

**Context Dependence and Procedural Meaning:  
The Semantics of Definites**

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## Abstract

This thesis argues that there is a theoretically interesting connection between members of the intuitive category of context-dependent expressions, including “we”, “tall”, “local”, “every man”, “the woman”, “it”, “those donkeys” and so on. A treatment of the linguistic meaning of these expressions will be proposed based on the idea that their use raises issues for the audience about the proper understanding of the utterances in which they occur. The proposal will be developed in terms of a semantics for questions, which draws on the idea that to know the meaning of a question is to know what would count as an answer. It can be summarised along similar lines: to know the meaning of a context-dependent expression is to know what properties or relations (of the appropriate type) it could be used to express. The framework in which this idea will be developed can account for why the expressions that are given this issue-based treatment can also be given dependent, bound readings.

The class of definite expressions, including descriptions and pronouns, is analysed in detail. A quantificational approach, where the determiner is existential, is assumed for all forms of definiteness. In all cases, the restrictor is interpreted by an atomic definite concept. The audience’s grasp of the properties which definite concepts express is the result of inferential processes which take the linguistic meaning of a definite expression as input. These processes are constrained by pragmatic principles.

The analysis of context-dependent expressions is extended to account for dependent interpretations. A treatment of donkey sentences that accounts for their variable quantificational force is shown to follow naturally from the analysis. A pragmatic account of infelicitous uses of definites is provided and shown to compare favourably with that provided by dynamic semantic theories. Also, a novel treatment of plural definites is provided which accounts for their variable quantificational force.

## Contents

<b>Acknowledgements</b>	<b>6</b>
<b>Chapter 1 Introduction</b>	<b>9</b>
1 Issues relating to context-dependent expressions	9
2 Definites and context dependence	12
3 Dynamic semantics	14
4 Outline	18
<b>Chapter 2 Definites: Empirical Issues</b>	<b>19</b>
<b>Section I Introduction</b>	<b>19</b>
<b>Section II Static Approaches</b>	<b>22</b>
1 Definites as quantifiers	22
2 Incomplete descriptions and context dependence	27
3 Plural descriptions	34
4 Issues and problems for the Russellian account	40
4.1 Linguistics and the Russellian view	40
4.2 Uniqueness and identifiability	44
4.3 Maximality	50
5 Summary	53
<b>Section III Plurals</b>	<b>53</b>
1 Introduction	53
2 Plurals	55
2.1 Background	55
2.2 Issues	58
2.3 Distributive/Collective	61
3 A grammar with plurals	65
4 Plural definites	76
4.1 Introduction	76
4.2 Definites denote collections	77
4.3 Maximality	81
4.4 Plurals and negation	87
4.5 Cumulative readings	102
5 Pragmatic possibilities	116
5.1 Introduction	116
5.2 Loosening	117
5.3 Strengthening	121

	6 Summary	125
<b>Section IV</b>	<b>Pronouns</b>	<b>126</b>
	1 Introduction	126
	2 Cross-sentential cases and E-type pronouns	132
	3 Donkey pronouns and quantificational force	153
	3.1 Uniqueness	153
	3.2 Non-unique alternatives	161
<b>Section V</b>	<b>Identifiability, Partiality, and Dynamic Semantics</b>	<b>175</b>
	1 Introduction	175
	2 Situation semantics	179
	3 Dynamic semantics	182
	4 Dual strategies	208
<b>Chapter 3</b>	<b>An Issue Based Approach to Context Dependence</b>	<b>222</b>
<b>Section I</b>	<b>Introduction</b>	<b>222</b>
<b>Section II</b>	<b>The Semantics/Pragmatics Distinction: Classical and Presuppositional Views</b>	<b>224</b>
	1 The classical semantics-Gricean nexus	224
	2 Dynamic presuppositional approaches	230
<b>Section III</b>	<b>The Semantics/Pragmatics Distinction: The Psychological View</b>	<b>234</b>
	1 An intermediate level of representation	234
	2 Decoding	236
<b>Section IV</b>	<b>The Conceptual Systems and Context Dependence</b>	<b>239</b>
	1 Basic issue	239
	2 The conceptual system	243
	3 Context dependence	246
	4 "tall"	247
	4.1 The semantics of issues	248
	4.2 Issue resolution	250
	4.3 Descriptive vs. rigid	253

	5 Quantification	255
	6 Quantification and the focus of joint attention	259
<b>Section V</b>	<b>Definites</b>	<b>262</b>
	1 Basics	262
	2 Singular definites and partial resolution	268
	3 Referential use	275
	4 Loose ends	282
<b>Chapter 4</b>	<b>Binding</b>	<b>285</b>
<b>Section I</b>	<b>Introduction</b>	<b>285</b>
<b>Section II</b>	<b>Binding into Context-Dependent Expressions</b>	<b>288</b>
	1 The uniformity issue	288
	2 Variable-free binding	289
	3 Dependent interpretations of context-dependent expressions	292
<b>Section III</b>	<b>Conditional Donkey Sentences</b>	<b>310</b>
<b>Chapter 5</b>	<b>Pragmatics</b>	<b>320</b>
<b>Section I</b>	<b>Overview</b>	<b>320</b>
	1 Introduction	320
	2 The semantics/pragmatics interface	320
	3 Relevance theory	323
<b>Section II</b>	<b>Infelicity and Gratuitous Effort</b>	<b>330</b>
	1 Pointing and focus	330
	2 Marbles	334
<b>Section III</b>	<b>Justifying the Strongest Meaning</b>	<b>337</b>
	1 Default based strategies	337
	2 Which Strategy?	341
	3 Maximal/Non-maximal	346
	4 Summary	353
<b>Bibliography</b>		<b>355</b>

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To my family.

# Chapter 1

## Introduction

### 1 Issues relating to context-dependent expressions

There is a fairly substantial class of natural-language expressions which we might classify, in a pre-theoretical sense, as context dependent. There are the indexical expressions, such as "I" and "now". There are comparative adjectives, such as "tall" and "fast". There are very many expressions which are implicitly perspectival, such as "local", "come" and "arrive". Expressions involving quantification are also commonly regarded as being, in some sense, context dependent. An utterance of (1) could be understood in any number of different ways depending on the circumstances in which it is uttered:

(1) Everyone brought a gift.

Not only quantified noun phrases but also adverbial quantifiers generally have their domain implicitly restricted by context:

(2) John usually takes Bill to the movies.

Of course, definite descriptions, pronouns, demonstratives and possessive constructions are also readily classified as context dependent.

An interesting fact about expressions in this category is that, with few exceptions, they can receive dependent, or 'bound', interpretations. This is observed in Partee (1989) (drawing on Mitchell (1986)). Partee discusses examples such as (3):

- (3) a. John watched the match in a local bar.  
b. Every sports fan watched the match in a local bar.  
c. Every foreign correspondent who had a contact met him in a local bar.

Our understanding of "local" in (3a) is implicitly fixed relative to some contextually supplied reference point, such as the utterance location or some other salient place in the context. In (3b), "local" is not understood relative to a fixed point, but it is interpreted as expressing something like a function from individuals in the domain of quantification to a property of locations. As Partee notes, this interpretation is in many respects similar to the bound-variable reading available for pronouns in the scope of quantifiers, as in (4a):

- (4) a. Every girl thinks she will win.  
b. Every girl who had some friends in the stand waved to them.

Partee also notes that "local" can have a dependent reading more like the 'donkey pronoun'-reading of the pronouns in (3c) and (4b). That is, though the interpretation of "local" covaries with the individuals being quantified over, the reference point derives from individuals which are in some relation to the individuals in the domain of quantification. In (3c), our understanding of "local" is fixed relative to the contacts of the correspondents.

Comparative adjectives can also have this kind of dependent reading. Consider (5):

- (5) Every netball team nominated a tall girl to take the jump-offs.

Here, if we are quantifying over netball teams of different age groups (under-12, under-13 and so on), our understanding of "tall" covaries with the elements in the domain.

We saw above that quantified expressions are themselves considered to be context dependent. They can also have dependent readings in the scope of other quantificational expressions:

- (6) a. Every host received a gift from every guest.
- b. Usually, when John throws a party, every guest brings a gift.

In (6a), the domain of quantification for "every guest" can be understood as covarying with the hosts. In (6b), the domain for "every guest" is dependent on whatever index "usually" quantifies over. Note that (6b) is a donkey sentence: although "every guest" is dependent on "usually", it is understood relative to the party John threw at the relevant index.

Of course, definite expressions of all types, and not just pronouns, can have dependent interpretations. Consider the definite description in (7a) and the demonstrative in (7b):

- (7) a. Most farmers who bought sheep and donkeys at the state fair sold the donkeys in their home town for profit. (That way they covered their expenses).
- b. Usually, if a farmer tends donkeys not belonging to him as well as his own, he beats those (donkeys) instead of his own.

The main exceptions to this generalisation are indexical expressions, such as "I" and "now", which are always understood relative to some feature of the utterance circumstance.

The question which I want to address in this thesis is whether there is any theoretically interesting connection between members of this intuitive category of context-dependent expressions? In this thesis, I will argue that there is. I will propose a treatment of the linguistic meaning of these expressions based on the idea that their use raises issues for the audience about the proper understanding of the utterances in which they occur. The proposal will be developed in terms of a semantics for questions which draws on the idea that to know the meaning of a question is to know what would count as an answer (see Hamblin 1973). My proposal can be summarised along similar lines: to know the meaning of a context dependent expression (of type a) is to know what properties or relations (of the appropriate type) it could be used to express. The framework in which this idea will be developed will enable me to say why the expressions

which are given this issue-based treatment can also be given dependent, bound-into readings.

## **2 Definites and context dependence**

Within the category of context-dependent expressions, I will be focussing mostly on the semantics of definites. In particular, I will be concerned with definite descriptions and pronouns. However, I will include possessive constructions, demonstrative pronouns and expressions of the form "that F", "these Fs" and so on. Given the many facts about the interpretation of definites that have been discovered over the years, I do not pretend that my analysis will resolve every issue. Indeed, it may seem a little foolhardy to attempt to cover the semantics of all forms of definites in a single thesis. Nevertheless, I feel that it is important to stress the semantic similarities among the forms of definites since, I would argue, they are understood by the same mechanisms. My strategy will be to treat definites as expressions of quantification, to identify some of the major problems for that approach, and to show how the analysis of context-dependent expressions can be implemented so that these problems can be overcome.

The focus on definites leads to a more general consideration of how context dependence has been treated in the semantic literature, since theories of context dependence have largely been developed in analysing definites of various types. Approaches to context dependence can be classified in terms of two broad distinctions. The first is between static and dynamic approaches. The second is between theories which employ an intermediate level of representation and those which do not. Classical approaches to context dependence, as found in Kaplan's (1989a) treatment of indexicals and demonstratives are static and do not involve an intermediate level of representation; situation semantics (Barwise and Perry 1983) falls into the same category. Kamp's (1981, 1990) version of dynamic semantics does employ an intermediate level of representation while the dynamic theories of Heim (1982) and Groenendijk & Stokhof (1990) do not. Each of these three types of theory will be reviewed at various points in this thesis. However, my own treatment of context dependence and definites occupies the fourth position

in this space of possibilities. I will argue that an intermediate level of representation is well motivated given the breakdown of the classical semantics-Gricean pragmatics nexus.

The classical semantics-Gricean pragmatics nexus treats the propositional content of an utterance as determined by the meaning of the sentence uttered. Classical semantic theories provide truth-conditions for the sentences of a language in the familiar ways. Gricean pragmatics is needed to account for other information which is communicated by an utterance. In particular, it is needed to defuse certain apparent problems raised by the use of connectives, such as "and" "or" and so on, and also by quantifying expressions. This approach, however, has become increasingly untenable given the fact that pragmatically derived information affects judgements concerning truth-conditions (see Kamp 1979, Wilson & Sperber 1981, Kempson & Cormack 1981, Carston 1988, Recanati 1989 i.a.).

If we assume that the propositional content of an utterance is represented at an intermediate level, several consequences follow. First, the specification of linguistic meaning should take the form of a mapping from syntactic representations onto this intermediate level, for which a model-theoretic interpretation can be provided. Second, this more cognitive approach affords the possibility of saying something about how linguistic processes interface with processes governed by discourse or conversational principles. At this level, the meaning of context dependent expressions can be given in terms of procedures for constructing a representation of utterance content.

This position can be seen as static as it does not subscribe to the dynamic view that natural language meaning can be characterised in terms of context update potential. I will discuss various aspects of dynamic semantics, both theoretical and empirical, in the course of this thesis. However, I would like here to summarise briefly my reservations about this type of approach.

### 3 Dynamic semantics

Dynamic semantics can be regarded as a semantic framework devised to deal with context dependence in natural language. It can be looked upon as a departure from traditional formal semantic approaches, such as those deriving from Montague, in that it attempts to take into account the fact that language is used for communication. The leading idea is that, at least with assertive speech acts, verbal communication is a process by which an (audience's) information state is transformed by the information contained in an utterance. An extended discourse is thus a succession of transformations. Assuming that the sentences uttered in a discourse determine the information which brings about these transformations, then we could say that the meaning of a sentence determines this information. Semantics is thus a matter of characterising this transformation potential in a systematic, or compositional manner.

Although dynamic semantics seems a promising way to deal with linguistic meaning, it is, I feel, a little limited. Consider the following comments made by Muskens, van Benthem & Visser (1997) in a recent review paper on dynamic semantics:

Our [i.e. those of dynamic semantics] paradigms mostly provide *kinematics*: an extensional analysis of transitions made, whereas one eventually wants genuine *dynamics*: an account of underlying processes, which explains observed transition behaviour. So far, much of logical semantics has had an extensional engineering flavour, following Lewis's (1972) dictum: *In order to say what a meaning is, we may first ask what a meaning does, and then find something that does that.* (p643)

These somewhat enigmatic<sup>1</sup> comments conclude Muskens et al.'s detailed exposition of recent developments in dynamic semantics. I have included them here since the juxtaposition of Lewis' remarks with a discussion of the kinematics of discourse belies a tacit (working) assumption: all

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<sup>1</sup> Enigmatic because it is unclear whether we are meant to conclude that the extensional point of view is a good thing, given the stated desirability of genuinely dynamic theories.

aspects of the interpretation of natural language are determined by the linguistic meaning. A text-book discussion of the motivation for dynamic semantics, from Gamut (1991 vol II: 285ff), demonstrates this quite clearly. The argument can be summarised as follows:

One starting point for model theoretic semantics is that meaning is reducible to truth conditions. The following two sentences have the same truth conditions:

- (5) A man walks in the park.
- (6) Not every man does not walk in the park.

If we identify logical meaning with truth conditions, we should therefore conclude that (5) and (6) have the same logical meaning.

Now, consider what happens if each of these sentences is followed by the sentence "He whistles":

- (7) A man walks in the park. He whistles.
- (8) Not every man does not walk in the park. He whistles.

These two discourses differ in interpretation: only in (7) can we interpret the pronoun, "he", as being anaphorically linked to a term in the first sentence. So, although (5) and (6) have the same truth conditions, the difference between (7) and (8) shows that they have a different role in discourse: a different 'discourse meaning'.

How are we to account for this? Gamut suggest that the principle of compositionality points the way out: The two discourses in (7) and (8) above differ in meaning. They are both simple sequences of two sentences and the second sentence is the same in each. It follows from the principle of compositionality that the first sentences in (7) and (8) differ in meaning. Since these sentences have the same truth conditions, it follows that their meaning does not reside in their



truth conditions.

Question: What notion of meaning will enable us to distinguish between the two discourses?

Answer: Context update potential.

End of argument.

According to Gamut, the two discourses differ in meaning. Note that the difference between the two lies in the fact that the pronoun lacks an interpretation in (8) which is available for the pronoun in (7). To put this another way, there is a certain construal (paraphrased in the formula in (9)) which (7) can have, but which (8) lacks.

(9)  $\exists x[\text{man}(x) \ \& \ \text{walk}(x) \ \& \ \text{whistle}(x)]$

Note that the inference from the fact that (7) and (8) have different possible interpretations to the conclusion that they have different meanings is not demonstrative. It rests on the (working) assumption mentioned above that all aspects of the interpretation of a discourse are determined by the meaning of the sentences uttered. But is this a reasonable assumption to make without question? Clearly not, if the long history of the Gricean program in pragmatics is given any credence.

I suspect that the reason why the working assumption is adopted in dynamic semantics and Gricean arguments are not considered is that Gricean arguments are seen as having no purchase in this sort of case. On the one hand, Gricean conversational principles are only seen as applying to determining what is implicated, given a full specification of what is said. In the case of (7) and (8), we are considering the possibilities for anaphora resolution, thus the determination of what is said. On the other hand, and more importantly, there is a sense in which the dynamic paradigm leaves the traditional Gricean paradigm behind. What is clear from examples (7) and (8) above

is that the contrast between them resides in the difference between "not every man does not" and "some man does". Even if we saw Gricean principles as helping to determine what is said, the best that could be said about (8) is that the speaker would be violating one of the manner maxims enjoining clarity, if she intended the anaphoric dependency in question. But this merely raises the question of what notion of clarity is being appealed to. It is the aim of dynamic approaches to capture the role which the different expressions play in interpretation (albeit in an extensional, 'kinematic' manner) thus giving a clearer idea of what is going on. If anything, dynamic semantics can provide an explication of the vague notion of clarity in these cases - making the traditional Gricean notions redundant.

This having been said, I want to argue that we need not throw out the pragmatic baby with the Gricean bathwater. Just because we cannot apply the traditional Gricean paradigm to these cases, we should not rule out the possibility that some transitions between states involving discourse anaphora are determined by other than semantic factors.

Note that the standard type of Gricean argumentation has two parts. The first step is to gain assent to a methodological principle, Modified Occam's Razor: *Senses are not to be multiplied beyond necessity* (Grice 1989: 47). The second step is to show how one can provide a more parsimonious account by invoking a single sense which interacts with independently motivated conversational principles to yield different interpretations in different contexts.

If we take a step back and look at this manoeuvre, we see that, in fact, it appeals to independently motivated pragmatic principles which can be thought of (in this context) as affecting the transition between information states. It is a methodological argument against the simple-minded principle that different interpretations necessarily result from different meanings. However, in order to use this argument, we need to update our understanding of the processes governed by conversational principles. For instance, we will need to demonstrate why the discourse in (7) lacks the interpretation in question. In fact, Gamut's argument about these examples happens to involve a statement of Partee's infamous marble problem. This problem, along with others which

are treated in the dynamic framework as semantic, will be treated in pragmatic terms in what follows.

#### **4 Outline**

As mentioned above, the main aim of this thesis is to defend a quantificational treatment of definites, both descriptions and pronouns. I begin the discussion in chapter 2 with a review of proposals as to how the quantificational analysis may be developed. I will indicate four major problems that this approach faces. These have to do with incomplete descriptions, uniqueness, plural definites and referential uses. I will discuss in greater detail the issues surrounding plural definites and uniqueness in that chapter. I will also widen the scope by looking at quantificational approaches to pronouns within the E-type tradition. The dynamic treatment of anaphoric pronouns will be considered in greater detail as well.

In chapter 3 contains a proposal for the general treatment of context-dependent expressions. In chapter 4, an analysis of binding into context-dependent expressions will be set out along the lines of the variable free approach familiar from categorial grammar. In chapter 5, I will take up the main pragmatic issues that arise throughout the thesis.

## Chapter 2

### Definites: Empirical issues

#### Section I                    Introduction

This dissertation is mostly about definites. I will assume that the class of definites includes singular and plural forms of definite descriptions, *the N'*, demonstrative descriptions, *this/that N'*, possessive constructions, *A's N'*, pronouns, *she/this/that*. It is often the case that distinctions are made between certain forms of definites for the purpose of semantic analysis or that distinctions are made between certain uses of a particular form. Clearly, there are distinctions that need to be made between the meaning of, say, demonstratives and descriptions, between demonstrative pronouns and personal pronouns, and so on. However, I think that a case can be made for a general quantificational treatment of definites which sets them apart from names or referring expressions on the one hand and other quantificational noun phrases on the other.

This chapter has two main purposes: to review various possibilities for the treatment of definite descriptions and pronouns and to argue for the kind of quantificational treatment of these forms which will be developed in subsequent chapters.

I begin, in section II, with an overview of the quantificational treatment of descriptions. The stance taken there is generally sympathetic to Russell's theory of descriptions. I will however identify four major problems which quantificational theories face. These have to do with uniqueness, maximality, referential uses and incomplete descriptions.

The problem of maximality is a problem for the treatment of plural definites. In section III, I will review the literature on plurals in general, summarising with a sketch of a grammar for plurals. I will then turn to the treatment of plural definites as it is found in the literature. I will argue that

the alternation between maximal (or universal) readings and non-maximal (existential) readings is quite systematic in definites and sets them apart from other plural noun phrases, including conjoined noun phrases. This position is at odds with the overwhelming consensus in the literature on plurals that plural definites have a maximal reading only. To the extent that the obvious existence of non-maximal readings has been acknowledged, it has been treated as something of a side issue - consigned to the 'vagueness' wastebasket. I will argue that this treatment is just wrong and that the alternation between readings in plural definites results from an underspecification in their meaning. In the course of this discussion, I will show that something of a lacuna exists in the treatment of plurals and negation in the literature.

The treatment of plural definites outlined in section III has important consequences for the treatment of pronouns. In section IV, I will pursue the E-type approach to anaphoric pronouns which treats them quantificationally. This will be closest in spirit to Cooper's (1979) free pragmatic approach to E-type pronouns. One of the major issues for this kind of analysis is posed by the marble problem. I will outline how a free pragmatic approach might adequately deal with this problem. This outline will be more fully developed in chapter 5, where pragmatic issues are taken up. In this section, the problem of uniqueness will be encountered when we come to look at singular donkey anaphora. I will review and endorse the arguments against Evans (1977) and Cooper (1979) that singular donkey pronouns do not carry uniqueness implications. Like Neale (1990) and others, I will argue that the uniqueness constraint can reasonably be dropped for donkey pronouns. But unlike Neale, the motivation will concern the fact that donkey pronouns are syntactically and semantically different expressions from non-dependent pronouns. I will provide some evidence for this claim. The details will be fleshed out in chapter 4 where the proposals for dependent interpretations of definites are made. With regards the variation in quantificational force of donkey pronouns, the analysis of plural definites from section III will be shown to carry over to this case.

In section V, I turn to the problem of uniqueness for non-dependent definites. I will outline in detail the precise nature of the uniqueness issue for the quantificational approach to definites.

I take it as a fact that for discourses such as (1), no uniqueness implication is derived by hearers the usual case:

(1) A man walked in the park. He whistled.

I will argue that general appeals to 'realistic' uniqueness in such cases are inadequate. Nevertheless, I will be defending a uniqueness account of singular non-dependent definites. I will briefly consider the merits of the situation semantics approach in these matters and show that it faces the same problem as the kind of analysis I am pursuing. I will then examine aspects of dynamic semantics which pertain to this question. I will focus on the treatment of discourses in which singular pronouns are anaphoric on indefinites. The examination will reveal two things: First, the mechanism of dynamic binding employed in this approach merely approximates to routine pragmatic inferences concerning speaker's grounds. Second, when all cases involving singular pronouns are taken into account, the dynamic approach faces the same problem concerning uniqueness as the quantificational approach. I will propose an account of anaphoric relations involving singular definites based on the assumption that they encode a uniqueness constraint. I will argue that there are certain conditions under which hearers cannot fully grasp the propositional content of an utterance but do not judge the discourse infelicitous. I aim to show that the pattern of judgements supports this proposal better than the dynamic alternative. This analysis will be developed in chapter 3. I will take the time at the end of this section to highlight some other weakness in the dynamic treatment of pronominal anaphora. A general theme of this section is that dynamic semantics is generally quite limited in empirical scope and that a dual approach involving dynamic and E-type analyses is often proposed.

## Section II    Static approaches

### 1    Definites as quantifiers

Russell's theory of descriptions is the source of the widely-held view that definite descriptions are expressions of quantification. The theory of descriptions can be seen as a solution to the problem of apparently non-denoting descriptions. If we start with the assumption that the logical forms of descriptions are terms formed out of their descriptive content, their meaning might be given as (1):

$$(1) \quad \llbracket \exists x[\phi(x)] \rrbracket = \text{the unique individual } d \in D \text{ such that } \llbracket \phi(x) \rrbracket^{[x/d]} = 1.$$

But a problem arises in cases where the descriptive material in the expression fails to denote, or denotes more than one thing. We could say that in such cases the denotation of the description is undefined, but then what are we to say about a statement in which the description occurs? Consider (2):

$$(2) \quad \text{The king of France is bald.}$$

We seem to have the option of saying that an utterance of (2) fails to express a proposition or that it expresses a proposition which lacks a truth value. Neither of these options is acceptable to the Russellian: (2) expresses a perfectly comprehensible proposition. Moreover, (3) expresses a tautology:

$$(3) \quad \text{Either the king of France is bald or it is not the case that the king of France is bald.}$$

The Russellian solution is to propose an alternative account of the logical form of descriptions, on which (2) has the logical form of (4a) rather than (4b):

- (4) a.  $\exists x[\forall y[\phi(y) \leftrightarrow y = x] \ \& \ \text{bald}'(x)]$   
 b.  $\text{bald}'(\iota x[\phi(x)])$

If we adopt a quantificational approach to definite descriptions, other facts fall into place. For instance, the quantificational analysis of descriptions allows us to account for the *de re/de dicto* distinction in a straightforward manner (see Kripke 1977). This distinction is illustrated in (5), where definites interact with modals and attitude verbs:

- (5) a. Mary might have married the man upstairs.  
 b. Mary thinks the woman who lives with Bill is a spy.

Each of these sentences could be used to make one of two claims. (5a) could be used to claim of the man upstairs that, in some counterfactual circumstance, Mary marries him; or it could be used to claim that in some counterfactual circumstance, Mary marries the man upstairs. We can account for this if definites are quantificational, since quantificational elements can enter into scope relations. On the first reading of (5a), the description takes scope over the modal; in the second, it is within the scope of the modal. For example, if we represent the two readings of (5a) in a language for intensional predicate logic, we would have:

- (6) a.  $\exists x[[\forall y[\phi(y) \leftrightarrow y = x] \ \& \ \diamond(\text{marry}'(x)(m))]$   
 b.  $\diamond(\exists x[[\forall y[\phi(y) \leftrightarrow y = x] \ \& \ \text{marry}'(x)(m)])$

The ability of descriptions to take scope relative to other quantifiers is difficult to illustrate in the case of singular definites, since these pick out a unique individual. So while quantificational expressions generally enter into scope relations with other such expressions, as in (7a), we cannot show this with singular definites, as in (7b):

- (7) a. Most students admire a teacher.  
 b. Most students admire the head teacher.



However, plural definites give rise to scope ambiguities, as we should expect:

(8) The patients were seen by a doctor within an hour of admission.

So, if descriptions are expressions of quantification we can account for scope facts.

Another advantage of the quantificational approach is discussed in Neale (1990). This involves the distinction between genuine referring terms, or singular terms, and descriptive expressions. Following Kripke (1972), we can say that if an expression  $\alpha$  is a genuinely referring term, then its referent enters into the specification of the truth conditions of the proposition expressed by an utterance of " $\alpha$  is F" with respect to both actual and counterfactual situations. If we assume, following Kripke, that names are genuinely referring terms, we can illustrate this idea by considering (9), adapted from Neale (1990: 22):

(9) David Wiggins is very interested in questions about identity.

The claim is that the truth conditions of the proposition expressed by (9) depend on David Wiggins in counterfactual situations. Now suppose that David Wiggins is the current honorary librarian and that he is indeed interested in questions about identity. Then we would say that (10) is true:

(10) The current honorary librarian is very interested in questions about identity.

Does this mean that David Wiggins enters into the specification of the truth conditions of the proposition expressed by (10)? Following Kripke, we find that the answer is no. To see this, suppose that in a counterfactual circumstance John Perry is the current honorary librarian, but that he is also very interested in questions about identity. In this counterfactual situation, the proposition expressed by (10) is still true, but it is clear that its truth does not depend on how things are with David Wiggins, as he is not, in the counterfactual case, the honorary librarian.

We can therefore conclude that descriptions are not necessarily interpreted as genuine referring expressions. There is a difference between the semantic properties of descriptions and genuinely referring expressions, such as names. This difference can be captured by treating descriptions quantificationally.

There is a side issue here concerning Neale's particular treatment of definite descriptions. Neale maintains the stronger position that descriptions can never be interpreted as genuine referring expressions - in the sense that they pick out the same individual in all counter-factual circumstances. This is so in spite of the evidence discussed originally by Donnellan (1966).

Donnellan's point is that although definite descriptions are often properly understood to be communicating an object independent proposition, it is also often the case that descriptions - like demonstratives of the form "that F" - are used to communicate object dependent thoughts. He calls the former use attributive and the latter referential. The now familiar discussion involves the example in (11):

(11) Smith's murderer is insane.

Suppose that this sentence is uttered by a detective upon finding Smith's abandoned body which has been shockingly mutilated. Though the detective may have no idea who murdered Smith, he can utter (11). This attributive use is to be expected given the Russellian account. Donnellan also discusses an utterance circumstance in which speaker and audience are at Jones' trial for the murder of Smith. They are convinced of his guilt and, seeing him rant and rave in court, the speaker utters (11). In that case, the intuition is that (11) communicates an object dependent proposition to the effect that Jones is insane. This is the referential use.

The point at issue is whether the referential use calls for some kind of dual analysis. For example, definite descriptions could be ambiguous between the Russellian description and some kind of referential expression. The latter analysis would presumably be given along the lines of

referential uses of demonstratives ("that F" etc). Neale's point is that the object-dependent proposition communicated in circumstances of referential use is not necessarily the proposition expressed. He defends a unitary treatment of descriptions on the grounds that the object dependent proposition conveyed by (11) can be derived from the Russellian proposition expressed as a conversational implicature by the use of Grice's theory of conversation. Thus the dual analysis is otiose, by Modified Occam's Razor.

At this level of discussion I leave the issue open and will pick it up briefly at the end of chapter 3. I might note in passing, though, that I find Neale's vigorous defence of a unitary, Russellian treatment of definite descriptions a little at odds with his readiness to suppose that pronouns (and presumably demonstratives) are to be given the kind of dual analysis which is rejected for descriptions<sup>1</sup>. This is in spite of the fact that definite descriptions, personal pronouns, demonstrative pronouns, and demonstratives of the form "that F" can all be understood attributively and referentially<sup>2</sup>. Also, they can all receive readings on which they are bound.

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<sup>1</sup> Note that Neale gives a very good account of the non-referential, non-bound variable uses of pronouns as full definite descriptions (as a version of the E-type approach). I will discuss this in section IV.

<sup>2</sup> The attributive use of demonstratives is not so often discussed. Some examples are provided in (i):

- (i) a. John owns some donkeys which he beats mercilessly; but he also tends donkeys belonging to neighbouring farmers. Of course, he doesn't beat those (donkeys).
- b. Every farmer who tends donkeys belonging to other farmers as well as his own beats those (donkeys).

(ia) involves a cross-sentential anaphoric dependence between a demonstrative and an indefinite. (ib) is a donkey sentence with demonstratives. We can also get non-referential uses of pronouns of all types even where they are non-anaphoric. Consider a scenario where we come across some curious and unidentifiable animal prints on the beach. In that case I can utter (ii), where the pronoun would be used attributively (eg as in "That, whatever it is...")

- (ii) That/It must be enormous.

If you consider Neale's argument for a unitary non-referential account of descriptions, he uses the classic Gricean manoeuvre: one can account for referential uses using a theory of implicature; this analysis reduces the number of senses; Modified Occam's Razor dictates that we choose the unitary account. But by this very argument, demonstratives should be treated as non-referential as well, as should pronouns, since the analysis would reduce the number of senses. We will return to this issue later.

## **2 Incomplete descriptions and context dependence**

One issue about the quantificational treatment of descriptions which Neale discusses briefly is that of the context-dependence of the descriptive content. Consider (12):

(12) The table is covered with books.

A strict application of a Russellian analysis predicts that the proposition expressed by this sentence should actually be false, since there is more than one table in the world. However, if I were to utter (12) in my study where the sole table is covered with books, it would be taken to express a true proposition. The problem, as Neale notes, is not restricted to definites. Consider a report of a dinner party given for a few friends. An utterance of (13) in such circumstances would similarly be taken to have expressed a true proposition if the guests present each brought a bottle of wine:

(13) Everyone brought a bottle of wine to my dinner party

If "every" is treated as a quantifying determiner with universal force, the meaning of the sentence uttered should make the proposition expressed come out false, since not every person in existence brought a bottle of wine to my dinner party.

So, expressions of quantification require some kind of contextual restriction in most cases, and definite descriptions seem to be no different in this respect.

The problem this raises for compositional treatments of the semantics of quantification has three possible solutions. Either we can assume that expressions such as "every man" should, in most cases, be analysed as being completed at a syntactic level by means of some kind of phonologically null, pronominal like element, or that at a level of syntactic representation, the nominal complement of the determiner is reconstructed, and this representation is the object of semantic evaluation. Or we can suppose that the contextually recovered material is not syntactically present and the object of evaluation is just the form given by the combination of "every" and "man", but that the evaluation takes place against a (pragmatically) constrained universe of discourse. Finally, following Westerstahl (1985), we could suppose that natural-language determiners do not have the same meaning as their logical counterparts, but that they are in fact context-dependent determiners. It turns out that the latter possibility is the most plausible alternative. Before we look at the details of Westerstahl's proposals, let us briefly consider the other two.

One problem with the syntactic ellipsis account is that there is no evidence for the presence of the implicit material at the syntactic level. For instance, if the elided material is recovered at some syntactic level of representation then we would expect that constructions which are sensitive to syntactic identity to reveal the presence of this material. Klein (1980) considers examples such as (14):

- (14) On Sunday, John hosted a bridge party while Mary took the children to the beach. At the end of the day, John said that everyone had a good time; and Mary did too.

As he notes, ellipsis is sensitive to the kind of syntactic identity conditions which we would expect these quantified noun phrases to conform to if the contextual material is represented at some syntactic level. But in (14) "everyone" in the antecedent sentence is understood as

"everyone at the bridge party", while in the ellipsed sentence, it is understood as "everyone of the children". So we can conclude that the context-dependence of these expressions is not a phenomenon which is to be described at a syntactic level.

Turning now to the second option, if we consider an example such as (15) in a situation where we are discussing a particular exam, we can see that, regardless of how the extra restriction is explicitly spelled out, someone who understands what is meant on such an occasion would verify the utterance by comparing the class of students who sat that particular exam with those who sat the exam and passed:

(15) Most students passed the exam.

Let us adopt the semantic framework of Barwise & Cooper (1981) in order to deal with quantified noun phrases in English. This consists of a fragment of English, a formal language for the logic,  $L(GQ)$  and the translation rules. Given a model  $M = \langle E, [\cdot]^M \rangle$ , N's and VPs are translated as set terms. NPs are interpreted *quantifiers* on  $M$ , which denote sets of sets. Dets are interpreted as *determiners* on  $M$ , functions from sets to sets of sets. A sentence of the form in (16a) will receive the translation in (16b), where  $D_M$  is a determiner,  $A$  and  $B$  are set terms and  $(D_M A)$  is a quantifier:

(16) a.  $[S[_{NP}[_{Det}D] [_{N'}A]] [_{VP}B]]$   
 b.  $(D_M A)B$

In the case of (15), if we translate the N' phrase as  $A$  and the VP as  $B$ , we will have the formula (17a), whose truth conditions are given in (17b):

(17) a.  $(\text{most}'A)B$   
 b.  $[[(\text{most}'A)B]^M] \Leftrightarrow |[A]^M \cap [B]^M| > \frac{1}{2}|[A]^M|$

As Westerstahl (1985) notes, we might be tempted to look on the interpretation of (15), given in (17), as being relative to a model in which the domain,  $E$ , of the model is implicitly restricted. In this case, the restriction would be to the set of individuals who sat the exam. Westerstahl calls this the flexible-universe strategy and argues that it is ill-conceived on both methodological and empirical grounds.

It has been proposed (by Barwise & Cooper (1981)) that natural-language determiners are subject to a linguistic universal which has come to be known as conservativity:

Conservativity:

$$\text{For all } M \text{ and all } A, B \subseteq M, D_M AB \Leftrightarrow D_M A \cap B$$

That is, only that part of  $B$  which is common to  $A$  is relevant for the truth of  $D_M AB$ . If we were now to suppose that quantifying determiners have a constant interpretation in the following sense,

Constancy:

$$\text{if } M_1 \subseteq M_2 \text{ then } \llbracket D \rrbracket^{M_1} \text{ is } \llbracket D \rrbracket^{M_2} \text{ restricted to } M_1.$$

In other words:

$$\text{for all } A, B \subseteq M_1, B \in \llbracket D \rrbracket^{M_1}(A) \Leftrightarrow B \in \llbracket D \rrbracket^{M_2}(A)$$

then, taken together with conservativity, this would imply that natural-language determiners restrict the universe of quantification to the NP universe, which seems to be intuitively correct:

$$\text{For all } M \text{ and all } A, B \subseteq M, D_M AB \Leftrightarrow D_A AB.$$

But this depends on constancy, which, as Westerstahl notes, requires universes to be big enough to ignore. This leads to a methodological postulate that *discourse universes are large*. The exact

choice of universe is not important if it is large.

Now, if we wish to account for the interpretation of (15) as being due to an implicit restriction of the universe of discourse to the context set, we would violate this methodological postulate, since, in general, context sets are not large.

The second of Westerstahl's arguments against the flexible-universe strategy is familiar<sup>3</sup>. It has to do with examples such as (18) (Westerstahl's (8) p 49):

(18) The English love to write letters. Most children have several pen pals in many countries.

In this example, the universe of discourse must include English and non-English people. But *most* in the second sentence is restricted to English people, while *several* in the same sentence is not. It is clear that here we cannot account for the implicit restrictions with the flexible-universe strategy, since we have different restrictions occurring within the same sentence.

The problem here is a special case of a more general problem for natural language: relativisation to context occurs locally. Semantic analyses need to take account of this. Westerstahl's own solution introduces context-dependent determiners into the translation language via the transformation in (19a). The restricted determiner symbol is defined (19b) for X, a fixed set:

- (19) a. If D is a determiner symbol and  $\eta$  a set term then  $D^\eta$  is a determiner symbol.  
b.  $D_M^X AB \Leftrightarrow D_M X \cap A B$ .

The translation rules of the fragment are modified so that English determiners are translated by restricted determiner symbols. These symbols involve set variables, which need to be added to  $L(GQ)$ , and context determines the assignment of values to these. In the case where there is

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<sup>3</sup> See Soames (1986) for similar arguments against Barwise & Perry's (1983) treatment of incomplete definite descriptions which has similar properties to the flexible-universe strategy.



intuitively no restriction of the determiner, the context assigns the set E as the value of the variable.

A notable feature of this treatment is that the set variables in the translation language do not correspond to a symbol in the fragment. Like Kaplan's notion of character, Westerstahl's treatment employs an extra dimension of meaning which mediates between syntactic object and content. The restricted determiner symbols effectively represent functions from context to content. However, as the proposal stands, it introduces an unwanted dimension of rigidity. The value of the context set variable is determined by an assignment which is fixed by context. One can only assume then that once the value is fixed, the proposition expressed by an utterance involving a quantifier depends on the individuals in this set in the manner specified in (19b). This is problematic since one can understand the contextually recovered material for quantifiers to be descriptive. Consider (20):

(20) John threw a party. Everyone brought a gift.

The second sentence in this discourse can be given the Westerstahl treatment by allowing the variable assignment function which determines the value of the context set introduced by the subject noun phrase to pick out, say, the set of people who were at the party which John threw. This seems to be the right choice in this case. But now, with this choice of context set, the second sentence expresses a proposition in which the quantifying determiner is rigidly restricted with this set of individuals. The result is that, when we take the proposition and evaluate it at a counterfactual index, the truth of the proposition will not depend on who was at John's party at that index, but on the people who were at John's party in the actual world. To make the example a little more concrete, suppose that as things actually stand, John only invited his generous friends, all of whom indeed brought gifts. In that case, the proposition expressed by the second sentence in (20) is true at this index. Now suppose, counterfactually, that, in addition to his generous friends, John had invited his friend Silas, who, being a notorious miser, brought nothing. In this circumstance, we would judge what the second sentence says to be false.

However, according to our analysis, the proposition expressed by that sentence would still be true, since we are still only counting John's generous friends in our evaluation.

This discussion highlights the problem of appealing to variable assignments in the general case of context dependence. The idea works for the special case where pronominal expressions are used referentially, but not in general. Thus, a mechanism would have to be devised for allowing descriptive material to complete the restrictor of the determiner.

The problem of dealing with context dependence in an adequate way is a major concern of this thesis. Moreover, giving a proper account of this phenomenon will be central to a proper treatment of the empirical issues concerning the interpretation of definites. My proposals concerning the treatment of context dependence will be made in chapter 3, after we have considered a fair range of facts which need to be handled by an adequate account of the semantics of definites. There are two major alternative approaches to context-dependence and definites to the one which I will be defending. These are dynamic semantics and situation semantics. These approaches are to be distinguished from the one that I will be pursuing in that they introduce an element of partiality into semantic analysis. I will discuss aspects of the dynamic approach in more detail in sections V and VI of this chapter as well as chapter 3. With regards situation theory, we might note at this stage that Westerstahl's example (18) above already poses problems for Barwise & Perry's (1983, 1985) original statement of the theory, as has been noted in Soames (1986). We will consider some more serious problems for situation theory in section V of this chapter. At this stage, if one wants to maintain a view on which semantic evaluation is made against a total model, then the models in question have to be big enough to ignore. Moreover, contextual completion of quantificational expressions needs to be made locally.

