look at the types of initial-mention NPs of the co-referential chains in which the subsequent-mention defNPs occur (cf. Table 6).

The best candidates for being 'true' anaphoric defNPs are those occurring in a referential chain initiated by an indefinite NP. Of the subsequent-mention defNPs, 114, or 42.4% were of this type. A slightly higher percentage of the subsequent-mention defNPs, 155, or 57.6%, have a definite initial-mention NP, and quite often the defNP is even identical to this initial-mention. Since the initial-mention definite NPs in these cases must be interpretable without a previous mention, it might be assumed that the subsequent-mention defNPs in principle are, too. This would imply that they do not rely on the previous mention, in the narrow sense of being 'uninterpretable' without this initial-mention.

But if we take reliance of previous mention in a broader sense, the situation

Table 6 Distribution according to types of initial-mention NP for subsequent-mention defNPs

Type of initial-mention NP	Count	%	Count	%
Indefinite NP	114	42.4		
Definite NP	155	57.6		
Identical defNP			53	19.7
Non-identical simple defNP			27	10.0
Non-identical complex defNP			35	13.0
Other definite NP			40	14.9
Total	269	100.0		

will be somewhat different. One factor that seems to play a role in our intuitive judgements about the relatedness of two co-referent NPs is the distance between them. Table 7 shows the distance, measured in sentences, between the subsequent-mention defNP and the last preceding mention.

We see that most of the subsequent-mention defNPs occur at a short distance from their last preceding co-referent NP, which might be taken as a

Table 7 Distribution of subsequent-mention defNPs according to distance from last mention (where the last preceding mention occurs in: 0 – the same clause, 1 – the same sentence, 2 – the preceding sentence, 3 – the next preceding sentence, etc.)

Distance	Count	%	Cum. %
0	2	0.7	0.7
1	20	7.4	8.2
2	103	38.3	46.5
3	36	13.4	59.9
4	21	7.8	67.7
5	20	7.4	75.1
6	9	3.4	78.4
7	12	4.5	82.9
8	5	1.9	84.8
9	4	1.5	86.2
10–19	26	9.7	96.3
20–29	7	2.6	98.9
30–65	4	1.5	100.0
Total	269	100.0	100.0

sign of relatedness in the broader sense. But a quite substantial number of the subsequent-mention defNPs can be found further away.

If two co-referent NPs occur at a considerable distance from each other in the text, and if the establishment of a link between the two NPs is essential to the understanding of the discourse, the second occurrence can be regarded as a (proper) **re-introduction** of the same discourse referent. Re-introductions are sometimes signalled explicitly by a non-restrictive relative clause or adjectival modifier; cf. the co-referential chain in (4).

- (4) Sentence no.: NP:  
 257: ... the, subduing, sedatives ...  
       (I sentence)  
 259: ... them ...  
       (64 sentences)  
 324: ... the earlier mentioned sedatives ...

This example was, however, the only instance of explicit re-introduction found among the 'long-distance' subsequent-mention defNPs in the present sample.

A more conclusive discussion of co-referentiality and anaphoricity has to be postponed to a later occasion, one important reason being that our empirical knowledge of co-referentiality in natural discourse is still very limited. For the moment, it will suffice to conclude that the number of defNPs that can be regarded as anaphoric is probably even less than was indicated by the 36.1% subsequent-mention defNPs.

### 2.2.3 Summary

The statistical data in the present study can be summarized as follows. First, only about one-third of all defNPs are subsequent-mentions, and probably even fewer should be considered actual anaphors. In addition, about one-tenth of the *indefNPs* are subsequent-mentions, some of which may possibly be regarded as anaphoric. Second, only one-tenth of all *indefNPs* are actual introductions in the sense of introducing a discourse referent which is subsequently referred to, and most of these have a very short scope. Furthermore, these initial-mention *indefNPs* represent no more than about one-third of *all* initial-mention NPs. Finally, as much as one-third of the *indefNPs* and half of the defNPs were isolated mentions. Taken together, I think that these statistics presents us with a complex picture of the role of definiteness and co-referentiality in natural text, although the methodological and theoretical issues raised in the evaluation of this kind of data deserves further attention.

With regard to indefinite NPs and subsequent-mention definite NPs, I have here had to confine myself to mentioning some observations and problems

which may be taken as a point of departure for further empirical investigations and theoretical discussion.

In the case of definite NPs, I think the least one can say is that the claim that the anaphoric use of definite NPs is primary and the first-mention uses secondary is not substantiated by the data in this study. If one would still like to maintain this claim, one has to account for why the alleged secondary function is the most common one.

### 3 THE PROCESSING OF FIRST-MENTION DEFINITE NPs

On the basis of the statistical data on first-mention defNPs presented above, and a further examination of the sub-sample of first-mention defNPs, two main conclusions were drawn. First, the fact that the most common uses of definite NPs are first-mention uses motivates a search for an alternative to the traditional anaphora based accounts of the role of definiteness in the processing of NPs.

Second, a closer look at the first-mention definites shows that, besides being very frequent, they differ in a number of ways which cannot be described adequately in terms of discrete types, but call for a more flexible description of the information and processes involved.

I start with a discussion of three contributions within the field of definiteness in which an ambition to take the first-mention definites more seriously can be traced. The discussion is confined to some features of these theories that are relevant in the present context. Then I attempt to develop some tools for describing the differences among first-mention definites with regard to the information and processes possibly involved in their interpretation.

#### 3.1 Löbner's functional theory of definiteness

An important contribution to the search for an alternative to the anaphora based theories of definiteness is presented by Löbner (1985), who suggests a radically different approach. Instead of taking anaphoric definites as the paradigm case and extending the analysis to other cases, he takes certain (possible) first-mention uses as the point of departure for a general theory of definiteness. Löbner's paradigm cases are those where the definite article, as it were, is necessary for semantic reasons. Nouns like *father*, he argues, in a sense *require* the definite article, e.g. *the father (of Mary)*, and can be used with a possessive determiner, e.g. *her father*, whereas other nouns, like *man*, are more often used with an indefinite article and seldom occur with a possessive, e.g. *?her man*.



Löbner distinguishes three semantic subclasses of nouns or concepts. **Sortal** nouns, e.g. *man*, only classifies objects. **Relational** nouns, e.g. *son*, describes objects as standing in a certain relation to other objects. **Functional** nouns, e.g. *husband*, are a sub-class of relational nouns which relates objects unambiguously to others. Löbner claims that the meaning of the definite article is that the head noun of the definite NP is to be interpreted as a functional concept. The relation that defines the reference of a functional concept is a (partial) function, which relates the object unambiguously to another object. In short, a definite NP is interpreted as a **function** with **arguments** determining the reference of the NP.