Until a full statement about how this completion process is implemented can be made, I will use Westerstahl's proposal as an interim means to represent the fact that contextual completion is local in the sense argued for above.

Returning to the case of incomplete descriptions such as (12) above, we could, following Barwise and Cooper, treat the definite article as a determiner whose  $L(GQ)$  rendering is given in (21a). The Russellian alternative advocated by Neale is given in (21b):

- (21) a.  $the_{sing}AB \Leftrightarrow |A-B| = 0$  if  $|A| = 1$   
           undefined otherwise.  
       b.  $the_{sing}AB \Leftrightarrow |A-B| = 0 \ \& \ |A| = 1$

The restricted version of (21b) is given in (22b):

- (22)  $the_{sing}^XAB \Leftrightarrow |A \cap X - B| = 0 \ \& \ |A \cap X| = 1.$

We should note here that the Barwise and Cooper formulation is non-Russellian, in that it allows a sentence involving a description not to express a proposition, or to express a proposition which lacks a truth-value. These are the two alternatives which the Russellian approach rejects. So, within the framework of generalised quantifiers, it is possible to remain open on the issue of whether definite descriptions should be treated in the Russellian manner, and yet maintain a quantificational approach.

### 3 Plural descriptions

In both Barwise & Cooper (1981) and Neale (1990), descriptions with plural grammatical forms are treated as headed by a separate determiner,  $the_{pl}$ . Neale's Russellian determiner is given in (23):

- (23)  $the_{pl}AB \Leftrightarrow |A-B| = 0 \ \& \ |A| > 1.$

Neale also provides for a numberless description,  $the$ , which is needed to account for examples

such as (24a&b):

- (24) a. Whoever fixed this sink knows nothing about plumbing.  
b. Everyone who saw a man and a woman walk in the park heard the man whistle.  
c.  $\text{wheAB} \Leftrightarrow |A-B| = 0 \ \& \ |A| \geq 1$ .

Barwise and Cooper also define separate determiners for "the four" etc:

- (25) the n AB  $\Leftrightarrow |A-B| = 0$  if  $|A| = n$   
undefined otherwise

The idea behind these analyses is that definite descriptions in some sense exhaust the range of a particular predicate, albeit usually contextually restricted. There is also the separate idea that grammatical number and/or overt indications of number encode information about cardinality of this range. But note that in the case of Neale's numberless description, a strict generalisation relating grammatically singular descriptions with the information that the predicate only applies to a single individual breaks down.

From this brief outline, we can see that the quantificational approach, if suitably enriched with a theory of context-dependent quantifiers, can deal with many of the properties of descriptions in a fairly straightforward manner. However, as it stands, there are some obvious limitations. The first has to do with the fact that the generalised quantifier approach sketched above has little to say about so-called collective interpretations of noun phrases in general. Thus, collective interpretations of definite descriptions fall outside the scope of the analysis as it stands. Collective interpretations arise in cases where a predicate phrase expresses a property which can hold of collections of individuals without in fact holding of any of the (sub-collections of) individuals making up that collection. For instance, predicates such as *gather* and *meet* seem to apply only to groups of individuals:

- (26) a. John and Mary met on Tuesday.  
b. The children gathered in the square.

Many complex predicates display this property. To illustrate, notice that (27b) is not entailed by (27a):

- (27) a. John and Bill carried that piano upstairs.  
b. John carried that piano upstairs.

By contrast, some predicates are naturally distributive: if they hold of a collection, they hold of the individuals which make up that collection:

- (28) a. John and Bill slept in the attic.  
b. John slept in the attic.

The generalised-quantifier analysis sketched above requires all predicates to be distributive, since they entail that the property expressed by the VP holds of each of the individuals which make up the (possibly contextually restricted) set denoted by the restrictor of the NP. This limitation can be overcome by incorporating the treatment of plurals pioneered by Link (see 1983) into a generalised-quantifier framework. We will examine various proposals along these lines in section III.

A similar limitation arises in the case of mass terms such as "the gold", and we can develop an account of statements such as "Most of the gold is in the safe" in terms of measuring quantities, rather than counting elements, along the lines sketched above. We shall not be considering mass terms in this essay.

Finally, definites can appear in generic statements such as (29):

(29) The whale is a mammal.

The generalised-quantifier approach sketched above has nothing to say about these cases either. We will touch on this issue briefly in chapter 4.

One final note on the quantificational approach to descriptions is worth making. We began this section by reviewing briefly the considerations which lead Russellians to adopt the quantificational approach. We then saw that, having adopted this approach, we can account for various facts about the scope of definites, incomplete descriptions and so on. However, these other facets of the analysis which 'come for free' with the Russellian analysis of *the king of France* can also be handled within a non-Russellian approach which treats descriptions effectively as terms.

If we return to analyses of the logical form for descriptions in terms of the iota operator, considered now as a partial function from unit sets to the unique members of those sets, we can see, first, that under this analysis, the semantics of descriptions will differ from that of names, considered as singular terms, since the value of the function can potentially vary when it is evaluated at different indexes (possible worlds). The scope of descriptions with respect to modal and other intensional operators can be handled on the assumption that scope in natural language, in general, is a product of syntactic factors. For example, in the generative tradition, scope relations are thought to reflect the position of the noun phrase within the sentence structure assigned by the grammar. This does not necessarily correspond to 'surface' position, since there are thought to be movement operations which are not reflected at this level (see May 1985). So, if we consider the interaction of descriptions with modal operators as in (30a), we could argue that the logical form which corresponds to the wide-scope construal, (30b), reflects the LF obtained by movement of the description to a position which C-commands the modal, (30c):

- (30) a. Mary might have married the man upstairs.  
 b.  $\lambda x[\text{Mary might have married } x](\iota z[\text{the man upstairs}(z)])$   
 c.  $[\text{the man upstairs}]_i[\text{Mary might have married } t_i]$ .

(30b) is not equivalent to the formula in which the iota term is interpreted within the scope of the modal, the logical form corresponding to the surface form of the sentence.

The interaction of plural definites with expressions of quantification can be similarly handled if we treat distributivity as a property of plural predicates. Although we shall return to this issue in detail in section III, we can illustrate the scope potential of plural terms in general by considering a non-definite plural term such as "John and Bill":

- (31) a. The patients were seen by a doctor within an hour.  
 b. John and Bill were (each) seen by a doctor within an hour.

What makes a referential plural term sensitive to scope is the distributivity of the predicate which applies to it. In the case of (31b), we could have the noun phrase [*a doctor*] C-commanding the plural subject at LF, (32a), resulting in the logical form in (32b). (Note that the translation of "each", *D*, is a function which transforms plural predicates into predicates which apply to plural individuals (collections) whose atomic parts satisfy the original predicate)

- (32) a.  $[\text{a doctor}]_i[\text{John and Bill were each seen by } t_i]$ .  
 b.  $(\text{det}_{\exists}(\text{doctor}'))(\lambda x[(D(\lambda y.\text{see}'(y)(x)))(\text{john}'\&\text{bill}'))]$

Thus, if we treat definite descriptions as terms, an account of the scope interactions of plural descriptions with other expressions of quantification would fall out of an account of plural terms in general.

In the case of incomplete descriptions, we could similarly suppose that an operation on iota

operators which transforms them into context-dependent operators can be constructed:

$$(33) \quad \iota z^X[\phi(z)] = \iota z[\phi(z) \ \& \ X(z)]$$

This latter operator could then serve as the translation of definite noun phrases, where the predicate variable is provided by the context.

Thus it would seem that the sole motivation for the quantificational approach to descriptions comes from the idea that "The king of France is bald" expresses a perfectly comprehensible proposition, which, moreover, has a truth value. An alternative would be to say that with descriptions, existence is a presupposition. Which of these options is to be preferred remains an open question. On the face of it, though, it would seem that the Russellian has a point, since the intuition that King-of-France examples do have a truth value is much sharpened by examples such as (34):

(34) The king of France isn't bald, because there is no king of France.

On both accounts, a question remains as to why some uses of non-denoting descriptions strike informants as less than acceptable while others do not:

- (35) a. The king of France is (not) bald.  
b. Last night, I had dinner with the king of France.

However, the problem is more severe for a presuppositional approach, if the motivation for this approach is that sentences containing non-denoting descriptions are not truth-evaluable or are otherwise deficient. For (35b), there is a clear intuition that the speaker's claim is false, and the utterance seems fully acceptable. The speaker simply seems to have been mistaken about whom she had dinner with.



With regards (35a) the Russellian could argue that the deficiency in some cases arises from violations of conversational principles, as has been argued by Grice in "Presupposition and conversational implicature" (1989).

## **4 Issues and Problems for the Russellian account**

### **4.1 Linguistics and the Russellian view**

The major support for a quantificational approach to definite descriptions comes from semantic considerations. The proposition expressed by an utterance containing a description behaves differently to that containing a singular term with regards counterfactual circumstances and intensional constructions. A major motivation for adopting a Russellian quantificational treatment stems from Russell's arguments concerning king-of-France examples. We have seen that if one is interested in implementing this approach in a linguistic framework, one has to deal with the contextual restriction involved in most uses of descriptions. Let us suppose that this can be done in a manner related to Westerstahl's proposal for quantifiers outlined above. It follows then that we would need to distinguish between something like the character of the linguistic form of a description and its Russellian content. Thus, if one grasps the linguistic meaning of a definite description, then one understands that some contextual completion is necessary (albeit sometimes redundant) in order to grasp the content of the utterance. It was also suggested that the contextual completion for quantifiers in general can be descriptive. This is no less the case for descriptions. Consider (36)<sup>4</sup>:

- (36) a. Last year, John threw just one party. The guests brought a gift.  
b. I've just arrived. The camel is outside and needs water.

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<sup>4</sup> (36b) is taken from Asher & Lascarides (1998).

It was suggested that Westerstahl's actual proposal is deficient with regards to this kind of contextual completion as he employs contextually relativised assignments to set variables in his characterisation of context dependent determiners. The necessary amendment will be presented in chapter 3.

It is important to note that in proposing an analysis of the linguistic meaning of definites along the lines just sketched, one has to deal with Soames (1986) claim that "...the strategy of relying on the context to complete the description by providing extra **descriptive** content seems to be fundamentally flawed." (p352 emphasis in the original). Soames argument turns on consideration of an attributive use of "the murderer" in an utterance of "The murderer is insane" in a circumstance in which we come upon Smith's body. If we allow in descriptive completion then this utterance might be thought to express one of the propositions characterised in (37):

- (37) a. The murderer of the president of the United Jersey bank is insane.  
b. The murderer of the man lying on the rug in front of me is insane.  
c. The murderer of my neighbour's boss is insane.

Soames argues that, generally, the context cannot support the determination of descriptive content. In the case at hand, the speaker may believe that the victim satisfies each of the descriptions in (37a-c) without his intention in uttering the sentence favouring any one of them. More importantly, the speaker's remark may be judged true even if these descriptive completions apply to someone else who has not been murdered.

Soames proposes instead that the description may be completed by contributing an object to the content of the description. In the current example, the content of "the murderer" will be a descriptive concept involving the victim as one of its constituents. That is, the content will be the same as that of "the murderer of him" with the victim as the referent of the indexical.

The suggestion then is that unless one can account for incomplete description along the non-

descriptive lines suggested by Soames, then the program of adopting a total semantic approach to these matters is "fundamentally flawed". Well, if we reconsider the examples in (36) above, then we may have to say that the program is fundamentally flawed since there is no object to be recovered from the context with which we can unequivocally anchor the proposition expressed.

However, things are not as grim as they may at first appear. Let us take these three examples one at a time. Consider first (36a). In this case, we could say that unlike the case where we are standing over Smith's body, the speaker no doubt intends that the audience entertain a belief whose content we could more fully gloss as "the guests at the party which John threw brought a gift". Unlike Soames' example, the speaker's intentions must favour such a proposition. It would be unreasonable to do otherwise since the information in the context supports no other understanding of the utterance. Soames' discussion of his example invokes our intuitions in a case in which we are standing over the victim. In that case, we agree with Soames when he says that the proposition expressed by "The murderer is insane" may be true even if the completing descriptions in (37a-c) apply to someone else who has not been murdered. But this only shows that the incomplete description can be completed in this non-descriptive way. No doubt, in the murder scenario, the non-descriptive completion is the most obvious or relevant. If the process of recovering the completion is governed by conversational principles, as we will suppose, then in the Soames' scenario, we would most likely take the speaker to have intended that we recover the non-descriptive completion. But in some scenarios, this may not be the case and in others, such as in (36a), it cannot.

Turning now to (36b), we see that unlike in (36a) or Soames' example, there is no clear cut intuition about what descriptive content is recovered. What is fairly clear cut is that we are meant to infer that the camel in question is the mode of transport that the speaker use to get wherever it is the utterance is made. Beyond this, the completion seems pretty much up for grabs. However, I do not think that this is all that problematic so long as it is agreed that when we talk about the content of an utterance we are talking about the content of the thought which comes to be entertained on the basis of the utterance. There is a difference between this and the content

of the speaker's intentions. This is fairly obvious in the case of conversational implicature. To take an example that will be discussed in detail in chapter 5, consider John's father's understanding of John's mother's utterance in (38):

(38) *Scenario*: John's father is talking on the phone to John.

*John's father (to John's mother)*: John wants to go swimming with Bill today.

*John's mother*: He has a cold.

Now, it is clear here that John's mother intends that John's father realise that she is withholding permission on the grounds of his having a cold. However, in these cases, John's mother's intentions cannot be reasonably said to extend to the precise content of the beliefs that John's father comes to entertain in the course inferring this response: Something along the lines of "John's having a cold is sufficient grounds for John's mother withholding permission" will do. So, in this case of conversational implicature, we say that the content of the speaker's intention is that the audience derive certain inferences to the effect that she is withholding permission on the grounds that John has a cold. The path to this result cannot reasonably be said to be specified in the speaker's intentions.

In this thesis, I will be adopting the assumption that when we specify the content of an utterance, or the what is said by an utterance, we are characterising the content of the representation that the audience comes to entertain on the basis of the linguistic stimulus and that the audience's grasp of this content often involves the same processes which determine conversational implicature when it comes to context dependent expressions. In some cases, we can characterise the speaker's intentions as specifying somewhat precisely what this content is, as in the case of "the murderer" perhaps. In other cases, as in the 'camel' example above, given the circumstances of the utterance, the speaker cannot reasonably be said to have an intention in which the precise content of the utterance is specified. Rather, in this case, the speaker is implying in a back-handed way, that the camel outside is her mode of transport. Just how this is inferred, and just what the content of the utterance is taken to be on the route to this inference is left up to the audience

to some extent.

This is not to say that the content of the utterance is in some way vague or underspecified. It is neither. It is just that the content of the speaker's intention does not have to fully specify what this is. Note also that this position does not impugn any of the Russellian considerations which lead us to adopt a quantificational position since the Russellian arguments can be made with examples such as "the king of France" or "the number of the planets in our solar system" where the content of the description can be said to be fully specified in the speaker's intentions.

## 4.2 Uniqueness and identifiability

Our position is that if one grasps the linguistic meaning of a definite description, then one understands that some completion may be necessary in order to grasp the content of the utterance. This follows from a specification of the linguistic meaning of context-dependent quantifiers somewhat along the lines of Westerstahl's proposal (39a-b). For singular definites, the Russellian analysis would be as in (39c) adapted from Neale (1990). Note that this analysis will need modification at least to eliminate the unwelcome rigidity. It will ultimately be modified in other ways as well. But for now it will do for the purposes of the discussion in this section:

- (39) a. If  $D$  is a determiner symbol and  $\eta$  a set term then  $D^\eta$  is a determiner symbol.  
b.  $D_M^X AB \Leftrightarrow D_M X \cap A B$ .  
c.  $\text{the}_{\text{sing}}^X AB \Leftrightarrow |A \cap X - B| = 0 \ \& \ |A \cap X| = 1$ .

Just how the completion is to be made for a given utterance containing a singular description is of course not specified here at all. It is assumed that this is inferred.

Now there is, it seems, a condition on the proper use of singular definites which we might refer to as the identifiability condition. Consider a scenario where you are in my study in which there

is a table (covered with books). I utter (40):

(40) The table is covered with books.

In this case, it is most natural to infer that I am talking about the table in the room we are in and thus that I intend you to recover an appropriate completion for the description along these lines. We could gloss the content of this as "The table in this room is covered with books". Now consider an alternative scenario where there are two tables in the room (both covered with books) and where I utter (40) without any gesture. It is clear that my utterance is unacceptable in that case. Let us say that the utterance in the second scenario violates the identifiability condition. Another instance of this might be the unacceptable discourse in (41):

(41) Five senators interviewed Monica in person and the senator got her phone number.

It seems natural to account for the identifiability condition as arising from the semantic uniqueness condition specified in the linguistic meaning of such expressions. We could say that in these utterance situations, the speaker does not provide enough information for the hearer to be able to recover the content of the utterance, given that linguistic meaning of the definite constrains them to recover uniquely denoting descriptive content.

We can find support for this account of the identifiability condition if we consider other expressions of quantification which are generally contextually restricted. Compare the acceptability of an out of the blue utterance of (42a) with that of (42b):

- (42) a. Everyone was drunk by ten o'clock.  
b. I made a punch for my party last Saturday which was way too strong. Everyone was drunk by ten o'clock.

Again we could say that an utterance involving "every" imposes an identifiability condition due

to the semantic condition that the meaning of the phrase has to be completed in the context.

There is a problem for this account of the identifiability condition for singular definites however. Consider the discourse in (43):

(43) A man and a woman were walking together in Hyde Park. The man whistled.

This example is adapted from the familiar example in the dynamic literature given in (44):

(44) A man was walking in Hyde Park. He whistled.

As we will not be concerning ourselves with pronouns until section IV of this chapter, we will focus our attention on (43) although the problems here apply with equal force for E-type approaches to pronominal anaphora such as that proposed in Evans (1977), Cooper (1979), Neale (1990) and elsewhere. The point, most cogently made in Heim (1982) (see also Kamp 1981) is that the discourse in (43) simply does not imply that just one man was walking with a woman in Hyde Park. This is, I think, clear. On the account of incomplete descriptions sketched above, it is difficult to accommodate this fact, however.

This type of anaphoric use of descriptions is clearly a case of incomplete description. Intuitively, we might describe the situation more precisely by using something like (45):

(45) A man and a woman were walking together in Hyde Park. The man who was walking together with a woman in Hyde Park whistled.

In other words, the contextual restriction on the descriptive content of the definite description in the second sentence in (43) is something like (46):

(46)  $X_1 = \{x: x \text{ walks together with a woman in Hyde Park}\}$

Thus the L(GQ) logical form of the sentence in the context would be as in (47):

(47)  $(\text{the}_{\text{sing}}(\text{man}' \cap X_1))(\text{whistled}')$

This entails that there was exactly one man walking with a woman in Hyde Park. But, it is agreed that the original discourse in (43) does not entail this. So there seems to be a problem here for the Russellian analysis of definites.

The view from Kamp and Heim and the great amount of research which has followed the wake of their pioneering work is that there is no such uniqueness entailment because definites (or at least pronouns) do not encode a semantic uniqueness constraint. Indeed, the dynamic view is that definites (or at least pronouns) should not be treated as Russellian descriptions<sup>5</sup>. I will review these proposals in detail in section V of this chapter and in chapter 3. For now we should note that if (43) were to be treated dynamically, according to Heim (1982), the content of the discourse would be equivalent in the relevant respects to that represented by the formula  $\exists x \exists y [\text{man}'(x) \wedge \text{woman}'(y) \wedge \text{walk}(x) \wedge \text{walk}'(y) \wedge \text{whistle}'(x)]$ . As there is no semantic uniqueness condition associated with definites in dynamic semantics, the identifiability condition is considered to be a *formal* condition on the construction of discourse interpretation. This will be discussed in more detail in later sections.

At this stage, we could follow the lead of Evans (1977), Kadmon (1990), Neale (1990) and others and claim that uniqueness is involved in these discourse anaphoric cases, but that a more flexible notion of *realistic* uniqueness is required. This is probably a notion which many proponents of a Russellian analysis would advert to in cases such as (43) and (44). A statement of this idea can be found in Evans (1977: 130) with regards E-type pronouns (which he analyses

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<sup>5</sup> I equivocate here with regards descriptions as there is less of a universal consensus in the dynamic literature regarding whether descriptions should be handled in the same manner in which E-type pronouns of the type in (44) should be handled. Heim's (1982, 1983) theory includes both pronouns and descriptions. Kamp (1981) does not. In fact, Kamp & Reyle's (1993) textbook on DRT explicitly avoids the issue of how to treat descriptions.



in terms of a Russellian description with a uniqueness entailment):

"We should allow the reference of an E-type pronoun to be fixed not only by predicative material explicitly in the antecedent clause, but also by material which the speaker supplies on demand"

Similar sentiments have been expressed by Kadmon (1990) with regards (48) (her (21) p 280):

(48) Once upon a time, Leif bought a chair. He got it at a tag sale.

She remarks:

"at the time the definite is used, the hearer need not know in what way the chair in the story is unique. [...] The hearer is apparently able in the context of a story to rely on the speaker for uniqueness - one interprets *it* as something like 'the one chair that the story is about', or 'the one chair that the speaker has in mind', or 'the one chair that Leif bought that the speaker has in mind'." (ibid)

We can suppose then that a realistic uniqueness strategy for a Russellian would go as follows: On encountering an utterance where there is not enough information available in the utterance circumstance to recover uniquely denoting descriptive content, the audience would be justified in fleshing out the descriptive material with "which the speaker has in mind". In the case of (43) above, we would gloss the hearer's understanding of the second sentence in the discourse as "The man who was walking with a woman in Hyde Park which the speaker has in mind whistled".

Now, unfortunately for Russellians such as Neale and Evans, this strategy would deprive them of an account of the identifiability constraint in terms of the semantic uniqueness constraint encoded into singular definites. Worse still, it would make incomprehensible the infelicity of an utterance of discourses such as in (41) since the audience could simply flesh out the description

as "The senator among those who interviewed Monica which the speaker has in mind". We can see that this strategy is implausible if we consider (49):

(49) Five senators interviewed Monica in person and a certain senator got her phone number.

This discourse is perfectly felicitous and comprehensible, but "a certain" means something like "one the speaker has in mind".

I think that the uniqueness-identifiability problem is serious for a quantificational approach to non-dependent singular definites which include some kind of uniqueness constraint. Although I will ultimately defend such an account, getting at the conditions for felicitous discourse will involve a good deal of digging. I will put off a full discussion of this issue until section V where an appraisal of the dynamic alternative to the identifiability condition is made.

I might remark in closing this section that Kadmon's (1987, 1990) defence of a uniqueness constraint is cast within a dynamic setting. Thus she has the luxury of the dynamic identifiability constraint to fall back on in order to account for infelicitous cases. However, we will find that the dynamic treatment of infelicity in formal terms is less than effective in many cases and that Kadmon's combination approach does not advance our understanding of what is going on in these cases. Moreover, like Evans and Cooper (1979), Kadmon also defends a uniqueness proposal in the case of singular donkey pronouns. We will review familiar objections to this in section IV. By contrast, I will argue that it is possible to defend a distinction between dependent singular definites and non-dependent singular definites within which it will be possible to discard the uniqueness constraint in the former case.

At this stage, we should take note that the uniqueness issue is quite serious for the Russellian account of definites, and that it constitutes one of the major challenges to it posed by the dynamic alternative. Another major challenge comes with the problem of maximality. This will be raised in the next section.

### 4.3 Maximality

A fairly common extension of the Russellian analysis of singular definites to the plural form involves a proposal that definites exhaust the range of their descriptive material. Within the generalised-quantifier framework, this idea can be implemented as in (50):

$$(50) \quad \text{the}_{\text{pl}}AB \leftrightarrow |A-B| = 0 \ \& \ |A| > 1.$$

Clearly, this proposal needs to be amended to take account of incomplete descriptions, as in (61):

$$(51) \quad \text{the}_{\text{pl}}^XAB \leftrightarrow |A \cap X - B| = 0 \ \& \ |A \cap X| > 1.$$

It was mentioned above that this analysis says nothing about collective predications based on plural noun phrases. But even focussing on cases for which (51) should provide an adequate analysis, the truth conditions given there are too strong.

The examples which show most clearly that something is amiss with this analysis involve negative contexts. Neale (1990), who advocates the analysis in (50) for plural definites, notes (p. 256-257, fn 31) that it would predict that (52) below should be true if some farmers vaccinate some, but not all, of their donkeys:

$$(52) \quad \text{No farmer vaccinated the donkeys he owns.}$$

In other words, it predicts that (52) is equivalent to "No farmer vaccinates all the donkeys he owns". This is clearly wrong. We interpret (52) in the same way that we would "No farmer vaccinated any of the donkeys he owns.". Note that the bound-variable pronoun within the description ensures that it is interpreted within the scope of the binding negative quantifier.

Although the details of the quantifier analysis make the wrong prediction in the negative case, it is tempting to assume that the idea underlying this analysis can be retained. That is, (52) is understood as covering all cases of donkeys owned by each farmer. So, one might be inclined to say that it is only the way in which the idea of exhaustiveness is implemented in the quantifier analysis which is contradicted in negative contexts, but not the spirit of the analysis. But this would be the wrong way to proceed. In fact, 'non-exhaustive' readings show up in both negative and positive contexts. For example, (53) is structurally similar to (52), but here the maximal-generalised quantifier analysis (equivalent to "all the windows") would be appropriate:

(53) No guests at the hotel realised that the windows in their rooms lock automatically when they go out.

In (54a&b) below, we have plural definites in the restrictor of a left-monotone-decreasing determiner (a negative context). In (54a) we get the 'exhaustive' non-maximal reading (equivalent to 'any'), but in (54b) we get the 'non-exhaustive' maximal reading (equivalent to 'all'):

(54) a. Every farmer who abused the donkeys he owned was prosecuted.  
b. Every farmer who vaccinated the donkeys he owned received a clean bill of health from the EC agricultural commission.

In the literature on donkey anaphora, which will be reviewed below, a pattern of alternation between maximal and non-maximal readings of donkey pronouns has been discovered and much discussed. The relevant pair is given in (55):

(55) a. Every farmer who owned a donkey vaccinated it.  
b. Every customer who had a credit card paid her bill with it.

The intuition about (55a) is generally that if a given farmer owns, say, three donkeys but only vaccinated one of them, what is said would be false. By contrast, the implausibility of the

assumption that a person would use more than one credit card to pay a bill seems to affect our intuitions about (55b), which is understood as saying that every customer paid with one of their credit cards. We can replicate this pattern with plural descriptions anaphoric on material in previous discourse:

- (56) a. John bought some donkeys and some sheep. He vaccinated the donkeys.  
b. John took some credit cards and cash on his trip. He paid most bills with the credit cards.

Again, in the credit-card case, the intuition is that one of the credit cards was used for each of the payments in question. This is a case of non-maximal, 'non-exhaustive' readings of plural definites. These examples can be multiplied at will in cases where the maximal reading conflicts with world knowledge. However, world knowledge is not the only factor which can give rise to the non-exhaustive reading:

- (57) a. Mary cannot come to work because her children are ill.  
b. Johnny was naughty because he fed the elephants at the zoo chocolate.

Here, the maximal reading is not implausible, yet the intuition is that these examples get the non-exhaustive reading.

So it seems that the details of the standard quantificational analysis, proposed by Russellians such as Neale (1990), and standard non-Russellian treatments, proposed by Barwise & Cooper (1981) among others, fail to capture the type of exhaustivity found in negative contexts. Moreover, although definites are regularly interpreted exhaustively in both negative and positive contexts, they are not always interpreted in this way. So the quantificational approaches to plural definites that have been examined in this section would have to provide for two separate logical forms in order to cover this type of data.

## **5 Summary**

To sum up this section, we have reviewed some familiar motivations for a Russellian, quantificational approach to descriptions. We have seen that, in fact, alternative non-Russellian approaches, either quantificational or not, are equally motivated by the semantic and scope considerations. In fact, the sole argument for a thorough-going Russellian account comes from consideration of "king of France" issues. On this score, there is little to choose between the Russellian account and one that, say, employs truth-value gaps. That I lean toward the Russellian approach here has to do with the fact that the alternative is no less problematic empirically while it introduces complications into the logic which are otherwise unwanted.

However, in this section we have seen that on almost every detail of the Russellian account there are serious problems to be overcome. There is the problem of devising an adequate theory of context dependence in order to deal with incomplete descriptions. There is the problem of uniqueness-identifiability. There is the issue of referential uses of descriptions and there is the problem of maximality.

The first step in constructing an adequate quantificational account of definites will involve setting out an adequate account of plurals and plural definites. This will be the subject of the next section.

### **Section III Plurals**

#### **1 Introduction**

In the last section, we examined the shortcomings of quantificational analyses of plural definites cast within a generalised-quantifier framework. One of these shortcomings was a product of the essentially distributive nature of the GQ framework; the other results from the inadequacy of the

exhaustiveness assumption in the analysis of plural definites. In this section, I will review the literature on plurals and plural definites. We will see that there are a variety of ways in which the insights of the literature on plurals can be accommodated within a framework which keeps to the spirit of Barwise and Cooper's original proposals: for example, dealing with collective readings of plural noun phrases is a fairly straightforward matter, at least in outline. We will also see, however, that the default assumption in the literature on plurals is that plural definites are exhaustive. While there has been some attempt within this literature to raise the issue of non-maximal readings, the ambivalence in the interpretation of definites has been treated, by and large, as a minor issue. I will argue that existing treatments of this issue are largely inadequate. We will also see that the lack of a proper appreciation of the ambivalence in the interpretation of definites has clouded other issues, for example the treatment of so-called cumulative readings. However, I will put aside a fuller discussion of the maximal/non-maximal alternation until sub-sections 4 and 5, where the full landscape of theoretical possibilities will be reviewed and analysis of definites will be proposed.

The remainder of this section falls into two parts. In sub-section 2, I will outline some of the major issues which semantic proposals about the logical properties of plurals need to address. I will then sketch a framework for the analysis of plurals, designed not to yield new analyses, but merely to take account of the main insights of the literature on plurals within a framework which is generally compatible with the motivation behind the generalised-quantifier framework. In sub-section 4, I consider the treatment of definites within the plural literature. I will argue that existing proposals for dealing with the maximality issue are unsatisfactory. I will also argue that a proper appreciation of the special nature of definites in this respect enables one to finesse some problems to do with cumulative readings.

## 2 Plurals

### 2.1 Background

There is good reason to treat certain predicates in natural language as expressing properties of something like collections of individuals, rather than of individuals, as is standard in approaches based on first-order logic. To illustrate, consider the examples in (1):

- (1) a. John, Bill and Mary slept in the attic.  
b. John, Bill and Mary met in the square.

(1a) entails (2a), but (1b) does not entail (2b):

- (2) a. John slept in the attic.  
b. John met in the square.

In fact, (2b) is at least semantically unacceptable, if not also syntactically ill-formed. The same pattern is found in complex predicates. (3a) does not entail (3b):

- (3) a. John, Bill and Mary carried that piano upstairs.  
b. John carried that piano upstairs.

This way of putting things is perhaps slightly misleading, since (3a) has two possible readings, which could be paraphrased as in (4a,b):

- (4) a. John, Bill and Mary each carried that piano upstairs.  
b. John, Bill and Mary carried that piano upstairs together.

It might therefore be more accurate to say that, on the reading glossed in (4b), (3a) does not entail



(3b).

These facts pose an immediate problem for the semantic treatment of the English conjunction "and", since the null hypothesis is that of noun-phrase conjunction can analysed given in terms of sentential conjunction, which is assumed to be equivalent to logical conjunction. Following the proposals in Partee & Rooth (1983), and assuming that the NP [*John*] translates as  $\lambda P.P(j)$ , we can use the definition of  $\sqcap$  for conjoinable types in (5), and the equivalence in (6), to get the standard translation of the subject noun phrase in (7):

(5) Definition of  $\sqcap$ :

$$\begin{aligned} \llbracket X \sqcap Y \rrbracket &= \llbracket X \wedge Y \rrbracket \text{ if } X \text{ and } Y \text{ are type } t. \\ &= \llbracket X \rrbracket \cap \llbracket Y \rrbracket \text{ otherwise.} \end{aligned}$$

(6)  $\lambda P.P(j) \sqcap \lambda P.P(m) = \lambda P.P(j) \wedge P(m)$

(7) [*John, Bill and Mary*] :=  $\lambda P.P(j) \wedge P(b) \wedge P(m)$

On this analysis of "and", we predict incorrectly that (3a) entails (3b). That is, this analysis only gives the distributive reading of (3a) (corresponding to (4a)) on the normal interpretation of the predicate *lifted that piano upstairs*.

The solution to this problem involves two moves. The first is to treat the NP conjunction "and" as ambiguous, with an additional interpretation as an operator which forms 'collections' out of individuals. The second is to treat predicates as capable of expressing properties of, and relations between, collections of individuals. A language in which these ideas are implemented must have terms which stand for collections and predicates which apply to these terms and which, considering only extensional expressions, denote sets of collections. The standard models for first-order languages contain domains of discourse consisting only of individuals, which are therefore inadequate for this purpose. The now-familiar solution, based on Link (1983), is to

replace the usual domains of discourse with complete atomic join semi-lattices. Link himself advocates the use of algebraic structures for this purpose, the main motivation being that it makes it possible to deal with mass terms as well as count nouns within the same framework. As I am not treating mass nouns in this work, I will follow the suggestions of Landman (1989) and use set-theoretic complete atomic join semi-lattices. These structures have a domain of the form  $P^+(X)$ , the set of non-empty sub-sets of  $X$ . The elements of the domain model collections. Individuals (the referents of names and such) are modelled as singleton sets. Non-atomic individuals are formed by the operation of union,  $\cup$ . A model with the desired properties would be a structure of the form in (8):

$$(8) \quad \langle P^+(X), AT(X), \cup, \subseteq, \llbracket \cdot \rrbracket \rangle$$

The set  $AT(X)$  contains the atoms of  $P^+(X)$  ( $=\{\{d\}: d \in X\}$ ). The interpretation function  $\llbracket \cdot \rrbracket$  assigns a collection to each constant and an n-place relation among collections to each n-ary relation sign. I leave the definition of the formal language implicit, noting only that I reserve the ampersand sign for the translation of the collectivising "and", thus:

- (9) a. For any plural terms,  $a$  and  $b$ ,  $a \& b$  is a term.  
 b.  $\llbracket a \& b \rrbracket = \cup \{ \llbracket a \rrbracket, \llbracket b \rrbracket \}$

The following notational conventions will save explicit typing of variables:

<u>Variables</u>	<u>Type</u>
$x, y, z, \dots$	$e$
$X, Y, Z, \dots$	$(et)$
$R^n$	$e^n$
$\mathbf{X}, \mathbf{Y}, \mathbf{Z}, \dots$	$((et)t)$
$\mathbf{R}^n$	$(et)^n$

I use primed notation to translate constants in an obvious way: so the translation of "gather" is *gather'*, which is ((et)t), and so on. Thus (10a) translates as (10b):

- (10) a. John and Bill gathered.  
b.  $\text{gather}'(j\&b)$

## 2.2 Issues

Let us first deal with the unacceptability of (11):

- (11) John gathered.

It was noted above that such examples are at least semantically unacceptable: "gather" is conceptually associated with a property of collections of more than one individual. This could be captured in the formal system via the meaning postulate in (12), where  $\text{Num}(x)$  counts the number of atomic elements of the collection denoted by  $x$ :

- (12)  $\forall x \square [\text{gather}'(x) \leftrightarrow \text{Num}(x) \geq 2]$

Unlike "gather", most one-place predicates are not conceptually associated with properties of collections. However, predicates like "fell asleep" also require an interpretation of the same type as that of the genuinely collective predicates, if only to deal with co-ordination, as in (13):

- (13) John, Mary and Bill gathered in the attic and fell asleep.

Here, the subject must denote a collection to satisfy the requirements of the first VP conjunct, so the second conjunct must also apply to a collection. To deal with the plural versions of non-collective predicates, Link (1983) introduces a pluralising operator, \*, defined as in (14):

(14)  $* := \lambda X \lambda Y. Y \subseteq X \wedge Y \neq \emptyset$

Thus, the logical form of (13) would be (15):

(15)  $\lambda X. [\text{gather}'(X) \wedge * \text{fall\_asleep}'(X)](j \& b \& m)$

Note that, given the definition of the pluralisation operator, (15) entails (16) if we adopt Quine's proposal to treat  $a$  and  $\{a\}$  as identical if  $a$  is an individual<sup>1</sup>:

(16)  $\text{fall\_asleep}'(j)$

In what follows, we will adopt this proposal and ignore the difference between  $a$  and  $\{a\}$  in the model.

Note that with this innovation, we can now express relations between sentences involving plural predicates (sets of collections) and those involving singular predicates (sets of individuals). Note also that we can write  $\text{fall\_asleep}'(j)$  where we understand "fall asleep" to be conceptually associated with a property of individuals. That is, we can express the meaning of such singular sentences in our language for plurals without any kind of 'conceptual shift'. In other words, we can express plural sentences involving collections and simple sentences involving individuals in the same language.

What, then is the correct analysis of (17)?:

(17) Some students gathered in the attic and fell asleep.

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<sup>1</sup> See Schwarzschild (1996) for discussion and arguments against the claim that a proper treatment of natural-language semantics requires a distinction between  $x$  and  $\{x\}$  in the general case. This distinction cannot be drawn if Quine's proposal is adopted. Note also that Quine's proposal only applies to an individual and the unit set containing that individual. It does not extend to the general case, viz a set and the unit set containing that set.

One solution would be to follow Link (1983, 1991):

(18)  $\exists X[*\text{student}'(X) \wedge \text{gather}'(X) \wedge *\text{fall\_asleep}'(X)]$

If we want to maintain the conceptual connection between sentences involving plurals and singulars, we could systematically shift the standard meanings of determiners in such a way as to account for intuitions of entailment and so on. For example, we would want to say that (17) entails (19a), which would be appropriately translated as (19b):

(19) a. Some students fell asleep.  
b.  $\exists x[\text{student}'(x) \wedge \text{fall\_asleep}'(x)]$

Thus we would need to operate on the translation of the determiner head of the subject NP in (17) in order to lift it to the appropriate type. The standard translation of existential determiners,  $\text{det}_{\exists}$  is type  $((\text{et})(\text{et})t)$ , defined as in (20):

(20)  $\text{det}_{\exists} = \lambda P \lambda Q. \exists x [P(x) \wedge Q(x)]$

Given Link's rendering in (18) we want our pluralised determiner to be type  $(((\text{et})t), ((\text{et})t)t)$ .

The general type-lifting strategy is pursued most notably by van der Does (1993, 1994b), but there the agenda is to derive determiners of type  $((\text{et})((\text{et})t)t)$ . That is, van der Does wants to treat 'pluralised' determiners as functions from singular common noun denotations (et) to sets of sets of collections. For reasons which will become clear when we turn to the treatment of plural definites, I want to follow Link in treating determiners as functions from sets of collections to sets of sets of collections. There is some independent motivation for this from examples such as (21), which do seem to involve quantification over collections denoted by the noun phrase's restrictor:

- (21) a. All competing companies have common interests.  
b. No two students gave the same answer.

Here we would have to assume that "competing" denotes a function from sets of collections to sets of collections. Thus the determiner would express a relation between such sets, and the type  $((et)t)((et)t)t$  seems warranted.

It is also clear from van der Does (1993) that in order to propose a lifting of singular determiner meanings to plural meanings, detailed attention to the different readings of sentences involving plurals is required. In particular, we would need different lifts for distributive and collective readings (as well as possibly so-called neutral readings). So instead, I will pursue the strategy of Link (1987), which involves proposing determiner meanings for plurals and making sure that in cases where sentences should reduce to their singular meaning, they do. Before embarking on this, let us examine these different readings, in order to see what is at stake.

### 2.3 Distributive/Collective

Consider (22):

- (22) John and Bill carried that package upstairs.

We saw that this sentence can have two readings. On the collective reading, a task is carried out by John and Bill together; on the distributive reading, they carry the package upstairs separately. We could account for this difference by appeal to the dual interpretation of the NP conjunction. However, the distributive/collective alternation also shows up in the absence of conjunction:

- (23) Some boys carried that package upstairs.

Moreover, by complicating the example a little, we see that it is possible to have distributive or collective readings in both arguments:

(24) Two boys carried three packages upstairs.

Attempts to deal with the distributive/collective alternation have taken up a lot of space in the literature on plurals. A fundamental issue is whether to locate the alternation in the noun phrase or in the predicate. As many have pointed out (Roberts (1987), Lonning (1987) *inter alia*) a simple-minded application of the idea that the distinction has its source in the noun-phrase meaning runs into problems with conjoined predicates where the NP has to be interpreted collectively in one conjunct and distributively in another:

(25) Three boys carried a piano upstairs and drank a beer.

So the distributivity must somehow be located in the predicate. The question then is, how do we account for these readings? One appealing idea is that the different readings of predicates do not reflect different logical forms, but rather different ways in which these can be verified. Indeed, I will propose below that the so-called neutral and collective readings can be blurred in this way. However, this proposal does not work for the distributive/non-distributive distinction. To see this, suppose, for the sake of argument, that (26) can be read collectively or distributively because the predicate can be true of the collection of men or of each individual making up a collection of men:

(26) Some men carried a piano upstairs.