Furthermore, Löbner distinguishes between **semantic** and **pragmatic** definites. Semantic definites are functional concepts which are interpreted 'independently of the immediate situation or context of utterance'. Pragmatic definites include anaphoric and deictic definite NPs. Löbner claims that his functional theory can be extended so as to also cover the pragmatic definites. However, there would seem to be no straightforward solution to the problem of how a proper treatment of anaphora could be integrated into a functional theory of definiteness (cf. below, section 3.4).

Here I will focus on some aspects of Löbner's analysis of the so-called semantic definites and, in particular, on the distinction between sortal and (functional or non-functional) relational nouns. It should be noted that a functional interpretation is not confined to occurrences of functional nouns, e.g. *the clutch* (of a car), but also applies to cases of *plural* definite NPs containing a non-functional relational noun, e.g. *the tyres* (of a car).

In some cases, 'being relational' can correctly be described as an inherent semantic property of the *noun*. For example, *mother* belongs to a class of nouns that have traditionally been called relational and that take obligatory arguments as part of their definition; a mother is always the mother of *someone*. This is particularly clear when we have a sortal:relational pair of nouns which can denote the same person or object, e.g. *woman* : *mother*. There are, however, few objects in the world for which such alternative perspectives are encoded in language, that is, for which there is a choice of noun carrying either a relational or a sortal reference to an entity. Other nouns that often have an inherent relational meaning are verbal abstracts (nominalizations), which carry over the arguments of the verb. When considering a number of other nouns, however, it seems more problematic to assume that all nouns can be semantically classified as being either sortal, relational, or functional. Löbner also recognizes that many nouns are 'ambivalent' in that they can be used either as sortal or relational concepts. He illustrates this by an example where the definite NP *my table* is used to refer to an orange box used as a table, i.e. to an object which is not classified by the noun but whose function is defined by the noun. The possibility of a relational interpretation of 'sortal' nouns is, however, quite

common and not restricted to cases where the referent of a definite NP, *the X*, is a non-typical X functioning as an X. Most NPs that receive a relational interpretation do so because of properties of the objects they are commonly used to refer to. A door, for example, is usually *the door* of a house or the like. But, in the (less common) context of a carpentry shop selling doors, it is possible to talk about a door as an unconnected object.

Thus, while we can analyse **occurrences** of nouns as having either a relational or sortal interpretation, for most nouns in the lexicon these terms do not describe a discrete distinction. In terms of lexico-encyclopaedic knowledge connected to **nouns**, I think we should view it as a tendency among language users to (think and) talk about objects in the world as being more or less closely tied to other objects in the world. That is, the distinction reflects our structuring of the world.

Most of the concepts that we intuitively conceive of as relational are so by pragmatic reasons rather than semantic. And these are relational only by default, i.e. if nothing else is indicated by the context. They denote objects that *usually* belong to or in some other way are related to other objects or situations. Let us now turn to the issue of the arguments of such nouns, which for the sake of discussion, I will talk about as inherently relational.

Inherently relational nouns may take one or more arguments. What are the characteristics of these arguments? Löbner considers two qualitatively different types of arguments: **situations** and **objects**. The situational argument corresponds to what in possible world semantics would be called a possible world index. It is an obligatory (often implicit) argument of all functional concepts. Löbner's motivation for distinguishing situational arguments from object arguments is that almost all functional concepts relate to at least some components of the situation. Exceptions are, for example, mathematical concepts like *the product of two and four*. But since it is often difficult to categorically determine just which elements of the situation are involved in a certain functional concept, Löbner chooses to assume a situational argument in all functional concepts 'in case it may be needed'. In addition to the situational argument, a functional concept can have one or (less commonly) two object arguments which may be explicit or implicit. According to the number of arguments, Löbner differentiates between functional concepts with only a situational argument, FC1s, and those that in addition also have object arguments, FC2s or FC3s, for example:

- (5) FC1: the weather (in England)  
 FC2: the Prime Minister (of Britain . . .)  
 FC3: the distance (between A and B . . .)

But how are we, in each particular case of a functional concept, to distinguish between situational and object arguments and determine the

number and types of arguments? One possibility is to study whether a difference between situation and object arguments is reflected in language. Löbner suggests that an argument for treating *the weather* as an FC1, in contrast to the FC2 *the Prime Minister*, would be the way their arguments are specified when explicitly provided, cf.

- (6a) the Prime Minister of Britain  
 the Prime Minister ??in Britain  
 (6b) the weather ??of England  
 the weather in England

A possessive construction is preferred for the **object** argument *Britain*, denoting a state, whereas a locative construction is chosen for the **situation** argument *England*, denoting a location. But the evaluation of such structural preferences is complicated by the fact that they are partly language-specific. In Turkish, for example, the 'situational' argument of *the weather* would be provided by a genitive rather than by a locative attribute (which in Turkish is a preposed noun with a locative suffix plus the suffix *-ki* signalling that the noun is a modifier). Consider the Turkish equivalents of (6a-b):

- (6a') Britanya'nin başbakanı /Britain + GENITIVE Prime Minister + POSSESSIVE/  
 ??Britanya'daki başbakan /Britain + LOCATIVE + 'ki' Prime Minister/  
 (6b') İngiltere'nin havası /England + GENITIVE weather + POSSESSIVE/  
 ??İngiltere'deki hava /England + LOCATIVE + 'ki' weather/

In other cases, the locative construction would be preferred, just like in English, cf.

- (7a) ??İngiltere'nin gelişmeleri  
 /England + GENITIVE developments + POSSESSIVE: 'the developments of England'/  
 (7b) İngiltere'deki gelişmeler  
 /England + LOCATIVE + 'ki' development: 'the developments in England'/

Thus, one and the same argument can be treated differently by different languages. As also suggested in 2.2.1.1, the genitive construction may be seen as the paradigm case for explicitly signalling a relation between two objects. But it cannot be taken as an absolute criterion for distinguishing between different types of arguments. Rather than a binary distinction between object and situation arguments, there seems to be a scale along which different languages draw different borderlines. At the one end of the scale there are arguments specifying a 'possessor' of the referent, and at the other, arguments that specify the location of the referent. Thus, there does not seem to be any principled way

to distinguish between arguments that are themselves objects and those that are components of a situation.

Furthermore, the *number* of relevant arguments is not determined only on the basis of the definite NP itself, but sometimes also depends on contextual factors. A definite NP such as *the dream to become rich*, which Löbner regards as a FCI, may take additional specific arguments in certain contexts. Consider the Swedish example:

- (8) *Drömmen om att bli rik* fick John att arbeta dag och natt.  
/The dream to become rich kept John working day and night./

In order to understand the causality expressed in this sentence, the definite NP must be interpreted as '*John's dream to become rich*' and not only as a generic unrelated concept. This interaction between properties of the NP and the context in determining the number and types of arguments is also seen in the way a noun like *door*, as mentioned above, in some contexts may be interpreted as a sortal concept and in others as a relational concept. A special case of this is seen in the generic use of inherently sortal nouns. In a generic context a definite NP, such as *the woman*, may very well take restricting arguments of time/place, e.g. *the woman of Sweden today*.