And suppose the same is true of "drank a beer". Now, let us for the moment follow Link (1987) and give the following pluralised GQ style analysis for "some men":

(27)  $\llbracket \text{some men} \rrbracket = \{X \subset \text{Pow}^+(U) : X \cap \llbracket * \text{man} \rrbracket \neq \emptyset\}$

The problem here is that the conjoined verb-phrase predicate "carried a piano upstairs and drank a beer" would be empty if the first conjunct, say, denoted  $\{\{m_1, m_2\}\}$  and the second,  $\{\{m_1\}, \{m_2\}\}$ . The standard solution to this problem (see Roberts (1987), Link (1991), Schwarzschild (1996) inter alia) is to suppose that distributive readings are obtained by an operator on the VP which is translated as the following function. (Recall that  $AT(X) = \{\{d\} : d \in X\}$ ):

$$(28) \quad \delta = \lambda Y \lambda X. AT(X) \subseteq Y$$

Returning to an analysis of (24), we need to deal with the question of numerals. In the Barwise & Cooper GQ analysis, numerals are treated as determiners:

$$(29) \quad n(A)(B) \Leftrightarrow |A \cap B| \geq n$$

However, in the case of plurals, there is another option which is to treat numerals as predicate modifiers - functions from sets of collections to sets of collections with particular cardinalities. The idea that numerals can act as predicates has good motivation in natural language:

$$(30) \quad \text{We are three.}$$

Moreover, the predicate-modifier analysis seems to be required in cases such as (31):

$$(31) \quad \text{No two students had the same answer.}$$

The three students left.

Two out of three students smoke.

After every three puffs of a cigarette, John would cough.

Link (1991) applies the predicate-modifier analysis to numerals, supposing that the determiner head of noun phrases such as [*three boys*] is a phonologically null existential determiner.



Unfortunately, there are problems with this approach. First, we would not want to say that in (32) we are quantifying over collections of three individuals:

(32) All three boys carried the piano upstairs.

Clearly "all three" here means something like "all three of the (three) boys", which requires special treatment. What shouldn't require special treatment, though, is "exactly three" and "at most three"; but, as observed in van Benthem (1986), there is no obvious way in which these non-Mon<sup>t</sup> expressions can be treated in a predicate-modifier approach. To see this, consider Link's (1987) proposal concerning numerals:

(33)  $[[\text{det}_3 \text{ three men}]] = \{X: X \cap [[\text{three men}]] \neq \emptyset\}$

In the case of "Three men lifted the piano", (33) tells us that at least one collection of three men lifted the piano. On the collective reading, it tells us that there has been at least one joint lifting with exactly three men involved; there could have been more of these events, of course. This seems to be correct. On the distributive reading, it tells us that there were three men each lifting the piano. In neither case do the truth conditions assigned by (33) tell us that a total of exactly three men were involved in lifting the piano, which is as it should be. But now, in the case of "exactly three", the predicate modifier approach is inadequate, since "Exactly three men lifted the piano" tells us about the total cardinality of men who lifted the piano. The modifier approach, as we have seen, does not limit the cardinality in this way.

Determiners modified by "exactly" also add a new complication to our treatment of numerals by giving rise to so-called neutral readings. To see this, consider the scenario in which John and Bill lift the piano together and, separately, Max (who is very strong) lifts the piano. The sentence would be true of this situation, and yet it is neither a collective reading nor a distributive reading. What is worse, "at least three" is also open to this neutral reading. Link (1987) admits that for these modified determiners, the predicate-modifier version of "three" is inadequate, and that

some formulation along traditional GQ lines would be appropriate. This seems to be a reasonable conclusion. Thus we are left with a split in the analysis of numerals: "three" as a predicate modifier, "at least/at most/exactly three" as a full determiner. Whether this is sufficiently parsimonious depends on the independent motivation of the predicate-modifier analysis. As we have seen above, there is some evidence for this. Moreover, the phonologically null existential determiner also seems motivated in the case of bare plurals read existentially, e.g. "Children were playing in the square".

Link (1987) does not propose a detailed analysis of the modified numeral determiners. However, elsewhere, in Link (1991), he refrains from incorporating the distinction between collective and neutral readings into the semantics, on the ground that such fine distinctions are probably a product of judgements about different verifying models rather than different logical forms. I agree with this position. However, somewhat surprisingly, he opts for a collective analysis rather than a neutral version as the basis for his treatment. As we have seen this is inadequate for the modified determiners (which he does not deal with in the later published article<sup>2</sup>). Instead, I will propose an analysis of quantified noun phrases assuming a neutral structure for predicates. This will be the topic of the next sub-section.

### **3 A grammar with plurals**

In this section, I will propose a mapping between natural-language structures (LFs) and a translation language for quantifying determiners. Somewhat non-standardly, I will propose that the translation language in the case of determiners simply involves primed symbols, for which I will provide equivalences. These latter sometimes involve flagrant switching between set theory

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<sup>2</sup> Note that Link (1991) was reportedly in circulation since 1984. It extends his (1983) treatment of a first-order logic for plurals. Thus issues which require higher-order functions are not treated there; these were the subject of his (1987) paper.

and type theory, sanctioned by the equivalence between sets and their characteristic functions. In general, determiners will be translated as  $((\text{et})t), ((\text{et})t)t$ : thus special provision will be needed for purely singular determiners such as "every" and the singular indefinites. Recall that in all cases, where a translation in the standard 'singular' GQ theory could have been given, the meaning of the plural translation should reduce to that of the singular. We should also aim to maintain as far as possible the nice properties of determiners such as conservativity, constancy and quantity. Finally, we will need to incorporate the insights from Westerstahl (1985) by making the translation-level determiners context dependent. This is the main reason for setting out the grammar in terms of translations and equivalences. This manoeuvre will have important consequences when we deal context-dependent expressions in chapters 3 and 4. I begin by setting out the meanings for plural existential and (modified) numeral determiners which cover collective, distributive and neutral readings. I then examine in detail how to account for the readings of sentences of the form  $[_S[_{NP}n[N]][_{VP}[V][_{NP}k[N]]]]$ . Finally, I move on to look at other determiners.

Let us begin with a sentence of the form in (34):

$$(34) \quad [_S[_{NP}det_{\exists}[A]][_{VP}B]]$$

In general, the nominal restrictor of the subject noun phrase of such a sentence will be translated as  $*A' (= \lambda Y. Y \subseteq A' \wedge Y \neq \emptyset)$ . The verb phrase may or may not be modified by the syntactic reflex of  $\delta$ . The translation of " $det_{\exists}$ " will be  $det_{\exists}'$ ; this might be defined as in (35):

$$(35) \quad det_{\exists}'(A)(B) \Leftrightarrow \bigcup \{X: A(X) \wedge B(X)\} \neq \emptyset$$

So a sentence such as (36a), will be translated as (36b):

$$(36) \quad \begin{array}{l} \text{a.} \quad \text{Some students are asleep.} \\ \text{b.} \quad det_{\exists}'(*student')(*are\_asleep') \Leftrightarrow \bigcup \{X: *student'(X) \wedge *are\_asleep'(X)\} \neq \emptyset \end{array}$$

Note that, given the definition of  $\star$ , (36b) reduces to (37):

$$(37) \quad \text{det}_{\exists}'(*\text{student}')(*\text{are\_asleep}') \Leftrightarrow |\text{student}' \cap \text{is\_asleep}'| \geq 1$$

This may strike some as unsatisfactory since the plural form seems to imply something stronger than (37), namely (38):

$$(38) \quad \text{det}_{\exists}'(*\text{student}')(*\text{are\_asleep}') \Leftrightarrow |\text{student}' \cap \text{is\_asleep}'| \geq 2$$

However, there are cases where the plural form is used but (39) is not implied:

$$(39) \quad \text{If some students fall asleep in the lecture, I make a loud noise.}$$

On the other hand, if the plural determiner is defined as in (35), we might wonder how the impression that more than one individual is being talked about is generally conveyed. If we suppose that this implication is derived pragmatically, we will find it hard to explain why "Some students are asleep" implies more than one, but "A student is asleep" implies no more than one, given that the information content of these sentences is the same, viz (37). By the same token, if we start out with the stronger meaning, (38), then we will find it hard to explain why (39) seems to cover cases where one student is asleep. One way around this problem is to introduce a strictly pluralising operator,  $\star$ :

$$(40) \quad \star := \lambda X \lambda Y. Y \subseteq X \wedge |Y| \geq 2$$

We could then suppose that "students" could be translated as  $\star\text{student}'$  or  $\star\text{student}'$ . Thus in general "Some students are asleep" would have the logical form:

$$(41) \quad \text{det}_{\exists}'(\star\text{student}')(*\text{are\_asleep}')$$

Turning now to numerals, we have seen that "at least three", "at most three" and "exactly three" need to be handled in the usual way, that is, as expressing relations between the predicate restrictor of the noun phrase and the verb phrase. Let us consider "exactly three":

$$(42) \quad (\text{exactly\_}n)(\mathbf{A})(\mathbf{B}) \Leftrightarrow |\bigcup\{X: \mathbf{A}(X) \wedge \mathbf{B}(X)\}| = n$$

We can now demonstrate the virtue of this neutral approach to determiners. Notice that (43) could be true because there was one big gathering or because there were a number of smaller gatherings:

(43) Exactly ten students gathered in the bar.

The definition in (42) simply rounds up the collections of students who gathered in the bar and counts them. It is tempting at this point to suppose that the bare numeral "three" could be treated as a determiner along these lines:

$$(44) \quad (\text{three})(\mathbf{A})(\mathbf{B}) \Leftrightarrow |\bigcup\{X: \mathbf{A}(X) \wedge \mathbf{B}(X)\}| \geq 3$$

However, it is standardly claimed that on a non-distributive reading, (45) can imply that there is at least one group of exactly three students who carried the piano, while not implying that no more than three students in total carried the piano:

(45) Three students carried the piano.

If this is right, the analysis for the bare numeral given in (44) is not entirely adequate, since the implicature here would take the form of Link's predicate modifier alternative, which is to some extent independently motivated. It might then be argued that a similar analysis could be given for "three":

- (46) a.  $\text{three}' = \lambda X. |X| = 3$   
 b.  $\text{det}_3'(\text{three}' \cap * \text{student}')(\text{carried\_the\_piano}')$

Unfortunately, it is possible to understand bare "three" as expressing a neutral reading. Consider a hospital accountant who is drawing up a bill for Jones and is told (47):

- (47) Three surgeons performed an operation on Jones.

This could be true if, say, two surgeons jointly performed one operation and a third surgeon performed another. What seems to be suggested here is the neutral reading ("at least three and at most three"), for which (44) would be the appropriate analysis. So we probably need to provide two ways of treating bare numerals, as predicate modifiers and as full blown determiners.

Let us now consider sentences of the form  $[_S[_{NP}n[N]]][_{VP}[V][_{NP}k[N]]]]$ , as in (48):

- (48) Two women carried three packages upstairs.

According to what has been proposed so far, there are potentially eight LFs for this sentence, corresponding to seven separate readings (two of the LFs correspond to semantically equivalent logical forms). Before we set about characterising these, let us take the simpler (49) on the distributive reading:

- (49) Two boys carried that package upstairs.

As noted above, the distributive reading is thought to correspond to the form in (50) (assuming here and below the determiner analysis of "two"):

- (50)  $(\text{two}'(*\text{boy}'))(\delta(\text{carried\_that\_upstairs}'))$

Finally, when [*every boy*] combines with a predicate which can be collective or distributive, only the distributive reading is available:

(63) Every boy built that house.

On one reading, (63) is pragmatically odd: it suggests that the building was somehow built and rebuilt several times. However, there is another reading on which it is not pragmatically odd: this can be paraphrased as something like "Every boy participated in the building of that house." We shall return to the participatory reading briefly below. For now, we shall follow the custom in the literature (see inter alia Link (1983) van der Does (1993)) and treat the determiners in question as subject to a condition that they only quantify over singularities. To implement this, let us start from the standard singular treatment of these determiners. (We will call the head of the phrase [*a boy*],  $det_{\exists s}$ ):

(64)  $every'(A)(B) \Leftrightarrow |A-B| = 0$   
 $det_{\exists s}'(A)(B) \Leftrightarrow |A \cap B| \geq 1$

We do not really need to say a lot more about the translation of such expressions in our grammar, since we have introduced Quine's proposal into the semantics of the translation language. All we need to ensure is that the restrictors of the determiners are translated as singular predicates, i.e. as things which denotes sets of singletons. To achieve this, we merely have to leave out the pluralising operator involved in the translation for plural noun phrases. Notice that this implies that (65) only talks about boys who built the raft on their own:

(65) Every boy who built that raft will win a prize.

This seems too strong, since (65) would more naturally be understood as talking about boys who participated in building the raft. I will assume here that in certain cases, such as (65) and even (63) above, it is pragmatically inferred that the predicate applies to individuals who participated in the activity in question. This pragmatically enriched interpretation can be represented via the participation operator,  $\dagger$ , defined in (66) below (cf Link 1983):

(66)  $\dagger = \lambda Y \lambda X. \exists Z [Y(Z) \wedge X \subseteq Z]$

Thus the logical forms corresponding to (52a,b) will be (54a,b):

- (54) a.  $\text{two}'(*\text{woman}')(\uparrow_j \text{carried}'(\text{three } * \text{package}))$   
 b.  $\text{three}'(*\text{package}')(\uparrow_i \text{carried}'(\text{two } * \text{woman}'))$

We now need to incorporate distributivity into the syntax and semantics. We can do this by marking distributivity in the rump. That is, we can signal whether an argument is distributive by changing the form of the empty category. Let us say that an empty category  $d_k$  encodes an instruction to insert the distributivity operator  $\delta$  in the translation of the lift. Thus a rump of the form in (55) will be translated as in (56a) if the NP indexed  $j$  immediately dominates the rump, and it will be translated as in (56b) if the NP indexed  $i$  takes narrow scope:

(55)  $[e_i[\text{carried } d_j]]$

- (56) a.  $\uparrow_j \text{carried}'_j = \lambda Q \lambda X. Q(\delta(\lambda Y. \text{carried}'(Y)(X)))$   
 b.  $\uparrow_i \text{carried}'_i = \lambda Q. \delta(\lambda Y. Q(\lambda X. \text{carried}'(Y)(X)))$

Finally, in the case of a doubly distributive reading, we have both empty categories of the form  $d$ , and a translation of the rump for the narrow scope object, as in (57)

(57)  $\uparrow_j \text{carried}'_{i,j} = \lambda Q. \delta(\lambda X. Q(\delta(\lambda Y. \text{carried}'(Y)(X))))$

Using this system, we can account for the four readings (DD, DN, ND, NN) on each scope construal. Note that the subject wide scope and object wide scope NN readings will be equivalent.

It should be mentioned at this stage that some have doubted the existence of object wide scope readings. In the case of our original example, "Two women carried three packages", these readings are perhaps difficult to discern. However, if we change the context a little, the different



readings emerge. I think we get a clear object wide scope DD reading if we consider (58) in a context where the rules of etiquette are closely observed and where having two fish forks placed at a dinner setting is strictly taboo:

(58) Two fish forks were placed next to three plates!

Here we can readily imagine a verifying scenario involving three plates and six fish forks.

As to the object wide scope DN reading, consider a scenario where a hospital administrator has, in order to cut labour costs, issued an edict that no more than two surgeons jointly operate on a patient. You can imagine her dismay when she hears the following from the accountant:

(59) Last month, more than two surgeons operated on ten patients.

Finally, the object wide scope ND reading can be brought out in the following example:

(60) Two strong boys managed to carry three heavy weights around the endurance course.

We now need to consider how we should deal with other determiners. First, let us deal with the strictly distributive determiners. We will consider here those heading the noun phrases [*every boy*] and [*a boy*]. We want the heads of these noun phrases to restrict their arguments to sets of singletons (which correspond to sets of individuals). These forms cannot combine with VPs which are grammatically plural:

- (61) a. \* Every boy like Mary.  
b. \* A boy like Mary.

Moreover, they cannot combine with semantically plural predicates such as "gather", even where grammatical agreement constraints are not violated:

- (62) a. ? Every boy gathered in the square.  
 b. ? A boy gathered in the square.

Finally, when [*every boy*] combines with a predicate which can be collective or distributive, only the distributive reading is available:

- (63) Every boy built that house.

On one reading, (63) is pragmatically odd: it suggests that the building was somehow built and rebuilt several times. However, there is another reading on which it is not pragmatically odd: this can be paraphrased as something like "Every boy participated in the building of that house." We shall return to the participatory reading briefly below. For now, we shall follow the custom in the literature (see inter alia Link (1983) van der Does (1993)) and treat the determiners in question as subject to a condition that they only quantify over singularities. To implement this, let us start from the standard singular treatment of these determiners. (We will call the head of the phrase [*a boy*],  $det_{\mathfrak{S}}$ ):

- (64)  $every'(A)(B) \Leftrightarrow |A-B| = 0$   
 $det_{\mathfrak{S}}'(A)(B) \Leftrightarrow |A \cap B| \geq 1$

We do not really need to say a lot more about the translation of such expressions in our grammar, since we have introduced Quine's proposal into the semantics of the translation language. All we need to ensure is that the restrictors of the determiners are translated as singular predicates, i.e. as things which denotes sets of singletons. To achieve this, we merely have to leave out the pluralising operator involved in the translation for plural noun phrases. Notice that this implies that (65) only talks about boys who built the raft on their own:

- (65) Every boy who built that raft will win a prize.

This seems too strong, since (65) would more naturally be understood as talking about boys who participated in building the raft. I will assume here that in certain cases, such as (65) and even (63) above, it is pragmatically inferred that the predicate applies to individuals who participated in the activity in question. This pragmatically enriched interpretation can be represented via the participation operator, †, defined in (66) below (cf Link 1983):

$$(66) \quad \dagger = \lambda Y \lambda X. \exists Z [Y(Z) \wedge X \subseteq Z]$$

So there is a pragmatically enriched understanding of (63) and (65) on which *built that raft* is modified by the participatory operator.

The same analysis can be applied to other determiners which quantify strictly over individuals. For instance, it is thought that "many" and "most" are strictly singular. If so, an analysis such as (67) should suffice:

$$(67) \quad \text{most}'(A)(B) \Leftrightarrow |A \cap B| > 0.5|A|$$

However, there are genuine cases where quantification is over collections:

(68) All competing companies have common interests.

These can be handled using our neutral analysis:

$$(69) \quad \text{all}'(A)(B) \Leftrightarrow |\bigcup \{X: A(X) \wedge \neg B(X)\}| = 0$$

There is also a question about whether quantifying determiners such as "most" can head a noun phrase which can combine with a genuinely collective predicate. For instance, (70) seems to me an acceptable way of conveying the information that a large proportion of boys gathered in the square:

(70) Most boys gathered in the square.

To the extent that this is well formed without pragmatic enrichment, we could use the neutral meaning for *most'*. Similarly, (71) seems to be to be well formed:

(71) Most competing companies have common interests.

The neutral meaning for "most" would be as in (72):

(72)  $\text{most}'(A)(B) \Leftrightarrow |\bigcup\{X: A(X) \wedge B(X)\}| > 0.5|\bigcup\{X: A(X)\}|$

Finally, we should note that negative quantifiers also require a neutral reading. Consider (73):

- (73) a. No competing companies share common interests.  
b. Few competing companies share common interests.

What (73b) says is that the total number of competing companies which have common interests with some of their competitors is a small proportion of the total number of competing companies, or some contextually defined number. For these cases, the neutral analysis is again appropriate:

(74) a.  $\text{no}'(A)(B) \Leftrightarrow |\bigcup\{X: A(X) \wedge B(X)\}| = 0$   
b.  $\text{few}'(A)(B) \Leftrightarrow |\bigcup\{X: A(X) \wedge B(X)\}| < k$

Of course, as in the case with "most", these can also have their singular meaning.

This concludes the outline of a grammar for plurals. I will now turn to the issue of plural definites. Recall that by the end of section II, I claimed that plural definites can be read both maximally (as is standardly assumed) and non-maximally. I will set out an interim proposal which captures this fact at the end of the next sub-section, when all possible alternatives for

analysing the encoded meaning of plural definites have been considered. The full theoretical motivation for this account will be developed in later chapters.

## **4 Plural definites**

### **4.1 Introduction**

In this section, we shall return to the issue of how to deal with plural definites. Before embarking on the discussion of plurals in general in the last two sections, we had reviewed the treatment of plural definites within static quantificational frameworks. Both Neale's Russellian treatment and Barwise and Cooper's non-Russellian treatment were found wanting in the same two respects: neither could deal with cases where definites are involved in predications with genuinely plural expressions, such as "gather" and "carried a piano", and both had endorsed a maximality assumption which, even in cases not involving genuinely plural predications, was argued to be inadequate. Having looked at the major issues in the treatment of plurals in general, and at how these issues are handled in the literature, we are now in a position to consider our two issues in the context of the literature on plurals. The questions I will address in this section are: how are definites treated with respect to the collective/distributive distinction, and how is the fact that definites are often interpreted existentially dealt with? It will turn out that there is a third issue, which relates to plurals in general, but which is invariably taken up in tandem with the non-maximality issue, which we will also have to cover. I will call this the issue of cumulative readings.

The structure of the rest of this section is as follows. I will outline what I take to be the current consensus on the basic treatment of plural definites. I will indicate briefly how this can be fitted into the generalised-quantifier framework, thus settling the first issue left over from section II. I will then return to the exhaustiveness issue, and review some examples which cast doubt on the viability of the basic treatment of plural definites. As many of my counter-examples involve

plural definites in negative contexts, I will devote a sub-section to the treatment of plurals and negation. This is included to forestall the idea that a lot of my counter-examples can be explained away by appeal to a different treatment of negative quantifiers. Next I turn to another major source of non-exhaustive readings, which has been much discussed in the literature, after Scha (1981). These examples involve a form of cumulative quantification. I will show that though the vagueness of plural predication introduces its own form of non-exhaustiveness, this is separate from the potential of definites in general to be read either maximally or non-maximally in general. Finally, and stemming from the discussion of cumulative readings, I will look closely at various attempts to explain away non-maximal readings of definites by appeals to considerations of vagueness. What I aim to show in this section is that plural definites are genuinely equivocal with respect to the maximal/non-maximal alternation. I will conclude with a preliminary analysis of plural definites within the framework of the grammar for a language with plurals outlined in the last section.

## 4.2 Definites denote collections

By far the most common way of dealing with plural definites is to treat them as plural terms, that is, as expressions denoting collections. The analysis would then involve a plural version of the iota operator, the sigma-operator, which is a function from sets of sets to the unique maximal set in the domain. For example, Link's (1991) review paper proposes an analysis based on this operator, defined as in (75):

$$(75) \quad \sigma X P(X) := \iota X [ *P(X) \wedge \forall Y [ *P(Y) \rightarrow Y \subseteq X ] ]$$

Note that this is the non-strictly plural version of the translation: there is no implication that there is more than one P. To build strict plurality into the translation, Link introduces the properly plural sum operator, defined as in (76a). This definition is based on that of the properly plural operator, repeated in (76b):

- (76) a.  $\sigma^*XPX := \sigma X \star PX$   
 b.  $\star = \lambda X \lambda Y. Y \subseteq X \wedge |Y| \geq 2$

On this approach, a translation of the sentence in (77a) would be something like (77b):

- (77) a. The girls gathered.  
 b. gathered'( $\sigma^*X$ girl(X))

The analysis of plural definites as terms which denote the maximal element in their domain is endorsed in Link (1983, 1991, 1987), Scha (1981), Roberts (1987), Lønning (1987), Schwarzschild (1996), Lasersohn (1989) and Gillon (1987). It has two important features: first, that definites are plural terms and second, that they are maximal. The first feature is viewed by some as a positive aspect of the proposal (see Roberts (1987), Lønning (1987)), since it is seen as enabling definites, along with certain other plural noun phrases, to be marked off from genuine expressions of quantification. I do not propose to dwell long on this issue, but I think that the distinction between collective terms and quantified noun phrases is not very well motivated if the category of collective terms is to include definite noun phrases, phrases headed by "some", numerals and bare plurals. We saw in the last section that noun phrases headed by "every" and "each" call for special treatment in a grammar for plurals, since their definition involves strictly atomic individuals. But if we leave aside these peculiarly singular determiners, matters become much less clear. What we saw in the last section was that quantification over collections, in the sense of counting collections in a domain, is quite severely restricted to neutral readings. However, the semantics of noun phrases headed by "most", "many", "all", "few", "no" and so on can all combine with predicates which are genuinely plural, that is, which express properties of collections. We saw in the last section that bare numerals, in certain cases, also called for a neutral treatment along the lines needed for plural quantification in general and noun phrases such as "exactly n", "at most n" and so on. That is, noun phrases such as "three boys" cannot (always) be handled in terms of the predicate-modifier version of the determiner. But the term-based approach of Roberts (1987), Lønning (1987) and Kamp & Reyle (1993), etc. requires

the predicate-modifier approach to numerals and is thus insufficiently general. In general, on closer scrutiny, there is no clear-cut distinction between genuinely quantificational and collective noun phrases. There are clear cases of genuine singular quantification (eg "every"), there are cases which favour singular quantification (eg "most"), there are cases which seem to go either way readily (eg "no", "many") and then there are numerals and indefinite plurals, which, from one perspective, also go either way. The general treatment of determiners outlined in the previous section treats all noun phrases as potentially involved with plural predicates, with the exceptions of "every" and possibly "most". There is insufficient motivation for dividing noun phrases into two distinct classes on the basis of their interaction with genuinely collective VP predicates.

Returning now to our examination of the term-based approach to definites, we can begin to incorporate this into a generalised-quantifier approach. In general, natural-language noun phrases which are treated as terms (e.g. those involving names), can be given a quantifier treatment along the lines of the familiar lift:

$$(79) \quad \uparrow \text{john}' = \lambda P.P(\text{john}')$$

We can do the same with sigma-terms, which are the proposed translations of plural definites:

$$(80) \quad \uparrow \sigma^* X \text{girl}(X) = \lambda P.P(\sigma^* X \text{girl}(X))$$

In terms of the grammar set out above, we might adopt the following translation and equivalence:

$$(81) \quad \text{the}_{pi}'(\mathbf{A})(\mathbf{B}) \Leftrightarrow \mathbf{B}(\sigma^* \mathbf{X} \mathbf{A}(X))$$

Ignoring, for the moment, the context sensitivity of definites, as is standard in the literature, let us reflect on what is offered in (81). Notice first is that it gives us a non-Russellian treatment of definites. If we wished to reject this aspect, we could follow Link(1983) and opt for something



like (82):

$$(82) \quad the_{pl}'(A)(B) \leftrightarrow \{X: X = \sigma * ZA(Z) \wedge B(X)\} \neq \emptyset$$

So this aspect of the proposal is optional. With either version, we can deal with the collective/distributive alternation which is found in sentences involving definites just as much as in sentences involving other plurals. So for instance, (83) below can have a collective or distributive reading in the subject position. The translations would be as in (84):

(83) The girls carried that piano upstairs.

- (84) a.  $the_{pl}'(*girl')(\delta(\text{carried\_that\_piano}'))$   
b.  $the_{pl}'(*girl')(\text{carried\_that\_piano}')$

We can thus provide a basic treatment of plural definites within a static quantificational account, which, moreover, can deal with collective as well as distributive readings.

We could now introduce context sensitivity into the equivalence by making the argument of the sigma-operator a plural term formed by combining of the first argument of  $the_{pl}'$  and a context set,  $K$ :

$$(85) \quad \sigma XP(X) := \iota X[* (P \cap K)(X) \wedge \forall Y[* (P \cap K)(Y) \rightarrow Y \subseteq X]]$$

As is standard in the literature on plurals, this aspect of the semantics of definites (and other noun phrase expressions) is largely left implicit. The understanding is that "the girls" picks out the collection of girls in the context. The analysis involving the sigma operator implies that the expression picks out the total collection of girls in the context. In what follows, I will also leave implicit this context-dependent dimension of noun phrases, as this aspect of their meaning is not entirely relevant to the core issues.

### 4.3 Maximality

Having indicated how a treatment of plural definites would go in a grammar which deals with plurals and the collective/distributive dimension, we now turn to the issue of maximality. Recall the claim in section II above that plural definites can be subject to a non-maximal, or basically existential, reading as well as the more widely-recognised maximal readings. Two types of example were discussed in that section, involving both positive and negative contexts. Examples were given which showed that definites can have both types of readings in both types of constructions. In this section, we will review this data again, introducing another parameter, that of definites under distributive and collective readings.

Recall that Neale (1990) provides in a footnote a direct counter-example to his analysis of plural definites, involving the negative quantifier "no":

(86) No farmer beats the donkeys he owns.

It is worth mentioning again that the plural definite is to be read as dependent on the subject (the pronoun has a 'bound variable' reading). It follows that the non-maximal, existential reading of the object noun phrase is not a result of a maximal definite description taking scope over the subject noun phrase. We will not be dealing with dependent readings of noun phrases and other expressions until chapter 4; however, their peculiar properties are not relevant to the issue of maximality. As noted above, it might be thought that this type of example, and those involving explicit negation, do not present serious challenges to the maximal definite analysis, since some form of exhaustiveness still seems to be involved. That is, for each farmer in (86), each of his donkeys shares the same property, that of not being beaten by him. I shall return to this issue at length below, for the moment noting only that if such counter-proposals turn out to be inadequate, then (86) will count as the strongest case of a plural definite receiving a non-maximal reading.

As a prelude to the discussion of plurals and negation in general, we should also remind ourselves that plural definites can have maximal readings in negative environments:

- (87) No guests at the hotel realised that the windows to their bedroom lock automatically when they go out.

Here again, the plural definite "the windows to their bedroom" is a dependent noun phrase, so there is no question of the phrase taking scope over the negative element. In this example the definite is most naturally construed maximally, i.e. all of the windows are understood to lock automatically.

Another type of negative context which illustrates the easy alternation between maximal and non-maximal readings of definites is in the restriction of determiners such as "every", "no" and "few":

- (88) a. Every farmer who abused the donkeys he owned was prosecuted.  
b. Every farmer who vaccinated the donkeys he owned received a clean bill of health from the EC agricultural commission.

Again I have taken dependent noun phrases to ensure that the effect cannot be accounted for in terms of scope, and again we see that there is an alternation in the interpretation of the definites. In (88a), the phrase, "the donkeys he owned" is most naturally read as equivalent to "any of the donkeys he owned", whereas in (88b), the reading is most naturally glossed as "all of the donkeys he owned". It should be becoming clear at this stage that which of the two readings we get depends on the context. This is a good indication that the meaning of plural definites allows them to be interpreted in either of the two ways.

In section II, we also noted the ready alternation between readings in positive contexts. The examples are repeated below:

- (89) a. John bought some donkeys and some sheep. He vaccinated the donkeys.  
b. John took some credit cards and cash on his trip. He paid most bills with the credit cards.
- (90) a. Mary cannot come to work because her children are ill.  
b. Johnny was naughty because he fed the elephants at the zoo chocolate.

We can now introduce examples involving predicates which are subject to collective readings. Given the scenario outlined in (91) below, informants generally agree on the judgements indicated in the example sentences which follow.

(91) *Scenario I:* John, Mary and Bill are left alone on the beach for the day. Being industrious children, they set about occupying themselves productively. John and Bill build a raft. Mary constructs an elaborate sandcastle.

- (92) a. John and Bill built that raft. (true)  
b. John, Bill and Mary built that raft. (false)  
c. The children built that raft. (true)
- (93) a. No raft was built by John, Bill and Mary. (true)  
b. No raft was built by the children. (false)

Note that in this scenario, the children in question are John, Bill and Mary. The point of these examples is to show a clear contrast in intuitions concerning a plural definite, on the one hand, and on the other, a noun phrase which picks out a collection that, on the standard analysis, would be co-extensive with the denotation of the definite. I will use this strategy repeatedly in the following discussion of the treatment of non-maximal readings in the literature on plurals.

In particular, I will use this strategy to undermine the claim that non-maximal readings in general

can be accounted for by appeal to the fact that plural predications are in many ways vaguer than singular predications. As a preliminary to this discussion, I will briefly show how the vagueness of plural predications is orthogonal to the issue at hand.

The vagueness of plural predicates applied to collections is widely recognised in the literature, and has been used to explain away examples where definites are subject to non-maximal readings (Link 1983, Roberts 1987, Lønning 1987, Kamp & Reyle 1993, Schwarzschild 1996<sup>3</sup> inter alia). For instance, Link (1983) notes that (94) can be judged true even if, strictly speaking, not all of the children in question took part in the construction of the raft:

(94) The children built that raft.

He comments on such examples as follows:

It seems to me that in *All the children built the raft* it is claimed that every child took part in the action whereas in *The children built the raft* it is only said that the children somehow managed to build the raft collectively without presupposing an active role for every single child. (p.20)

That is, for Link, the formula *built'(that\_raft')(σX\*children'(X))* can be true even if the individuals denoted by the plural term *σX\*children'(X)* do not all participate in the eventuality denoted by the rest of the formula. In other words, the definite, or the translation of the definite, picks out the maximal collection in the context and the appearance of a non-maximal reading is due to the fact that a plural predicate can be truthfully applied to a plural term, even though the individuals in the extension of that term are not actively involved in the eventuality described by that predicate.

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<sup>3</sup> The most notable alternative account of at least some non-maximal readings was originally proposed in Scha (1981). We shall return to this proposal below.

These views are spelled out in more detail in various discussions in the literature, in particular by Roberts (1987), who takes her cue from Dowty's (1987) work, and by Schwarzschild (1996). I will discuss these below in the context of issues involving relational predicates and cumulative readings. The point I want to make here, and will emphasise throughout this discussion, is that the treatment of plural definites as the paradigm case of plural terms creates a fatal confusion in thinking about vagueness of plural predications. In my view, plural definites are particularly inappropriate examples to use in discussions of vagueness, since they are themselves subject to non-maximal readings. The assumption that plural definites always denote the maximal collection has made it possible to conflate the existence of non-maximal readings with the issue of vagueness. In fact, as we will see presently, there is a clear distinction, when it comes to judgements about vagueness, between the behaviour of plural definites, on the one hand, and expressions which pick out the collection co-extensive with the maximal set, on the other. To see this, consider the following scenario:

*Scenario II:* When John, Mary and Bill need to build a raft, they all agree in principle to take part. But Bill is very lazy and lies in the hammock all day reading a book.

We can demonstrate the genuine vagueness of predicates like *build a raft* by considering our intuitions about the truth value of (95a) in the context of Scenario II:

- (95) a. John, Mary and Bill built that raft.  
b. The children built that raft.

Most informants find it difficult to judge whether (95a) would be true in these circumstances. The difficulty, it is agreed, is caused by the vagueness of sentences attributing a property to a collection of individuals. This vagueness is clearly conceptual, and is reminiscent of the difficulty subjects have in judging whether, say, wall-to-wall carpet can be considered to be

furniture<sup>4</sup>. The source of the vagueness can be pinned down by adding to Scenario II the information that Bill murmured some words of encouragement from time to time while lying in the hammock. Given this revised scenario, intuitions become clearer that (95a) is true. So there is a sense in which the vagueness of *build that raft* on its collective construal has to do with what counts as taking part in the event described by the predicate. Bill's lying nearby in the hammock throughout puts him at the very limits of what might be thought of as participation in the raft building.

By contrast, with or without the extra information, informants are happier to judge that (95b) is true in this scenario.

In the works to be reviewed below, examples involving plural predicates and definites with non-maximal readings are explained away along the following lines. Plural predicates allow a certain looseness in their interpretation when applied to plural terms. That is, a sentence with a collective predicate and a plural subject denoting a collection can be judged true even if not all the individuals in the extension of the subject term are involved in the eventuality described by the predicate. Note that this is a very different claim from the one which just says that plural predicates are vague when it comes to determining what counts as an instance of participation. The first claim, which, in my opinion, is erroneous, is based on consideration of the truth value of example (95b) in the situation described in Scenario III below:

*Scenario III:* When it comes to John, Mary and Bill building a raft, Bill steadfastly refuses to take part. He lies in the hammock all day, reading a book and ignoring the others.

Now, given Scenario III, informants still tend to judge that example (95b), which contains a

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<sup>4</sup> This example is taken from Fodor & Lepore (1996), who treat it as a case of genuine semantic vagueness, as opposed to cases where subjects lack the factual information to decide whether a sentence *a is F* is true.

plural definite, is true. On the basis of such judgements, the conclusion is drawn that a plural predicate can be true of a collection even if not all the individuals in the collection are strictly speaking involved. But this is wrong. If we ask informants to judge whether (95a) above is true in Scenario III, the response is an unequivocal "no". There is a clear distinction between definites and apparently extensionally equivalent terms, and it is on the basis of evidence about the latter that we must reject claims such as those advanced by Link in the above quote.

On my account, the reason why informants judge the sentence containing the definite true is that definites can have a non-maximal construal. My account predicts a clear distinction in judgements between (95a) and (95b) in the context of Scenario III, whereas the Link-style account, with its (illicitly) extended notion of vagueness, predicts no difference, contrary to fact.

The current consensus in the literature on plurals is that non-maximal readings are a side-effect of this extended notion of vagueness. We shall return later to look at other formulations of this point of view. But note that it is hard to maintain this account of non-maximality in the face of the argument just outlined. The analysis of definites, as standardly set out in the literature, has to be amended.

However, there are still many points of interest in these examples involving collective plural predicates, and in those carried over from the previous section. We will deal with each of them in turn. The first issue they raise concerns the treatment of plurals and negation.

#### **4.4 Plurals and negation**

It is a curious fact about negative contexts that noun phrases which pick out collections, when found in construction with a negative operator, seem to be ambiguous. Consider the examples in (96):



- (96) a. John didn't see Bill and Sue at the party.  
b. No one saw Bill and Sue at the party.

Each of these examples can either be taken to mean that neither Bill nor Sue was seen by the individuals in question, or that not both Bill and Sue were seen. Notice that the first reading is similar to what I have been calling the non-maximal reading of definites. We can construct examples involving definites which seem to display the same possible alternation:

- (97) In the exam, John didn't answer the questions on logic correctly.

Someone who wants to maintain the maximal analysis of definites may be encouraged by the data involving conjoined names. There are two ways of dealing with the alternative readings they allow. One is to suppose that they are caused by the ability of the conjoined expression to take scope over the negative element. The other is to claim that there is no scope interaction, but that the non-maximal reading is due to an indeterminacy in plural predications which leads to an either-or understanding. This last approach, advocated by Krifka (1996), is of course a version of the vagueness hypothesis. We will consider it briefly before turning to the scope analysis.

According to Krifka (1996), the maximal/non-maximal alternation in the interpretation of definites is due to a more general indeterminacy in the semantics of plural predications. His interpretation rule for plural predicates, given in (98), is motivated in the following discussion:

"Grammar has to specify truth-conditions for  $P(x)$  if  $x$  is an atomic individual. Furthermore, it is natural to assume that the truth of  $P(y)$ ,  $y$  being a sum [plural] individual, will somehow depend on whether  $P$  applies to the parts of  $y$ . Now if nothing indicates any particular proportion to which  $P$  should apply to the parts of  $y$ , then the two natural extreme options are the universal interpretation and the existential interpretation."

(p147)

These considerations are built into the rule in (98):

- (98) If a predicate  $P$  applies to a sum individual  $x$ , grammar does not fix whether the predication is universal ( $\forall y[y \subseteq x \rightarrow P(y)]$ ) or rather existential ( $\exists y[y \subseteq x \wedge P(y)]$ ), except if there is explicit information that enforces one or the other interpretation. (p146)

Krifka explicitly uses examples such as (96) above to demonstrate that plural terms in general, and not just plural definites, are subject to both maximal (universal) and non-maximal (existential) readings. (Note, that this is on his assumption that there are no scope interactions involved). We have seen in the last section that this claim, which is often made in the literature, is ill-founded. Notice too that according to (98), (99) below *could* be true if, say, one Swedish player and one American contested last year's Wimbledon final:

- (99) Two Swedish players contested last year's Wimbledon final.

This is because *contested last year's Wimbledon final* is a collective predicate and is thus subject to Krifka's (98). But this is clearly nonsense. Similarly, Krifka predicts that (100) could be true if Martina Hingis and Jana Novotna contested the match in question:

- (100) Martina Hingis and Ana Kournikova contested last year's final.

What saves Krifka's account from total absurdity is the pragmatic rule he proposes in conjunction with the semantic rule above. This rule ensures that there is only one reading of the examples just mentioned, the one which accords with our intuitions:

- (101) If grammar allows for a stronger or weaker interpretation of a structure, choose the one that results in the stronger interpretation of the sentence, if consistent with background assumptions! (p146)

Given this strategy (as Krifka calls it) we can account for the judgements in (99) and (100). But note that, according to this proposal, it is possible for such sentences to have an existential construal, given a suitably outlandish context. I think that if anything is certain in semantics, it is that two Swedes must be involved in the case of example (99), and that both women must be involved in the case of (100), for these examples to be true, and there can be no context, no matter how outlandish, which will sway our judgements on these matters.

Krifka's proposal about the interpretation of plural predication explicitly groups together definites and non-definite plural expressions, and therefore underlines the extreme unlikelihood of being able to account for the non-maximal readings of definites by locating the alternation in the meaning of the predicate. Krifka's formulation follows a discussion of examples of non-maximal interpretations of definites in both negative and positive contexts. We shall return to the negative example presently. But let us first note that Krifka considers examples such as (102) below as having non-maximal readings, and takes seriously the problem of how to deal with these:

(102) Mary cannot come to work. Her children are sick.