In conclusion, Löbner's theory is an interesting contribution to the discussion of first-mention definites in two important respects. First, in the perspective of modelling the processing of definite NPs, I think that the main insight to be gained from his functional approach is that we should direct our attention to the role of relationality in the interpretation process. In this connection, there are two senses of relational that should not be confused. A **noun**, on the one hand, can be **more or less inherently relational**, depending on the lexico-encyclopaedic knowledge connected with the noun. An **NP occurrence** in a specific context, on the other hand, can be described as having a **relational or non-relational interpretation**.

Second, Löbner's theory is an attempt to do away with the traditional view of anaphora as the paradigm case for definiteness. However, I do not think that our recognition of the non-secondary role of first-mention definites necessarily suggests a reverse view, in which these uses are taken to be more basic than the anaphoric use. In section 3.4 I will suggest an approach that treats neither anaphora nor first-mention as primary, but in which the choice of interpretation strategy, in interaction with the definiteness of the NP, is influenced by the lexico-encyclopaedic information connected with its head noun.

### 3.2 Hawkins' notion of shared sets

In a rich and detailed analysis of the necessary and sufficient conditions for the use of the definite article, Hawkins (1978) provides an interesting contribution

to the discussion of different first-mention definites. The basic notion in Hawkins' theory of definiteness are (i) **pragmatic set recognition**: the referent of a definite NP is located in a 'shared set' of objects which is identifiable by the receiver by means of the context; (ii) **totality** (or inclusiveness): the definite NPs refers to 'the totality of the objects of mass' within this 'shared set' which satisfy the referring expression. I will here focus on the notion of shared sets and the question of how these sets are identified by the receiver.

A **shared set** is a set of objects of which the speaker and hearer have shared knowledge on the basis of the previous discourse or the situation of utterance:

An important assumption which I am making is, therefore, that the objects available to speaker and hearer to which linguistic expressions with the definite article can refer, are arranged in these discrete mental or physical sets defined by shared knowledge and the shared situation of utterance.' (Hawkins, *ibid.*, p. 130)

Common to most first-mention definite NPs is that the shared set is determined by a **trigger** such as the NP *a book*, which is said to trigger a set of associated objects like author, pages, title, etc. For reasons that I will return to in the following, I will introduce, instead of 'triggers', the term **anchors** for talking about these entities or elements in relation to which first-mention definites may be interpreted. (Note that the term 'anchors' is also to some extent similar to Löbner's 'arguments'.)

Let us examine the taxonomy of first-mention uses suggested by Hawkins. His criterion for differentiating between **larger-situation** and **associative** uses is whether the 'shared set' is triggered by the larger situation or by an NP in the preceding discourse. In addition to these first-mention uses, Hawkins discusses cases like *the front page of the Guardian*. These so-called '**unfamiliar uses with explanatory modifier**' are distinguished from the other uses by two properties: (i) the 'trigger', or anchor, is contained in the definite NP itself, and (ii) the referent of the definite NP is not 'familiar' to the receiver.

If these criteria are taken to define a taxonomy of uses, which is often done, several difficulties arise. These become particularly evident if one tries to operationalize such criteria for classificational purposes and apply them to NP occurrences in natural texts. In the study presented earlier in this paper, this difficulty first turned up as a methodological problem. But, as I will try to show, a further analysis suggests that it should rather be taken as a theoretical problem. While some instances fit well with Hawkins' types, there are others which call for a more flexible description of the information and processes involved. Some illustrations of this will be given in the following.

Hawkins' account implies that the anchor is *either* the larger situation *or* an NP in the preceding discourse *or* a modifier of the definite NP. However, it is often the case that the interpretation of a first-mention definite NP involves more than one anchor, which can come from different sources. Consider (9) uttered at a ticket office of the central station in Stockholm.

(9) I am going to Gothenburg. When does *the next train* leave?

In interpreting the definite NP *the next train* as the next train from *Stockholm* to *Gothenburg*, the clerk at the ticket office has to make use of both discourse externally and discourse internally provided anchors. Consider also the following sentence from a text about EEC, where the link referred to is the link between EEC and NATO.

(10) Through De Gaulle *the link to NATO* was broken.

Here, the modifier *to NATO* provides one anchor needed to interpret the definite NP, and the second anchor is found in the discourse model which contains a representation of EEC due to previous mention.

In cases like (9) and (10), it seems inadequate to talk about the interpretation of the definite NPs in terms of discrete sets determined *either* by modifiers of the definite NP *or* by other NPs in the text, *or* by the larger situation.

In this connection, I want to mention a problem of a more methodological nature. From the point of view of the analyst it is often difficult to judge whether a particular anchor could be said to originate from the discourse or from the larger situation. For example, when the reader of a Swedish newspaper article encounters the definite NP *the government*, it is of little consequence whether *Sweden* has been mentioned explicitly in the preceding discourse or not. Thus, there may be several potential sources for one and the same anchor, and the question of which one is actually 'used' in the interpretation process cannot be answered categorically.

As regards Hawkins' '**unfamiliar' uses with explanatory modifier**, it should also be pointed out that 'unfamiliarity' of the referent is neither a necessary property of definite NPs with 'explanatory modifiers', nor is it a property that is confined to this structural type, cf.

(11a) *The engine of my car* has much more power than yours.

(11b) *The engine* has much more power *in my car* than in yours.

In both these cases, the receiver either may or may not have previous knowledge of the referent of the definite NPs. The difference lies only in the way the anchor *my car* is provided.

Furthermore, by using 'unfamiliarity' in the way he does, Hawkins fails to make two necessary distinctions, namely, between the identification of anchors and the identification of referents, and between the knowledge involved in the first process and the knowledge involved in the second one. This also becomes evident in his discussion of what he calls associative and larger-situation uses involving specific knowledge. As an example of the latter, he mentions the definite NP *the Little Mermaid* (referring to a statue in Copenhagen). However, if the receiver has previous specific knowledge of the referent, there is no need

for any anchor Copenhagen to be contextually present (for example, in a discourse about famous statues). As a matter of fact, this description is very similar to a proper noun, something which is also reflected in the capitalization of the words. As an example of a definite NP involving (some amount of) specific knowledge in the identification of an anchor, we may instead consider the definite NP in (12), uttered in Oslo:

(12) I am going on a cruise to see *the fjords*.