For Krifka, (102) is a case where the strategy of choosing the strongest meaning is overridden by certain factors. So, on Krifka's own terms, there should be no difference in reading depending on whether the individuals in question are picked out by use of a description or a name. Let us consider a scenario where John, Bill and George are the officials (the referee and two linesmen) assigned to control a certain football match. According to Krifka's account, both (103a) and (103b) should be judged true if John and Bill are sick, but George is perfectly well:

- (103) a. The game had to be cancelled because the match officials were sick.  
b. The game had to be cancelled because John, Bill and George were sick.

Yet, there is a clear difference in judgement between the two cases: (103a) is acceptable in this

scenario, and (103b) is not. This suggests very strongly that the source of the variability is not in the nature of predication but in the meaning of definites.

One reason why Krifka sets things up in the manner outlined above is to deal with negative contexts without invoking scope. Recall that in negative contexts, sentences with non-definite conjoined noun phrases can also have two readings:

(104) No one saw John and Mary at the party.

What I hope the above discussion brings out is that there is an asymmetry between the interpretations of conjoined noun phrases in positive and negative contexts. In positive contexts, conjoined noun phrases can only have the exhaustive reading (modulo the type of vagueness noted above), while in the negative contexts, they can have two readings. This asymmetry is crying out to be handled in terms of scope. Let us consider a few more reasons why a scope analysis is probably correct.

If examples such as (104) above are to be handled in terms of scope, we will assume, as in all cases of scope variability, that this is a reflection of permissible structures licensed by the syntactic component of the grammar. So on the reading on which neither Mary nor John is seen by anyone, the conjoined noun phrase in (104) must be in a position from which it C-commands the negative quantifier phrase. To flesh out this proposal, let us adopt the grammar for plurals proposed in sub-section 3 above. On that account, we can have an LF which, in the relevant structural respects, looks like that in (105):

(105) [[John and Mary]<sub>j</sub>][[No one]<sub>i</sub>][e<sub>i</sub> saw e<sub>j</sub>]]

Recall from earlier discussions that conjoined noun phrases of this type can have two sorts of interpretation. They can denote collections formed by the union of the individuals denoted by the conjuncts, or the conjunction can be interpreted as a type-shifted version of Boolean conjunction.

In the present case, it does not matter which analysis we choose, so long as the collective interpretation is taken together with a distributive analysis of the predicate which applies to it. Let us adopt the second version for expository convenience. Then, the LF will have to be amended so that the rump is distributive in its second argument:

(106)  $[[\text{John and Mary}]_j][[\text{No one}]_i][e_i \text{ saw } d_j]]$

Recall also that the translation of  $[e_i \text{ saw } d_j]$  is as in (107) when the moved subject noun phrase is c-commanded by the moved object noun phrase:

(107)  $\uparrow_i \text{ saw}'_j = \lambda Q. \delta(\lambda Y. Q(\lambda X. \text{saw}'(Y)(X)))$

Thus, the logical form corresponding to the LF in (106) will be as in (108), where  $\uparrow_j' \& m' = \lambda X. X(\uparrow_j' \& m')$ :

(108)  $(\uparrow_j' \& m')((\uparrow_i \text{ saw}'_j)(\text{no}'(\text{one}')))$

This reduces to (109):

(109)  $\delta(\lambda Y. (\text{no}'(\text{one}'))(\lambda X. \text{saw}'(Y)(X)))(\uparrow_j' \& m')$

This says that each of John and Mary is such that no one saw them.

The main advantage of the scope analysis over Krifka's proposal is that it predicts that a conjoined noun phrase will lack the neither/nor reading when it is unable to take scope over the negative element, and that this prediction is borne out. There are two possible reasons why the wide-scope reading would be blocked. Either the conjoined noun phrase is in a position from which it cannot move, such as an NP island, or it is dependent on an element which keeps its interpretation within the scope of the negative element. Let us consider the second possibility

first. In (110) below, we have a conjoined noun phrase each conjunct of which contains a 'bound variable' pronoun, dependent on the negative quantifier:

(110) No boy saw his father and his mother at the party.

Unlike the similar (104) above, this sentence cannot be understood as saying that every boy is such that he saw neither his mother nor his father at the party. Krifka's account offers no explanation for this. The scope account predicts it.

When conjoined noun phrases are contained in a larger noun phrase, our account predicts that the non-maximal reading will be blocked, since movement out of noun phrases is blocked by the syntactic component. This prediction is borne out. Consider (111):

(111) Sergeant Exley could not find a witness who could place Mickey C. and Johnny Stompanato at the scene of the crime.

On Krifka's account, the stronger reading, on which neither Mickey C. nor Johnny Stompanato could be placed at the scene, should be favoured, contrary to judgement.

Finally, it is also worth mentioning that on the scope account of the multiple readings of conjoined noun phrases, we predict that other noun phrases involving non-conjunctive coordination should also have more than one reading in negative contexts. That is, negative sentences containing phrases like "John or Mary" should also have more than one construal. This is indeed the case:

(112) Bill didn't invite John or Mary, I can't remember which.

So, to sum up, the apparent non-maximal reading of non-definite conjoined plural noun phrases is simply a product of scope; it is not a product of some kind of vagueness in plural predications.

I would like to argue for the further conclusion that the non-maximal reading of definites in negative contexts is not invariably caused by the maximal definite taking scope over the negative element. On the contrary, unlike other plural noun phrases, plural definites can be interpreted non-maximally in situ. While making this point, I want to highlight a serious lacuna in the treatment of negation in the literature on plurals.

Let us begin by considering the meaning of a basic negated predicate in a language involving plurals. We will assume that negation is always interpreted in a Boolean fashion. In standard treatments of VP negation in a non-plural language, the negated VP denotes the complement of the set denoted by the VP. This can be derived using logical negation and lambda abstraction. Thus the phrase [not[leave]] would be translated as in (113a), suggesting a translation for "not" as in (113b):

- (113) a.  $\lambda x \neg \text{leave}'(x)$   
 b.  $\text{not}' = \lambda P \lambda x \neg P(x)$

The question now arises, what is the denotation of a negated plural predicate, such as "didn't carry that piano"? Intuitively the answer is clear. It is the complement of the set of collections denoted by "carried that piano". However, if we want to derive this meaning using Boolean negation, we need to proceed with some caution. In the present case, the translation of [*didn't lift that piano*] could be given as in (115a), suggesting a translation for negation as in (115b):

- (115) a.  $\lambda X. \neg \text{lift\_that\_piano}'(X)$ .  
 b.  $\text{not}' = \lambda X \lambda Y. \neg X(Y)$

This seems to be a reasonable analysis for VP negation. Note also that examples like (116) indicate that negation can take wide scope over plural subject NPs, which would call for a separate LF:

(116) Two Italians did not contest last year's Wimbledon final.

Now consider a case where the negated predicate expresses a property which is essentially singular, eg "leave". As we have seen, in a grammar for plurals, this must combine with an operator, \*, in order to combine with plural subjects, as in "Three students left". What happens when negation is added to this construction, as in (117)?

(117) Three students didn't leave.

We are considering here only the narrow-scope negation reading, which can be paraphrased as "there are three students who didn't leave". On the basis of previous examples, we might expect the logical form in (118) to be an appropriate translation:

(118) (three' students')( $\lambda X. \neg *leave'(X)$ )

But this would be wrong, on either the predicate-modifier analysis or the neutral analysis of *three'*. On either analysis, (118) would be true in a circumstance in which there are four students of whom two left and two didn't. Similarly, if the subject in (119a) below is interpreted collectively, as in the translation in (119b), it would come out true in a circumstance in which John and Bill leave and Sue doesn't:

(119) a. John, Bill and Sue didn't leave.  
b. ( $\lambda X. \neg *leave'(X)$ )(j'&b'&s')

There are two ways around this problem. The first would involve applying the pluralising operator after negation. Thus [*didn't leave*] would be rendered as  $*\lambda x \neg leave(x)$ . But this solution is not theoretically appropriate, since we are supposing that the pluralising operator applies at a lexical level: there is no reflex of this in the syntactic representation. Moreover, this move would be inappropriate for relational predicates, as in (120), where the problem is the same on



the narrow-scope negation construal:

(120) John didn't recognise three guests at the party.

As we will see below, the grammar must in general insert the pluralised version of the two-place predicate into the translation in these circumstances; thus, the first solution would not be general enough.

It seems then, that the only solution would be to ensure that the distributive operator is inserted outside the scope of negation in our translation. That is, we need to ensure that the translation of (117) is as in (121):

(121) (three' students')( $\delta(\lambda X. \neg * \text{leave}'(X))$ )

This can be implemented in the syntax/semantics mapping by ensuring that VP negation remains within the rump  $[e_i \vee e_j]^5$ .

To sum up, the proper interpretation of plural expressions in negative contexts where the plural takes scope over negation involves the use of the distributive operator. This means that the grammar will possibly over-generate interpretations: for example, "Three students left" may be assigned a structure by the syntactic component whose semantic representation would be true in a circumstance where there are four students and exactly two left. However, one can almost see "Three students didn't leave" being uttered where the intended reading is the unintuitive one, but where there is a kind of jokey play on words, turning on the audience treating the negated predicate as collective.

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<sup>5</sup> This means that wide-scope negation must result from negation being interpreted in a higher position in the tree, rather than from some kind of reconstruction process. For some motivation for there being two negation slots, see Cormack & Smith (1997).

Let us now return to definites and consider their interpretation in negative contexts. Consider (122):

(122) No one saw the students.

The most natural reading of this sentence is of course the one on which no students are seen by anyone. My claim is that definites are subject to the maximal/non-maximal alternation. If the reading in question is to be a product of this alternation, I must reject the orthodox analysis and treat definites, like indefinites, as headed by a phonologically null existential determiner, or by its neutral equivalent. This has been implicit in my discussion of readings above. As I will argue in more detail below, the maximal/non-maximal distinction has its source in the understanding of the restrictor on this determiner. This restrictor consists of the article-N' complex: thus, "the students" is analysed as  $[\emptyset_{\exists}[\text{the students}]]^6$ . What causes the alternation is the possibility of understanding [*the students*] as *\*student* or as *max(\*student)*, where  $\text{max}(X) = \lambda Y. \forall Z[Z \in X \rightarrow Z \subset Y]$ . Given that either of these options is a possible interpretation of [*the students*], we can account for both readings. To flesh this out, I assume that the determiner "no" has a translation which is defined in the normal way:

(123)  $\text{no}'(\mathbf{A})(\mathbf{B}) \leftrightarrow \cup\{X: \mathbf{A}(X) \wedge \mathbf{B}(X)\} = \emptyset$

The LF for (122) is given in (124):

(124)  $[[\text{no one}]_i][[\emptyset_{\exists}[\text{the students}]]_j][e_i \text{ saw } e_j]$

Recall that  $[e_i \text{ saw } e_j]$  is translated as  $\uparrow_j \text{saw}'$  when the object noun phrase takes narrow scope; this is defined as in (125):

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<sup>6</sup> Note, this analysis does not necessarily apply to the phrase [*the students*] when it occurs in partitive constructions, i.e. as in "most of the students".

$$(125) \quad \uparrow_{\text{j}}\text{saw}' = \lambda Q \lambda X. Q(\lambda Y. \text{saw}'(Y)(X))$$

Then the logical form corresponding to the LF in (124) is the one in (126):

$$(126) \quad (\text{no}'(*\text{one}'))(\uparrow_{\text{j}}\text{saw}'(\text{det}_3'(\text{the\_students})))$$

The system I will defend for the interpretation of definites treats *the\_students'* as context dependent, where context determines which individuals are involved and whether the plural predicate denotes the set of all non-empty sets of students in the context or just the maximal set. On the non-maximal reading, the logical form expresses the same proposition as the one invariably expressed by "No one saw any of the students".

I now want to argue that the standard alternative treatment of definites, which analyses them as plural terms denoting a contextually determined maximal collection, cannot coherently account for the full set of *any*-readings of definites in negative contexts. The problem, as we shall see, is caused by the fact that in order to yield the *any*-reading, the definite would have to take scope over both the negative element and a distributive operator. The strategy I will pursue here is to show that there are cases where the *any*-reading is obtained in a negative context, but there is nowhere to insert the distributivity operator in such a way that it takes scope over the negative element.

If plural definites are treated as sigma-terms, it follows from the above discussion that the logical form of a sentence such as (127a) must be (127b):

- (127) a. The students didn't leave.  
 b.  $(\delta(\lambda X. \neg * \text{leave}'(X)))(\sigma X[* \text{student}'(X)])$

Similarly, for a sentence such as (128), the definite must take scope over the negative quantifier and the distributive operator:

- (128) a. No one saw the students.  
 b.  $(\delta(\lambda X.(\text{no}'(\text{one}')(\text{saw}(X)))(\sigma X[*\text{student}'(X)])$

But we have seen that in the case of dependent plural definites such as "the donkeys he owns", the *any*-reading is equally available:

- (129) No farmer beat the donkeys he owns.

For the dependent reading to be derived, "the donkeys he owns" must, at least semantically, remain within the scope of the quantifier. The few works which have looked at this problem (see Lappin & Francez (1994) for a summary) have proposed that "no" be treated as in (130):

- (130)  $\text{no}' = \lambda A \lambda B. \forall X [A(X) \rightarrow \neg B(X)]$

To derive the required reading, the plural definite in the object position must take semantic scope over the negation operator in the translation; moreover, a distributivity operator must be inserted between the meaning of the definite and the negation. To derive all this from any kind of syntactic structure, we would have to suppose that a sentence of the form  $[[\text{no one}][\text{VP}]]$  is reanalysed as  $[[\text{all one}][\text{neg}[\text{VP}]]]$  at LF. Worse still, we would then have to allow movement of the object noun phrase and insertion of the distributivity operator to take place after this reanalysis. As far as I know, there is no motivation for such an analysis of the negative quantifier. At best, there have been proposals in the literature (see Kamp & Reyle 1993) to treat "no one" as "not some", where the reanalysis presumably has negation taking scope over the whole sentence. This type of reanalysis will not help in the present case, since what we want is to insert the plural definite plus distributivity operator within the scope of the quantificational element, but outside the scope of negation.

Finally, if we were to allow some kind of non-standard reanalysis of sentences containing "no", it should be equally possible for the conjoined noun phrase "his father and his mother" to take

scope intermediate between the negative element and the quantificational element; but as we have seen, there is a contrast between conjoined dependent noun phrases and dependent definites in these cases:

- (131) a. No boy saw his father and his mother at the party.  
b. No boys saw his parents at the party.

To sum up this part of the discussion, we have seen that dependent plural definites are just as amenable to the *any*-reading as their non-dependent counterparts. The only way of deriving the *any*-reading on the standard analysis of plural definites is for the definite to take semantic scope over both the negative element and a distributivity operator. In the case of non-dependent plurals, this is a reasonable stance; but in the case of dependent plural definites, it would require a syntactic analysis which is so far divorced from current thinking in natural-language syntax as to be untenable. The only other way of dealing with this problem would have been to follow the line of Krifka (1996); however, we have seen that this strategy is ill-founded.

A couple of other really highlight the incoherence of the standard position in relation to negative contexts. Firstly, there are many other expressions which create negative contexts and in the scope of which plural definites most naturally yield the *any*-reading:

- (132) Few farmers beat their donkeys.

Again, on the standard view, a very unnatural reanalysis of "few" into a separate negative and quantificational element at LF would be required in order to derive the most salient interpretation of this example.

Secondly, we saw above that the way to derive the *any*-reading of a noun phrase composed of conjoined names was to assume that the meaning of that phrase takes scope over the negative element. We also saw that the availability of this reading was constrained by syntactic factors

(as we would expect, since the null hypothesis is that semantic scope is licensed by the syntactic component of the grammar). Now the standard analysis requires the plural definite to take at least semantic scope over the distributivity operator plus the negative element. We have seen that this is highly implausible given the facts about dependent definites. But even in the case of non-dependent definites, we can show that the standard analysis would require plural definites - unlike the corresponding conjoined noun phrases - to be immune from island constraints. Recall that the *any*-reading is not available for a conjoined noun phrase contained within a syntactic island:

(133) Sergeant Exley could not find a witness who could place Mickey C. and Johnny Stompanato at the scene of the crime.

This is as expected. Now, compare (134):

(134) Sergeant Exley could not find a witness who could place the suspects at the scene of the crime.

The most salient reading here is the *any*-reading, and yet the plural definite is contained within a syntactic island.

In conclusion, the interaction of plural definites with negative elements reveals many weaknesses in the standard approach. My alternative account on which the *any*-reading of definites can be derived on the non-maximal reading, is compatible with any set of reasonable assumptions about the syntax-semantics interface. Moreover, the contrast between (133) and (134) is readily explicable on this account.

More generally, I have argued that in positive and negative contexts, plural definites show an ambivalence between maximal and non-maximal readings which warrants the type of analysis sketched here. Apart from the severe problems faced by the standard account in dealing with

negative contexts, we have seen that the standard treatment of non-maximal readings in positive contexts, based on the assumption of vagueness in the semantics of plural predicates, is misguided. In the next, and final section, I will return to the analysis of non-maximal readings of plural definites in positive contexts. In particular, I will try to show how the fatal assumption that plural definites have only maximal readings has led to severe confusion in the treatment of the so-called cumulative readings of plural relational predicates.

#### 4.5 Cumulative readings

In a paper published in (1981), Scha draws our attention to the problem raised by two-place predicates for the analysis of plurals. The now-famous examples include (135a,b):

- (135) a. The sides of R1 run parallel to the sides of R2.  
b. The squares contain the circles.

We are asked to consider the truth values of these examples in the context of, respectively, figures 1 and 2 below.

FIGURE 1

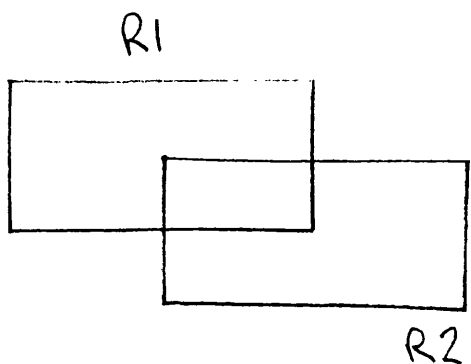
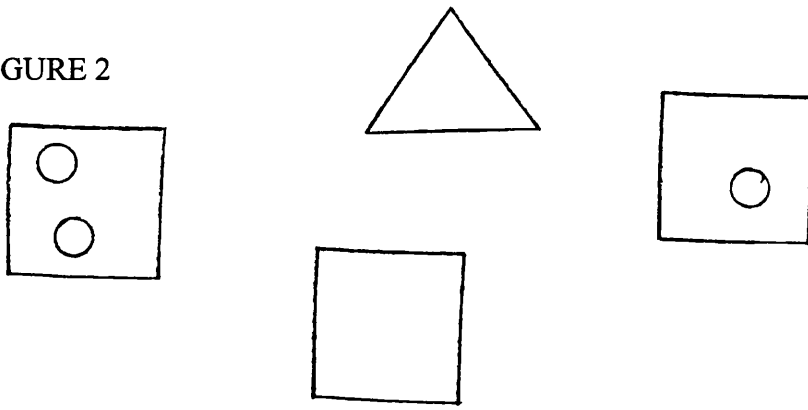


FIGURE 2



Both sentences are judged true in these circumstances. Scha's point was that this raised problems for semantic analyses of plural definites on which they are treated as equivalent to "every side of R1" and so on. He proposed instead a version of the now widely accepted analysis on which plural definites are treated as denoting the maximal collection of individuals picked out by the descriptive material. Thus, the logical forms of (135a,b) would simply be (136a,b):

- (136) a. parallel'(side\_of\_R2')(side\_of\_R1')  
b. contain'(circle')(square')

There are some aspects of Scha's proposals which are orthogonal to the issues raised by his examples but which ought to be mentioned. Firstly, Scha supposed that distributive readings of non-definites, as in "three boys carried a heavy package", could be derived on the assumption that "three boys" has one construal where it is strictly distributive and one where it is strictly collective. This type of treatment, which locates distributivity in the noun phrase rather than in the verb phrase, has come under heavy criticism in Roberts (1987), Lønning (1987) inter alia, the main objection being that it cannot deal with conjoined VPs where one conjunct is read collectively and one is read distributively. The example discussed earlier was:

- (137) Three girls carried the piano upstairs and drank a beer.



What is of enduring interest in Scha's example is that, even if we adopt the analysis on which the distributivity is located in the VP, we are still left with the problem of how to deal with (135a,b). Taking (135a) first, we can see that a doubly distributive analysis is inappropriate, since it would be equivalent to something like (138):

(138)  $\forall x[\text{side\_R1}'(x) \rightarrow \forall y[\text{side\_R2}'(y) \rightarrow \text{parallel}'(y)(x)]]$

A singly distributive reading would correspond to (139):

(139)  $\forall x[\text{side\_R1}'(x) \rightarrow \text{parallel}'(\text{side\_R2}')(x)]$

But at this stage, our semantics is not sufficiently developed to state the truth-conditions of *parallel'(side\_R2')(x)*, and part of Scha's paper is devoted to the treatment of relations between collections. We will consider these proposals below, and also look at the objections to these proposals, some alternative proposals and the problems with those. Before embarking on this, I will lay the ground work for my discussion of Scha by taking up the issue of two place predicates applying to pairs of collective terms, and what we understand as the meaning of these constructions.

Let us begin by looking at predicative natural-language expressions and the relations they express. Consider the example in (140):

(140) John kissed Mary.

I take it that a semantic theory should be interested in explicating the content of a competent English speaker's understanding of this example. I assume that this understanding is mediated by some conception of the kissing relation. I take it that this relation, and hence our conceptualisation of it, is limited as to the individuals it can hold between: for instance, it cannot hold between, say, a rock and a millipede, a quantity of water and a cork, an idea and a word, and

so on. I also assume that it cannot actually hold between a collection of individuals and another individual or collection of individuals. Perhaps this is a little too strong. Perhaps, at a pinch, we might consider the relation to hold between Bill, on the one hand and, collectively, Mary and Sue, on the other, if Mary and Sue offer their lips to be kissed in very close proximity and Bill comes along and plants his (hopefully, ample) lips so that they simultaneously make contact with both sets of lips in the required fashion. But it almost certainly cannot hold between, say, John and Mary collectively, on the one hand, and Bill and Sue collectively, on the other. Contrast this with the carrying relation. This can hold between, say, Sue and Bill collectively, on the one hand, and a collection of two packages, on the other. So in the normal case, the object noun phrase in an example like (141) can only properly be understood as distributive:

(141) John kissed Mary and Bill.

But now recall that our grammar allows for a collective construal as well:

(142)  $\text{kissed}'(m' \& b')(j)$

This reading may well be made available by the syntactic and semantic components of the grammar sketched above, but it would presumably be filtered out in most cases on grounds of plausibility (unless we assume that John has big lips and the three people in question like to indulge in somewhat quirky practices). The more plausible reading generated by the grammar would be (143):

(143)  $\lambda X[\delta(\lambda Y.\text{kissed}'(Y)(X))(m' \& b')](j)$

Now consider the example in (144):

(144) John and Mary kissed Sue and Bill.

This sentence has an expected reading on which John kisses Sue and Bill in turn, and where Mary separately kisses Sue and Bill. But our intuitions also tell us that if the sentence is used to describe a circumstance in which, say, John only kisses Sue, and Mary only kisses Bill, it will have been used truthfully. There is nothing in the grammar as presented so far which would lead us to predict this. So far, our grammar tells us that we can have eight logical forms, corresponding to eight LFs: distributive/distributive, distributive/collective, collective/distributive and collective/collective for each scope construal.<sup>7</sup> With such a proliferation of logical forms, it is something of an embarrassment that we cannot yet account for this type of reading.

Let us do some accounting. If we take the distributive/distributive LF on either scope construal, we get a logical form expressing the same proposition, which is true in circumstances in which four kissings occur, as in the case described above. The other six LFs correspond to logical forms all of which express propositions in which the kissing relation holds between either an individual and a collection or two collections. As we have seen, these propositions are unlikely to be true in any but the most bizarre circumstances. They are certainly not true in the case described above.

I will call this last reading the cumulative reading, alluding to the obvious relation to cumulative quantification. I propose to deal with it in a manner inspired by Scha, deriving it from the collective/collective LF combined with the use of meaning postulates. So let us return to Scha's analysis of definites.

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<sup>7</sup>It is worth mentioning that this type of proposal about the grammar of plurals is fairly standard, and similar in relevant respects to those of Link (1991) and Schwarzschild (1996) among others. Scepticism about these proposals arises mainly from doubts about scope ambiguities, or about how to treat the distributive readings. Nevertheless, any proposed grammar for plurals would generate a substantial variety of different forms, and it would be fair to say that none of them would explicitly generate a form which gives rise to the reading in question.

In contrast to his treatment of indefinite expressions such as "three boys", Scha claims that plural definites only have a collective interpretation at logical form. Thus examples such as (145a,b) get the logical forms in (146a,b):

- (145) a. The girls walked.  
 b. The girls gathered.

- (146) a. WALK(girl')  
 b. gathered'(girl')

In Scha's system, all n-place predicates are of type  $((et)^n t)$ , so that "walked" is rendered as  $((et)t)$ . In the grammar I outlined above, the translation symbol of "walked", i.e. *walk'*, is associated with our concept of walking, and thus expresses a property which does not properly hold of collections. In my grammar, the fact that the translation of "walk" in the plural has to combine with collections was handled by introducing the pluralising operator, \*. As noted above, I see this as a sub-syntactic, i.e. lexical (or morphological) operation. Scha accounts for the fact that (145a) is understood distributively and (145b) collectively in terms of postulates:

$$(147) \text{ WALK}'(X) \leftrightarrow |X| \neq 0 \wedge \forall Y [Y \in AT(X) \rightarrow \text{WALK}'(Y)]$$

This is how all distributive readings of sentences with definites - including those with relational predicates - are meant to be derived. The virtue of this account, according to Scha, is that it can handle the examples in (135) above, repeated in (148) below, by the use of meaning postulates for *CONTAIN* and *PARALLEL* given in (149):

- (148) a. The squares contain the circles.  
 b. The sides of R1 run parallel to the sides of R2.

- (149) a.  $\text{CONTAIN}(Y)(X) \leftrightarrow \forall U \in \text{AT}(Y) \exists V \in \text{AT}(X) [\text{CONTAIN}(U)(V)]$   
 b.  $\text{PARALLEL}(Y)(X) \leftrightarrow (\forall U \in \text{AT}(X) \exists V \in \text{AT}(Y) [\text{PARALLEL}(V)(U)]) \wedge$   
 $(\forall V \in \text{AT}(Y) \exists U \in \text{AT}(X) [\text{PARALLEL}(V)(U)])$

That is, Scha recognises that plural definites cannot invariably be assigned an "every" reading. In this way, he motivates the treatment of plural definites as collections together with the use of postulates.

Let us briefly consider some of the objections to Scha's proposal. Roberts (1987) notes that on this account, relational predicates corresponding to a very large class of verbs including "lift", "carry", "write", and so on, would be ambiguous, since they can be read either collectively or distributively. That is, there would have to be two lexical entries for each of these verbs, one with the associated meaning postulate giving rise to the distributive reading. Roberts' alternative, like those of Link and many others including myself, is to treat distributivity via an operator on phrases. However, as they stand, accounts along these lines cannot deal with either Scha's examples, or indeed the example involving "kiss" discussed above. There is still a gap. Other criticisms of Scha's account are based on the fact that his meaning postulates reduce everything to individual atoms. In some cases, as Lønning (1987) notes, this will not do, since a sentence such as (150) could be true in a circumstance where the boys are John and Bill, there are three cakes ( $c_1, c_2, c_3$ ), and John and Bill collectively polish off  $c_1$ , while Bill eats the other cakes himself:

(150) The boys ate the cakes.

Scwarzschild (1996) quotes a later work by Scha & Stallard (1988) in which they propose two equivalences corresponding to what they take to be the possible readings for this sentence:

- (151) a.  $\lambda Y, X. \forall U \in AT(Y) \exists V \in AT(X) [EAT(U)(V)]$   
 b.  $\lambda Y, X. (\forall U \in AT(Y) \exists V \in AT(X) [EAT(U)(V)]) \wedge (\forall V \in AT(X) \exists U \in AT(Y) [EAT(U)(V)])$

Notice that while Lønning's objections to this type of analysis is justified, what Scha & Stallard are trying to do here is capture the maximal/non-maximal effect in the semantics of the relations. This is not too different from the alternative analyses which were developed in response to this proposal. The maximal/non-maximal effect appears in relational predications because, in some sense, there is a vagueness involved. What Scha and his critics have in common is that they see this effect as having its source in the way we evaluate sentences expressing relations between collections. We shall return to look more closely at the literature on this question below. For now, I want to consider what I take to be one of the motivations for Scha's peculiar proposal.

One distinguishing feature of Scha's account is that he at least recognises a difference between the behaviour of definites and non-definites in these cases. This can be seen from the fact that he treats definites only as collections, while he treats expressions such as "three boys" as ambiguous, with different readings (collective/distributive) derived from the translation of the noun phrases. Where Scha goes wrong, in my opinion, is that in the context of Figures I and II, he only looks at plural definites (cases such as (148a,b) above); however, he does not consider other types of plural noun phrases. Consider again my (144), repeated as (152a) and contrast it with (152b), assuming that the boys in the context are John and Bill and the girls, Sue and Mary:

- (152) a. John and Bill kissed Mary and Sue.  
 b. The boys kissed the girls.

In both cases two readings are salient the distributive-distributive one and the cumulative one. What makes these sentences true on the cumulative construal would be two kissing events: say, John kisses, Mary and Bill Sue.

Now return to the figures in Figure I and II above. Let us give the sides names in Figure I and the squares and the circles names in Figure II. The sentence in (153a) below should be equivalent to (153b) on the collective construal of the conjoined noun phrase with the cumulative reading, and similarly for the examples in (154):

- (153) a. The sides of R1 run parallel to the sides of R2.  
b. S11, S21, S31 and S41 run parallel to S12, S22, S32 and S42.
- (154) a. The squares contain the circles.  
b. S1, S2, S3 contain C1, C2 and C3.

It now seems that there is a difference between these cases. (153a,b) seem to be equivalent on the cumulative construal, but (154a) and (154b) do not. Looking at Figure II, we see that the square S3 does not contain any of the circles. The same effect can be obtained by considering two scenarios. In scenario I, Bill dances with Mary and Sue, John dances with Mary and Ellen, and Max dances with Sue, and there are no other boys or girls in the context. Scenario II is just like scenario I except that Max dances with no one. Now consider (155a,b) in relation to these scenarios:

- (155) a. Max, John and Bill danced with Mary, Sue and Ellen.  
b. The boys danced with the girls.

It seems clear that (155b) is true in both scenarios but (155a) is not. This difference obviously has something to do with the definite, as Scha intuited, but his solution failed to distinguish the peculiar cumulative reading of relational predicates when in construction with plural noun phrases from the general ability of plural definites to have more than one interpretation. Again, the problem is created by focusing on definites as the paradigm case of terms denoting collections.

Let us step back for a minute and reconsider our original example which gave rise to a cumulative reading:

(156) John and Bill kissed Mary and Sue.

Recall that the kissing relation (unlike the lifting relation) intuitively does not hold between collections. Let us suppose that the source of this effect is the meaning assigned to the grammatically plural lexical item "kiss". The plural item, unlike its singular counterpart, is not translated by *kiss'*, but by *pl(kiss')*, where the pluralising operator *pl* for relational predicates is defined as in (157)<sup>8</sup>:

(157)  $\forall X, Y[(pl(\mathbf{R}))(X)(Y)] \leftrightarrow \exists C_1[C_1 \text{ covers } X \wedge \forall U \in C_1 \exists V \subseteq Y[\mathbf{R}(U)(V)]] \wedge \exists C_2[C_2 \text{ covers } Y \wedge \forall V \in C_2 \exists U \subseteq X[\mathbf{R}(U)(V)]]$

Some remarks about this move are in order. Firstly, it has the same basic shape as Scha's meaning postulate for PARALLEL in that it ensures that each individual in the collection denoted by one argument is involved somehow in the relation in question with some part of the collection denoted by the other. However, unlike Scha's proposal, it does not specify that each individual is involved in the relation qua individual. This takes care of Lønning's example with "eat". Of course, in the case of "kiss" the only plausible type of cover for each argument is one which partitions it into atoms, so this will be implied. Secondly, (157) does not allow an element of a collection to be uninvolved in the relation. Thus, I predict that (158) is false in a scenario where Bill and John ate all the cakes between them and Mary had none:

(158) John, Bill and Mary ate the cakes.

But I am also claiming that (159) would not be judged false, not because of the vagueness of the

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<sup>8</sup> Note  $\mathbf{C} \text{ covers } X \Leftrightarrow \bigcup \{C : C \in \mathbf{C}\} = X$



plural relation but because the plural definite can have a non-maximal reading:

(159) The children ate the cakes.

This is in contrast to Scha & Stallard's dual meaning-postulate analysis, which predicts that (159) would be true on one of its construals.

None of the existing alternatives to Scha's meaning-postulate approach to plural predicates can predict the difference in judgements between pairs of examples such as (158) and (159), (155a) and (155b) and (154a) and (154b). For example, Roberts (1987) proposes simply that examples such as (159) are assigned the logical form in (160), but that our conceptualisation of the relation *R* may lead us to judge that it may hold between collections of individuals even if not all the individuals in either of the collections are involved:

(160)  $R(A)(B)$

Her starting point is the difference in our understanding of what kinds of circumstances would have to hold to verify (161) and (162):

(161) The women released the prisoners.

(162) The guards released the prisoners.

Clearly, the most salient reading of these examples is the cumulative one. In my terms, this would arise on a collective/collective interpretation, with the MP associated with *pl* specifying that each member of the collections which stand in the relation *pl(released')* is involved in some way. Of course, as these sentences contain definites, they can have a non-maximal as well as a maximal reading. So, for instance, on a non-maximal/non-maximal reading of (162), a subset of the guards could be understood to stand in this relation to a sub-set of the prisoners. However,

in Roberts' discussion, she has in mind a maximal/maximal construal of (161) and (162).<sup>9</sup> Her discussion of (162) goes as follows:

For example, in order for the guards to release the prisoners, it may not be necessary for each of the guards to be personally involved in the release of one or more of the prisoners. (p144)

She continues:

The release may involve distinct routine tasks which differ from guard to guard, for example, filling out forms or taking over from another guard while he releases the prisoners. (ibid)

By contrast, from her discussion of (161) given the scenario of something like a prison break instigated by the women, it seems that she has in mind that each of the women is involved in some direct way in the release of one or more of the prisoners (a cumulative maximal/maximal reading).

The upshot of Roberts' discussion seems to be that the reason why we judge (162) to be true even if not all of the guards are directly involved in some way is that we are able to count them all as being involved in some sense because they were, say, on duty at the time. This becomes clearer in her discussion of (163):

(163) The Marines invaded Grenada.

She has in mind the reading on which "the Marines" denotes the collection including all

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<sup>9</sup> Actually, I think that (161) and (162) can have a non-maximal/maximal reading. Indeed, I think that a non-maximal/maximal reading of (162) would be most natural, if we were talking about a major prison complex.

individuals who are members of that branch of the military. The idea is that even though a small proportion were actively involved in the invasion, the rest are somehow indirectly involved by the supporting activities they perform, such as raising money from congress etc. The reason why we expect all of the women to have been actively involved in the prison break, according to Roberts, is that we have no other way of thinking about their involvement, except as being direct. This is because of our background knowledge of how prison breaks occur, as compared to orderly prison releases.

So, according to Roberts, the apparently non-maximal readings which Scha handles in terms of meaning postulates, and which I claim are due to an ambivalence in the interpretation of definites, are in fact maximal readings, but we have a certain licence in our evaluation of whether a given member of the collection is involved. I am willing to grant that (163) is true even on its maximal reading, but I strongly doubt that (162) is true on a maximal reading. However, I do not wish to argue over intuitions here. My main point is that here again an argument about the vagueness of collective predications is being used to explain non-maximal readings of plural definites. It would not be difficult to construct examples based on the predicate "release", parallel to the boat-building ones discussed above, to show that there is a contrast between plural definites and conjoined noun phrases; but the form of the argument should by now be familiar enough.

What is new about Roberts' vagueness argument is her use of examples involving verbs expressing relations which genuinely hold between collections in order to motivate her objections to Scha's use of meaning postulates to capture the non-maximal reading of (135b) ("The squares contain the circles"). But there is a great difference between the two types of example, since "contain" expresses a relation which intuitively cannot hold between collections, at least if we are thinking about containers of the normal type. That is, intuitively, the relation which we associate conceptually with this verb holds between single containers and the collections of things they contain. It follows that the vagueness argument cannot even apply, since we can not talk about elements of a collection participating in a relation if this relation does

not hold between pairs of collections. If you doubt that the relation expressed by "contain" cannot hold between collections, the argument surely goes through in the case of "kiss", and so on.

The implication of Roberts' argument is spelled out explicitly in Schwarzschild (1996):

The conclusion that many have reached based on the foregoing examples, and with which I concur, is that even predicates which are applicable to individuals can have a simple collective reading. On this reading, we should not, indeed can not, specify in the grammar how many of the singularities that make up a plurality must satisfy the predicate in order for that plurality to satisfy it. (p. 90)

I think this view is misguided for two reasons: First, if a predicate is associated with a property or relation that does not hold of collections, there is no sense in which we can say that the predicate applies to a collection. Second, the basis for this kind of claim is the idea that plural definites are the paradigm case of terms denoting collections. On this approach, examples such as the following (cited by Schwarzschild from Dowty (1987)) are taken to show that when a plural verb occurs in a sentence with a plural noun phrase, the meaning of the verb becomes mysteriously vague just because plurals are involved:

(164) At the end of the press conference, the reporters asked the President questions.

I submit that there is nothing mysterious about the meaning of "ask". The reason why we understand this sentence as expressing a proposition which is true of a circumstance in which only a small proportion of the present journalists actually ask a question is because, on the one hand, we can assign definites either a maximal or non-maximal interpretation; and on the other hand, in this kind of context, the issue of whether all the journalists present actually ask a question is not all that pressing, i.e. relevant.

This last point brings us into the area of pragmatics. An adequate defence of the line I am proposing calls for an account of how readings are chosen, and in particular why preferred readings tend towards the stronger, or more informative construal. I will discuss this issue at length in the final chapter. For now, I hope I have shown that there is a systematic alternation in the interpretation of definites between a maximal and a non-maximal reading, and that the source of this alternation does not lie in any vagueness in the meaning of the accompanying plural predicates. I also want to press the further point that the source of the alternation is in the linguistic meaning of the definites themselves. That is, as far as the grammar is concerned, the interpretation of plural definites could be maximal or non-maximal. I think that the evidence reviewed so far strongly suggests this conclusion. However, some alternative possible accounts of this alternation are still open at this stage. In the next section, I will evaluate these alternatives.

## **5 Pragmatic possibilities**

### **5.1 Introduction**

My claim is that the source of the maximal/non-maximal alternation in the interpretation of plural definites is located in the meaning of definite noun phrases themselves. Even those who insist that definites have only maximal semantics acknowledge that (165) would not be judged false, or at least would not be judged inappropriate, if only a small proportion of the reporters actually asked the questions:

(165) At the end of the press conference, the reporters asked the President questions.

In the last section, I argued that an account of these intuitions based on the vagueness of plural predications is inadequate in many respects. However, it would be possible to resist one could resist my claim about the meaning of definites by developing a pragmatic account of these cases. There are two lines worth considering here. Someone might insist that plural definites only have

maximal semantics, and argue that the impression of non-maximality is derived not from the meaning but via some pragmatic process akin to conversational implicature. Alternatively, one might hold that definites have a unitary semantics, but that it is non-maximal (or existential), and that the impression of maximal readings is derived by pragmatic processes. I will consider these possibilities in turn.

## 5.2 Loosening

Let us look again at some examples which, intuitively, have non-maximal readings:

- (166) a. Mary cannot come to work because her children are off school.  
b. Johnny was naughty because he fed the elephants chocolate.

If we wanted to maintain that definites have maximal semantics, we would need to say something about these non-maximal readings. There are a couple of manoeuvres, based on a notion of loose use, which might be attempted here. A related example of loose use would be an utterance of (167) below used to describe a fairly raucous affair:

- (167) Everybody (at Bill's party) was drunk.

Most people would accept that this may be strictly speaking false in the circumstance, but would nevertheless be a very apt description of the event.

The loose use argument might go as follows: Definites have maximal semantics, so example (166a) above would be strictly speaking false when only two of Mary's four children are sick. However, an utterance of (166a) would be pragmatically appropriate in such a circumstance because the proposition that her children are sick has implications which are actually relevant to Mary's non-attendance at work. The same kind of argument would presumably work for the

elephants case, (166b).

There is a possible objection even at this stage, based on the nature of the data involved. The question we ask informants about examples such as (166a) and (166b) is not whether they could be appropriately used, but whether they are true or false in the circumstances described.

Whatever the merits of this objection, the loose use argument really does not work in cases where the existential reading is obtained in downward entailing examples. Let us return to (168):

(168) No farmer abused the donkeys he owns.

If the definite has maximal semantics, then the type of inferences that might be derived from an utterance of (168) would be that no farmer is a complete monster, that no farmer was systematic about his beatings, and so on. But all these inferences are consistent with some donkeys having been beaten, whereas on the most natural reading of (168), no donkeys are beaten at all. Effectively, if the meaning of definites is maximal, the existential reading in negative contexts would involve pragmatic strengthening of the proposition expressed. Standard accounts of loose use obviously cannot deal with this.

It might then be claimed that pragmatic loosening occurs in positive contexts, while pragmatic strengthening occurs in negative environments. But this would need some kind of justification.