The fjords referred to are the fjords in Norway. The relation between the fjords and the relevant anchor 'Norway' cannot be identified on the basis of general knowledge about countries, but only by means of some degree of specific knowledge about the relation between fjords and Norway, cf. the dictionary definition of *fjord*:

a narrow arm of the sea between cliffs or steep slopes, esp. in Norway (*Longman Dictionary of Contemporary English* 1978)

But there are other countries with fjords, e.g. Iceland. So, in order to know which fjords the speaker is going to see, the anchor 'Norway' has to be available in the context. However, the interpretation does not necessarily involve any specific knowledge of the referents, the fjords of Norway.

In conclusion, what makes Hawkins' work interesting in the present context is that it attempts to account for a wide range of examples of first-mention uses of definite NPs. Furthermore, his theory makes explicit certain assumptions regarding the interpretation of first-mention definites to which more or less direct parallels are commonly also found in more process-oriented theories.

There would, however, appear to be two main problems in Hawkins' treatment of first-mention definites. First, a taxonomic view based on the notion of discrete shared sets overlooks the necessary distinction between four independent aspects of the interpretation of first-mention definite NPs:

- (i) Is the referent of the definite NP 'familiar' or not, that is, does the interpretation involve an identification of a previously known referent?
- (ii) Does the interpretation of the definite NP involve (one or more) anchors or not?
- (iii) Are the anchor(s), if any, given in the text or by the discourse situation, that is, what are the discourse internal and external sources of the anchors?
- (iv) Is the knowledge involved in establishing the relation between the referent and the anchors specific or generic?

Secondly, the point of departure for Hawkins' theory are cases where the referent is familiar to the listener. The analysis of these cases is then extended to the so-called 'unfamiliar' cases. In this sense, it could be argued that Hawkins' theory is still essentially a familiarity theory of definiteness, although he himself

argues against such traditional approaches. This is also implicit in his choice of the term 'trigger', which I find unfortunate, since it seems to imply that the sets are always *evoked* by an NP or the global situation, i.e. that *all* first-mention definites except those with an 'explanatory modifier' depend upon their referents being 'already there' in the discourse model.<sup>9</sup> When studying first-mention defNPs in natural text, one is struck by the vast amount of objects that appear to be accessible to this kind of reference at each point of the discourse. That all these potential discourse referents would be included in the discourse model does not seem very plausible, since the overwhelming majority will never play a role in the discourse. What *has* to be there though, in some way or another, are the anchors.

### 3.3 Bosch & Geurts' model of definite NP processing

As already mentioned, problems analogous to those pointed out in connection with Hawkins' 'distinct set' account of first-mention definites also turn up in computational models of definite NP resolution. In contrast to Hawkins, however, such processual approaches also attempt to capture the dynamic aspects of what is accessible to definite reference. For the sake of illustration, I will here discuss a recent proposal for a computational model of definite NP processing, presented by Bosch & Geurts (1989) (henceforth B&G), which is representative for current models of the processing of definite NPs in both these important respects.

In what I interpret as a reaction against former treatments of first-mention definites as secondary, B&G suggest that the term *anaphora* should be understood in a wider sense than has previously been the case. In their use, anaphora is 'the resumption of referents that are already represented in the current discourse model', which is said to contain the following sets of objects:

- (i) objects in explicit focus;
- (ii) objects that can be accommodated in relation to explicit focus;
- (iii) unfocused objects in the discourse model;
- (iv) objects in the global context.

Given this definition of discourse model, anaphora would also cover the processing of many first-mention definite NPs. I do not, however, believe that such a widening of the definition of anaphora contributes to a better treatment of first-mention definites or to a more adequate general theory of definiteness. First, if we broaden the definition of anaphora to such an extent, the term seems to lose its *raison d'être*, since it becomes almost synonymous to definiteness. A more restrictive definition of anaphora is needed for other purposes. Second, as B&G themselves note, even with this wide definition, there are still cases of



first-mention uses which will be difficult to integrate into an anaphora-based account, e.g.

(13) *The product of three and four is twelve.*

Such examples are taken by B&G as an argument for Löbner's functional approach to definiteness, which they claim to essentially agree with. It is not, however, clear to me how any implications of this view are integrated into their sketch of a computational model of definite NP processing. As with Hawkins' theory, the basis for their model still seems to be the familiarity of the referent rather than the relational property of the description. This is reflected in the formulation that definite NPs refer to entities that are already represented 'somewhere in some form or other' (B&G). The definite NP resolver searches through the four sets of objects in the discourse model until a referent is found. Thus, a 'distinct set' approach here turns up as a 'compartmentalization' of search spaces.

In B&G's model, first-mention definite NPs are resolved by a process which they, like many other authors, call accommodation. Simply put, this is a way of linking the referent of the antecedent-less definite NP to elements of the discourse model. The two (empirical) questions that arise then are: 'What can a first-mention definite NP be accommodated in relation to?' and 'What does the process of accommodation look like?'

B&G's answer to the first question is that first-mention definite NPs are resolved by reference to either (i) objects that can be accommodated in relation to objects in **explicit focus** or (ii) objects in the **global context**. The two processes are referred to as **focal accommodation** and **global accommodation**, respectively.

The concept of (explicit) **focus** (Grosz 1977; Sidner 1979; Sanford & Garrod 1981) plays a central role in most current theories of anaphora. It is commonly thought of as a limited set of prominent discourse referents that are accessible to pronominal reference at a particular point of the discourse. Echoing Sidner, B&G suggest that:

The range of objects to which a referent can be linked via focal accommodation is the same as the range of objects from which an anaphoric pronoun can select its referent, i.e. the discourse referents that are currently in explicit focus.

It is obvious that there are unfocused objects in the discourse model to which accommodation is excluded, as is also shown by B&G. But their proposed constraint is clearly too strong, as can be seen in the following passage from a novel.<sup>10</sup>

(14) . . . She waited for them to realize that *the car* was no longer in motion.  
(8 graphic sentences without either explicit or implicit reference to the car)  
He bent his head over Maisie's fair gleaming curls as they walked into the

house where she had her room. Martha watched them going inside, cheeks laid together, dancing a half-mocking half-dreamy sliding step. She wished that her principles would allow her to cry. But this would not do; she efficiently let out *the clutch*, and drove herself back to the flat . . .

The definite NP *the clutch* must be interpreted in relation to the car, which is no longer in focus at that point of the discourse. Thus, the range of discourse referents that a referent can be 'accommodated in relation to' is wider than the set of objects that are accessible to pronoun reference. One conclusion of this, I think, is that we have to question whether the concept of focus in its present definition is applicable in modelling the interpretation of first-mention definites.

In the case of global accommodation, B&G's model includes the constraint that the referent cannot be accommodated *in relation to* objects in the global context, but only by direct reference to such objects, cf.

The range of objects to which a referent belongs that is introduced via global accommodation is the global context of the discourse.

Recall the discussion of example (9) above, where the definite NP *the next train* is interpreted in relation to elements provided by both the global context and the discourse. It does not seem reasonable to assume that the referent, the next train from Stockholm to Gothenburg, is included together with a whole set of other trains in the discourse model, as is implied by Hawkins' 'shared set' approach. And this is probably not what B&G have in mind either. In their discussion about global context, they make the following important remark with regard to constraints on global accommodation. What is contained in the discourse model, they say, is a *partial* representation of the global context, determined by the local context, i.e. the preceding discourse and the immediate situation of utterance, etc. Applying this to our example, we may get something like this: discourse-initially the discourse model contains representations of all trains for which one could possibly buy tickets. This set of possible referents is then stepwise restricted, first by the context of being in Stockholm (the default if nothing else is said about some other place of departure), then by the mention of going to Gothenburg, and finally by the modifier *next* of the definite NP. But even with these restrictions on a particular *kind* of objects in the discourse model, namely trains, there is a vast amount of *other kinds* of objects that could be referred to by first-mention definite NPs in the same context, such as *the whole family, the post office, the weather*.

And, more importantly, there are numerous first-mention definites which, in my view, involve identification of *anchors* provided by the global context, rather than the identification of a *referent* in the global context, such as *the economy* or *the traditions* (of this country). In this sense, B&G's definition of

global accommodation is also too narrow, since it would appear to cover only those cases of first-mention definites which are direct references to a referent in the global context.

As regards the question of what the process of accommodation looks like, B&G's model is less explicit. If they were correct in their claims about what the definite NP can be accommodated in relation to, focal accommodation could be envisaged as a sequential search through the limited set of discourse referents in focus, in order to see if the representation of any of these has a link to an entity that would fit the definite description. But if, as I believe, the set of possible anchors is wider and more differentiated, it would be desirable to find some clues in the definite NP that facilitates this search, or to put it simply: the interpreter, when encountering the NP, would know at that point what kind of anchor(s) to look for. Furthermore, we would obtain a less crowded discourse model if we assume that it is the anchors of the referents, rather than the referents themselves, that *have* to be represented in some way or other in the discourse model.

### 3.4 *Preliminaries to an alternative model of definite NP processing*

In order to sum up some of the conclusions from the empirical investigation and the theoretical discussion above, I will here try to sketch some preliminaries to a more adequate and flexible way of modeling the processing of first-mention definite NPs.

Before I go on, I would like to point out that I do not want to claim that the procedures proposed here necessarily correspond to the cognitive processes involved in the interpretation of first-mention definites. In our present state of ignorance, it is only possible to speculate about the actual processes going on in the mind of the receiver. By analysing natural or constructed examples of definite NP uses, however, we can try to provide partial answers to questions such as: what information has to be available in order to interpret this or that definite NP? How may this information be provided by the discourse and the global context? On the basis of such considerations, we may generate hypotheses about what people do when they hear or read a first-mention definite NP.

In view of the vast amount of first-mention definites in natural text, a model where the processing of first-mention definites always involves a failing search for an already established discourse referent as a first step seems less attractive. A reverse ordering of the procedures is, quite obviously, no solution to this problem, whereas a simultaneous processing, as proposed by B&G (cf. note 2), might be. Here I want to suggest another possibility, which to my knowledge has not been considered in earlier discussions on this topic.

Imagine the following situation. If someone, after an accident at the daycare

center, says *Call the mother!*,<sup>11</sup> a reasonable question from the newly arrived assistant might be *Of whom?* or *Whose mother?*, and he would probably be satisfied by the answer *Of Mary*, or *Mary's*. But if the first person, on the other hand, had said *Call the woman!*, it is more likely that the assistant would ask *Which woman?* and expect to get the answer *Mrs Smith* or the like.

What I would like to illustrate with this example is the possibility that, in addition to (in)definiteness of an NP, other properties of the NP may also guide the selection of an appropriate interpretation strategy.

Partial support for this assumption was found in an earlier study of defNPs in natural discourse (Fraurud 1989). Dictionary definitions of nouns occurring as heads in subsequent-mention and first-mention defNPs were compared. It turned out that, whereas the former commonly had the form of indefinite descriptions, the latter were more often relational/functional descriptions such as 'the X of a/the Y', where X was a hyponym of the noun and Y described a type of anchor. A useful heuristic principle for the reader, or computer system, might thus be to expect definite NPs with a head noun which has a classificational, or sortal, definition to be anaphoric, and a definite NP with a head noun which is defined in relation to other objects to be a first-mention definite.

With regard to interpretation procedures, this could be formulated in the following hypothesis: the order in which different interpretation procedures are applied is determined by lexico-encyclopaedic knowledge associated with the head noun of the NP. That is, if the noun occurrence is judged as relational, a non-anaphoric procedure is applied first, and if it is judged as sortal, an anaphoric procedure is given priority. The assumption that this would apply uniformly to all first-mention definites is, however, probably too strong. Thus, when a definite NP is encountered, a non-anaphoric interpretation procedure may be triggered (i) directly, by lexico-encyclopaedic knowledge connected with the head noun, suggesting a relational interpretation, or (ii) indirectly, by a failure to find an already established discourse referent.

In the preceding discussion, I preferred to use the word 'anchors' instead of Hawkins' 'trigger', Löbner's 'arguments' or 'what first-mention definites can be accommodated in relation to' in B&G's model, all concepts which to some extent are similar in meaning. As I have tentatively used the term in the discussion above, anchors would be just any kind of elements in relation to which first-mention definite NPs are interpreted, including discourse referents and elements provided by the global context. The term **discourse referents** is here used for representations in the discourse model of entities explicitly mentioned in the discourse, as distinct from what may be called **background referents**, which are representations of entities that have so far not been mentioned in the discourse but of which the receiver has previous knowledge.

The discourse referents that are available as anchors are presumably a restricted number of all discourse referents in the model, but, as we have seen

above, these cannot be equated with those in focus. The anchors stemming from the global context range from time/place/circumstance 'co-ordinates' to objects and persons in the discourse situation (not to be equated with background referents). A more precise characterization of the restrictions on available anchors has to await the results of further empirical investigations.

Informally, anchors can be thought of as elements of a contextual framework or setting built up as the result of an interaction between the global context and the discourse. The anchors can either be established prior to, or be 'contained in', the definite NP. At the beginning of a discourse, the only anchors available are those determined by the global context. As the discourse evolves, this set of anchors may be altered and/or extended by means of explicit or implicit signals in the discourse. In the same way, more local anchors are continuously specified and altered.