Note that if the literal meaning of (168) involves the maximal semantics of the definite, then it is left open whether a given farmer beats any of his donkeys. That is, (168) would be true in three kinds of circumstance: (i) where all farmers beat some but not all of their donkeys, (ii) where they all beat none and (iii) where some farmers beat some but not all and the rest beat none. Now the evidence suggests that the existential (all beat none) reading is strongly favoured in such negative contexts (in the absence of further information). So the maximal account would have to explain why there is a natural tendency to infer that none of the donkeys get beaten when the

information provided by the linguistic meaning is that not all of the donkeys get beaten. It is difficult to imagine how such a pragmatic account would go. Notice, for example, that the standard mode of pragmatic strengthening in such cases, scalar implicature, cannot be used here to derive the natural 'not any' reading. To see this, consider an alternative:

(169) No farmer beats all of his donkeys.

Although it is doubtful that this examples carries a scalar implicature, such an implicature, if it existed, would have the effect of suggesting that circumstances (i) and (ii) do not hold. That is, the stronger propositions which apply only to these situations would be implicitly denied.

In any case, the natural interpretation of (168) is that no farmer abuses any of his donkeys. This is stronger than the interpretation supplied by the assumed maximal semantics of the definite. The natural scalar inference would deny this stronger proposition. So the question is, what kind of rational process would lead to the required interpretation? I do not think there is one, so I do not think that this strengthening account will go through.

In the absence of such an account, we should abandon this line of defence of the maximal semantics view, and look for another way out.

We might appeal to 'local' pragmatic processes as an alternative means of solving the negative contexts problem. However, we will see that the above arguments weigh equally against local loosening accounts.

Local pragmatic adjustments to meaning do occur. Usually, this adjustment is of the strengthening variety. Consider the following pair:



- (170) a. I've had breakfast.  
b. I haven't had breakfast.

It is consistent with the meaning of the perfect tense in (170) that the speaker has eaten breakfast once in her life, but not on the day of the utterance. However, we normally take (170a) to mean that she has had breakfast on the day of the utterance; so this extra information is clearly inferred. Moreover, this information seems to get the proposition expressed, at least in the case of (170b), since we would not judge it false if the speaker had breakfast many times before the day of the utterance. It seems, then, that what is being negated is something equivalent to, "I have had breakfast today". One could therefore argue that local pragmatic strengthening is possible<sup>10</sup>, which leads to a weaker overall interpretation in negative constructions.

This raises the question of whether pragmatic loosening also occurs locally. In a recent paper, Carston (1996) argues that it does. She discusses examples such as (171):

- (171) *Mary*: John is a real bulldozer. He will be perfect for the committee.  
*Bill*: John isn't a bulldozer. (He's a juggernaut).

The idea is that "bulldozer" does not express the concept BULLDOZER (which does not apply to humans), but a weaker concept applies to things which have certain bulldozer-like properties. This weaker concept is constructed on an ad-hoc basis: that is, we start from some representation of the BULLDOZER concept, and construct a related representation lacking some of the properties of bulldozers.

Note that loosening, whether local or not, is apparently not a 'slot filling' process, of the type

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<sup>10</sup> It could be argued that this example is not a straightforward case of pragmatic strengthening. The perfect construction could be analysed as having some kind of slot which has to be filled in by the hearer, rather like a pronoun. If so, we would need to find another example where enrichment is 'free'.

involved in finding the referent of a pronoun singularly used, for example. It is more like the free enrichment process which takes place in the breakfast examples discussed above. That is, we start with a more or less determinate meaning provided by the grammar, and perform some kind of operations on (the representation of) that.

If we accept that loosening can occur locally, we could say that in negative sentences with definites, loosening occurs locally as well. This loosening could be of two types. We could loosen the meaning of the definite so that it may apply to something other than the unique maximal collection, or we could loosen our notion of plural predication so that a plural predicate is treated as applying to a plural term if it applies to some of its parts. In either case, local loosening would give rise to the stronger meaning in negative contexts.

However, the claim that local loosening is responsible for the existential readings in negative contexts leads to the same dilemma as the claim that such readings are due to global strengthening: there is no obvious motivation for the process. On the assumption that the grammar encodes a maximal meaning for definites, we start with a form of words which means something like "not all". Although it is possible to tinker with our representation of the meaning of the definite, we need to know what kind of evidence provided by the utterance would justify this. Once again the question arises, why go from "not all" to "none"?

### **5.3 Strengthening**

Let us now consider the claim that plural definites encode simple existential semantics. An account along these lines would have to say something about the maximal, universal readings of definites. The obvious move would be to say that some kind of (local) strengthening takes place. But it is not difficult to see that this proposal will face a similar problem to the maximal-semantics account: what evidence is there to justify the move from "some" to "all" in the general positive case?

It will be useful here to look briefly at some types of situation in which the existential and universal readings are selected; the issue will be taken up in more detail below. Consider the following pair of examples:

(173) The burglar was able to get into the house because the windows were left open.

(174) John taught a course in French syntax last term. The lectures were in French.

It is fairly clear that (173) gets an existential reading. Note that it would be true (or, at least, appropriately used) both in a circumstance where some but not all windows were left open and in a circumstance where all windows were left open. It seems that on the basis of an utterance of (173), we cannot justifiably infer anything about the status of the totality of windows. Notice too that, if we replace the definite description in (173) with a bare plural noun phrase ("windows were left open"), the same information would be conveyed; indeed, even with the form of words "some windows", the same effect would be obtained. The reason for this, as I will argue below<sup>11</sup>, has to do with whether it would be relevant to have information about all of the windows. In this case, it would clearly not, given that it is enough for one window to be open for a burglar to get in. As a result, we cannot justifiably take the speaker of (173) to have communicated that all the windows were open. For the same reason, we would not take the "some windows" variant to have communicated that some but not all windows were left open. In other words, the kind of contextual issue which drives the maximal reading in the case of definites, also drives the scalar implicature in the case of "some".

With (174), the universal reading is fairly salient. Notice, too, that replacing the definite description with "some lectures" gives rise to a pretty clear scalar implicature. So we could argue that in these cases, what drives the choice of the universal reading for the definite also drives the scalar implicature for the indefinite.

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<sup>11</sup> See also Breheny (1997).

We are currently considering the proposal that definites encode non-maximal semantics and that the maximal reading is obtained via some kind of free enrichment. It may be tempting at this point to conclude that this is the right analysis. A sketch of the account might include something like the following proposal: Definites, like indefinite descriptions, encode basic existential (non-maximal) semantics. Free enrichment of the predicate restrictor of a description (definite or indefinite) is always possible. There is something about the difference between the form of words "the Fs" and "some Fs" which - in situations where information about all Fs would be relevant - encourages enrichment in the former case and the derivation of a scalar implicature in the latter. The difference presumably has to do with the non-truth-conditional property of definites, on the one hand, and the fact that "some" is a cardinality predicate (albeit a vague one) on the other. This proposal seems more plausible when we consider the case of bare plurals, which can also receive an existential interpretation. Consider (175), a variant of (174):

(175) John taught a course in French syntax last term. Lectures were in French.

Here, if anything, the maximal reading is more salient. This type of example suggests very strongly that the classical "some/not all" scalar implicature turns partly on the form of words, and not the content alone. In the case of bare plurals, the form of words does not force the issue either way; and here it seems that some kind of free enrichment is taking place.

Returning to the question raised by which the non-maximal account of definites: "What evidence is there to justify the move from "some" to "all" in the general case?", the answer would turn, in part, on the form of words used in the utterance. Clearly, the details of this proposal would need to be fleshed out, but, given the evidence presented here, it does have some appeal. However, on further consideration, the account involving non-maximal semantics plus free enrichment turns out to be less than satisfactory. Its success here has to do with a particular property of the examples chosen; it will become clear what this is when I present a slightly different account below. The problem with this account is best illustrated by considering negative contexts.

On the non-maximal semantics plus free enrichment account, the strong preference for existential readings in negative contexts can be readily explained: If the grammar provides a non-maximal meaning and this leads to the strongest available proposition, then the natural response would be to accept it - local enrichment would be otiose given the apparent tendency to favour stronger readings. In fact, one might wonder why the hearer would ever depart from the grammatically given meaning. If we look again at a case of a maximal reading in a negative environment, e.g. (176), it seems that the reason is simply world knowledge:

(176) Every farmer who vaccinated the cows he owns received a clean bill of health from the EC agricultural commission.

Given what we know about vaccinations and EC bureaucracy, we would assume it more likely (or something) that farmers get a clean bill of health only by vaccinating all their animals. This shows that free enrichment is a genuine and open possibility in the case of definites. It is not a matter of 'last resort', as when we are interested in information about all of the individuals to which the restrictor applies: in this case, the non-maximal meaning gives us more information, as it covers any cases which the maximal reading does, and more.

By the same token, in the case of non-definites such as bare plurals and indefinites, we would also expect world knowledge to drive enrichment to the maximal reading. Unfortunately, it does not. The reading we get for (177a,b) goes against our expectations about vaccination regulations:

- (177) a. Every farmer who vaccinated some cows he owns received a clean bill of health from the EC agricultural commission.
- b. Every farmer who vaccinated cows he owns received a clean bill of health from the EC agricultural commission.

I think these considerations should lead us to abandon the idea that we start with a fixed, grammatically determined meaning of definites, and that free local enrichment (or loosening) can

account for the variation in intuitions. It seems that we would then have to say that definites do not express a determinate meaning in this regard. That is, the only way to account for the *disparity* between definites and non-definites in these constructions is to suppose that the choice between the maximal and non-maximal readings in the case of definites is genuinely open.

## 6 Summary

I would now like to sum up the position I hope we have reached in the course of this chapter. The best way to do this is to consider how definites are treated in the kind of grammar outlined above.

I am going to assume that definite noun phrases, [*The F*], are headed by determiners which are rendered in the translation language as existential. However, unlike the translation of indefinite noun phrases, the translation of the head of a definite noun phrase is not contextually restricted. Rather, the translation of the restrictor of the determiner is an atomic expression (type ((et)t)) whose meaning has to be fixed in the context. This makes a difference in the case of plurals. For consider a sentence of the form in (178a). This has the translation and equivalence given along the lines of Westerstahl's (1985) proposal for contextual restriction, in (178b). Contrast this with the proposal for definites in (179):

- (178) a. [[some A][B]]  
 b.  $\text{det}_\exists^c(\mathbf{A})(\mathbf{B}) \Leftrightarrow \{X: *(A \cap C)(X) \wedge (\mathbf{B})\} \neq \emptyset$

- (179) a. [[the F][B]]  
 b.  $\text{det}_\exists'(\mathbf{the\_F})(\mathbf{B}) \Leftrightarrow \{X: \mathbf{the\_F}(X) \wedge \mathbf{B}(X)\} \neq \emptyset$

In the case of the definite NP, the translation of the restrictor is something whose meaning is provided by a definite concept. This notion will be fleshed out in more detail in chapter 3. For

now, we merely need to note that it has as a consequence that the first argument of the determiner in the case of the definite can have its meaning fixed in such a way that the predicate applies only to the maximal set, or it can apply to any non-empty subset of the contextually relevant A's. In this way, we locate the source of the maximal/non-maximal alternation in the meaning of the form of words "the Fs" itself.

At this stage, we could also adopt something like (179) for singular definites. In that case, as we discussed for the case of singular indefinites (such as "a man") and noun phrases with the universal "every", we would have to make special provision so that the singular form cannot combine with genuinely collective predicates. The result would look much the same as in (179) except that *the F* in the case of singular definites would be constrained to apply to singletons. In chapter 3, I will show how the descriptive material in the noun phrase (including grammatical number) constrains the contextual determination of these definite concepts. For singular definites, we need to specify that the head noun of the noun phrase is not translated with the pluralising operator in forming the descriptive constraint on the definite's interpretation. Moreover, some kind of uniqueness constraint would be built into the contextual determination of this singular form.

## **Section IV    Pronouns**

### **1        Introduction**

In turning now from definite descriptions to pronouns, we will be shifting the initial focus of attention from issues having to do with quantification and quantificational force to issues having to do with context dependence. Recall that, in section II, I used an argument based on Westerstahl (1985) to suggest that the proper treatment of examples like those in (1) call for an

intermediate step in the interpretation process, viz. the quantified noun phrases need to be treated semantically as functions from contexts to denotations:

- (1) a. Every guest brought a gift.
- b. Most students like Mr Smith.

I also pointed out that definites call for a similar treatment, and that this is so regardless of whether they are treated as quantifiers or as descriptive terms:

- (2) a. The table is covered with books.
- b. The students gathered in the bar.

In a way, the fact that quantified noun phrases and definites require this kind of treatment is not all that interesting, since there is a substantial class of natural-language expressions, including "local", "tall", "come", "behind", as well as modals and adverbial quantifiers, which all require similar treatment.

The Westerstahl-style account of context-dependent quantified expressions adopted as an interim analysis involved translating determiners such as "every", not as the usual function *every'*, but as a context-dependent function, *every<sup>X</sup>*, defined as in (3):

$$(3) \quad \text{every}^X(A)(B) \Leftrightarrow \text{every}'(A \cap X)(B)$$

The idea is that context determines the value of the set variable *X* via the choice of assignment function. It was mentioned in chapter 1 that in all but the peculiar indexical cases, it is possible to bind into context-dependent expressions:

- (4) a. Every sports fan watched the final in a local bar.
- b. Every netball team nominated a tall girl to take the jump-offs.



In each of these examples, the context-dependent expressions "tall" and "local" covary in their interpretation with the elements of the domain of quantification. For instance, if we are quantifying over netball teams of different age groups, then what counts as tall for an under-seventeen team will not be the same as what counts as tall for an under-thirteen team. The same effect can be seen with quantified noun phrases:

- (5) a. Usually, when John throws a party, every guest brings a gift.  
b. Every host received a gift from every guest.

If we paraphrase (5b), say, in a predicate logic language, incorporating the contextually-supplied material as an expression in that language, the result might be something like (6):

$$(6) \quad \forall x[\text{host}'(x) \rightarrow \forall y[\text{guest}'(y) \wedge \text{at\_party\_of}(x)(y) \rightarrow \exists z[\text{gift}(z) \wedge \text{received\_from}(y)(z)(x)]]]$$

Here, the contextually-supplied material involves a two place predicate, one argument of which is filled by a variable bound by the subject.

Alternatively, if we were to analyse this example using the grammar outlined in the last section, the translation of the phrase [*every guest*] would pick out a set of pairs consisting of an individual and a generalised quantifier. This set would correspond to a function from hosts to quantifier denotations.

In either case, the interpretation of [*every guest*] in (5b) is a different kind of semantic object from the normal (unbound) quantified noun-phrase denotation.

I take it that the null hypothesis about the mapping between natural-language syntax and semantics is that it is homomorphic. It follows that the phrase [*every guest*] in (1) is a different kind of syntactic object from the similar [*every guest*] in (5). A syntactician might describe the difference by saying that in one case there is binding into a phrase and in the other there is not.

Unfortunately, within the generative tradition, the only available model for the syntactic reflex of binding is the structural relation between a quantifying phrase and either a trace of movement or a co-indexed pronoun.

As Partee (1989) notes, there is no evidence that expressions like "local" and "tall", in examples such as (4) above are in any sense in construction with a pro-form at the level of natural-language syntax. Nor is there any evidence of movement out of the quantified noun phrase in (5). This suggests that the treatment of binding within the generative tradition has certain limitations. I agree with Jacobson (1995) that these limitations result from an unjustified allegiance within the generative tradition to the idea that pronouns ought to be treated both syntactically and semantically along the same lines as variables in a first-order logical language. Since pronominal phrases are the paradigm case of natural-language expressions which can be bound into, the unfortunate conclusion that all binding should be treated in natural-language syntax as a relation involving some kind of variable-like expression seems to have been uncritically accepted. I will argue that these limitations can be overcome by using the kind of variable-free syntax advocated by Jacobson, which I will develop in chapter 4.

In this section, I will be considering the merits of treating certain pronominal forms as definite descriptions. This is the so-called E-type analysis. We will see that this analysis has many advantages, but that it also has many short-comings. One which will not be discussed here but which will be taken up in the chapter on binding involves the issue of uniformity.

The E-type approach is introduced in order to handle two basic types of examples involving pronouns. These are pronouns anaphoric on quantificational expressions in previous discourse, shown in (6) and donkey anaphora, exemplified in (7):

- (6) a. John bought a donkey. Harry vaccinated it.
- b. Few congressmen support Clinton and they are junior.

- (7) a. Every farmer who buys a donkey vaccinates it.  
b. Usually, if a farmer buys some donkeys, he vaccinates them.

There are other perceived categories of pronouns. The most prominent involve referential uses and bound variable uses, exemplified in (8) and (9):

- (8) *Scenario:* Mary points at John.  
*Mary:* He is a spy.

- (9) a. Every girl thinks she will win.  
b. Some students ate their pizza straight away.

It is worth noting that the bound variable pronoun in (9b) is subject to a collective and distributive reading. On the collective reading, (9b) picks out circumstances in which collections of students collectively possess a pizza and eat it. On the distributive reading, it picks out circumstances in which individual students possess their own pizza and eat it themselves. Donkey pronouns are also subject to collective readings. Consider (10):

- (10) Most boys who were given some packages carried them home.

In fact a singular donkey pronoun can also be subject to collective readings of various sorts:

- (11) a. Many students who wrote a paper submitted it to a journal  
b. Every boy who was given a package carried it home.

In (11a) we can imagine verifying circumstances which includes students who collectively write a paper and submit it. In (11b), covers circumstances in which some of the boys in question are given more than one package and carry them home together.

It is possible to organise these different uses of pronouns into different categories from the more traditional taxonomies. There is a natural distinction between dependent uses of pronouns, including bound variable and donkey pronouns, and non-dependent uses, including cross-sentential E-type and referential pronouns. Dependent pronouns, either bound variable or donkey pronouns, can be handled in a variable free account of binding in the same manner as the dependent versions of other context-dependent expressions. This will be demonstrated in chapter 4. For the moment, it is sufficient to note that the variable free approach treats such expressions as something like functions from elements of a quantificational domain to objects of the appropriate type. As we will see in chapter 4, it is possible to suppose that, as in the case of "local" and "every guest", with pronouns we can start out with the same ingredients for dependent and non-dependent versions and the mechanisms of the syntax-semantics interface are such that both versions are possible interpretations of the form in question.

One of the observations which will be made in this section is that only grammatically singular pronouns which are non-dependent are subject to a uniqueness constraint. That dependent singular forms are not subject to this constraint can be argued to follow from the fact that the semantic uniqueness condition is incompatible with the formation of the dependent interpretations of pronouns, and thus is discarded in that case. This will be proposed in subsection 3 where the problem of dealing with the donkey pronouns and quantificational force within an E-type approach is discussed.

In the next subsection, cross-sentential anaphora will be considered. The E-type approach will be introduced there and various proposals will be discussed. The major problem for this approach with regards cross-sentential anaphora revolves around Partee's infamous marble problem. A proposal regarding how to deal with this problem in the spirit of Cooper's (1979) free pragmatic approach will be introduced.

## 2 Cross-sentential cases and E-type pronouns

Within the static tradition, pronouns whose antecedent material occurs in a previous sentence in a discourse are treated as if the target sentence had a paraphrase containing a definite description. For instance, the discourse in (18a) is intuitively equivalent to that in (18b):

- (18) a. John bought a donkey. Harry vaccinated it.  
b. John bought a donkey. Harry vaccinated the donkey John bought.

This is the so-called E-type analysis. Different versions were originally devised independently by Evans (1977), Cooper (1979) and Parsons (1978).

In the argument accompanying Evans' proposal, a case is made against Geach's view that, properly speaking, pronouns should be treated strictly in the manner of variables of a first-order language. On this approach, the meaning of the discourse in (18a) would be given in terms of the logical form in (19), where there is binding across sentential boundaries:

- (19)  $\exists x[\text{donkey}'(x) \wedge \text{bought}'(x)(j') \wedge \text{vaccinated}'(x)(h')]$

This says that there is a donkey which John bought and which Harry vaccinated. Evans' objection to this kind of analysis is that it fails to capture the fact that the original example entails that there is just one donkey which John bought. I wish to sidestep for the moment the issue of whether this discourse does in fact entail that there is a unique donkey which John bought. As was mentioned in section II, I believe that Evans is wrong on this point, but I will take this issue up below. For now, I want to focus on the separate issue of Evans's general treatment of the interpretation of this kind of cross-sentential anaphora, since there is clearly something to recommend it. To see this, let us move away from the problematic example in (18a) and consider other cases of cross-sentential anaphora, such as (20a) and (21a). Again, the E-type approach claims that the interpretations of these discourses are equivalent to those of (20b) and (21b) respectively:

- (20) a. John bought some donkeys. Harry vaccinated them.  
b. John bought some donkeys. Harry vaccinated the donkeys that John bought.
- (21) a. Few congressmen admire Kennedy, and they are junior.  
b. Few congressmen admire Kennedy, and the congressmen who admire Kennedy are junior.

We can describe what is intuitively going on in these cases as follows: The antecedent of the E-type pronoun is a quantificational expression. The sentence in which it occurs is being used to talk about a certain set of individuals, and it asserts about these that their number is such and such. Now it seems that we can use pronouns in subsequent discourse to add more information about this set of individuals. Thus, a paraphrase of sentences involving these E-type pronouns in terms of a description is appropriate, given that descriptions are canonically used for just this purpose.

Note that in neither (20a) nor (21a) would it be appropriate to analyse the discourse by supposing that the quantified noun phrase in the first sentence binds the pronoun in the second. This strategy would give the entirely inappropriate reading for, say, (21a), that few congressmen are such that they admire Kennedy and are junior. Similarly, a discourse-binding approach to (20a) would express the proposition that there are some donkeys which John bought and Harry vaccinated. Rather, (20a) seems to say that Harry vaccinated all of the donkeys which John bought.

An advantage of the type of approach outlined above is that it predicts that (22a), with its gloss in (22b), should be unacceptable on the ground that it is semantically anomalous. By the same token, it correctly predicts (23a) to be fine. As we will see, this is a point in favour of the E-type approach, since the mechanism used in the dynamic literature to rule out (22a), would also incorrectly rule out (23a):

- (22) a. John bought no donkeys. Harry vaccinated them.  
b. John bought no donkeys. Harry vaccinated the donkeys John bought.
- (23) a. It is not the case that John bought no donkeys. Harry vaccinated them.  
b. It is not the case that John bought no donkeys. Harry vaccinated the donkeys John bought.

There are several ways of implementing the basic idea underlying the E-type approach. Evans' own proposal is that the denotation of these pronouns is fixed by a description recovered from the previous discourse by a special rule of the grammar. One feature of this proposal is that E-type pronouns always take widest scope with respect to such things as modal operators. I agree with Neale (1990) in his criticism of Evans on this particular point. Consider for instance (24):

- (24) Last year, many Republicans were Clinton supporters. This year, they are very thin on the ground.

Here, the pronoun in the second sentence is interpreted as something like "the Republicans who are Clinton supporters", but within the scope of the temporal operator of the second sentence.

An alternative to Evans' E-type view is to treat these pronouns actually as descriptions. The quantificational version of this proposal is made in Cooper (1979), Neale (1990) and van der Does (1996a) *inter alia*. The alternative on which E-type pronouns denote partial functions from individuals to individuals (as in Heim 1990 and Lappin & Francez 1994 *inter alia*) corresponds to the non-Russellian view. Here, I will be staying with the quantificational view partly to remain consistent with the analysis of descriptions. I will however present some more methodological considerations in favour of the quantificational view when Lappin & Francez choice function account of donkey pronouns is discussed later in this section.

Neale (1990) dubs his quantificational E-type analysis the D-type approach. This account gets

a fair empirical coverage with basic cases of cross-sentential anaphora, so we will consider it next.

The D-type alternative is to treat this class of pronouns literally as quantified noun phrases whose descriptive content is recovered from the context. So for instance, Neale's logical form for the second sentence in (18a) would be as in (25a), where *the<sub>sing</sub>* is given the truth definition in (25b):

- (25) a.  $[\text{the}_{\text{sing}} x: \text{donkey}'(x) \wedge \text{bought}'(x)(j)](\text{vaccinated}(x)(h')$   
b.  $[\text{the}_{\text{sing}} x: F(x)](G(x))$  is true iff  $|F-G| = 0 \ \& \ |F| = 1$

In the case of plural E-type pronouns, Neale uses the plural description, defined as in (26):

- (26)  $[\text{the}_{\text{pl}} x: F(x)](G(x))$  is true iff  $|F-G| = 0 \ \& \ |F| > 1$

Neale's logical forms are cast in a language of restrictive quantification. Thus the syntax-semantics interface is mediated by a rule which translates traces of movement as variables, together with a rule which allows movement at LF to ensure syntactic structures of the right form. Note also that Neale envisages three ways of dealing with pronominal forms: if they are c-commanded by a co-indexed operator at LF, they can be interpreted as bound variables. If they have no antecedent (or a directly referential antecedent), they are interpreted as directly referring terms. Finally, if their antecedent is not directly referential (and therefore quantificational) and they are not c-commanded by their antecedent, they are interpreted as E-type pronouns.

With these analyses of E-type pronouns, together with a numberless version, Neale can handle a wide array of problematic examples. We will consider his treatment of donkey anaphora in the next section. Here it is worth remarking that problematic examples such as the so-called 'MiG' and 'paycheck' sentences can be dealt with using (25) and (26). The MiG example, given in (27), is thought to have two readings. These can be captured on the E-type approach if scope interaction is permitted and the pronoun in the wide-scope noun phrase is treated as E-type:



- (27) a. The pilot who shot at it hit the MiG that chased him.  
 b. [the x: pilot'(x) ∧ [the y: MiG(y) ∧ chased'(x)(y)](shot\_at'(y)(x))]( [the y: MiG(y) ∧ chased'(x)(y)](hit(y)(x))  
 c. [the y: MiG(y) ∧ [the x: pilot'(x) ∧ shot\_at'(y)(x)](chased'(x)(y))]( [the x: pilot(x) ∧ shot\_at'(y)(x)](hit'(y)(x))

Apart from demonstrating the range of this kind of E-type approach, this example also shows how E-type pronouns which are bound into are handled. If we look briefly at the logical form of the wide-scope subject reading, given in (27b), we see that restrictor of the description which translates the E-type pronoun,  $Mig'(y) \wedge chased'(x)(y)$ , has been copied over from the restrictor of the translation of the description in the scope. This implies that E-type pronouns can be bound into, i.e. have a dependent interpretation, if and only if the descriptive material which is recovered from surrounding discourse is similarly dependent.

As to the general question of how the descriptive material is recovered, Neale offers his P5:

- (28) (P5) If  $x$  is a pronoun that is anaphoric on, but not c-commanded by '[Dx: Fx]' that occurs in an antecedent clause '[Dx: Fx](Gx)', then  $x$  is interpreted as the most "impoverished" definite description directly recoverable from the antecedent clause that denotes everything that is both  $F$  and  $G$ . (p182)

So, in the case of the original example, (18a), the first sentence in the discourse would be translated as in (29):

- (29) [an x: donkey'(x)](bought'(x)(j'))

The rule in P5 tells us that the description which interprets the pronoun in the second sentence should pick out the set of donkeys which John bought. Neale notes that there are different ways of regarding his P5. It, or something like it, could be developed into a full-blown

transformational rule. This is indeed the course which Evans pursued. To achieve this goal, the descriptive material recovered from the context would need to be represented at some level of syntactic representation. In section II, when we discussed the contextual restriction of quantificational expressions in general, this strategy was found wanting, and it is unlikely that things will be any different when it comes to E-type pronouns. Moreover, as we will see with (32) below, P5 or its syntactic equivalent cannot properly deal with cases where a non-dependent E-type pronoun is anaphoric on a quantified noun phrase which itself is in the scope of another quantifier. Evans' syntactic correlate of P5 would construct an interpretation for the pronoun which involves an unbound dependency in such cases. So a strict syntactic rule along the lines of P5 predicts such examples to be ill-formed, contrary to fact.

Neale considers two other ways of looking at P5: as a generalisation about the way in which the restrictive material required for the interpretation of the pronoun is recovered from the context, or as a processing heuristic. I find neither of these very satisfactory.

One problem with P5 has to do with cases where E-type pronouns do not pick out the intersective set. Neale mentions some of these:

- (31) a. Few Hondurans voted in the election. They were intimidated by the secret police.  
b. No philosophers were allowed into the party. They were turned away at the door by a huge bouncer.

These are cases of so-called nominal anaphora. In the case of (31a), the pronoun most naturally picks out the set of all Hondurans, not those who voted in the election. In (31b), the context set involves a sub-set of philosophers.

There is yet another type of problematic example, mentioned by Neale in a footnote. This involves the quite common case of a pronoun anaphoric on a quantifier which is within the scope of another quantifier in the preceding discourse:

- (32) Most invited guests brought some gate-crashing friends. They were turned away at the door.

The logical form of the first sentence in (32) is given in (33):

- (33) [most x: guest'(x)][(some y: friends(y))(brought(y)(x))]

According to P5, the restrictive material for the E-type pronoun in the second sentence is *friends'(y) ∧ brought'(y)(x)*. However, this cannot be used, since there would be a free variable.

We can conclude from this discussion that a rule such as P5 is unlikely to have the kind of general scope which is clearly required. The question is, what, if anything, can we say about the recovery of the interpretation of E-type pronouns?

I mentioned in section II that Neale is also vague as to how contextual material which restricts quantifiers in general is recovered. My conclusion there was that the meaning of quantified noun phrases ought to be seen as something like a function from contexts to contextually-restricted generalised quantifiers:

- (34)  $D^X(A)(B) \Leftrightarrow D(A \cap X)(B)$

If E-type pronouns are to be treated quantificationally, there is no reason to expect them to be treated any differently. Of course, unlike with full descriptions, the restrictive material in the interpretation of E-type pronouns would be recovered purely from the context. Abstracting away from certain issues, we might say that E-type pronouns are characterised as follows, where  $D_{def}$  is the translation of the determiner heading pronominal noun phrases:

- (35)  $D_{def}^X(B) \Leftrightarrow D_{def}(X)(B)$

On this approach, the content of the pronoun's restrictor is freely determined by the context. This

is basically the approach of Cooper (1979).

The adequacy of this free approach depends on how the choice of context set is constrained. In particular, it depends on how certain problematic examples are handled. A totally free approach, for instance, would predict that a reading of (36) below is intuitively available on which the pronoun in the second sentence can pick up the set of Democrats who do not support Clinton:

(36) Most Democrats still openly support Clinton. However, they are from constituencies with an active fundamentalist electorate.

This reading is just not available here, despite the fact that it would make good sense. Instead, we get the pragmatically odd reading on which the Democrats who still openly support Clinton come from fundamentalist regions. This kind of evidence suggests very strongly that the choice of context set is not entirely free. In fact, it suggests a possible generalisation about the source of context sets for E-type pronouns:

(37) If the antecedent of an E-type pronoun is a quantified noun phrase of the form  $[\text{det}_{[\text{NP}]}A]$ , whose translation is  $\lambda P.D^X(A)$ , and this phrase is contained in a sentence of the form  $[[\text{det}[A][_{\text{VP}}B]]]$ , then *only* the set  $A \cap X \cap B$  is available as the context set for the pronoun.

Note that this rule just states that the relevant intersective set involved in the computation of the truth conditions of the previous sentence is available as a value of the context variable introduced by the E-type pronoun. This excludes the possibility of using the set  $A \cap X - B$  as the value of the context variable, thus explaining why we cannot use the pronoun in (36) to pick out the set of Democrats who do not support Clinton. However, as it stands, the rule in (37) insufficiently general for a number of reasons. Let us look at each of these in turn:

The first problem for (37) involves cases of nominal anaphora, some examples of which are repeated in (38):

- (38) a. Few Hondurans voted in the election. They were intimidated by the secret police.  
 b. No philosophers were allowed into the party. They were turned away at the door by a huge bouncer.

In these examples what is being picked up by the E-type pronoun is not the intersective set from the previous sentence, but merely the set which is the denotation of the restrictive phrase of the antecedent noun phrase. So we will at least need to amend our rule in (37) to something like (39):

- (39) If the antecedent of an E-type pronoun is a quantified noun phrase of the form  $[\text{det}_{[N]}A]$ , whose translation is  $\lambda P.D^X(A)$ , and this phrase is contained in a sentence of the form  $[[\text{det}[A]][_{VP}B]]$ , then *only* the sets  $A \cap X \cap B$  or  $A \cap X$  are available as the context set for the pronoun.

But this reformulation is still too restrictive. For instance, it says nothing about cases where the antecedent noun phrase is within the scope of another. Recall (32), repeated as (40):

- (40) Most invited guests brought some gate-crashing friends. They were turned away at the door.

In this example, the context set for the E-type pronoun is obtained by taking the union of the sets of gate-crashing friends who were brought along by invited guests. At this stage, we could go back once again and amend the rule in (39) to take account of this type of case. The result would resemble the rule proposed by van der Does (1996a, 1996b). There, van der Does sets up a file system similar to that of Heim (1982), whereby possible context sets for E-type pronouns are kept track of. In other words, van der Does incorporates some of the ideas of Heim's file-change semantics into a static, E-type framework, essentially dispensing with some of the theoretical assumptions underlying dynamic approaches to anaphora. While I am generally sympathetic with the line taken by van der Does, I will not pursue his strategy here. The reason will emerge if we look briefly at his proposal.

Effectively, van der Does uses a double-indexing system for quantified noun phrases which are anaphoric on previous discourse. An anaphoric phrase is indexed for the variable whose value will serve as the context set, and it is also indexed for the variable associated with the antecedent noun phrase. So, in a discourse such as (41), the anaphoric expression will be indexed for the variable associated with the antecedent, "some children":

- (41) a. Some children were playing in the park. The boys were kicking a ball around.  
b. Some<sup>x</sup>(children')(were\_playing'). The<sup>y</sup><sub>x</sub>(boys')(were\_kicking\_a\_ball').

In this system, the semantic representation of a discourse is associated with a file. Here, the values assigned to set variables by the assignment function for the discourse are computed as the intersective set involved in computing the truth conditions for the sentence where the variable is introduced. So, for instance, after the first sentence, the file contains the information that the context-set variable  $x$  is assigned as its value the set of children playing in the park. As the noun phrase in the second sentence is subscripted with this variable, the context-set variable for the definite is assigned this value. After the second sentence, a second variable,  $y$ , has been introduced into the file. There it is recorded that this variable has as its value the set of boys who were among the children playing in the park. Subsequent discourse can have anaphoric noun phrases subscripted either  $x$  or  $y$ , depending on whether the phrase in question is anaphoric on "the boys" or "some children". The framework is developed by van der Does to handle examples such as (36) above. It is not difficult to see how nominal anaphora can also be incorporated by allowing a dual superscript system, one for the intersective set and one for the set denoted by the nominal restriction alone. But still we would need to extend the information stored in this file, since a pronoun can draw from more than one antecedent:

- (42) John and Mary took most students out for an end of term dinner. They had pizza.

Here 'they' picks out both John and Mary and the students. Slightly more creative examples would demonstrate that even more than two noun phrases can be involved, and the file would

have to keep track of these. We might also wish to include the antecedents made available in intensional contexts:

- (43) Last year, many Republicans were Clinton supporters. This year, they are thin on the ground.

While we could, in principle, keep track of all the potential context sets which might play a role in interpreting these anaphoric expressions, the result begins to look like no more than an exercise in cataloguing the available types of interpretations. What is lacking is some kind of theoretical motivation for what can and cannot be in this file. Moreover, this type of approach pushes to one side the most interesting questions raised by the E-type approach to anaphora and the static approach to context dependence in general. These are questions about the limits of what we might call linguistic meaning and the role played by non-linguistic factors in interpretation.

I want instead to map out another way of thinking about the relationship between (E-type) pronouns, their antecedents and their interpretations. These suggestions will be fleshed out in more detail in subsequent chapters.

The approach I want to pursue says effectively that the selection of the context set is free: that is, there are no grammatical rules which dictate what can and cannot be chosen as the value of this set. I am assuming that the choice is made according to some pragmatic principles. However, we have also seen that there do seem to be constraints of some sort on the selection of this set. In the case of (36), we saw that we could not construe the pronoun as picking out the set of Democrats who do not support Clinton, even though this would make most sense, pragmatically. A variation on Partee's marble example illustrates a related point:

- (44) I had ten marbles which I dropped. I found eight of them. They must be under the sofa.

In this case, if "they" in the last sentence is used to refer to the eight marbles found, the discourse makes little pragmatic sense. One can, on a moment's reflections see that the last sentence is being used to talk about the missing marbles. Although it is clear that this is what would be meant in such a context, the discourse is in some way deficient, or unacceptable.

So we need to look into the nature of these constraints. I think that the instinct of many who have concerned themselves with this issue is that the constraints must be grammatical: the assumption has been that what is wrong in the marble example and related cases is that there is no syntactic antecedent for the pronoun.

I want to resist this impulse, for two reasons: the first is technical, and the second is more one of principle. To illustrate the technical problems which arise on this approach, let us consider Chiercha's (1992) version of the grammatical constraint on E-type resolution:

(45) In a configuration of the form  $NP_i \dots it_i$ , if  $it_i$  is interpreted as a function [E-type], the range of such functions is the (value of the head) of NP. (p159)

This rule gets the facts right with standard cross-sentential E-type anaphora, as in (18), with donkey anaphora and nominal anaphora. It can also rule out a possible interpretation in the context even if the pragmatically plausible value is highly salient. Thus, consider Chiercha's (46):

(46) Every donkey owner beats it.

Although the set of donkeys owned by farmers is made salient here, it cannot serve as the value of the pronoun, because the only possible antecedent is *Every donkey owner*, and the rule in (45) dictates that the range of the function which interprets the pronoun must be taken from the head of this NP, which is the set of donkey owners. Chiercha also discusses how his constraint can rule out the pragmatically plausible interpretation in the case of marble examples. However, he



takes the case where the pronoun is singular:

(47) I lost ten marbles and found nine of them. It is under the sofa.

The constraint in (45) rules out (47) because the singular pronoun cannot have an antecedent in the previous sentence, all the NPs being plural. However, it is possible to construct a marble example which is equally ill-formed, but where Chiercha's rule would allow the pragmatically plausible interpretation:

(48) I dropped every marble I had. There were ten of them. I found nine. It was under the sofa.

Here we can index the pronoun to the singular NP *every marble I had*. The head of this NP picks out the set of marbles, which of course can serve as the range for the function which would intuitively interpret the pronoun.

The problem with Chiercha's rule is that it cannot properly capture formally the notion of antecedent which we appeal to in discussions of anaphora. The problems become even worse if we attempt to formulate an equivalent rule for plural anaphora. In the case of the marble example in (44) above, again we have a salient pragmatically plausible interpretation for the pronoun, but the discourse is ill-formed because it lacks an antecedent. But notice that in this case, if we index the plural pronoun in the last sentence to one of the plural NPs in the previous discourse which talk about marbles, then the head of that NP denotes the set of marbles and this set can serve as the range of the function which interprets the pronoun. The same problem would arise for our Clinton example, repeated below:

(49) Most Democrats still openly support Clinton. However, they are from constituencies with an active fundamentalist electorate.

It seems that if we wish to formally define the notion of antecedent, we will need to go back to

something like van der Does' strategy of listing all of the potential context sets or its equivalent in Chiercha's system. But Chiercha's constraint is proposed within the spirit of a free approach to anaphora resolution. It is meant to be a grammatical constraint on a free pragmatic process, not a semantic rule for determining the interpretation of the pronoun.

The second problem I have with the idea of encoding a constraint on E-type interpretation into the grammar is that it implies a kind of ambiguity between non-directly referential pronouns which have their antecedents in previous discourse and those which do not. The latter type of case is illustrated in (50):

(50) *John and Mary are studying an unknown animal's tracks left on a beach.*

*Mary:* It has probably been wounded. See how it has favoured its left front leg.

Indeed, in conversation, marble examples can lose their air of infelicity. Consider the following text taken from a (not very interesting) textual narrative:

(51) When John came into the room, he found Mary holding a bag of marbles and staring intently at the floor. "What's up?", asked John. "I had ten marbles in this bag, but I dropped them." replied Mary, lifting up the rug. "How many have you found?". "Nine". "Bummer". Now both John and Mary began searching the nooks and crannies of the room. After half an hour's searching, John turned to Mary, "Do you think it could have rolled into the next room?"...

There is no question that in these examples the pronoun is descriptive, and must be interpreted as E-type. So if there is a grammatical rule constraining the choice of contextually-supplied material needed for the interpretation of E-type pronouns, we have to say either that this rule can only apply to a certain class of such forms, or that the text above is strictly ungrammatical, but acceptable because the grammatical constraint is overruled for some reason. The first option seems to me to be dubious, since it implies both that descriptive pronouns are ambiguous and

that there can be a formal definition in the grammar that makes reference to a certain class of utterances. The second option seems to me misguided, since it simply raises the question of what conditions must hold in order for the grammatical constraint to be overruled. Note that it cannot just be that the E-type pronoun occurs in a conversation - across speakers, as it were - since such uses can be infelicitous on occasion. For instance, the use of the pronoun in (52) is just as infelicitous as in the original marble example:

(52) When John came into the room, Mary curtly handed over a box of chocolates. "Here are your chocolates". "Thanks". "There were ten, but now there are only nine". "What did you do, eat it?", said John, annoyed.

Another alternative would be to say that the grammatical constraint can be overruled if whatever the pronoun is supposed to be talking about is sufficiently salient. But then why not just say that all cases of infelicity have something to do with salience?