Common to most first-mention definite NPs is that they are interpreted in relation to one or more contextually provided anchors. I will refer to this aspect of their interpretation as **anchoring**. In addition, or alternatively, the interpretation may involve the identification of a background referent.

The interpretation of a first-mention definite NP can be thought of as the construction of a new discourse referent with pointers, or links, to one or more anchors and/or a background referent. Analytically, this can be described as involving some or all of the following procedures.

- (P1) Establish a new discourse referent, D
- (P2) Identify one or more anchors to which D can be linked by suitable relations
  - (P2:1) Determine the relevant number and types of anchors
  - (P2:2) Select anchors
- (P3) Identify a background referent to which D can be linked by an identity relation

where

- (i) no general temporal ordering is assumed
- (ii) either (P2) or (P3), or both (P2) and (P3) are applied

The relations referred to in (P2), which for the lack of a better cover term is called 'suitable' relations, range from part-of and belong-to relations to spatio-temporal and 'situational' relations.

One way to think of the interpretation of a definite NP such as, for example, *the king* occurring in a Swedish newspaper article from 1989, could then be as follows: lexico-encyclopaedic knowledge of the noun suggests a relational interpretation, and thus a new discourse referent is established (P1). It also provides the information that a king is a man that, within a certain PERIOD, has a unique role in relation to a COUNTRY (P2:1). The contextually provided

anchors PERIOD = 1989 and COUNTRY = Sweden are selected (P<sub>2</sub>:2). Given these anchors, the background referent Carl XVI Gustaf is identified (P<sub>3</sub>). The resulting representation is a discourse referent with pointers to the background representation of Carl XVI Gustaf and to the anchors 1989 and Sweden.

Now an important conclusion to be drawn from the discussion in the preceding sub-sections is that such a sequential procedure, involving all of those steps, cannot be assumed to apply uniformly to all first-mention uses. This is what I try to capture by the remarks (i) and (ii) above. First of all, the procedures in (P<sub>2</sub>-P<sub>3</sub>) are sometimes complementary, and I find it likely that sometimes a certain procedure does not apply although the relevant anchors and/or background referents are available. Secondly, there seems to be no reason to assume a general temporal ordering of the procedures. I will discuss these issues in the following two sections, starting from some considerations regarding the information that must be assumed to be available in order to account for the interpretation of first-mention definite NPs.

### 3.4.1 (P<sub>2</sub>): the identification of anchors

I will first consider those first-mention definites that appear to involve an identification of one or more anchors, (P<sub>2</sub>). In these cases, the requirements for a felicitous interpretation are: (i) the anchors have to be accessible at the point of the discourse where the definite NP appears and (ii) the receiver has to know which of these accessible anchors are relevant to the interpretation of the definite NP. That is, he has to be able to recognize the possible relation between the referent and the anchor(s).

How are the anchors made accessible? As we saw above in the discussion of Hawkins' theory, the anchors may be provided (i) **discourse internally**: by modifiers of the NP, or by constituents of the same sentence or elsewhere in the discourse; (ii) **discourse externally**: by the global context, including the participants of the discourse; or (iii) by a combination of (i) and (ii). In our example with *the king* above, the anchor Sweden may alternatively be given by a preposed adjectival modifier *the Swedish king*, a postponed prepositional phrase modifier, *the king of Sweden*, another constituent in the text, *In Sweden, the king* . . ., or by the global situation of being in Sweden. In addition, it should be pointed out that anchors may also be implicitly evoked by the discourse. If you start talking about sitting behind *the steering wheel*, this may evoke a vehicle anchor, after which a reference to the windscreen would be unambiguously interpretable. Or consider the possible situation when, on the basis of several different details in a story, you gradually understand that the event takes place in a certain country during a certain period, and then use these anchors when encountering definite NPs like *the capital* and *the king*.

Let us now consider the kind of knowledge required for recognizing the

relation between the referent and a particular anchor. It is generally assumed that the interpretation of a definite NP such as *the author* in the context of talking about a book involves generic knowledge about a relation between authors and books. Regardless of whether we think of the activation of this knowledge in terms of a search in a lexicon or in a network of nodes connected by such relations, this knowledge can be looked at from two different perspectives. On the one hand, it can be viewed as a generic knowledge of books, e.g. that books have authors, pages, covers, contents etc., and on the other, as a generic knowledge of authors, e.g. that an author is always the author of a book, an article or the like.

The implication of the first view is that the mentioning of a book, activating generic knowledge about books, would trigger a set of associates (an author, pages, etc.) which is then 'already there' to be searched for when the definite NP *the author* is encountered. The opposite view implies that the occurrence of the definite NP *the author*, activating generic knowledge of authors, would trigger and guide a search for a suitable anchor, for example, a book, which is in this case found in the discourse model due to previous mention.

In different instances of first-mention definites, one or the other of these processing hypotheses may be more plausible. But neither of them can be assumed to apply *uniformly* to all first-mention definites. As a general theory of first-mention definites, the first hypothesis can be questioned on the basis of the observation that there, at any particular point of a discourse, appears to be an innumerable amount of entities which could be referred to by a first-mention definite NP. Whereas there are restrictions regarding what anchors the referent can be linked to, there seem to be hardly any limitations on the number of entities that can be linked to these anchors. This does not exclude the possibility that the first processing hypothesis applies to some cases of first-mention definites.

In the tentative description of the interpretation of the definite NP *the king* above, all the procedures (P2:1), (P2:2), and (P3) were assumed to apply. But in a general model of the processing of first-mention definites, these procedures must be treated as complementary. Here a few illustrations of the optionality of different procedures will be given.

Firstly, (P2:2) may be applied without guidance from (P2:1). This is the case where there is no lexico-encyclopaedic knowledge at hand to guide the selection of anchors. Imagine a person taking his car to the mechanic, who examines it and says:

(15) I can't do anything about it right now. *The carburettor* is out of order and I have to get a new one.

Even if the car owner has never heard the word *carburettor* before, he would probably interpret the definite NP as 'something in *the car* which is called a

carburettor'. That is, his identification of the anchor does not involve any generic knowledge of either carburettors or cars, but is just a matter of making sense of the utterance by picking out the most salient anchor at hand. Notice, however, that this strategy might have failed, if the mechanic instead had referred to the only welding set in his little garage, and if we assume that the car owner is as ignorant about welding sets as he is of carburettors, cf.

(16) I can't do anything about it right now. *The welding set* is out of order and I have to get a new one.

Secondly, many first-mention definites involve (P<sub>2</sub>) but not (P<sub>3</sub>): cases when interpretation depends entirely upon the identification of anchors and no background referent is identified. The reason may be either that the particular receiver lacks previous knowledge of the specific referent or that there is no such referent whatsoever, as in (13) above. Some further aspects of the optionality of (P<sub>3</sub>), the identification of referent(s), will be discussed in the next section.

Thirdly, there are cases where only (P<sub>3</sub>) applies: cases where the background referent is directly identified without relations to any anchors. The most obvious cases are definite NPs which are similar to proper names such as *the Little Mermaid*, which I, contrary to Hawkins, do not think require a previous presence of any anchor. (In fact, it can very well be the other way around; an anchor 'Copenhagen' could be implicitly evoked by the definite NP.)

Intuitively, even some other kinds of first-mention definite NPs seem to function more or less like proper names, providing direct access to an entity in the global context without necessarily involving any identification of anchors. That is, unless nothing else is stated (if no non-default anchors are evoked by the discourse), a default referent 'named' by the definite NP is merely picked out. In our example above, then, *the king* would simply and directly be identified as 'our' present king, Carl Gustaf (unless it is indicated that we talk about, for example, Norway), in the same way as the proper name *Chomsky* when uttered within the linguistic community would pick out the syntactician Noam Chomsky (unless someone else with the same family name had been introduced in the discourse). An even more persuasive example is perhaps the definite NP *the moon*. For someone who is ignorant of the fact that there are also other planets than the earth which have moons, it is obvious that 'the moon' simply is the moon, rather than the moon of the earth. But it seems likely that he would interpret *the moon* in the same way even after having acquired knowledge of the planetary system (for a discussion see Dahl in press).

The identification of anchors could possibly be more adequately described as a simultaneous processing of different kinds of available information. That is, the procedures in determining the relevant number and types of arguments (P<sub>2:1</sub>) and selecting the actual anchors (P<sub>2:2</sub>) are not necessarily temporarily



ordered, and both of them need not always be applied. Rather there would appear to be an *interaction* between lexico-encyclopaedic knowledge associated with the head noun of the definite NP and the general knowledge associated with currently present anchors.

### 3.4.2 (P<sub>3</sub>): the identification of background referents

As already mentioned, the identification of background referent(s), (P<sub>3</sub>), is not an obligatory procedure in the interpretation of first-mention definite NPs, but is applicable only in those cases where the receiver has a previous representation of the referent and is able to identify the referent. The difference between cases where a specific referent is identified or not has often been discussed in terms of Donnellan's (1966) binary distinction between a **referential** and an **attributive** use of definite descriptions. In its referential use, a definite description serves to identify a particular individual. In the attributive use, the description *the so-and-so* is taken to mean 'whoever or whatever is the so-and-so'. The referential:attributive distinction has been very influential in theories of reference as well as in process models of definite NP resolution.

However, as pointed out by Partee (1972), this view is probably too simple. Referring to Kaplan (1968-9), she criticizes Donnellan's treatment of definite descriptions as being 'ambiguous', and remarks that the typical examples of referential and attributive definites may more properly be regarded as 'two extremes on a continuum of "vividness"'. The receiver's knowledge of a referent is not just a matter of having a previous representation of the referent or not, but may more appropriately be described as a matter of degree. That is, in the cases where the reader *is* able to identify a background referent, his previous representation of the referent can be, as it were, more or less 'loaded' with information. In fact, it seems to be quite common for definite NPs to be underdetermined with respect to 'degree of identification', especially in texts written with the intention that they should be interpretable by readers with different amounts of background knowledge, i.e. without confusing the ignorant or boring the acquainted. It is obvious that the label 'ambiguity' is not adequate for those uses.

It should also be pointed out that the sender may have a certain referent in mind, without necessarily expecting or intending the receiver to identify it. In fact all 'combinations' as regards the specific knowledge and intentions of the sender and receiver seem possible: both the sender and the receiver *or* any one of them, *or* neither of them may have specific knowledge of the referent.

However, the degree of identification is not only a matter of the amount of knowledge that the receiver actually possesses. Consider the following example from an article about the composer Schubert in an encyclopaedia on music history.

(17) ... when he got the opportunity to play with the orchestra and to get to know *the classics* ...

In the given context, *the classics* might be interpreted as something like 'the first rank composers (in Europe) preceding Schubert'. To what degree will the actual referents of this definite description be identified? On the one hand, this depends on the reader's amount of background knowledge. A reader ignorant about music history may be content with the description itself, while the lover of classical music may think of Haydn, Mozart and perhaps Beethoven and some others. On the other hand, there seems to be reason to assume that not even the latter will necessarily 'bother' to identify all or even anyone of the particular referents. A plausible assumption is that the degree of identification will depend on the reader's judgement of what is relevant for the understanding of the whole discourse. This, in turn, may, among other things, depend upon the readers' predictions regarding what role the discourse referent(s) will play in the following discourse.

In conclusion, the differences in interpretation with regard to the identification of referents cannot be described in terms of a referential:attributive ambiguity of the NP. Instead we may talk about *degrees of identification*, which can be assumed to depend on such factors as: (i) the interpreter's amount of previous knowledge of the referent; (ii) the interpreter's judgement regarding which parts of this previous knowledge are relevant in the current context; and (iii) the ontological status of the referent (specificity, genericity, concreteness, animacy, individuation).

This implies that the procedure (P<sub>3</sub>), identification of background referents, does not have to apply even if it is possible in principle due to previous knowledge of the referent. Furthermore, when the procedure is applied, it is presumably only a relevant part of the full background representation of that referent that is activated.

#### 4 CONCLUSION

In the first part of the paper, we saw that the traditional view, according to which indefinite NPs introduce new discourse referents, and definite NPs refer back to already introduced ones, gives a distorted picture of the facts. Whereas subsequent-mention indefinites are arguably somewhat marginal, the proportion of first-mention definites is much too large to warrant the current treatment of them as secondary to the anaphoric cases. Furthermore, frequency data on co-referentiality relations suggest that the role of co-referentiality has been over-estimated in earlier treatments. Most indefinite NPs and half of the definite NPs in natural texts do not partake in any co-referentiality chains. The predominant type of referential relations are instead relations that hold

between discourse referents, or between discourse referents and the global context.

The second part of the paper concentrated on the role of these relations in the processing of first-mention definite NPs, and some preliminaries for modelling the anchoring of discourse referents were developed. The present version of the model obviously needs further elaboration. The most important remaining problems concern the dynamic aspects of the representation of anchors, i.e. the problems of how and when anchors are evoked and how their 'scope' is determined. These questions can only be answered on the basis of further empirical studies of natural discourse. For the moment, I can only conclude that the problem of the representation of anchors is not solved by the currently existing focusing mechanisms, which has been developed in order to account for the interpretation of anaphoric NPs.