I think that this is in fact the right way to go. However, I also think that those who have gestured in the direction of salience when discussing this issue have dodged at least one of two questions which need to be answered for a salience account to be at least *prima facie* plausible. The first question is, how can we determine what is and isn't salient in these circumstances? The second question is, why should salience matter? This second question has been systematically ignored in the literature on E-type pronouns, but it is vital to answer it if we want to defend a free pragmatic approach. It is vital because, in marble discourses such as (49), it can clearly be inferred from the previous discourse that exactly one marble remains unaccounted for. For a free pragmatic approach, the question is why one cannot use (49) and expect the audience to make the bridging inference as one readily can with descriptions:

When Mary took the picnic supplies out of the trunk, the beer was warm.

If pronoun resolution is genuinely free, why can't the pronoun in the second sentence felicitously

refer to missing marble? Even if it were possible to define a theoretical notion of salience such that the missing marble falls below a certain level, we still need a theory in which unacceptable discourse can be accounted for in terms which make reference to salience. In chapter 5, I will propose an account of pragmatic unacceptability based on Sperber & Wilson's (1986/95) relevance theory. As we will see, a principled account based on their theory is possible because their pragmatic criterion makes reference to a notion of processing effort. The same approach will also handle the reduced acceptability of examples with misplaced focus, as in (53):

- (53) A: What did Mary do to Bill?  
B:# She kissed BILL.

In all such cases of infelicity, the form of the account will be the same: the speaker has encouraged the hearer to adopt a certain processing strategy which in the event yields no results. In order to interpret the stimulus, the hearer must abandon that strategy and adopt another. Thus, she has been put to gratuitous processing effort. The paradigm case of this kind of irrelevance, I will argue, is where the speaker points at one thing, and proceeds to talk about another. Although I will leave the details of this until we talk about pragmatics proper, I want to look a little more closely at the kind of strategy I have in mind for the recovery of contextual material for pronouns, since this will show us how to deal with the first question raised above, about the notion of salience.

The most common way of fleshing out this notion in accounts of discourse processing is by appeal to 'focus of attention'. The idea might be presented as follows: since pronouns have no nominal content, pronominal interpretation is unconstrained in the sense that pronouns can be used to denote any kind of thing, so long as the addressee's conception of that thing is lexicalized with agreement features matching the pro-form's. This being so, it is natural for hearers to expect the interpretation of a pronoun to be in some sense recoverable from what is currently in the focus of their attention. It is natural partly because otherwise the search space becomes enormous. With descriptions, by contrast, their nominal content radically constrains the search

space to just those objects which are in the denotation of the nominal restrictor. Thus a natural strategy based on this expectation would be to consider only those things in the focus of attention in deciding what the pronoun is being used to talk about. This is, I think, a fair rational reconstruction of many proposals about the processing of noun-phrase forms found in the literature on discourse, both psycholinguistic and computational.<sup>1</sup> Of course, it would be possible to flesh out these ideas a little by using various models of this process: the computational metaphor of the stack is very popular here. However, I want to move in a slightly more theoretical direction.

Although I am basically in sympathy with any proposal aiming to deal with the comprehension of pronouns in terms of focus of attention, I think that the idea needs modifying in one fundamental respect. Strictly speaking, we should not be looking at what is in the focus of the hearer's attention, but at what is in the focus of the *joint* attention of the speaker and the audience. The difference is crucial for dealing with the marble problem. Let me take a step back for a moment to try and spell out why joint attention is important.

If we consider the canonical use of deictic pronouns, we find that they are accompanied by pointing or some similar gesture:

(54) *John points at one of his fuchsias.*

*John:* That is a fuchsia.

I would argue that, logically speaking, in all such cases, the pointing precedes the utterance. That

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<sup>1</sup> See Grosz & Sidner (1986) for a classic use of the notion of focus in accounting for discourse phenomena. See also Gordon, Grosz & Gilliom (1993) for work in centering theory which develops Grosz and Sidner's work. For more psycholinguistically oriented approaches which attempt to develop models of processing discourse utilising the notion of focus of attention, See Sanford & Garrod (1981) and Garrod & Sanford (1994) for a more recent handbook review. See also Chafe (1987) for an alternative view of discourse processing which employs this notion of focus.

is, the speaker gets the audience to pay attention to something and then talks about it. The felicity of the use of the pronoun depends on this. But what matters is not just getting the audience to pay attention to certain things; it is getting these things into the focus of joint attention. Pointing and related gestures are the most basic means of realigning the shared attention of those present (self included). In fact, I have suggested elsewhere (Breheny 1997) that pointing has procedural meaning, in that it directs the operation of a cognitive mechanism in a certain way. The cognitive mechanism in question here is the so-called shared-attention mechanism (Baron-Cohen & Swettenham 1996). This is thought to develop in pre-verbal children, and is evinced by the marked progression from so-called proto-imperative pointing to proto-declarative pointing (where proto-declarative pointing involves a request that an object in the distal environment become the subject of mutual reflection).

I do not think it would be too wide of the mark to suggest that communicative behaviour in general involves the exploitation of this mechanism. If we consider communication in the terms of Sperber & Wilson (1986) (who call it 'ostensive-inferential communication'), it has two aspects. First, it is behaviour which draws attention to certain things, creating a presumption that the information thus made available will be worth processing (i.e. it will be relevant in the technical sense). Second, its goal is to expand the pool of mutually available information, or the 'mutual cognitive environment'. On this approach, an utterance is just a way of drawing attention to certain facts about certain things. A just-processed utterance puts at the very focus of joint attention those things which have just been talked about.

Let us now consider in turn the various kinds of marble example discussed above, and see what this notion of the focus of joint attention buys us. Consider first the felicitous marble example, repeated below:

- (55) When John came into the room, he found Mary holding a bag of marbles and staring intently at the floor. "What's up?", asked John. "I had ten marbles in this bag, but I dropped them." replied Mary, lifting up the rug. "How many have you found?". "Nine".

"Bummer". Now both John and Mary began searching the nooks and crannies of the room. After half an hour's searching, John turned to Mary, "Do you think it could have rolled into the next room?"...

I would argue that we do not judge the use of the marble pronoun here to be unacceptable, because John is talking to Mary after a prolonged period where they are jointly engaged in looking for the missing marble. So, at the point at which the utterance occurs, the focus of the joint attention of speaker and hearer is the missing marble. The acceptability of this kind of dialogical marble example diminishes as it becomes less clear that the missing marble is indeed the object of joint attention:

(56) When John came into the room, Mary curtly handed over a box of chocolates. "Here are your chocolates". "Thanks". "There were ten, but now there are only nine". "What did you do, eat it?", said John, annoyed.

I think it is important to stress that it is the focus of joint attention, and not just the hearer's attention, which matters here. To see this, consider a scenario where you are not much of a horticulturalist but you are in my garden looking at a fuchsia plant, considering the shape of its leaves and so on. Now, if I were standing around nearby (say fixing the barbecue) and I call across, "It's a fuchsia", your first reaction would be "What?". That is, I would contend that this use of the pronoun is just as unacceptable as in the bad dialogical examples, despite the fact that what I am referring to is the very focus of your attention.

Consider now the original example. Here we have a case of continuous discourse:

(57) I lost ten marbles and found nine of them. It was under the sofa.

In continuous discourse, the only things in the focus of joint attention at a given point are those

which have been 'talked about'<sup>2</sup> in uttering previous sentences (or previous parts of the current sentence). Thus, the search space for pronoun resolution is limited to whatever has already been talked about in earlier parts of the discourse.

With this approach, we can account for the fact that the pronoun in (58) cannot be used felicitously to talk about the Democrats who do not support Clinton:

(58) Most Democrats still openly support Clinton. However, they are from constituencies with an active fundamentalist electorate.

As I will argue in later chapters, what determines what is talked about in the first sentence of (58) is the equivalence set up by the quantificational determiner. This equivalence, as we have seen, determines the logical properties of the sentence, but it also introduces the set of Democrats in the context and the set of Democrats who support Clinton. In this example, these are the only sets made available (apart from the unit set containing Clinton, made available in processing the second argument of the determiner), and I will argue that they are the only things which are talked about, and which can provide an answer to the question of what the pronoun in the second sentence is talking about. This method can be extended to E-type anaphora whose antecedent is inside the scope of an intensional operator:

(59) Last year, the mayor of Boston was a Democrat. This year, he is a Republican.

In this case, what will be made available by computing an interpretation of the first sentence is a set of pairs of indexes and mayors of Boston, and this can serve as the value of the bound-into pronoun in the second sentence.

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<sup>2</sup> I have put quote marks around this term here as I intend it as a kind of technical term. This term will eventually be replaced by a notion of cognitive accessibility (defined in terms of the logical properties of antecedent material) in chapter 3. I do not intend the notion to carry any connotations related to the notion of 'topic'.



Having argued that the search space is restricted to those things which have been talked about in the previous discourse, I would be quite happy to drop the issue. However, I think that there is a little more to be said<sup>3</sup>. So far, I have been mainly concerned with the content of the audience's expectation about where to look for the interpretation of a pronoun. I would now like to consider briefly what kind of strategy might be built around this expectation.

I want to claim that the general strategy is simply to search the focus of joint attention. When a pronoun occurs in a sentence which is part of a continuous discourse, the search space is what has been talked about already. However, I think that in this case, other heuristics are also employed. These have to do with what is held in working memory.

A discourse which introduces objects into the focus of joint attention does so via nominal phrases. It is reasonable to assume that in searching the space for the value of a pronoun, one can address working memory for the syntactic and semantic representations just constructed. One possible heuristic would be to match the morphological features of the pronoun (gender and number) with those of noun phrases occurring in previous discourse. This would temporarily restrict the search space to individuals accessible via morphologically matching noun phrases - a strategy which would yield acceptable results in a great majority of cases.

On this approach, we might think of the linguistic antecedent of a pronoun as a signpost to the answer to the following question: what is the value of this pro-form?

Of course, this is just a heuristic for searching the space of possibilities. There are cases where it will not work, as when a plural pronoun picks up individuals accessible via more than one noun phrase in previous discourse:

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<sup>3</sup> Actually, a whole lot more can be said on this issue, but this would involve spelling out how the constraints on pronoun resolution interact with other processing considerations: in particular, considerations to do with topic, and so on.

- (60) a. Some faculty members took the speaker to a local Italian restaurant. They had pizza.
- b. John took the speaker to a local Italian restaurant. They had pizza.

Here, two preceding noun phrases must be considered and used as linguistic antecedents.

### 3 Donkey Pronouns and quantificational force

There is another type of example where pronouns are anaphoric on, but not c-commanded by, quantified noun phrases, and thus where an E-type approach would be called for. These cases differ from the basic one in (18a) above, but are somewhat similar to the MiG examples, in that the pronoun itself gets a dependent interpretation. Some examples are given in (61):

- (61) a. Every farmer who owns a donkey beats it.
- b. If a farmer buys a donkey, he usually beats it.
- c. Most farmers around here own some donkeys. But they treat them pretty well.

In a sense, the basic E-type idea comports well with our intuitions about these types of example. But there are also a variety of problems which many existing E-type approaches have to contend with in dealing with intuitions about quantificational force.

#### 3.1 Uniqueness

It is now widely agreed that the original E-type accounts are inadequate to handle donkey sentences with singular pronouns. Consider (62a,b) and the paraphrases involving definite descriptions in (63a,b):

- (62) a. Every farmer who bought a donkey vaccinated it.  
 b. Every farmer who bought some donkeys vaccinated them.
- (63) a. Every farmer who bought a donkey vaccinated the donkey he bought.  
 b. Every farmer who bought some donkeys vaccinated donkeys he bought.  
 c.  $\forall x \forall y [\text{farmer}'(x) \wedge \text{donkey}'(y) \wedge \text{bought}'(y)(x) \rightarrow \text{vaccinated}'(y)(x)]$

The original E-type proposals of Evans (1977), Cooper (1979) and Parsons (1978) all treated the singular E-type pronoun as a singular definite, where singular definites were assumed to have uniqueness implications. However, by and large, informants judge that (62a) and (62b) mean the same thing. In particular, it is accepted that in the proposition expressed by (62a), there is quantification over farmers who buy one or more donkeys, and that however many donkeys are bought by each of these farmers, they all get vaccinated by him. This is represented in (63c), which is how Geach (1962) proposed that such sentences are understood.

On the uniqueness account, the singular pronoun forces the reading on which every farmer who bought exactly one donkey vaccinated that donkey. But the intuition is that if say, every farmer except Jones bought and vaccinated exactly one donkey, but Jones bought five donkeys and vaccinated none of them, then the proposition expressed by (62a) is false. On the uniqueness account, we should be able to construe (62) so that Jones is irrelevant to its truth.

Any approach which treats pronominal forms in the same manner as descriptions has to deal with the obvious fact that sentences such as (62a) do not have the kind of uniqueness implications which an E-type account would apparently predict. This uniqueness problem arises in addition to that raised by discourses such as that in (64).

- (64) A man walked in the park. He whistled.

As discussed in section II of this chapter, this discourse really does not imply that just one man

walked in the park. I won't repeat here the arguments against simple appeals to the notion of 'realistic' uniqueness. We will consider these cross-sentential cases at length in section V. At this stage, I wish to keep separate the problems which (64) poses for an E-type account and that posed by (62a). The motivation for this separation, as we will see, has to do with the fact that dependent expressions are different linguistic objects from non-dependent ones.

Two strategies for maintaining the E-type approach in the face of examples such as (62a) are available. Either one can maintain that singular donkey pronouns encode uniqueness and construct an account of classic donkey sentences along these lines. This strategy is pursued by Kadmon (1987, 1990) and Heim (1990). The other alternative would be to abandon the assumption that E-type pronouns in donkey sentences encode uniqueness. This strategy is pursued by Lappin (1989), Neale (1990), Chierchia (1992), Lappin & Francez (1994) among others. Obviously if one adopts the second strategy it would be desirable to do more than just stipulate that singular E-type pronouns in donkey sentences are not subject to the uniqueness constraint that other singular definites, including E-type pronouns, are subject to. As I will be pursuing the latter strategy in this thesis, I will devote some time discussing the issue after we have considered the alternative.

If one wants to maintain the assumption that donkey pronouns carry uniqueness implications<sup>4</sup>, then one has to say either that in general, donkey sentences such as (62a) assert that every farmer bought exactly one donkey or at least that it is implicit in what the speaker says that quantification is only over those farmers who bought exactly one donkey. I think that it is widely agreed among researchers that Geach's characterisation of the interpretation of this example, given in (63c), is more accurate. To make this point clear, Heim (1982) offered the sage plant example:

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<sup>4</sup> I follow the policy of Heim (1982) and use the form of words "uniqueness implication" here so as to remain neutral between the position that uniqueness is a Russellian entailment or that it is some kind of presupposition.

(65) Every person that bought a sage plant bought eight others along with it.

If uniqueness is an entailment, then (65) should just be judged false, if it is a presupposition, (65) should be infelicitous or at least, it should not be possible to judge it as true. However, informants are happy to judge examples such as (65) true given the right circumstances. The significance of Heim's example is that it is not possible to make the kinds of pragmatic accommodations which a uniqueness account could claim are made in the case of classical donkey sentences.

In the face of such examples, Kadmon (1987, 1990), maintains that donkey pronouns in these relative clause donkey sentences<sup>5</sup> do carry a uniqueness implication. In Kadmon's approach, the uniqueness condition is taken to be a presupposition. For a sentence containing a singular definite, such as a donkey pronoun, there must be a unique individual provided by the context, or otherwise accommodated in order that the sentence be felicitous.

Her argument concerning the sage plant example and related cases turns on the idea that in some cases the choice of unique referent is irrelevant because it makes no difference to the truth conditions. She argues that the informants accept the sage plant examples because they can consider each of the sage plant purchasers,  $x$ , as falling into one of two groups: either  $x$  bought at least nine plants, in which case, it matters not which of the sage plants you choose as the referent of the donkey pronoun,  $x$  will have bought eight others along with it; or  $x$  bought less than nine plants, in which case, it matters not which of the sage plant you choose as the referent, it will not be true that  $x$  will have bought eight others along with it. So for every sage plant buyer, the property that they bought eight others along with it holds of either all of the sage plants they bought or none.

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<sup>5</sup> There are also conditional donkey sentences, given in (i). These will be discussed presently:

- (i) If a farmer owns a donkey, he beats it.

So, in the special case of sage plant examples, informants are happy to judge it true or false in the right circumstances and they do not judge it infelicitous because we can assume a unique sage plant per buyer but leave the choice undefined because it makes no difference to the truth conditions.

Heim (1990) argues that this account makes the wrong predictions in the kind of negative example in (66) (taken from Rooth 1987):

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

Intuition dictates that (66) is false if just one parent lends a son in high school the car on week nights and the son in question has a brother in high school.

The example in (66) is unlike the sage plant example in that it does make a difference to the truth conditions which value one chooses for the pronoun. Thus the conditions for relaxing the uniqueness presupposition are not present here. Consequently, either (66) should be judged true in the circumstance just described- this would be a case of implicitly restricting quantification to parents with a single son in high school. Or it should be infelicitous - this would be a case of globally accommodating the presupposition that each parent has a single son in high school if they have a son in high school. The clear intuition that the sentence is false in such cases therefore conflicts with Kadmon's predictions.

Heim's (1990) E-type analysis also attempts to maintain what she calls the conservative assumption that donkey pronouns have uniqueness presuppositions. She focuses mainly on conditional donkey sentences of the form in (67) adapting aspects of Berman's (1987) analysis which employs quantification over situations for these examples:

(67) If a farmer buys a donkey he usually vaccinates it.

I will discuss aspects of this proposal relevant to such examples in chapter 4. For now it should be noted that in addition to the problems faced by Kadmon with regards (66), Heim's account also faces the problem of existential readings. These were discussed in section II. Some examples, taken from Pelletier & Schubert (1989) and Chierchia (1992) are given in (68):

- (68) a. Every customer who had a credit card paid her bill with it.  
b. If a customer has a credit card, she usually pays her bill with it.  
c. Everyone who had a dime put it in the meter.

Heim's account is designed to yield Geachian truth conditions at least for conditional donkey sentences. The examples in (68) show that these are unsatisfactory. We can gloss (68a) with the use of a secondary quantification, "For every customer who had a credit card: for some credit card they had: they paid their bill with it". Chierchia (1992) goes on to show that with the right background context, the existential reading for donkey sentence in (62a) would be favoured. This suggests that donkey sentences are open to both types of construal but that contextual factors determine one reading or another. In the case of the examples in (68), the implausibility of the universal reading seems to force the existential reading.

In summary, if we consider donkey sentences with singular pronouns, we can say that the uniqueness effect is absent in all but the few cases, such as (69), where it is forced pragmatically:

- (69) Every man who has a daughter thinks she is the most beautiful girl in the world.

In the general case of donkey pronouns, we find what we have termed a secondary quantification. (70a) is generally read as equivalent to (70b):

- (70) a. Every farmer who bought a donkey vaccinated it.  
b. For every farmer who bought a donkey: for *every donkey* he bought: he vaccinated it.

However, as we have seen, there are donkey sentences in which the secondary quantification is understood as having existential force:

- (71) a. Everyone who had a hat wore it to the concert.  
b. For every person who had a hat: for *some hat* that they had: they wore it to the concert.

In negative cases with singular pronouns, existential secondary quantification seems to be almost invariably the only sort available:

- (72) a. No farmer who bought a donkey vaccinated it.  
b. For no farmer who bought a donkey: for *any donkey* he bought: he vaccinated it.

However, given an appropriate scene-setting, the maximal reading is also available in negative constructions. Thus, consider a scenario where I am complaining about the lack of proper regulation at the state cattle auctions. In particular, I find it ridiculous that some vendors are selling cows with vaccination certificates while others are selling them without the right certification (although these vendors also claim, of course, that their cows have been vaccinated). As farmers tend to buy their cattle from more than one vendor, we have a state of affairs where some farmers buy cows none of which have certificates, some farmers buy cows all of which have certificates, and some buy cows some of which have certificates, while the rest do not. I find this latter fact particularly annoying, and draw your attention to it with the following utterance:

- (73) I bet that few farmers who bought a cow here today will go home certain it has been vaccinated.

Now suppose that as things stand, one hundred farmers bought one or more cows. Only five of these farmers bought cows which all had certificates. Of the others, fifty bought cows some of



which had certificates, while others were without. Finally, the remaining forty-five bought cows without certification. Given this information, informants tend to judge my claim correct, despite the fact that more than half the farmers go home with at least one certified cow.

So the variation in quantificational force seems to be available in all types of donkey constructions<sup>6</sup>. It seems, then, that the E-type approach, if it is to be viable, will have to address the following two issues raised by Heim (1990):

There are two big questions about this kind of approach. One is whether there is any principled way of predicting the force of the implicit secondary quantifier...The second question is how to implement the analysis without ad hoc manoeuvres in either the syntax or the semantics. (p163)

As regards the second question and plural donkey pronouns, I have argued at length that plural definites should be treated as expressions of existential quantification whose restrictors pick out sets of collections. The content of the restrictor is freely recovered from the context. The hearer may thus choose either a set of collections containing the relevant individuals being talked about, or simply the unit set containing the maximal collection. The latter choice will result in a universal reading, and the former will result in an existential reading. This account, predicts that both existential and universal readings are available in both positive and negative constructions. This prediction is borne out, as we saw in section II. Some relevant examples are repeated below:

- (74) a. Every farmer who buys some donkeys vaccinates them.  
b. If a business man takes some credit cards away with him, he pays most bills with them.

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<sup>6</sup> Note that Chierchia (1992) and Lappin & Francez (1994) assume that there is a gap in the paradigm with regards universal readings of singular donkey pronouns in negative contexts. We have just seen that there is no such gap, although pragmatic factors seem to militate strongly in favour of the existential reading in such cases.

- (75) a. No farmer who bought some donkeys vaccinated them.  
 b. No farmer who owns more than ten thousand sheep has the resources to vaccinate them.

Given that there is a genuinely free choice between readings, my answer to Heim's first question will involve a close look at the pragmatics of donkey sentences and other constructions. I will spell out my proposals in detail in chapter 5.

### 3.2 Non-unique alternatives

In this section, I will argue that there is a reasonable motivation for dropping the uniqueness condition on singular definite forms when they occur in donkey sentences. I will also consider related proposals from Neale (1990) and Lappin & Francez (1994) who also treat classic donkey sentences by dropping the uniqueness condition.

At the end of section III of this chapter, I sketched an outline of an analysis for plural definites in order to handle the maximal/non-maximal alternation which was found in these forms. I also included there a sketch of the treatment of singular descriptions. Let us suppose that if we are to pursue a quantificational analysis for E-type pronouns, then we might deal with these along the same lines. That is to say, for sentences of the form  $[_S[_{DP}[\text{the}_F]][_{VP}B]]$  and  $[_S[_{DP}[\text{pro}]][_{VP}B]]$  we would have logical forms as in (76):

- (76) a.  $\text{det}_3'(\text{the}_F)(B')$   
 b.  $\text{det}_3'(\text{pro})(B')$

If the description or pronoun is plural in the source sentence, then the first arguments of the existential determiners in (76a,b) will be predicates which apply to sets of collections. At this stage, I am not in position to elaborate on how these contextually constructed predicates come

to pick out the right objects given the syntactic form, this will be discussed in chapter 3. It was stated at the end of section III that if the description or pronoun in question is singular, then the predicate restrictor would be constrained to pick out a set of singletons which contains a unique member. Again, the details of this analysis will be revealed in chapter 3.<sup>7</sup> In the theory of the syntax-semantics interface which will be developed in chapter 4 to deal with binding into context dependent expressions, including definites, the translations will be of expressions of a different syntactic category and different semantic type. This cannot be shown in the labeled bracket representation above, but in the categorial terms which will be employed, the relevant part of definite noun phrases have category  $(S/NP)^{S/NP}$  and they will be of the type  $((et)((et)t))$ . This contrasts with the category and type in the non-dependent case, which are  $S/NP$  and  $((et)t)$ . The difference is standard in the categorial, variable-free approach to binding which I will be employing (see Jacobson 1995). In any case, this description simply highlights the fact that dependent definites denote different kinds of things to their non-dependent counterparts. As we will be treating definites quantificationally, this means that descriptive material in the restrictor picks out sets of pairs rather than sets in the non-dependent case. It was mentioned in the introduction to this section that the sets of pairs in the case of donkey pronouns will sometimes contain collections:

- (77) a. Many students who wrote a paper submitted it to a journal.  
b. Every boy who was given a package carried it home.

In (77a) we can imagine verifying circumstances which includes students who collectively write a paper and submit it. In (77b), covers circumstances in which some of the boys in question are given more than one package and carry them home together.

As we will see in chapter 4, the process of forming lexical entries for dependent context

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<sup>7</sup> In fact, the uniqueness constraint which I will employ is in many respects similar to that proposed in Kadmon (1990). The main difference being that it will not be cast within a dynamic/presuppositional framework.

dependent expressions of any type makes use of the linguistic meaning for the non-dependent entry. For singular definites, the linguistic meaning will involve a constraint which says that if the set denoted by the restrictor is non-empty, then it necessarily contains a unique singleton member. However, in forming the dependent entry for a singular definite, this constraint cannot apply since it will be of type  $((et)((et)t))$ . That is, the dependent version of the definite will be something which denotes a set of pairs. Thus, the constraint cannot apply and is discarded in the construction of the semantic entry for the dependent definite.

What this means is that in the case of non-dependent cross-sentential anaphora, such as (78), singular definites can only get a uniqueness reading:

- (78) a. John bought a donkey. Harry vaccinated it.  
b. John bought a donkey and a goat. Harry vaccinated the donkey.

However, in the case of dependent singular definites, there is no uniqueness restriction and no cardinality restriction. Hence the cardinalities of the pairs of objects which serve as the interpretation of the restrictor of the definite can only be constrained by other contextual factors:

- (79) a. Every farmer who owns a donkey beats it.  
b. Every farmer who owns a donkey and a goat beats the donkey.

Given that there are no constraints on the interpretation of dependent definites, the second member of the pair is just a set of collections of any cardinality. In the case of (79a), the collections would be pragmatically understood as consisting of the donkeys paired with the respective farmers. In certain contexts, it could be pragmatically inferred that there is a unique donkey per farmer. However, for most informants, (79a) is understood as quantifying over farmers who own one or more donkeys, and claiming that these individuals beat all of the donkeys they own. In my system, this reading is achieved by placing no cardinality restriction on the members of the set of collections which serve as the second member of the pair, but by

choosing only the maximal collection of donkeys owned by the respective farmers as the sole member of this set. Finally, in the case of existential readings of dependent definites, instead of just choosing the maximal collection of donkeys as the sole member of this set, we can choose the set of non-empty collections of donkeys paired with their respective farmer owners.

Let us now look at some of the other problematic data involving the effect of grammatical number on semantic interpretation. We need to consider two more cases: the case of pronouns anaphoric on “every”, and the case of non-dependent singular pronouns anaphoric on a dependent antecedent.

Consider first the pair in (80):

- (80) a. Every senator came to the reception. He had a good time.  
b. Every senator came to the reception. They had a good time.

(80a) is irredeemably unacceptable unless we understand the point of the discourse to be some kind of jokey suggestion that there is exactly one thing which satisfies the restrictor of the universal. (81) may be an example:

- (81) Every current Mandelson supporter came to the reception. He was pretty lonely.

I think this is the right approach. In a way, this puts me alongside Evans and against Neale, who thinks that (80a) should in principle be acceptable, since on his view, his numberless quantifier, given in (82), could provide the translation of singular definites in any type of construction:

- (82) *[whe x: Fx](Gx)* is true iff  $|F-G| = 0$  &  $|F| \geq 1$

This claim is motivated by acceptable examples such as (83):

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

However, I would argue that the singular definites in the second sentences of (83a,b) can be treated as dependent pronouns. In these cases, we can understand the second sentence as involving implicit quantification over situations or as involving an implicit modal operator. In both cases, the restriction would be supplied pragmatically. So, for (83b), we might understand the second sentence as "In all situations where a candidate is debriefed by Mrs Hendrix and where the proper procedure is followed, he will be given some advice on how to tackle the press". In this case, we get some extra information about some kind of standard procedure. If we adopt this approach to (83b), then we can treat the sentence in question in the same manner as conditional donkey sentences. I will discuss these examples in chapter 4. For now it is sufficient to note that on such a treatment, the pronoun would be dependent on a situational index (or some other type of intensional index).<sup>8</sup>

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<sup>8</sup> See the discussion in Roberts (1990) for the related case of modal subordination. There it is argued that the second sentence in the discourse (ia) is understood as being contextually completed along the lines in (ib):

- (i) a. A thief might break into the house. He would take the silver.  
b. If a thief breaks into the house, he would take the silver.

Roberts goes on to discuss other cases where this contextual completion approach may provide antecedents for anaphoric pronouns. (iia) is adapted from an example cited from Sells (1985). A possible gloss for the second sentence is given in (iib):

- (ii) a. A train leaves every hour for Boston. It stops in New Haven.  
b. Always, if a train goes to Boston, it stops in New Haven.

I will not discuss the full range of such cases in chapter 4. However, a general outline of the treatment will be provided.

In contrast to these acceptable examples, our original unacceptable example (80a), and the unacceptable (84) below cannot be reasonably be construed as involving some implicit quantification over situational or other indexes:

(84) Every boy left school early. He wanted to go swimming.

So the claim is that if one can construe such examples as involving implicit quantification, then the singular pronoun will be dependent and thus the readings for the examples in (83) will be derivable. If one cannot see any implicit quantification, as in (84), then the pronoun can only be non-dependent. In those cases, the uniqueness condition will be in force, and only the jokey examples will be acceptable.

There is further evidence to support this approach in cases where a singular pronoun enters into a cross-sentential anaphoric relation, and where the acceptability of the result depends on our ability to pragmatically accommodate some kind of implicit quantification, which results in a dependent reading. These cases, which are not really addressed by Neale, involve a singular pronoun anaphoric on a singular indefinite, which is itself within the scope of another quantifier.

In some cases, the result is less than fully acceptable:

- (85) a. Some cadets brought along a partner to the ball. She was wearing a corsage.  
b. Most journalists carried a mobile phone into the press conference. It was turned off, however.

As with the parallel unacceptable cases in (80a) and (84) above, the second sentence in these examples cannot be understood as implicitly involving some kind of modal force. Compare these with the improved examples below; in which the modal reading is available:

- (86) a. Every deck comes with a spare card. It is blank.  
b. Most journalists carried a mobile phone into the press conference. It had to be turned off, however.

It seems, then, that singular pronouns can be involved in these relations if they can be construed as dependent. Neale's numberless-description approach cannot account for the variations in acceptability of singular pronouns anaphoric on "every N".

By contrast, plural definites receive a plural, and hence maximal, reading regardless of whether they are dependent or not. So we should expect there to be no problem with antecedents in cross-sentential cases, even when there is no hint of implicit modal force:

- (87) a. Every cadet brought some friends along to the passing-out parade. They sat in the stands.  
b. Most journalists had some questions to ask the President. But they were about the sex scandal.

This is as we would expect. So why does (88) below strike us as at least slightly less than felicitous?

(88) Every senator came to the reception. They had a good time.

I would suggest that the reduced acceptability results from the processing heuristic proposed above, which guides the initial search of the focus space towards hypotheses recoverable via noun phrases which match the pronoun in morphological features. Because of the mismatch in (88), we should expect a bit of back-tracking, with resulting unacceptability. The fact that the strategy is less than optimal in such cases creates the impression that the stimulus is less than optimal.



This completes my preliminary account of the variations in quantificational force of donkey pronouns. The formal details of these proposals will be spelt out in chapters 3 & 4. Note that my account, like Neale's numberless-description analysis of singular donkey pronouns and Lappin's (1989) equivalent analysis, can already deal with the problem of indistinguishable participants, discussed in the literature<sup>9</sup>. Consider the following example involving a relative-clause donkey sentence:

(89) Every bishop who meets another man blesses him.

On the numberless account of singular donkey pronouns, this sentence will be understood as equivalent to something like "Every bishop who meets at least one other man blesses every man he meets". This interpretation entails that in a situation where two or more bishops meet, they bless each other. So the problem raised by examples with indistinguishable participants for the E-type analysis with the uniqueness assumption does not arise for the numberless account. On my account, (89) has the numberless reading when the dependent pronoun picks out the maximal set in the context. Unlike Neale and Lappin (1989), I also predict the existential reading for donkey pronouns in negative contexts and in the credit-card examples discussed above. Lappin & Francez (1994) also address the issue of variable quantificational force discussed above. As their analysis is quite close to my own, I will review it in some detail. In my view, their proposal raises a technical problem, and also a more fundamental problem connected with their conception of definites as terms. I will take up these issues in turn.

According to Lappin & Francez' analysis, the truth conditions for a sentence such as (70) are given in (89):

(89)  $\llbracket \text{Every farmer who owns a donkey beats it} \rrbracket = \text{true iff } (\text{Men} \cap \{a: \{b: * \text{own}(a,b)\} \cap \text{1\_donkey} \neq \emptyset\}) \subseteq \{c: * \text{beats}(c, f(c))\}$

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<sup>9</sup> Examples of this type are attributed to Hans Kamp by Heim (1990).

In this clause, the function  $f$  is defined on the set of individuals who own at least one donkey, and returns as its value a choice from the set of collections of donkeys owned by the individuals in the domain. That is, we can think of  $f$  as a free-choice function variable. The function variable can pick out any collection of donkeys owned by the individuals over which we are quantifying. Lappin & Francez can deal with the examples involving universal secondary quantification by supposing that the function picks out the maximal set. In cases such as the credit-card examples, which involve existential secondary quantification, they stipulate that the donkey sentence is true iff there is at least one choice function,  $f(c)$ , for which (89) above holds. That is:

$$(90) \quad \llbracket \text{Every farmer who owns a donkey beats it} \rrbracket = \text{true iff } \exists f[(\text{Men} \cap \{a: \{b: *own(a,b)\} \cap 1\_donkey \neq \emptyset\}) \subseteq \{c: *beats(c, f(c))\}]$$

To deal with the first problem raised by Heim, of how to predict the distribution of readings, they assume that the interpretation of donkey pronouns involves a parameter with two settings. On one setting, the function variable picks out the maximal collection of donkeys for each farmer, giving the universal reading. On the other setting, existential quantification over choice functions is introduced into the truth conditions, giving the existential reading. According to Lappin & Francez, the parameter defaults to the maximal setting unless background knowledge overrules this possibility.

My first problem with this account is linked to the discussion of plurals and negation in section III. The starred relations in Lappin & Francez' truth clauses denote relations between individuals and collections of individuals. Lappin & Francez provide the following equivalences to help us understand the truth conditions they propose:

$$(91) \quad \text{If } *R \text{ receives a distributive reading, then (i) } *R(a, b) \equiv \forall c[c \subseteq b \wedge |c| = 1 \rightarrow R(a, c)] \text{ and} \\ \text{(ii) } \neg *R(a, b) \equiv \forall c[c \subseteq b \wedge |c| = 1 \rightarrow \neg R(a, c)].$$

(91ii) claims that on its distributive construal, the negation of a formula expressing a relation

between an individual and a collection is equivalent to a formula which says that the individual in the first argument bears this relation to none of the individuals in the denotation of the plural term in the second argument. Lappin & Francez justify this analysis by appeal to some familiar examples:

- (92) a. John didn't see Max and Lucy.  
b. John didn't see them.

Their interest here is in the *any*-reading of the object noun phrases in (92): that is, they are focusing on the reading of (92a) on which John didn't see either Max or Lucy. Using (90ii), they derive this reading by interpreting the object noun phrase in situ; and similarly for the definite in (92b). But we have seen that these sentences have another reading, the *all*-reading, and there is no way of deriving this reading on Lappin & Francez' account. As we have seen, on standard assumptions about negation and distributivity, the plurals have to take scope over negation and the distributivity operator if the any reading is to be derived. When the plurals remain within the scope of negation, what results is the *all*-reading. Further evidence for this last claim is provided by conjoined noun phrases which are either dependent or contained in islands:

- (93) a. No boy saw his mother and his father at the party.  
b. Sergeant Exley did not find any witnesses who could place Mickey C. and Johnny Stompanato at the scene of the crime.

What Lappin & Francez probably have in mind is that the *all*-reading results when the definite is non-maximal, but this does not work for conjoined noun phrases. In any case, we will see that this aspect of their proposal causes problems when we look at negative donkey sentences.

Because of the way their pragmatic account is formulated<sup>10</sup>, Lappin & Francez want a sentence

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<sup>10</sup> Yet another pragmatic issue implicit in Lappin & Francez' approach also revolves around Heim's first question: is there any principled way of predicting the force of the implicit secondary

such as (94) to get the *any*-reading via the default maximal reading of the definite.

(94) No person who had a dime in their pocket put it into the meter.

The reason is that if the *any*-reading was derived via the non-maximal reading, their default strategy of choosing the maximal interpretation unless world knowledge rules it out could not explain the extremely strong tendency to choose the *any*-reading in negative constructions.

Lappin & Francez assign (94) the truth clause in (95) (their (32) p407):

(95)  $\llbracket \text{No person who had a dime in their pocket put it into the meter} \rrbracket = \text{true iff } (\text{persons} \cap \{a: \{b: \text{*has\_in\_his\_pocket}(a,b)\} \cap \text{1\_dime} \neq \emptyset\} \cap \{c: \text{*put\_in\_the\_meter}(c,f(c))\}) = \emptyset$

Recall that, according to the default parameter setting,  $f(c)$  is a function from people who have dimes in their pocket to the maximal collection of dimes they have. Given this, (95) says that (94) is true if and only if no person who had a dime in his pocket put all the dimes he had into the meter. This is clearly correct, but Lappin & Francez seem to overlook the fact. They rightly observe that (95) (their (33), p 407) gives truth conditions equivalent to those in (96). This is also clearly correct:

(96)  $\llbracket \text{No person who had a dime in their pocket put it into the meter} \rrbracket = \text{true iff } (\text{persons} \cap \{a: \{b: \text{*has\_in\_his\_pocket}(a,b)\} \cap \text{1\_dime} \neq \emptyset\} \subseteq \{c: \neg \text{*put\_in\_the\_meter}(c,f(c))\})$

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quantifier? Their approach involves the familiar default strategy. As I will argue in chapter 5 when I examine similar proposals due to Krifka (1996), this style of analysis has a serious weakness in the general case of choosing readings for definites, since the non-default interpretation can arise in cases where world knowledge would not filter out the default interpretation. I will argue there that a genuinely free choice among possible values for the contextually-specified aspect of a definite's interpretation, together with pragmatic principles, can account for the peculiarly skewed distribution of readings.

However, according to their account of the meaning of negated sentences, given in (91) above, (96) should be understood as saying that the original (94) is true if and only if no person who had a dime in their pocket put *any* of the dimes they had into the meter. The result is a completely different set of truth conditions from those in (95). Clearly, something has gone wrong. I do not think that the problem lies in the claim that (95) and (96) give the truth conditions of the original sentence equally adequately. Nor do I think that my gloss of the truth conditions in (95) is incorrect given the *maximal* interpretation of the function. The problem lies in the specification of the meaning of negated sentences involving plurals.

In general, as I argued in section III, the *any*-reading of dependent definites has to be analysed as a non-maximal construal. In my view, the problem for Lappin & Francez is created by their decision to handle the distribution of readings by appeal to a mechanism of defaulting to the maximal construal. This problem could perhaps be fixed if it were possible to have their parameter alternating between the logically stronger and weaker readings; but it is not clear how this idea can be implemented given the way they have set up the meaning of E-type pronouns. In any case, I would like to turn to some more general problems raised by their account. This will involve considering whether the term analysis of E-type pronouns has as much to recommend it as the quantificational approach.

Returning now to Lappin & Francez' analysis of the original donkey sentence, let us recall their basic claims. First, the function variable can pick out any collection of donkeys owned by the individuals over which we are quantifying. Examples involving universal secondary quantification are dealt with by supposing that the function picks out the maximal set. In the credit-card type of case, where existential secondary quantification is conveyed, it is stipulated that the donkey sentence is true iff there is at least one choice function,  $f(c)$ , for which (89) above holds. That is:

(97)  $\llbracket \text{Every farmer who owns a donkey beats it} \rrbracket = \text{true iff } \exists f[(\text{Men} \cap \{a: \{b: *own(a,b)\} \cap \text{1\_donkey} \neq \emptyset\}) \subseteq \{c: *beats(c, f(c))\}]$

Heim's first question, about how we predict the distribution of readings, is dealt with by supposing that a parameter with two settings is attached to the interpretation of donkey pronouns. On one setting, the function variable picks out the maximal collection of donkeys for each farmer, giving the universal reading. On the other setting, existential quantification over choice functions is introduced into the truth conditions, giving the existential reading. The parameter defaults to the maximal setting unless background knowledge over-rules this choice.