Moreover, several issues raised in connection with anaphoric and indefinite NPs remain to be investigated. In my view, however, some of the insights gained in the analysis of first-mention definite NPs could also be carried over to the analysis of anaphoric and indefinite NPs. I would like to conclude this paper by considering briefly the possible relevance of some distinctions developed in the present paper for modeling the processing of anaphoric and indefinite NPs.

The interpretation of an anaphoric NP can be described as a process of identifying a previously introduced discourse referent. Sometimes, this identification appears also to necessarily involve an identification of anchors, cf.

- (18) John had three children and Bill two. John loved his children and spent most of his spare time with them. For Bill, however, *the children* were merely a nuisance.

In order to interpret *the children* not as John's three children but as Bill's two children, introduced in the first sentence, the receiver first has to identify the anchor Bill. Thus, the procedure of identifying anchors, (P<sub>2</sub>), may also be relevant in an account of some anaphoric NPs.

Furthermore, the procedure of constructing a new discourse referent, (P<sub>1</sub>), has a parallel in the processing of a certain type of anaphor, namely plural (or singular) anaphors, with what is commonly described as split antecedents, cf.

- (19) *A man and a woman* sat at a cafe. *The couple* . . .

The interpretation of *the couple* can be analysed as involving a construction of a new complex discourse referent related to two previously introduced referents. The relation in question is not a relation of simple identity or of anchoring, but could be described as a summation relation. Without being able to provide a further analysis of anaphors with split antecedents here, I would like to take the opportunity to emphasize the necessity of taking these cases into consideration

at an early stage in the development of a general model of definite NP processing.

So far, I have assumed the identification of anchors to be a procedure involved in the interpretation of first-mention and, sometimes, anaphoric *definite* NPs. One might ask whether the interpretation of *indefinite* NPs also may involve anchoring. My present judgement is that the interpretation of certain occurrences of indefinite NPs appear to require the identification of anchors (with the obvious difference from definite NPs that the referent is not un-ambiguously related to the anchor(s)), but that these occurrences are not very frequent. If this is the case, it could be taken as a further argument for a more differentiated treatment of both indefinite and definite NPs, in which we would not necessarily assume a separate module for processing definite NPs.

In conclusion, instead of letting definiteness be the main determining factor in NP interpretation, we need a more flexible mechanism, where the way in which an NP in discourse is processed depends on several factors, including in addition to the definiteness of the NP, among other things, the lexico-encyclopaedic knowledge associated with the head noun and set of currently available anchors.

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### NOTES

1 This theory has been influential for a long time in computational and linguistic theories of definiteness. In more recent psycholinguistic research, it has

been shown that first-mention definites do *not* necessarily involve additional processing time (e.g. Sanford & Garrod 1981; see also note 9).

- 2 Bosch and Guerts explicitly refrain from claiming psychological realism of the subsequentity in their algorithm, suggesting that parallel search might be a likely alternative.
- 3 The large corpus is 'Skrivsyntax: Professionell prosa' (The syntax of writing: Professional prose) from Lund University, containing about 85,000 words.
- 4 An analysis which divides all sub-classes of NPs into definite and indefinite can of course be questioned. In addition to the possible objections to this dichotomy on principle, it should be mentioned that there are cases (among articleless NPs) when Teleman's criteria conflict and have to be weighted against each other.
- 5 As an example of the structural ambiguity of co-ordinate NPs, consider the NP 'Carola's wonderful parties and subsequent headaches'. Whether the scope of the genitive determiner *Carola's* is restricted to the first noun or exceeds over the whole co-ordinate NP is not syntactically signalled. One example of the semantic peculiarities of co-ordinate NPs is the following interesting property of Swedish articleless NPs (which in Swedish are used in a wider variety of functions than in English). When co-ordinated, articleless NPs can have the same referential functions as definite NPs.
  - (a) Svenssons har renoverat sin lägenhet./the Svensson's have renovated their apartment/
  - (b) De har moderniserat köket och badrummet./they have modernized the kitchen and the bathroom/
  - (c) De har moderniserat kök och badrum./they have modernized kitchen and bathroom/
  - (d) De har moderniserat köket./they have modernized the kitchen/
  - (e) \*De har moderniserat kök./they have modernized kitchen/

The difference between (b) and (c) is only stylistic; the articleless use is more common in formal language. In the present sample, half of the co-ordinate NPs were of this articleless type.
- 6 As is well known, not all indefinite NPs introduce discourse referents, cf. 'John is a teacher'. On the basis of such examples, it has been suggested that, for example, NPs in the position of predicate complement could not be introductory (Karttunen 1976). Counter-examples can, however, be found to each of the proposed syntactic and lexical constraints (cf. Fraurud 1986), e.g. 'The flies are a great problem. It has to be solved.' When it comes to actual occurrences of NPs, some of these can be judged as clearly non-introductory, but on the basis of semantic rather than syntactic considerations. Because of the lack of any absolute formal criteria, such an analysis was here made manually.
- 7 In text-books on semantics, anaphora is usually illustrated by examples where an indefinite NP, the 'antecedent', is 'referred back to' by an anaphoric definite NP or a pronoun, e.g. *a book: the book/it*. When considering cases when the first NP is not an indefinite but a first-mention *definite* NP, the problem arises whether subsequent co-referential definite NPs should be regarded as anaphors, and in that case, under what conditions. Imagine a situation where you, at the first page of a novel, read about a dark night when *the moon* was hidden by heavy clouds, and, several pages later, that an American space ship was going to *the moon*. The two occurrences of *the moon* are obviously co-referential (it is the same moon). But intuitively it seems to make little sense to speak about the second occurrence as anaphorically referring to a discourse referent evoked by the first one. This is a somewhat extreme case, but the principal problem is the same in all analogous cases.
- 8 An examination of Swedish texts indicates that *most* generic NPs in natural texts defy identification by means of morpho-

logical and syntactic criteria. For example, even bare plurals in subject position are not always generic, cf. 'Severe earthquakes have devastated the area'.

9. What Hawkins seems to have in mind, although he says nothing explicitly about the processual implications of his theory, is something similar to the psychological concept of priming, a process that would have to be highly constrained in some way or other in order not to result in an overcrowded discourse model. The theory of implicit focus (Sanford & Garrod 1981) provides a partial solution to this problem, suggesting an attractive alternative to the bridging-inference

theory of certain first-mention definites. Since it is not a theory of definiteness in particular, its emphasis is somewhat different from that of this paper. At present, I am not able to go further into the important but complicated issue of how linguistic data on the wide variety of first-mention definites in unrestricted natural texts should be related to psychological data on the processing of relatively short experimental texts.

- 10 Doris Lessing: *A Proper Marriage*.  
11 Maybe the use of a definite article rather than a possessive pronoun sounds slightly less natural in English than in Swedish, but that is of no importance here.

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