According to Lappin & Francez, this account answers the second question raised by Heim, about how to deal with alternations in quantificational force in a non-ad hoc way. Lappin & Francez claim that they have achieved this because the donkey pronoun in both existential and universal cases is interpreted by the same kind of function: viz, a choice function from individuals to collections.<sup>11</sup> In a way, this is true. However, instead of saying that the pronoun is interpreted by such a function, and that its value can be determined in the context, they set up a parameter for donkey pronouns, one setting of which forces the pronoun to pick out the maximal collection, while the other just stipulates existential quantification over such functions in the truth conditions. As they note, Lappin & Francez's account constitutes a marked improvement over the proposals in Chierchia (1992), where the existential readings are derived by a dynamic analysis of the donkey sentences, while the universal reading is derived by an E-type account. However, Lappin & Francez' account does raise questions about the nature of, and justification for, this parameter built into the meaning of donkey pronouns. Notice that it seems to follow from a parameter analysis that someone who knows the meaning of an E-type pronoun knows that a donkey sentence can be associated with two different sets of truth conditions (set out in (89) and (90) above). To which a proponent of Chierchia's dual strategy might respond that this looks as much like an ambiguity account as their own. Of course, the intention behind Lappin & Francez' proposal is clearly to avoid an ambiguity account; but this intention cannot be realised

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<sup>11</sup> Note that Lappin & Francez propose a rule for determining the domain and range of this function. This is not unlike the first attempt at such a rule made in (37) above. I will not go over this issue here, noting only that the rule they propose is inadequate as it stands. They will need to elaborate it substantially for the reason given above in my discussion of van der Does' system, which also needs elaboration to deal with all but the most basic case.

in the framework they have set up. For it not to be an ambiguity approach, one would have to allow the value of the choice function to be determined in the context. But this is not possible here. Let us consider why.

The basic way of letting context contribute to the content of a variable expression is to fix its meaning relative to an assignment function which is determined by the context. However, the assignment approach is not really satisfactory here, because the pronoun is being interpreted as a term whose value is the value of the choice function. Choice functions pick an entity (in this case, a collection) from a set. Now, in understanding a donkey sentence, one does not normally end up knowing which particular collection of donkeys owned by each farmer is beaten by him (unless it is the maximal collection). But this is what the use of a contextually-specified assignment function in the truth conditions would imply. What one understands of a donkey sentence is fixed by description. In the non-maximal case, this is all the information one gets. Consequently, the approach based on variable-assignment functions is ill-suited to the case where donkey pronouns are treated as variables over choice functions. This is in contrast to the case where the variable function which interprets the pronoun is defined so as to pick out a unique individual, as in Heim's (1990) reworking of Cooper's (1979) analysis. Unfortunately the uniqueness approach, as we have seen, does not work. That is why Lappin & Francez have turned to the choice function approach. But on the choice function approach, we cannot use the mechanism of contextually-determined assignments. Consequently, Lappin & Francez are forced to specify two sets of truth conditions. They are forced back into an ambiguity approach.

I think that this argument will generalise to any kind of approach along the lines of Lappin & Francez if the E-type pronouns are treated as terms. It is clear that they have seen what is needed in the E-type approach: we need to set up the meaning of the pronoun so that there is a free choice between maximal and non-maximal construals in the context. But this is only possible if the meaning of the pronoun is set up so that the available choices involve *descriptive* content. What is needed, therefore, is a quantificational account of pronouns. Of course, this is just the account I am advocating in this thesis: the assumption is that pronouns are just like definite

descriptions; and like definite descriptions, we should say, they are expressions of quantification, whose the restrictive content is determined purely by the context.

## Section V                    Identifiability, Partiality and Dynamic Semantics

### 1            Introduction

In the last section, it was argued that analyses of donkey anaphora which employ a uniqueness condition are inadequate. Some motivation for dropping this condition on donkey pronouns was given. This was based on the contrast between definites which are interpreted dependently and those that are not. So, we are in a position where the claim is that for dependent singular definites, there is no uniqueness condition while for non-dependent singular definites there is. We will be supposing that the logical form of singular non-dependent definites will be as in (1a,b) where the contextually defined restrictor will be constrained to apply to a unique singleton:

- (1)    a.      $\lambda P.\text{det}_{\exists}(\text{the\_F'})(P)$   
      b.      $\lambda P.\text{det}_{\exists}(\text{pro'})(P)$

In this section, I will consider the problem which this approach faces in the light of examples such as in (2):

- (2)    a.     A man and a woman walked in the park. The man whistled.  
      b.     A man walked in the park. He whistled.

These examples were discussed in section II where it was noted that, for instance, (2b) does not entail that just one man walked in the park. The problem which (2a,b) pose has to do with the



issue of identifiability. This can be stated as follows. If one assumes that singular definites are context dependent quantifiers which encode a uniqueness constraint, then it seems we have to assume that the audience only properly understands an utterance containing a singular definite if they can recover uniquely denoting descriptive content.

This assumption arises from two types of consideration. On the one hand, the infelicitous use of a singular definite can be explicated if we suppose this. For example, if there are two tables in a room (covered with books) and the speaker utters (3) without any further gesture, then it is both the case that the utterance is infelicitous and that the audience is unable to fully grasp what is said:

(3) The table is covered with books.

Similarly, the discourse in (4) would be judged both infelicitous and not fully comprehensible:

(4) Five senators interviewed Monica in person and the senator got her phone number.

On the context dependent quantifier account, the infelicity and the incomprehensibility go together: the speaker has used the singular definite, the linguistic meaning of which tells the audience that the restrictor denotes a unique individual. Thus they can infer that a particular individual is being talked about. Given the contextual information available to them, they are unable to decide which individual this is. Thus, the speaker has indicated with the use of a definite that a particular individual is under discussion but has done so in a circumstance in which the audience is unable to identify who that individual might be. If the speaker had wanted the audience to entertain a thought about a particular individual, then she should have supplied more information (for instance by pointing or adding extra descriptive content). Otherwise, she should have reformulated her utterance. In any case, the speaker has been less than co-operative. In Gricean terms, we might say that she has violated one of the manner maxims.

The second consideration has to do with examples which are slightly different to those just discussed. Consider (5a,b):

- (5) a. Every Mandelson supporter was at the reception but he was pretty lonely.  
b. Every boy left school early. He went to the beach.

(5a) was discussed in the last section where it was noted that the felicity of these examples turned on the extent to which the use of the singular pronoun anaphoric on a universal conveyed a jokey effect. One can explain the contrast here in Gricean terms as a case of flouting the maxim of manner in order to get across some effect<sup>1</sup>. But the Gricean account would depend on the assumption that the singular pronoun encodes uniqueness: the singular definite drives the search of the audience's part for a contextual completion which denotes a uniquely instantiated property. The only possible assumption available is that the intersective set of the previous sentence (the set of Mandelson supporters or the set of boys who left school early) contains just one individual. However, if this were so, the speaker should have formulated her discourse in a way in which this information is conveyed in a more straightforward manner. Note that, on this account, (5b) is less than acceptable even though the audience could recover an adequate understanding of the anaphor sentence.

A more interesting case which does not involve complicating factors to do with number mismatches is due to Partee (1972) (cited in van Rooy 1997). Consider the pair in (6) (slightly adapted from van Rooy):

- (6) a. John looking for the murderer of Smith. Bill is looking for him too.  
b. Mary is looking for a golden apple. Bill is looking for it too.

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<sup>1</sup>A fuller account of the contrast in this pair will be given in relevance theoretic terms in chapter 5. However, that account like the Gricean one depends on the uniqueness constraint being built into the singular definite.

Neale (1990) discusses examples such as (6a) noting that they can receive a reading on which the description and the pronoun anaphoric on it can both receive de dicto readings. That is, there is a reading of the discourse on which it does not entail that Smith was murdered.<sup>2</sup> Similarly, (6b) can be read de dicto/de dicto. The point of interest with (6b) is that even on this construal, Mary is looking for a unique golden apple. This is interesting since no such understanding is derived from an utterance of the first sentence in (6b) alone. What seems to drive this assumption is the presence of the singular pronoun in the second sentence. This is to be expected, of course, if we assume that the singular definite constrains the audience to retrieve uniquely denoting restrictive material for the definite.

The difference between the examples in (3) and (4) and those in (5a) and (6b) is that in the former cases, the hearer cannot reasonably recover an interpretation of the definite given the uniqueness constraint. However, (5a) and (6b) suggest that when the speaker can inferentially recover uniquely denoting material then they will, in order to satisfy the uniqueness constraint.

The examples in (3-6) can therefore be accounted for given the quantificational approach to singular definites with uniqueness. However, the examples in (2a,b) cannot. The uniqueness approach predicts that we understand (2b) as saying that just one man walked in the park. It was mentioned in section II that Evans (1977) and Kadmon (1990) appeal to a notion of realistic uniqueness in order to see off the problems raised by (2). It was argued back there that this strategy is unsatisfactory for the quantificational approach since leaves us with no explanation for why the examples in (3-4) are infelicitous. We can also see now that it leaves us with no explanation for why, in some cases, we inferentially recover uniquely denoting material from previous discourse, as in (5a,6b) and in others, as in (2), we do not. Recall that Kadmon's proposed strategy which would account for why we do not infer from (2b) that just one man walked in the park goes something like: On encountering an utterance where there is not enough

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<sup>2</sup>I am assuming here Russell's analysis on which the de re/de dicto distinction is a matter of scope. See Kripke (1977) for familiar arguments to do with intermediate scope which support this assumption. See also Neale (1990) for discussion.

information available in the utterance circumstance to recover uniquely denoting descriptive content, the audience would be justified in fleshing out the descriptive material with "which the speaker has in mind". In the case of (2b) above, we would gloss the hearer's understanding of the second sentence in the discourse as "The man who walked in the park which the speaker has in mind whistled".

Now, while I will argue that the examples in (2) are not infelicitous because audiences make certain assumptions about the speaker's grounds not unlike that proposed by Kadmon, it has to be shown why we are justified in doing so in the cases like (2) but not in (3-4) or (5a,6b). Note that it cannot simply be that the presence of an indefinite licences such an assumption for then one would expect no uniqueness effect in (6b).

Of course, the examples in (2) are just the kind of examples invoked by Heim (1982) in order to motivate a radically different alternative approach to singular definites. Her claim was that these discourses do not imply that these discourses do not have any uniqueness implications because singular definites do not encode uniqueness. Our understanding of these discourse is merely existential because that is all the information which the linguistic form of the discourse encodes.

We will review in some detail the general dynamic approach to anaphoric definites in sub-section 3. In the next sub-section, I will digress to examine briefly the treatment of singular definites in situation semantics. I will briefly review some of Soames' (1986) arguments against the treatment of definites in situation semantics. I will then argue that, with regards the identifiability problem just discussed, situation semantics fares no better than the account we are presently considering.

## **2 Situation semantics**

Situation Semantics, as devised by Barwise & Perry (1983, 1985), rejects approaches based on

total situations (worlds), and instead defines meaning in terms of parts of the world, or situations. In Barwise & Perry (1983), meaning is defined in terms of abstract situations, which are formally sets of a certain type. An abstract situation is a situation type, and is said to be factual if and only if it corresponds to some real situation. In other words, an abstract situation is factual when it represents properties or relations as holding among specific objects at given locations, and the properties and relations really do hold in the way characterised. The meaning of a sentence is seen as a relation between contexts (abstract situations) and sets of abstract situations. An utterance of a sentence in a context is true iff some member of the set of abstract situations interpreting the sentence in that context is factual.

The value of this theory lies in the possibilities it offers for dealing with context dependence. In situation-theoretic terms, the problem of context dependence is described in terms of a notion of persistence. A non-persistent sentence, one containing a definite description, for example, can be truly uttered of a certain situation (part of the world) without being true of larger situations containing the one referred to. Thus the situation-semantics framework may offer an answer to the question posed above, because that question arose within a framework based on a total semantics, i.e. truth conditions framed in terms of total models of the world. Notice, though, that total semantics as I have presented it allows for a form of contextual restriction. So the question is whether the situation-semantics context sensitivity can deal any better with the problem.

One immediate objection to Barwise & Perry's original proposal was addressed in Barwise & Perry (1985). As noted by Soames (1986) (from which this discussion is largely drawn), Barwise & Perry's original formulation of the theory makes the truth of a sentence dependent on a certain contextual situation, but fails to make what is said similarly context dependent. Thus, while utterances of (11) (where the description is used attributively) in different contexts, referring to different situations ( $s$  and  $s'$ ), could have different truth values depending on how the facts are in those situations, what is said by (11) will be treated as the same in both contexts:

(11) The murderer is insane.

To see this, suppose that (11) is uttered in different circumstances: by  $x$  on discovering Smith's body, and by  $y$  on discovering Brown's body, and that they refer to distinct situations  $s$  and  $s'$ . In this case, the set of abstract situations interpreting the two utterances would be the same (though the truth of the utterances will depend on how things are in  $s$  and  $s'$ ). In Barwise & Perry (1983) the objects of assertion and belief are the semantic interpretations of utterances. It follows that the content of the utterances would be the same. But of course these utterances do not say the same thing. What is said depends on the context.

In Barwise & Perry (1985), this problem dealt with by introducing propositions as the objects of the attitudes. The proposition expressed by a non-persistent sentence  $S$  relative to a context  $C$  consists of the set of situations determined,  $I$ , plus the real situation,  $r$ , that  $S$  is used to refer to in  $C$ . The proposition is then taken to be the claim that  $r$  is of type  $I$ . The situation referred to is called the resource situation.

Soames (1986) criticises this revised system for its treatment of definite descriptions used attributively. I will summarise his argument here, using the second sentence in (12):

(12) A man and a woman were sitting in the crowd. The man was smoking a joint.

In this discourse, as in the park example, the description 'the man' is most naturally understood attributively. To account for uniqueness using the standard strategy in situation semantics, we need to refer to a resource situation in which a unique man is smoking a joint. Soames (1986) has two separate objections to this. First, when an utterance contains an attributive description, such as "the murderer", the thought conveyed is generally not object dependent, but the resource situation would contain the particular individual who perpetrated the murder. Thus, the thought conveyed should depend on that individual. It should be object dependent. But the intuition in attributive uses of "The murderer is insane" is that the thought behind it is not object dependent.

The second objection, which Soames mentions only in passing (fn 13) but which is relevant here,

is that one can understand these examples without being able to identify the situation referred to. This is perhaps not so important in the case of murder, since there is only one such situation (a person can only be murdered once), but in (12), we have a rock festival where typically many men sit with women (and smoke joints). Thus the response to Soames proposed by Recanati (1996), who suggests that the resource situation referred to in the case of murder has a mode of presentation (being 'Smith's murder'), does not dispose of the problem raised by (12), since there is no way to individuate this situation uniquely. We therefore need to fall back on the idea that the resource situation is 'the one the speaker has in mind'. A related suggestion is made by Barwise & Perry (1983). But, as we have seen, if this strategy were generally available, discourses such as (13) should be perfectly comprehensible, and they are not:

(13) Five senators interviewed Monica. The senator asked for her phone number.

To sum up this discussion of Situation theory: We have seen that it offers an alternative account of context dependence to the one being defended here. However, as Soames observes, it suffers from being unable to discriminate between referential and attributive uses of descriptions. We might add that even if this problem can be overcome, it still leaves us in the same position with respect to the identifiability problem.

### **3 Dynamic semantics**

Dynamic semantics provides a solution to the uniqueness problem because it is, in a way, designed to do so. The difference between dynamic semantics and both situation semantics and the more traditional total semantic approach with regards the identifiability problem is that it provides a formal solution. In this section, we will consider the treatment of singular discourse anaphora in dynamic semantics<sup>3</sup>. We will see that on this approach, the possibilities for anaphora

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<sup>3</sup>While all versions of dynamic semantics deal with singular pronominal anaphora anaphoric on singular indefinites, very few have extended the analysis to singular definites, in spite of the fact

interpretation are determined by the dynamic meaning of linguistic expressions. We will then consider what insight this analysis can cast on the properties of anaphora responsible for the patterns of pronominal interpretation outlined above. I will argue that the limited empirical scope of dynamic semantics, even in the paradigm case of singular pronouns, shows that its basic idea about the context dependence of these expressions is in some ways wide of the mark. However, there is also clearly something right about this idea. In this regard, I will attempt to isolate the routine pragmatic inferences associated with the use of singular indefinite expressions, which dynamic semantics encodes into their meaning. These inferences have to do with the evidential status of the thoughts expressed by utterances containing singular indefinites. The fact that they are made routinely is not predictable from the logical properties of what is said.

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that their behaviour is, in the relevant respects, identical. Heim (1982) is the major exception. I will therefore focus on singular pronominal anaphora in this section, as I want to talk about dynamic theories in general. But note that a solution which can deal adequately with both descriptions and pronouns in discourse is preferable, unless it can be shown that their apparently similar behaviour in discourse results from different semantic properties. Groenendijk, Stokhof and Veltman (1997) advocate a dual analysis on which pronouns are treated using the equivalent of discourse referents, while descriptions are treated as dynamic, contextually restricted quantifiers (with a uniqueness entailment). However, Groenendijk, Stokhof and Veltman offer no motivation for their dual analysis, other than the fact that they are persuaded by the Russellian stance advocated in Neale (1990), which presents a static, contextually restricted quantificational account. They mention that, in fact, the account using discourse referents for pronouns could be replaced by the quantificational account, but leave the issue open. I will not discuss this variant of contextually-restricted quantification in great detail here. I will only note that the analysis depends crucially on discourses involving singular descriptions being unacceptable if more than one discourse referent satisfying the descriptive content of the description is explicitly introduced. Groenendijk, Stokhof and Veltman claim that it is rather difficult to elicit judgements on this matter. I do not think that it is so difficult. Consider (i):

- (i) Some witnesses saw a man and a woman walk in the park and heard the man whistle "Little Egypt". Some witnesses saw a man and a woman in the park and heard the man sing "Jailhouse Rock". But no witness who saw a man and a woman in the park noticed that the man was wearing blue suede shoes.

This discourse is perfectly acceptable and comprehensible, but we naturally count witnesses who saw men of the first type and men of the second type in the quantification. This means that there are possibilities where there is no unique man.



We saw in the last section that the type of partiality introduced by situation semantics into the semantics of natural language does not really go beyond what is obtainable through other kinds of local contextual restriction. Dynamic semantics offers a different kind of partiality, which is well suited to dealing with our problem. Effectively, the interpretation of a discourse such as (3) is seen as involving a kind of partial model. Singular indefinites introduce objects into the model (discourse referents, file cards, or pegs of other types), and the interpretation of singular anaphoric expressions can be identified with these. The general existential force comes with the embedding of the interpretation of the discourse in the total model.

This approach to the uniqueness problem involves a deeper shift in our conception of natural-language semantics, which makes dynamic semantics a radically different theory of natural-language meaning. Before accepting this solution to the uniqueness problem, it is therefore worth looking more closely at the view of meaning which underlies it.

Within the traditional semantic framework inherited from philosophical logic, meaning is seen as what determines truth-conditional content. The dynamic shift is based on the assumption that the primary function of utterances is to convey information, or rather, to alter the information states of conversational participants. From this perspective, we view the meaning of a sentence as consisting in its potential to change the state of the audience when uttered.

One inspiration for dynamic semantics has been the work of Stalnaker (1979) on context and presupposition. For Stalnaker, the context of an utterance is all the information which participants assume they have in common at the time of utterance: their common ground. We could think of the common ground as a set of propositions. However, Stalnaker argues that we should think of it as the set of possible worlds in which the information that the participants assume they have in common is true. Adding information to the context by making an assertion results in a reduction of the set of possibilities that are still 'live' in the common ground. One major motivation for this view, according to Stalnaker, is that this notion of context can play the kind of dual role which we intuitively associate with context: as the object towards which

speakers' intentions are directed, and the resource for determining just what a speaker's intention is on the occasion of utterance. It is the object of the speaker's intentions because it is assumed that the goal of making an assertion is to add the content of the assertion to the common ground. It is a resource for figuring out the speaker's intentions because the content of an assertion generally depends on the context. As Stalnaker (1996) stresses, these proposals about the nature of context and assertions have more to do with pragmatics than semantics. They do not imply any semantic analyses of natural language expressions, but provide a framework for describing what goes on in discourse.

An important difference between Stalnaker's static approach and the dynamic alternative can be highlighted by noting that the common ground in Stalnaker's theory is contained within the information state of the audience. This information state can have properties which do not bear on the content of what is commonly presupposed. In particular, it can reflect facts about the way in which information has been introduced into the common ground, without these facts being themselves part of the common ground. It thus provides the basis for an analysis of non-truth-conditional information thought to be encoded by certain expressions. In general, proposals within the dynamic literature have been cast in terms of utterance processing.

For instance, Heim's (1982) filing system is a system for handling incoming information conveyed by an utterance. Certain linguistic forms are seen as encoding procedural information: instructions about how to manipulate these files. Singular indefinites encode the instruction to open a new file; singular pronouns encode instructions to add information to an already open file. Similarly, in Kamp's Discourse Representation Theory<sup>4</sup>, the idea is that formal structures (DRSs) are created in response to linguistic stimuli via an algorithm which responds to procedural information encoded by, among other things, indefinites and pronouns. In both cases, the result of processing an utterance is a formal structure which can be evaluated against a model. This

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<sup>4</sup>Note that Kamp's DRSs are claimed to embody the formal properties of actual mental representations formed in response to linguistic stimuli. Unlike Heim's filing system, there is a logic to accompany this formal system; the DRSs serve as objects of the attitudes and so on.

structure carries the propositional content of the discourse, but also formally constrains subsequent updates.

This idea about how properties of linguistic expressions relate to properties of information states is a defining one for dynamic semantics. If this shift in perspective did not create a potential for dealing with non-truth-conditional meaning, the dynamic slogan "meaning equals context-update potential" would have little force. Other typical features of dynamic semantics, such as the treatment of indefinites as open sentences and unselective binding, can be captured within a static framework.<sup>5</sup>

However, the idea that information states of conversational participants have certain properties which do not affect their content, and that linguistic expressions have non-truth-conditional, even procedural properties (some of which may be encoded) is not proprietary to dynamic semantics. For instance, it is widely accepted that some information (in the common ground) will be more accessible to an agent than other information at a given time, so that states which contain the same information may be distinguishable by the relative cognitive accessibility of the information they contain. It is also widely acknowledged outside dynamic semantics that words like "but" have non-truth-conditional, even procedural meaning<sup>6</sup>. What distinguishes dynamic semantics is the way these ideas are formalised; in particular, the characterisation of information states using discourse referents and the proposals to analyse procedural meaning in terms of these objects.

For the sake of concreteness, let us briefly consider how Kamp's DRT treats the discourse in (16):<sup>7</sup>

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<sup>5</sup>Indeed, this analysis of indefinites and the idea of unselective binding were originally proposed by Lewis (1975) in a static framework.

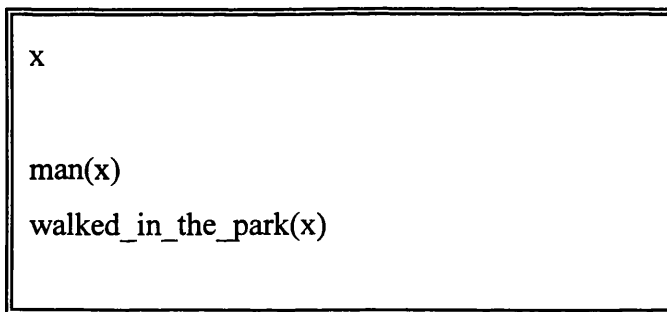
<sup>6</sup>See Grice (1989) on non-truth conditional nature of 'but'; Blakemore (1987, 1989), Wilson & Sperber (1993), Rieber (1997).

<sup>7</sup>It is not really important which version of dynamic semantics we use here, since they all share the properties in question. In particular, although the approach (DPL) advocated by Groenendijk

(16) A man walked in the park. He whistled.

DRT involves a mapping from the syntactic forms generated by the grammar onto discourse representation structures (DRSs). The discourse in (16) will serve to illustrate the different treatment of indefinites (of a certain class) and pronouns in DRT, as compared to classical static approaches. In particular, the phrase "a man" is not treated as a quantified noun phrase. Rather, it encodes the instruction to introduce a new discourse referent into the DRS, along with the predicative condition to be associated with this discourse referent. The verb phrase is translated as another predicative condition to be associated with this referent. The result of processing the first sentence is sketched in (17):

(17)



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and Stokhof (1990, 1991) and their colleagues is in many ways distinguishable from Kamp's, the differences are often methodological and are largely theory internal. I should perhaps note that my characterization of dynamic semantics in terms of just the features mentioned in the text is at odds with the general perception of the dynamic approach as defined by its view of meaning as context-update potential. But as I have indicated, this stance gains nothing unless we use it to get at the procedural properties of linguistic expressions; and all the different dynamic theories make the same proposal on this point. For this reason, I will use DRT as the token exemplar of dynamic semantics in subsequent discussion. I will not address the issues dividing Kamp and Groenendijk and Stokhof, and will therefore not discuss DPL directly. However, what I think ought to be said about DPL has already been said by Geurts (1998), who takes issue with Groenendijk and Stokhof's notion of dynamic conjunction.

The existential force intuitively associated with the first sentence of (16) is captured in the embedding conditions for the DRSs. Basically, the DRS is true iff we can find an assignment for the discourse referents (in this case, just  $x$ ) such that the individuals satisfy the conditions in the DRS.

What is of interest here is that the discourse referent introduced into the representation in processing the first sentence is available to be identified with those introduced by pronouns in subsequent discourse (modulo certain formal accessibility constraints). Moreover, there is a condition on pronouns which stipulates that their discourse referent has to be identified with one which is accessible in the DRS being constructed for the discourse. In the case of (16), there is only one (accessible) discourse referent, and hence only one formally possible antecedent. We thus arrive at the DRS given in (18):

(18)

$x, y$
$\text{man}(x)$
$\text{walk\_in\_the\_park}(x)$
$y = x$
$\text{whistle}(y)$

Let us consider the features of this analysis which are relevant to the discussion to follow. If we treat the DRS which results from processing the first sentence as characterising the relevant properties of the information state of the audience at that stage of the discourse, we will have a representation whose content is identical to the formula  $\exists x[\text{man}(x) \wedge \text{walk\_in\_the\_park}(x)]$ . However, this representation has other properties which affect what can happen in subsequent

discourse. In particular, the use of the indefinite makes available a discourse referent which is accessible for identification with those introduced by pronouns in subsequent discourse. Thus, so the story goes, we can continue in later discourse to use pronouns to talk about whatever individual is discussed in the first sentence. It might be seen as a virtue of this approach that it more naturally reflects what happens in normal discourse than the alternative static approach. For example, if we want to inform someone about an individual, we naturally start by introducing him through the use of an indefinite, and then provide more information about him, using pronouns to refer back to him.

However, this is just talk. The real virtue of dynamic semantics, questions of empirical adequacy aside, is that it provides a formally respectable solution to the identifiability problem. So far, we have seen that DRT provides an analysis of the discourse in (16) which is equivalent to the formula  $\exists x[man'(x) \wedge walk'(x) \wedge whistle'(x)]$ . It is agreed that this is what we understand of the discourse in (16).

The perceived advantage of dynamic semantics comes from the way in which the constraints on discourse interpretation emerge from the procedural properties of linguistic expressions. These rule out discourses such as those involved in the marble example as ill-formed. In essence, the dynamic approach offers a view of context-dependent meaning in which identifiability is subsumed under the formal notion of accessibility. Accessibility is a property of representations which is not reflected in their content. It nevertheless is thought to have a real reflex in human discourse. Thus, the claim is that the DRS in (18) above better captures the outcome of the process of interpreting the first sentence in the discourse than the static approach.

The question that arises is then the following: Can we replace the notion of identifiability stemming from the uniqueness constraint with that of dynamic accessibility? To put it another way, is it dynamic accessibility that underlies the patterns of anaphoric dependencies? In order to answer these questions, let us begin by considering how some examples are treated within the

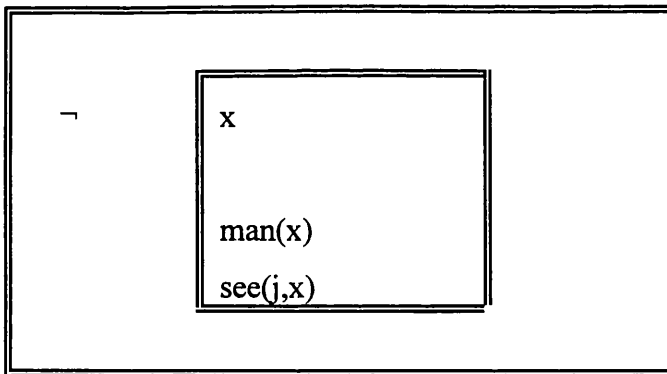
theory.

In order to analyse these examples, we need to know a little more about how different linguistic forms create different information states according to DRT. In particular, we need to look at the treatment of negation and quantification. For the purposes of exposition, I will not formally define the accessibility conditions for DRS, but will describe their effect informally. This lack of formal exposition should not detract from my arguments: The accessibility conditions themselves are fairly straightforward, but their formal definitions as set out in Kamp & Reyle (1993) are quite involved, and raise many technical issues which will not concern us here.

The DRS for (19) would be as in (20)<sup>8</sup>:

(19) John did not see a man.

(20)



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<sup>8</sup>Here we are considering the narrow-scope indefinite construal. We are also ignoring the issue of directly referential expressions such as "John" by simply inserting the symbol *j* into the DRS condition. Officially, names are treated via formal anchors in DRT, ensuring that the symbol is assigned to the same individual for all embeddings. See Kamp (1990).

DRSs of the form in (20) are true in a model iff there is no assignment of values to discourse referents such that the inner DRS is true. Moreover, the conditions on accessibility for DRSs are such that the discourse referent in the inner DRS is not available to be identified with discourse referents which are subsequently introduced into the main DRS. Thus, we can account for the intuitive unacceptability of the discourse in (21) (on the narrow-scope indefinite construal):

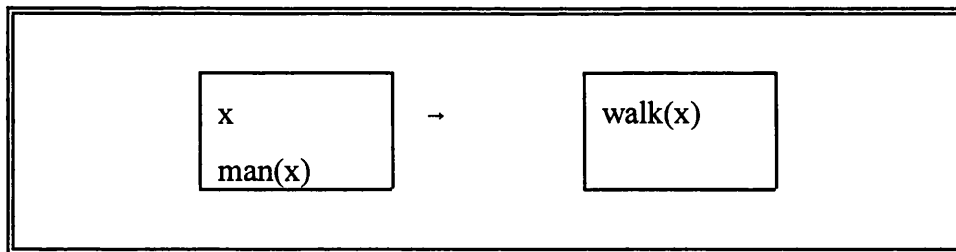
(21) John did not see a man. He was hiding.

The construction algorithm could not produce a well formed DRS for this discourse, since the requirement on the pronoun that its discourse referent be identified with an accessible discourse referent could not be met.

For quantificational sentences, the construction algorithm produces a complex condition within the main DRS for the discourse. This condition consists of sub-DRSs linked by a connective. For a universal statement such as (22), the result would be (23):

(22) Every man walked in the park.

(23)



DRSs of the form in (23) are true in a model iff for every assignment function,  $f$ , which verifies the first box, there is an assignment function,  $g$ , which differs at most from  $f$  in the values it



assigns to any discourse referents introduced in the second box, and which verifies the second box. Again we have sub-DRSs in this representation, and the accessibility conditions related to this complex condition determine the possibilities for subsequent identification. In particular, discourse referents in the complex condition are inaccessible for identification with subsequently introduced discourse referents. This accounts for the loss of acceptability in (24a,b):

- (24) a. Every boy left school early. He went swimming.  
b. Every cadet brought a friend to the passing out parade. He sat in the stands.

Notice that, in cases such as (24a), while E-type theories could account for the unacceptability in terms of number of mismatches and pragmatic factors, the dynamic approach deals with it formally, as lack of well-formedness. This difference between E-type and dynamic accounts becomes even clearer in the case of negation. As we saw above, in dynamic accounts, the unacceptability of (21) is explained in terms of accessibility. An E-type approach would simply rule this out as semantically anomalous.

It is now generally acknowledged that these formal well-formedness conditions rule out too much. In the case of negation, we have looked at two types of acceptable example involving negation in the antecedent. I will just mention the first in passing, since it contains a plural pronoun, and I am restricting this discussion to singular pronouns:

- (25) No philosophers were allowed into the night-club. They were turned away at the door by a huge bouncer.

The second, which contains a singular pronoun, is directly relevant:

- (26) It is not the case that there is no man in the park. He is hiding behind the bushes.

Attempts have been made to dispose of this kind of example by allowing a rule of double negation elimination to operate (see Krahmer and Muskens 1995). However, it has been pointed

out that the problem is quite general<sup>9</sup>:

- (27) a. It is possible that John does not own a donkey. It is also possible that he keeps it very quiet.
- b. It is ludicrous to pretend that this house doesn't have a bathroom. You showed it to me, remember?
- c. John didn't forget to bring an umbrella. It is in the hallway.

We have also seen in the previous section that singular pronouns can even be anaphoric on universally quantified phrases. Consider the following variant of (24):

- (28) Every current Mandelson supporter was at the party, but he was pretty lonely.

It has been claimed by van Rooy (1997) that these counter-examples to the accessibility constraint give rise to a kind of uniqueness implication. This has prompted van Rooy to propose a dual account, on which the standard dynamic approach handles examples such as the original (16), and a (non-quantificational) E-type analysis with a uniqueness implication handles these problematic examples and many others. In fact, it is not uncommon in the dynamic literature to find proposals which fall back on a dual dynamic/E-type approach to deal with cases ruled out by the accessibility constraints. Chierchia (1992) makes a similar move, and indeed, as we will see in the next sub-section, Kamp & Reyle (1993) effectively propose an E-type approach to deal with plural anaphora. The implicit assumption seems to be that it is impossible to do entirely without dynamic accounts. In the face of data such as in (26-28), it also seems that a kind of

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<sup>9</sup>(27a) is from van Rooy (1997); (27b) and (27c) are from Geurts (1998). (27a) is, of course, a variant of Evans' (1977) example:

- (i) Either John does not own a donkey or he keeps it very quiet.

I will ignore these problematic disjunctive examples for the moment, since I have not discussed dynamic disjunction.

classical E-type approach is indispensable.<sup>10</sup>

Let us assume that there are two strategies for dealing with the interpretation of singular cross-sentential anaphora: either the processing algorithm introduces a discourse referent with the requirement that it be identified with an accessible discourse referent, or we can have an E-type analysis with a uniqueness implication (presupposition or entailment). Let us now look at some cases where we might expect an E-type analysis to be required. These involve the expression "at least one":

- (29) a. I know that John has at least one daughter. She went to school with my son.  
b. Miss Marple has rounded up at least one of the robbers. She handed him over to the police last night.  
c. At least one man was walking in the park last night. I heard him whistling.

In Kamp & Reyle (1993), noun phrases headed by "at least one" are treated as quantificational. They do not introduce a discourse referent accessible for subsequent interpretation of singular pronouns<sup>11</sup>. There is good motivation for this within their theory, since there are cases where

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<sup>10</sup> By 'dynamic' here, I am referring to the kind of theory of natural-language semantics which treats certain expressions in a procedural manner relating to discourse referents of various sorts. By 'classical E-type', I am referring to theories of anaphora which treat them as either non-quantificational descriptions with uniqueness presuppositions, or quantificationally with uniqueness entailments. Van Rooy frames his E-type approach 'dynamically' by having sentences containing indefinites introduce both discourse referents for individuals and for (uniquely instantiated) properties. The latter move is one way of putting the E-type account into a framework in which meaning is defined in terms of context updates. However, this does not make it any less of a dual account, especially as the property markers are introduced as a way of making contextual information available for pronoun interpretation outside the realm of dynamic accessibility.

<sup>11</sup> An analysis of a sentence involving this phrase is given on p392, where it is treated as a generalised quantifier, thus ruling out singular anaphoric dependency. Later on, a cardinality treatment of noun phrases of the form "at least n", exactly n" and "at most n" is given, the result of which is that a plural discourse referent is introduced, denoting the collection of individuals which constitute the GQ intersective set. In both cases, the resulting structure contains nothing for singular discourse referents to be identified with.

anaphora is impossible on such phrases:

- (30) a. Last night I went into the kitchen and found that all of the pears in the fruit bowl had ratty teeth marks in them, and that the cook books had been upturned and gnawed at. So at least one rat must have gotten into the house. It is probably under the floor boards.
- b. *Teacher:* An empty vodka bottle was found in the girls' bathroom after the school dance on Friday, so at least one girl was drinking on school grounds. She has committed a serious rule violation.

We must therefore assume that for anaphoric dependence on "at least one" the only option is an E-type account. Unfortunately, in the cases such as (29) where there is no infelicity, there is also no uniqueness implication: that is, there is no implication that the relevant intersective sets in the antecedent sentences contain just one member. So a rote application of the E-type account proposed by van Rooy will not work here. Intuitively, in the case of (29a), we would want an E-type pronoun to pick up the daughter who provides the ground for the speaker's second statement. But it won't do for an advocate of the dynamic/E-type dual strategy to just say that we can generally relativise uniqueness to the one the speaker has in mind, since in that case, the dynamic account of the infelicity of the marble example and examples such as (31a), discussed above, would be lost:

- (31) a. Five senators interviewed Monica in person. He asked for her phone number.
- b. Five senators interviewed Monica in person. A certain senator asked for her phone number.

So the problem for the dual approach is just the same as that for the unitary E-type approach: why are some discourses felicitous when the uniqueness constraint is satisfied relative to speaker's grounds and not others? An answer which suggests itself is that in the examples in (29) the

assumption that the speaker has a particular individual in mind is salient, or accessible, while for (31b) it is not. But, I think that this is only part of the answer. We also need to say something about when such assumptions are justified. Note that if we are able to give an account of the conditions under which these assumptions are made, then we may be able to extend the account to the original problematic example for the E-type approach:

(32) A man walked in the park. He whistled.

Indeed, this is what I will do now. In addition, I will argue that the claim in dynamic semantics that indefinites of the form "an F" introduce a discourse referent as a matter of linguistic encoding makes the wrong predictions in certain cases. In fact, we will see that the discourse referent analysis of discourses of the form in (32) is only valid in cases where the audience is justified in assuming that the speaker has a particular individual in mind.

Leaving aside for the moment the problematic cases involving double negation and so on, where the extra E-type strategy was forced upon the dynamic approach, I want to consider how dynamic semantics interacts with general pragmatic processes. In particular, I want to look at how it might deal with scalar implicature. It is generally agreed that in many contexts of use, an utterance of (34) would give rise to the conversational implicature that John has no more than one daughter:

(34) John has a daughter.

However, the inference really depends on the context. Dynamic semantics correctly says that there is no implication of uniqueness here in virtue of the linguistic meaning alone. Dynamic semantics also says that the discourse in (35) does not necessarily imply that John has just one daughter, correctly so, in my opinion:

(35) John has a daughter. She is fifteen.

However, the use of examples such as (34) or (35) very often does give rise to a conversational

implicature to the effect that John has no more than one daughter. To explain this, dynamic semantics, like any semantic theory, would have to suppose that the output of the strictly linguistic interpretation process is input to inferential (e.g. Gricean) pragmatic processes. In particular, in the case of scalar implicature, conversational participants must be able to reflect on the information conveyed in virtue of the linguistic meaning, since a crucial premise in a scalar inference goes something like: "The speaker has uttered the sentence(s) *S*, which convey(s) the information *I*". Other crucial premises are required to make the scalar implicature go through (apart, of course, from the assumption that the speaker is behaving in accordance with whatever conversational principles are in force). For example, it is generally accepted that it has to be common ground that the speaker is in a position to know whether the more informative utterance would be true. (If it is clear that the speaker does not know whether the stronger proposition is true, she cannot be credited with the intention to imply that it is not true. Similarly, if it is not clear that the speaker is in a position to know whether the stronger proposition is true, she cannot be credited with the intention to imply that it is not true.) It is less widely recognised in the literature on scalar implicature that it also has to be common ground that the speaker's intending to convey the extra information has to be consistent with her own personal goals, as well as her epistemic means<sup>12</sup>. As Green (1995) points out, when two people are arguing, it is often clear that the scalar implicature is blocked not because the speaker is not in a position to assent to the stronger proposition but because she is unwilling to concede any more than she has to (for present purposes, viz the argument). Finally, of course, the extra information which would have been conveyed by the stronger utterance has to be useful for present purposes (I would say that it has to be more relevant than the proposition expressed by the utterance). I will now present an example involving an argument scenario, where the scalar implicature is blocked at least on the ground of the speaker's goals, (but also possibly on the ground that the stronger proposition isn't that much more relevant). (36) is a case where there is clearly no scalar implicature to the effect that B has witnessed no more than one high-speed motorway accident:

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<sup>12</sup>See Sperber & Wilson (1986/95) for discussion. See also Green (1995) for a related view.

- (36) A: If you've ever witnessed a high-speed motorway accident, you wouldn't oppose the introduction of a speed limit.
- B: I spend half of my working day driving on motorways, so, in fact, I have witnessed a high-speed motorway accident. But I still think that one should be allowed to drive as fast as one wants.

According to dynamic semantics, a discourse such as "A man walked in the park. He whistled" is equivalent in information content to the formula  $\exists x[man'(x) \wedge walk'(x) \wedge whistle'(x)]$ . So, on this approach to linguistic meaning, other things being equal, we would predict that an alternative response of B's, involving a sentence with a pronoun anaphoric on "a high-speed motorway accident", should no more give rise to a scalar implicature than the response in (36). But, contrary to expectation, the addition of this material to B's reply results in a very strong implication that he has witnessed just one:

- (37) A: If you've ever witnessed a high-speed motorway accident you wouldn't oppose the introduction of a speed limit.
- B: I spend half of my working day driving on motorways, so, in fact, I have witnessed a high-speed motorway accident. It was fatal. But I still think that one should be allowed to drive as fast as one wants.

Notice that contextual factors here weigh very strongly against such an implicature: someone who spends half of every day on the motorway is highly likely to witness a good many such accidents. Notice also that if B had used a restrictive relative clause, as in "so, in fact, I have witnessed a high-speed motorway accident which was fatal." then the inference that he had witnessed no more than one high-speed accident would not go through. But according to dynamic semantics, these discourses would be informationally equivalent. So, something is missing from the dynamic-semantic account.

I think that what we should say about (36-37) is that the indefinite does not introduce a discourse referent. Unfortunately, we cannot say that in the framework of dynamic semantics, since in this

framework, a discourse referent is always introduced. However, taking these examples together with the other data discussed in this section, I think we can build up an alternative account of the processing of singular indefinites, on which something like a discourse referent gets introduced, but as a result of pragmatic inferences (albeit very routine ones).

Let us return for the moment to the cases involving "at least one":

- (38) a. I know that John has at least one daughter. She went to school with my son.  
b. Miss Marple has rounded up at least one of the robbers. She handed him over to the police last night.  
c. At least one man was walking in the park last night. I heard him whistling.

In these cases, there is no uniqueness implication to the effect, say, that John has exactly one daughter, and what the pronoun is referring to seems to be the individual who provides the evidence on which the speaker's assertion is based. A common feature of these examples is that, in order to see them as felicitous, one has to imagine the speaker waiting a beat between the first sentence and the second. The same applies to the problematic negative examples discussed above:

- (39) It's ludicrous to pretend that this house doesn't have a bathroom. You showed it to me, remember?

This slight pause is important<sup>13</sup>. This can be shown by inserting "and" between the sentences in these discourses. The result is a loss of acceptability:

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<sup>13</sup> I am thinking here in terms of an actual or notional time difference. It could be that if we measure the time differences of the relevant utterances there is not much discernable difference. So the pause might not be real in phonetic terms, but the mental counterpart - the break in processing or the different style of (parallel) processing - probably is. Thanks to Deirdre Wilson for drawing my attention to this point.



- (40) a. Miss Marple has rounded up at least one of the robbers and she handed him over to the police last night.
- b. It's ludicrous to pretend that this house doesn't have a bathroom and you showed it to me, remember?

We can attribute this loss of acceptability to the fact that the use of 'and' generally encourages the hearer to process the discourse as a unit, in the context of the same (initial) set of background assumptions. In other words, it does not offer the audience that momentary pause which allows it to draw out consequences of the first sentence, consider the issues raised, and so on. To illustrate this, consider the well-known contrast between (41a,b), where the causal, reverse-temporal inference is blocked in the conjoined case<sup>14</sup>:

- (41) a. Mary fell over. John pushed her.
- b. Mary fell over and John pushed her.

Why should this slight difference matter in the case of "at least one"? I would argue that it is crucial if the assumption that a single individual is serving as the ground for the speaker's assertion is to become the focus of joint attention. Let me spell out what I mean by this.

Suppose that a speaker uses the form of words "at least one" in a monotone-increasing context (such as "At least one F Gs")<sup>15</sup>. Assume, moreover, that it is compatible with her own goals to be more informative (as we would in the examples discussed above), and that a more informative utterance would be useful, or more relevant (as also seems to be the case). Then the only reasonable conclusion is that she has chosen this form of words to make it clear that she doesn't

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<sup>14</sup> This effect of sentential conjunction is discussed in Carston (1993) and Wilson & Sperber (1997).

<sup>15</sup> At this stage, I am only considering monotone-increasing contexts for indefinites in general, since these are the only ones which are problematic for my E-type account. When indefinites are found in other contexts, e.g. the antecedent of a conditional, the restrictor of a non-monotone increasing quantificational determiner and so on, my E-type account has no problem. The dynamic approach has its own problems in these contexts, which I will address below.

know how many Fs have the property in question. This could be either because she has evidence for a single individual but doesn't know whether that individual is the only one, or because she has general circumstantial evidence. The first type of case includes those where the speaker has an object-dependent belief, and those where beliefs are acquired by description (as when you see an animal's tracks in the sand, or when someone reliable has told you "An F Gs", but where there hasn't been a scalar implicature). The second type of case (general circumstantial evidence) is rarer. To illustrate, consider a (real) scenario where I come home and find, on opening my kitchen door, that one or more rats have somehow got in. The evidence includes ratty teeth marks in the pears in the fruit bowl, upturned and gnawed-at cook books and other general rat-in-the-kitchen signs. Of these two possibilities, I would argue that, unless context indicates otherwise, the first is most likely to occur to an audience encountering an utterance of the form "At least one F Gs". Of course context does indicate otherwise in the examples, repeated below, where it is clear that the speaker has only general circumstantial evidence:

- (42) a. Last night I went into the kitchen and found that all of the pears in the fruit bowl had ratty teeth marks in them, and that the cook books had been upturned and gnawed at. So at least one rat must have gotten into the house. It is probably under the floor boards.
- b. *Teacher:* An empty vodka bottle was found in girls' bathroom after the school dance on Friday, so at least one girl was drinking on school grounds. She has committed a serious rule violation.

Here, the pronoun is infelicitous because there is clearly no particular individual serving as the ground for the assertion made in the first sentence. In most cases, however, we would be inclined to assume, in the absence of further information, that the speaker has chosen this form of words on the basis of evidence of a particular individual. This assumption is no more than a hypothesis, which is less than fully evidenced. Once it is made, however, the audience can tentatively assume that an individual has been introduced into the focus of joint attention, and can thus be the subject of further discussion using the singular pronoun (or definite). In the case of "at least one",

it is also clear that the speaker has used this form of words to draw the hearer's attention to what she regards as the more pressing implicated assumption, to the effect that she does not know exactly how many. It thus takes some time for the individual to get introduced.

Let us consider what light this pragmatic approach might shed on the phrase "an F". One could argue that in this case, unlike in the case of "at least one", the assumption that the speaker's assertion is supported by evidence about a particular individual would be routinely made, and would perhaps be regarded as more strongly evidenced. How much knowledge the speaker has of the number of individuals fitting the explicitly given description is more of an open issue in this case. That is, with "an F", as opposed to "at least", assumptions about the 'type' of belief are foregrounded, while the issue of how many is backgrounded. Not surprisingly, my claim would be that the assumption which gets a particular individual into the joint focus of attention is more immediately and routinely made. But this assumption is dependent on the usual constraints of evidence and justification. If the hearer cannot take for granted that it is compatible with the speaker's goals to convey as much information as she thinks is relevant, the required assumption about the speaker's belief state may not be justified. In that case, the hearer is only entitled to assume that the speaker is giving away the minimal information required. The minimal information derivable from an utterance of "An F Gs" is that the set of Fs which are also G is non-empty. In the course of, say, an argument, this might be all that would be allowed into the joint focus of attention. As a result, the subsequent use of a pronoun would be unable to pick up an appropriate 'discourse referent'. This is what is going on in the argument example, repeated below:

- (43) A: If you've ever witnessed a high-speed motorway accident you wouldn't oppose the introduction of a speed limit.
- B: I spend half of my working day driving on motorways, so, in fact, I have witnessed a high-speed motorway accident. (It was fatal.) But I still think that one should be allowed to drive as fast as one wants.

Without the sentence 'It was fatal', it is clear that we can only assume that B is talking about a

non-empty set of motorway accidents he has witnessed. With the version including the singular pronoun, we draw the somewhat surprising conclusion that the set of motorway accidents which B has witnessed has a cardinality of exactly one. This effect, I would argue, is due to the fact that, on the one hand, no 'discourse referent'-introducing assumption has been allowed into joint attention; and on the other hand, the use of the singular pronoun triggers a search for a particular individual in the joint focus of attention. The only satisfactory solution is that the intersective set of the previous utterance has a cardinality of one. Thus, the effect is the same as in the acceptable "every" example, repeated in (44) below:

(44) a. Every current Mandelson supporter was at the party, but he was pretty lonely.

There are similarities and differences between this account of anaphoric dependencies involving singular pronouns and the that of dynamic semantics. They are similar in the sense that they account for discourses of the form "An F Gs. It Hs" in terms of properties of the indefinite as well as the definite. The difference lies mainly in the fact that in dynamic semantics, an indefinite of the form "An F" always introduces a discourse referent in virtue of its encoded linguistic meaning, while "at least one" never introduces a discourse referent. In the account just discussed, the assumption that a particular individual is serving as the ground for what the speaker is saying is non-demonstrative, although routinely made. On the pragmatic account, this assumption can be made both in the presence of "an F" and "at least one F". But the assumption is subject to the usual conditions of justification. Thus, the pragmatic account predicts that there will be cases where the assumption cannot be made - with the attendant consequences for the way in which we understand the discourse in question.

I think that the pragmatic account would fare better than the dynamic account so long as we can give a reasonable argument for why, if the uniqueness condition drives a search for uniquely denoting descriptive material, this condition can be satisfied when the audience cannot fully recover any such material - so long as a kind of evidential warranty that the speaker's grounds for what they are saying involve a particular individual is assumed. It would fare better since we could explain when felicitous discourses with anaphoric singular pronouns (usually with "an F"

as the antecedent, but also involving "at least one F", double negation and so on) do not give rise to uniqueness implications, while others (including some involving "an F") do.<sup>16</sup>

So, we would be in a position to give a better account of anaphoric relations involving singular definites if we could say something about why this evidential warrant satisfies the encoded uniqueness condition. At this stage, it might be tempting to say that the uniqueness condition is in fact a presupposition and that this presupposition can be satisfied in the presence of certain assumptions. But this move, I feel, would amount to little more than a redescription of the facts. The notion of a uniqueness presupposition is fairly empty unless we can set out a framework which explicates the conditions under which presuppositions can be satisfied. In this regard, we can identify two prominent approaches to presupposition, that of van der Sandt (1992) and Stalnaker. Unfortunately, for our current purposes, van der Sandt's treatment of presupposition is not really adequate as it utilises the DRT framework for representing the interpretation of discourse, and assumes that "an F" always introduces a discourse referent, while having to accommodate a discourse referent in the cases involving "at least one F", double negation and so on. In effect, this treatment takes us no further in our understanding of this anaphoric relation than Kamp's.

To take another presuppositional approach, Stalnaker (1996) proposes that the singular pronoun carries the condition that in every world in the context set the speaker is talking about a salient individual. In the case of "A man walked in the park. He whistled." the assumption that just one man walking in the park is salient for the speaker is accommodated (by reconfiguring the context set so that in every world at least one man is walking in the park and one of these individuals is salient to the speaker). But unless something is said about the pragmatics of discourse, this proposal simply fails to rule out any of the unacceptable uses of pronouns. It is also silent on the question why, in the motorway argument example, no such accommodation is made. More importantly, it is clear from what Stalnaker says that the individual in question has to be salient

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<sup>16</sup>Of course, many discourses involving "an F" give rise to uniqueness implications due to the derivation of scalar implicature. But this, as we have seen, is an independent factor.

at least to the speaker. But in everyday discourse, this need not be the case, on any reasonable construal of 'salient'. Here, it is worth considering the comments of Kamp (1990) on the example in (46), for which, he notes, the DRS would carry information equivalent to that in (47):

(46) Last month a whale was beached near San Diego. Three days later it was dead.

(47)  $\exists t \exists t' \exists p \exists x [\text{time}(t) \ \& \ \text{time}(t') \ \& \ \text{place}(p) \ \& \ \text{prevMon}(t,n) \ \& \ \text{whale}(x) \ \& \ \text{beach}(x,p,t) \ \& \ \text{near}(p,\text{sd}) \ \& \ t \leq t' \leq \text{day}(t)+3\text{days} \ \& \ \text{dead}(x,t')]$

I will quote some of his comments on this example at length, since they highlight a certain weakness in the claim that the individual has to be salient to the speaker. They will also serve as the starting point for developing an alternative account. Notice, in particular, the distinction drawn between the information which the hearer gets from an utterance of (46) and the information which is available:

"There is an ongoing debate over the question whether a sentence pair such as [(46)] entails that the time  $t$  and the whale  $x$  are uniquely determined. Arguably the subsequent reference, by means of the pronoun "it", to the whale introduced by the indefinite description of the first sentence implies that there must be some particular whale that the two sentences are about. It need not be the case that only one whale was beached near San Diego last month, nor even that only one was beached near San Diego and was dead within three days. But nevertheless, the argument goes, the utterance should be linked (in some appropriate causal way) to one particular whale if it is to qualify as entirely felicitous. [...] This observation may be taken to imply that the content of [(46)] can be seen as the conjunction of two separate propositions, each expressed by one of the two sentences, after all. [...] According to my own intuition this is true: Sentence pairs such as [(46)] presuppose some relation which links the utterance to a particular whale and time. However, this relation can be arbitrarily indirect. For instance, [(46)] might be said by a person who read a short note to this effect in the daily paper a few days earlier; and that note, though ultimately going back to an eyewitness report, may itself have found its

way into the paper in as roundabout way as you like. I think that even in such cases the hearer of A's utterance is entitled to infer from the assumption that [(46)] is felicitously used that there must be some such link to a particular whale and time, even though he has no way of knowing, or even finding out, what the link in this particular case is. It seems to me that in such cases the *information* which the hearer gets from the utterance is indeed correctly captured by [(47)]. But there is also a sense in which the utterance can be construed as carrying, in virtue of a *complex* causal chain that connects it with the particular whale and time, additional information; and when this additional information is taken into account as well, the total content can be factored as a conjunction of the two singular propositions about the whale and the time that are expressed respectively by the first and second sentence." (fn 9 pp35-36, emphasis in the original)

I agree with Kamp that the information one effectively *gets* from an utterance of (46) is that which is captured by his DRS for this example. However, I find it difficult to reconcile the fact that, on the one hand, in the semantic theory for English which Kamp defends, the weaker existential information is all that is carried by the discourse in question; while on the other hand, he concedes in this footnote that in fact, the content of the discourse is that which is contained in two singular propositions involving a particular whale (and time). One can only imagine that, as his discourse representation structures are supposed to be the medium of thought, the idea is that the content of the beliefs one comes to entertain as a result of processing discourses is weaker than the content of the actual discourse itself. This is presumably what Kamp means when he says that this is what one gets from the discourse. But this idea implies that the discourse, qua linguistic object, carries a certain content. We may wonder in virtue of what does this discourse carry such a content. We might also wonder how one is meant to know that the content of the discourse is as it has been conceded if the information we get from processing the discourse is systematically weaker. I do not mean to suggest that these questions cannot be answered. In fact, they can be answered along fairly traditional lines. But if Kamp is endorsing this traditional view about the semantics of English, then I don't think that he has a good case to convince us to adopt his theory as a semantic theory.

As we will see in the next chapter, one of the virtues of a semantic theory which employs an intermediate level of representation (such as DRT) is that it enables us to overcome some severe problems faced by more classical views on which the content of utterances inheres in the content of their linguistic structures. If one backslides and concedes that in fact the content of utterances is carried by the linguistic forms themselves, then the employment of an intermediate level of representation is somewhat spurious when it comes to semantics (of course, not necessarily so when it comes to questions of cognition). For reasons which will be discussed in the next chapter, I would rather stay with the view that the content of an utterance inheres in an intermediate, psychological level of representation. To that end, I will suggest that the representation constructed in response to the discourse in (46) carries the stronger content which implies a unique whale is involved. For the pronoun in the second sentence uttered, the form in (48) will be involved in the translation:

(48)  $\lambda P.\text{det}_3(\text{pro}')(P)$

In the next chapter, it will be proposed that the singular pronoun encodes the information that necessarily, if the property expressed by *pro'* is instantiated, then it is uniquely instantiated. In some cases, as in (46), the audience will not be able to come to an adequate understanding of what *pro'* denotes. Nevertheless, if the audience can assume that a particular individual is serving as grounds for what the speaker is saying, then they will assume that the speaker intends that what *pro'* denotes depends on the content of their own thoughts (which may in turn be reliant on some other source, and so on). But this will be so only if the audience's actual understanding of the pronoun is adequate to the purposes of the conversation at hand.

There is a good deal more to be said about the implications of this proposal for definites, but that does not affect the issues being addressed in this section. For now, I hope to have shown that a path toward a unitary analysis of non-dependent singular definites (descriptions and pronouns) can be taken which treats these forms as quantificational and as encoding uniqueness. I also hope to have demonstrated that the empirical limitations of dynamic approaches to anaphoric dependencies involving singular pronouns stem largely from the decision to encode routine but



non-demonstrative pragmatic inferences into the meaning of linguistic forms.

Finally, it should be recalled that I have followed closely the pragmatics of discourse in which indefinites occur in monotone increasing contexts, and in which it is reasonable to make certain assumptions about speaker's grounds. Of course, part of the appeal of dynamic semantics lies in its analysis of anaphoric dependence in cases where the indefinite occurs in the antecedent of a conditional and the restrictor of a quantificational noun phrase, i.e. in donkey sentences. I have already outlined a non-dynamic, unitary E-type analysis of donkey anaphora which does not involve anything like a notion of discourse referent. One of the goals of this present section has been to show that in discourses of the form, "An F G's. It H's" the presence of the individual available for anaphoric reference has to be inferred. In a sentence of the form, "if an F G's, it H's" no such inference is generally made. Thus, my claim is that the two cases are unrelated in this respect. In the next section, I will review some well-known problems for dynamic semantics in the treatment of donkey sentences. I will also include some reminders of the severe problems for dynamic semantics raised by plural anaphora, problems which were originally highlighted by Evans (1977). The point of this section will be to demonstrate the desirability of a unitary E-type account, if it can be sustained. But the real work in getting this account off the ground has been done in this sub-section.

#### **5.4 Dual strategies**

In the original development of dynamic semantics, Kamp (1981) and Heim (1982), set out theories of natural language semantics which sought to simultaneously provide a novel analysis of (49) and (50a,b):

(49) A man walked in the park. He whistled.

- (50) a. Every farmer who owns a donkey beats it.  
b. If a farmer owns a donkey, he beats it.

We saw in the last section the analysis of (49) (in Kamp's terms) involved the introduction of a discourse referent with which referents introduced by subsequent discourse could be identified. The result of such a process is a representation whose content is equivalent to the formula in (51), in the relevant respects:

(51)  $\exists x[\text{man}'(x) \wedge \text{walked\_in\_the\_park}'(x) \wedge \text{whistled}'(x)]$

There is a sense in which the process of identification of discourse referents is akin to binding in logical languages. In the logical form in (51), the variables which are the arguments of the predicates are all bound by the existential quantifier. This effect is obtained via the embedding conditions for DRSs which effect a kind of existential closure for discourse referents in the main DRS. So, there is a sense in which dynamic interpretation of indefinites and pronouns brings about a kind of dynamic binding. Putting aside for the moment the fact that this move brought about a major shift in the manner in which linguistic meaning is considered, the technical innovation contained in this analysis provided an answer to the question of how cross-sentential binding could be incorporated into a theory of natural language interpretation. For previous to the introduction of dynamic semantics, the model of interpretation involved a syntactic component which only looked at sentence forms and a semantic component which produced truth conditions for these forms. A sentence of the form, "he whistled", on the prevailing theories would have been given a syntactic analysis on which the pronoun would be treated as a variable in a language such as that of the predicate calculus. Thus the input to the semantic theory would be a form which would be equivalent to a formula with a free variable. On the pre-dynamic view, there was no way of accounting for cross-sentential binding. Now, of course, in order for dynamic semantics to take root, the argument with Evans and other proponents of the classical E-type account concerning intuitions regarding uniqueness implications had to be won. Although the intuitions in these matters are often delicate, I think that on balance, the claims made by the

dynamic camp are stronger than those made by the classical E-type approach. If we accept that this is the case, then the technical innovation of dynamic binding provides a very elegant solution to the problem which the donkey sentences in (50a,b) posed to pre-dynamic theories. This problem is analogous to that for (49) in that there is apparent binding where the traditional interpretation mechanisms would not allow that, but also, even if the some modification to the syntactic theory could get the donkey pronoun bound by the indefinite, the resulting structure would have the wrong truth-conditions. That is, it has the wrong truth conditions given that we accept that the content of our understanding of the donkey sentences in (50a,b) is equivalent to the formula in (52), as was traditionally agreed:

$$(52) \quad \forall x \forall y [\text{farmer}'(x) \wedge \text{donkey}'(y) \wedge \text{own}'(y)(x) \rightarrow \text{beat}'(y)(x)]$$

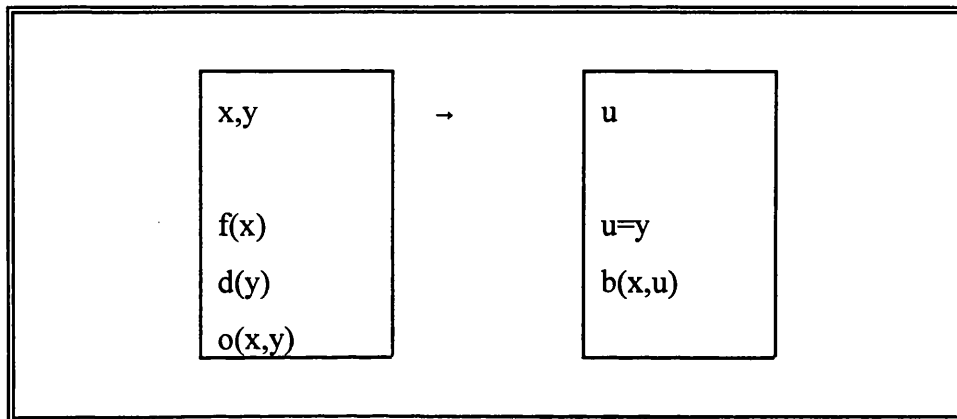
Taking (50a), the indefinite noun phrase "a donkey" in the restrictor does not c-command the pronoun. On traditional assumptions on which these phrases are analysed as being headed by an existential operator we would be at a loss to derive the right syntactic form since pronouns can only be bound by phrases which c-command them. Moreover, in any logical form which would serve as the translation of (50a), the existential formula would be in the restrictor of the universal introduced by "every" and thus could not bind the variable which was supposed to translate the pronoun. What is more, even if one made the very non-standard move of allowing the indefinite noun phrase to move out of the subject noun phrase, in contravention of one of the most basic constraints in natural language syntax (no movement out of noun phrases), the resulting structure's truth conditions would be equivalent to the formula in (53), which is not what we want:

$$(53) \quad \forall x \exists y [\text{farmer}'(x) \wedge \text{donkey}'(y) \wedge \text{own}'(y)(x) \rightarrow \text{beat}'(y)(x)]$$

Of course, Evans' (1977) E-type account had provided an analysis of (50a) without binding out of the restrictor's domain, but again the argument for that analysis depended on accepting that there are uniqueness implications with such sentences which most people simply do not judge

to be present. Dynamic semantics offers another means of getting an interpretation of donkey pronouns by having the indefinites on which they are dependent dynamically bind these. This solution emerges from the manner in which the structures which interpret universally quantified sentences and conditionals are evaluated. In Kamp's (1981) system, the processing of both (50a,b) would result in the DRS in (54):

(54)



Recall that DRSs of the form in (54) are true in a model iff for every assignment function,  $f$ , which verifies the first box there is an assignment function,  $g$ , which differs at most from  $f$  in the values it assigns to any discourse referents introduced in the second box and which verifies the second box.

The elegance of this technical innovation is impressive. So much so that many have persisted with a dynamic binding approach to donkey sentences in spite of the fact that on considering a wider variety of data, some serious problems emerge which do not really go away.

The original Kamp/Heim treatment of the basic donkey sentences implement a suggestion by Lewis (1975) with regards adverbial quantification which involves a process of unselective

binding. In quantificational contexts, open sentences are bound into by the quantificational element and we evaluate the resulting structure by counting the relevant n-tuples (pairs in the case of donkey sentences). This is effectively what is done in the DRS above. But now, when we come to a certain class of proportional quantificational elements, including "most" and "usually", there is a problem. The dynamic treatment of an example like (55), which implements the unselective binding analysis, would evaluate this example by counting pairs of farmers and donkeys owned:

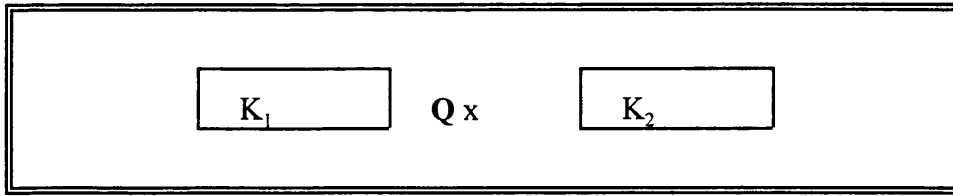
(55) Most farmers who own a donkey beat it.

This means that in a circumstance where there are ten farmers and one owns ten donkeys all of which he beats and the other nine own just one donkey and do not beat them, then the dynamic account would incorrectly predict the sentence to be true. That is, there are nineteen sets of pairs of farmers and donkeys identified by the restrictor, and with regards more than half of these (ten), beatings occur. This is the proportion problem.

A dynamic solution to this problem is presented in Chierchia (1992) which incorporates a version of dynamic binding with the standard generalised quantifier semantics for quantificational expressions. A related proposal is taken up by Kamp & Reyle (1993). I will discuss the text-book version as the results are the same.

Kamp & Reyle (chapter 4) propose a unitary treatment of quantified sentences of the form  $[[\text{det}_Q N][VP]]$  by having the translation algorithm produce a DRS of the form in (56):

(56)



Here  $Q$  denotes whatever generalised quantifier the determiner encodes. The variable placed between the boxes marks out the individuals that are being quantified over. The condition in (56) is verified by a suitable function  $f$  iff the relation  $R$ , which the generalised quantifier denotes, holds between the sets  $A$  and  $B$ . Here  $A$  is the set of objects  $a$  such that there is an extension,  $g$ , to that extension of  $f$  which is  $(f \cup \{ \langle x, a \rangle \})$  which verifies the left-hand box ( $K_1$ ).  $B$  is that set of objects  $b$  such that there is a function  $h$  which is an extension to the function  $g$  just defined which verifies the right hand box ( $K_2$ ). This condition is given in (57) (K&R's 4.165, p 421)  $R$  is the denotation of  $Q$ :

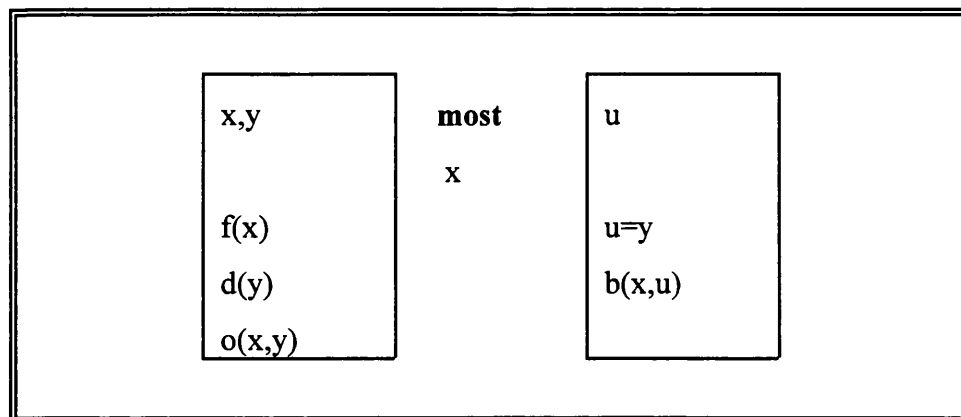
(57)  $M \models_f (56)$  iff  $\langle A, B \rangle \in R$  where

$$A = \{ a : a \in U_M \ \& \ \exists g [f \cup \{ \langle x, a \rangle \} \subseteq_{UK1-\{x\}} g \ \& \ M \models_g K_1] \}$$

$$B = \{ b : b \in U_M \ \& \ \exists g [f \cup \{ \langle x, a \rangle \} \subseteq_{UK1-\{x\}} g \ \& \ M \models_g K_1] \ \& \ \exists h [g \subseteq_{UK2} h \ \& \ M \models_h K_2] \}$$

If we take the denotation of **most** to be  $\{ \langle A, B \rangle : |A \cap B| > |A - B| \}$  and we represent the problematic sentence above as in (58) then we get the right result in as far as we are counting the right objects, i.e. farmers:

(58)



However, the content of the box in (58) is equivalent to "Most farmers who own donkeys beat at least one of the donkeys they own". Moreover, when the original universal donkey sentence in (50a) is given this generalised quantifier treatment, its truth conditions are predicted to be the same as "Every farmer who owns donkeys beats at least one of the donkeys he owns". The same results are entailed by Chierchia's (1992) account. So the proportion problem gets solved by this route, but only donkey sentences with existential readings can be accounted for. Recall that donkey sentences can get existential readings:

- (59) a. Most customers who had a credit card payed their bill with it.  
b. Everyone who owned an umbrella took it to the cricket match.

The state of affairs resulting from this modified dynamic account provokes differing reactions from on the one hand Kamp & Reyle and on the other Chierchia. For Chierchia (1992) it is a fact about donkey constructions to be explained that they sometimes give rise to existential readings, as in (59) above, and sometimes to universal readings, as perhaps is prominent in the classic case. This being the case, he allows that his version of dynamic binding captures the existential reading and that an E-type strategy gives rise to the universal reading. For Kamp & Reyle (1993) the analysis of donkey sentences using (57), though seeing off the proportion problem, is unsatisfactory because it gives rise to the existential reading. They feel that donkey sentences

ought to have the universal truth-conditions. They thus change the embedding conditions in (57) above to those in (60) where the second clause in the definition of  $B$  ensures the universal reading<sup>17</sup>:

(60)  $M \models_f (56)$  iff  $\langle A, B \rangle \in \mathbf{R}$  where

$$A = \{ \mathbf{a}: \mathbf{a} \in U_M \ \& \ \exists g[f \cup \{ \langle x, \mathbf{a} \rangle \} \subseteq_{UK1-(x)} g \ \& \ M \models_g K_1 ] \}$$

$$B = \{ \mathbf{b}: \mathbf{b} \in U_M \ \& \ \exists g[f \cup \{ \langle x, \mathbf{a} \rangle \} \subseteq_{UK1-(x)} g \ \& \ M \models_g K_1 ] \ \& \ \forall g[f \cup \{ \langle x, \mathbf{a} \rangle \} \subseteq_{UK1-(x)} g \rightarrow \exists h[g \subseteq_{UK2} h \ \& \ M \models_h K_2 ] \}$$

As their position with regards these matters is not argued for, it does not bear close scrutiny. However, it is worth remarking that they settle on the analysis given in (60) after a brief discussion which is basically an invocation of the appeal to uncertainty:

"When one asks English speakers about the truth or falsity of [(55)] one meets with a bewildering spectrum of intuitions" (p424)

The appeal to uncertainty appears almost obligatorily in discussions of donkey sentences. It is thus remarkable that in the mountains of literature on this subject the fact that judgements concerning donkeys sentences are uncertain is not accounted for. If, for example, Kamp & Reyle's (60) gave a correct account of donkey sentences, then why should there be any equivocation in judgements concerning the sentence "every farmer who owns a donkey beats it"? It is not as if the sentence is particularly difficult to parse. It does not contain double negation or other constructions which are known to cause understanding difficulties. In fact, the same rule is needed to account for our intuitions concerning the sentence, "Every boy thought he would win" on which the pronoun gets the bound variable reading - and no one has any problem with

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<sup>17</sup> This is cited directly from the text, but I think there has been a typographical error in that the second clause of  $B$ 's definition should read:

$$\forall g[f \cup \{ \langle x, \mathbf{a} \rangle \} \subseteq_{UK1-(x)} g \ \& \ M \models_g K_1 \rightarrow \exists h[g \subseteq_{UK2} h \ \& \ M \models_h K_2]$$



judgements concerning that kind of sentence.

There is a very simple explanation for the fact that there are many reports in the literature that informants' judgements are uncertain when it comes to donkey sentences: poor methodology in collecting data. This is a consequence, in my opinion, of the assumption that donkey sentences have but one semantic analysis. Thus, not enough attention has been paid to ruling in or out possible interpretations. In order to do this, one must first assume that there are different possible interpretations and then set up utterance scenarios which would test whether these are real. So, let us see if we can rule some possibilities out.

Let us first take a scenario where John is a local government inspector who is attached to the dog license division. The law is that every dog must have a licence and that if a dog does not have a licence, then its owner is liable to an automatic fine. Now, let us suppose that John makes a snoop on a certain neighbourhood, but that Jones gets tipped off. Jones owns four dogs, none of which are licenced, so on the day of the snoop, he hides his dogs from John. At the end of the snoop, John reports as follows.

(61) I didn't have to levy any fines today because every one in this neighbourhood who owns a dog has a licence for it.

I think that the intuition here is fairly clear that John is wrong and that what he has said is false. This tells us that donkey sentences can have a reading where there is no uniqueness implication.

We need to find out now whether donkey sentences can be understood in a way which is in accord with the classical analysis, as encoded in Kamp & Reyle's revised conditions. So, consider a scenario in which a donkey plague is sweeping the country. If a donkey catches the disease, it dies. Fortunately, there is a vaccination which can immunise donkeys from this disease, but it is expensive. Now the government dispatches an animal health officer to a certain farming region in order to check how the immunisation program is going. He reports on his mission in the

following way:

(62) Every farmer in this region who owns a donkey has had it vaccinated.

But suppose that a couple of farmers who keep some of their donkeys in remote hill regions didn't bother to have these vaccinated thinking that they would be unlikely to come in contact with the disease and being put off by the expense. Of course these farmers had the donkeys that they keep around the farm vaccinated since these come into contact with other donkeys. When the inspector called, they were a bit embarrassed about telling him that they had not in fact vaccinated these isolated donkeys, so they lied by omission. That is, they did not mention these unvaccinated donkeys. In this circumstance, I think that we can say that the inspector is wrong, that what he said is false.

Finally, we have seen in the credit card example above, there are circumstances in which donkey sentences are clearly understood not according to the classical truth conditions but according to the existential reading of the original modified dynamic binding analysis.

It is often said that with donkey sentences headed by "most" intuitions are even less clear than with "every". In this case, the uncertainty is clearly about whether there is a universal reading. That is, when presented with (63a,b), informants are more inclined to assent to the inquiry whether (63a) has the classical, universal truth conditions, than they are to say that (63b) means that most of the farmers who own a donkey beat all of the donkeys they own:

- (63) a. Every farmer who owns a donkey beats it.  
b. Most farmers who own a donkey beat it.

I think that there is a good explanation for this fact if we assume that donkey pronouns are open to a maximal and a non-maximal reading on the E-type analysis sketched in section IV. This has to do with the pragmatics of choosing among readings which are logically related. I will discuss

this issue in chapter 4 when the pragmatics of the distribution of readings is discussed. For now, I want to establish that the maximal reading is available for sentences involving "most". (The existential reading is clearly available, for instance if we exchange "every" for "most" in the credit card example.) Let us return to the dog inspector scenario. Recall that every dog must be licenced and if a dog is unlicensed, its owner is fined. Now suppose that in a certain neighbourhood, there are ten dog owners. Three of these own one or more dogs all of which have a licence. Two own one or more dogs without licences. The other five own one or more dogs with licences, but they each have recently acquired a dog, and have not yet obtained a licence for it. (The reason being that Smith's dog Bessie had a litter a couple of months back and these five each took one of the pups. They had been meaning to get a licence but hadn't got around to it. Of course, they know that this excuse wouldn't cut any ice with John the inspector as he is notoriously strict in these matters). Now, happily, these five people get tipped off about the surprise inspection, and they manage to hide the pups from John. At the end of the day, John reports as follows:

(64) I had to fine a couple of people today, but most people who own a dog in this neighbourhood have a licence for it.

Again, I think it is clear that John is wrong and that what he has said is false.

So, there is a fairly strong case to be made to the effect that donkey sentences can be understood maximally and non-maximally. So, if one wants to adopt the dynamic binding approach to donkey sentences and avoid the proportion problem, then either one can follow the path of Chierchia and suppose that there is a dual strategy for interpreting pronouns. Or one could just stipulate two sets of embedding conditions, such as those set out in Kamp & Reyle. But then we are faced with the theoretical issue raised by Heim (1990) of motivating the analysis in a non-ad hoc way.

As we saw in section IV, when we turn to donkey sentences involving plurals, the same

alternation between universal and existential readings emerges. Again, some kind of dual strategy seems the only option. So, if an E-type approach can deal with the phenomena on its own, it is to be preferred.

In general, plural anaphora pose the same kind of problem for dynamic semantics as do singulars in that a dual strategy seems to be required. To see this, consider (65):

(65) John has two daughters. They are in high school.

If one allowed dynamic binding here, the result would imply that the discourse here would be equivalent to the formula in (66) where the predicates are plural and distributive:

(66)  $\exists X[|X| = 2 \wedge \text{daughter\_of\_John}(X) \wedge \text{in\_h.s.}(X)]$

This is possibly acceptable in some cases of bare numerals as becomes clearer in a variation on Kamp's (1990) whale example:

(67) Last month, two whales were beached near San Diego. Three days later, they were dead.

Here there is not necessarily an implication that all of the whales which beached near San Diego were dead three days later. This latter reading is the one which the classic E-type approach of Evans (1977) and Neale (1990). Moreover, it would not be right in this case to claim that the second sentence says that just some of the whales that beached near San Diego died within three days. This latter reading would be derived on a non-maximal E-type analysis. So, once again, we could suppose some kind of discourse referent analysis is appropriate here. However, the E-type approach would be required in all other cases of plural anaphora. In particular, it seems to be required in cases involving "at least n", "exactly n" and "at most n". (68a) presents a case where an E-type reading on a maximal construal seems to be appropriate. (68b) seems to involve a non-

maximal construal:

- (68) a. John cited at least two papers by Chomsky in his talk. But they were on philosophy.
- b. John put at least three of his own papers on the course reading list and most students cited them in their essays.

Note that in the case of "at least n" where n is greater than one, a pronoun is anaphoric on this phrase will be plural and plural pronouns can pick up either the individuals which are serving as the grounds for what the speaker says, as in (69) below, or the whole intersective set, as seems reasonable in (68a,b).

- (69) At least two men were in the park last night. I heard them talking.

Finally, with other quantificational sentences, such as those discussed in section IV, only the E-type approach is appropriate. Recall examples such as in (70). Note that at least (70d) is most readily understood non-maximally:

- (70) a. Few congressmen admire Kennedy and they are junior.
- b. Most students complained about Jones. They thought he was being sexist.
- c. Most guests brought some uninvited friends. They were turned away at the door by a bouncer.
- d. Every monkey at the zoo is on a special diet; but Johnny was naughty because he fed them chocolate.

To sum up this section: Singular and plural donkey sentences give rise to maximal and non-maximal readings. Overcoming the proportion problem resulting from the original dynamic binding approach to donkey sentences means that only the non-maximal reading is obtainable, without further stipulation. With regard to plural anaphora in cross sentential cases, the pattern

is much the same as in the singular case, the dynamic approach is limited to those peculiar cases where what is taken to be being talked about are those individuals which serve as the grounds for what the speaker is saying. We can assume, as in the singular case, that these are introduced into the discourse via pragmatic inference. In all cases of anaphora, singular and plural, cross-sentential and donkey sentences, the dynamic binding approach is limited to a sub-class of cases and some kind of dual strategy would be called for.

## Chapter 3

### An Issue Based Approach to Context Dependence

#### Section I Introduction

In the last chapter, I reviewed some proposals about the meaning and interpretation of various forms of definiteness. I committed myself to a static approach to definites, including E-type pronouns. However, there are many ways in which the static approach might be worked out. I have argued for a quantificational treatment, on which the restrictive material has to be recovered from the context. It is now time to spell out my proposals in more detail.

Definites and other expressions of quantification, if treated in a non-dynamic framework, need to be supplemented or completed in some way. “Every cat” cannot be given a meaning like  $\lambda Q. \forall x[P(x) \rightarrow Q(x)]$  without specifying what relation the restrictive predicate  $P$  bears to the meaning of the noun-phrase restrictor. It is not enough, as a rule, just to say that  $P$  applies to cats. This problem of context dependence for quantificational phrases is quite general. For instance, “always” can be thought of as expressing a relation between classes of situations, but the restrictive material is often entirely absent, as in “John always drinks coffee with donuts.” Moreover, the contextually recovered material is very often descriptive. That is, “Every cat” is not generally understood as quantifying over cats from among a rigidly determined set of individuals (such as those there in the garden). This fact about natural language has contributed to the breakdown of what I will call the classical semantics-Gricean pragmatics nexus. This will be discussed in section I.

The collapse of the classical semantics-pragmatics distinction means that some other way of dealing with context dependence must be found. In section II, I will look briefly at the dynamic/presuppositional treatment of context dependence. The idea behind this approach is

simple enough: contextual restriction should be seen not as the result of constructing an interpretation in a total model, but rather as the result of delimiting a partial model, the common ground, in certain ways. However, we will see in section II that presuppositional approaches have only provided a limited treatment of context-dependent interpretation.

What some dynamic-presuppositional approaches have in common with the approach I will present in this chapter is the introduction of a new distinction to replace the old semantics-pragmatics distinction. This distinction is between the contribution to interpretation made by linguistically encoded information, on the one hand, and by information recovered via discourse or pragmatic processes, on the other. It is clear that in both types of approach it is necessary not only to specify the linguistic meaning (the first type of information), but to do so in a framework which allows linguistic meaning and discourse processes to interface in an adequately constraining way. I will argue that most theories of presupposition and accommodation fail to provide such a framework.

In sections III through V, I will build up a picture of utterance processing as it takes place at the interface between linguistic systems (which provide information of the first type) and more central, inferential systems (which take this information as input and compute an overall interpretation). A theory of linguistic meaning, on this view, has to specify what information linguistic expressions supply to this process of computing an overall interpretation, as in DRT, for example. But as with DRT, it is only possible to specify the information if one already has a framework for dealing with the information provided. To this end, in sections III and IV, I will outline a view of the conceptual systems which handle this information. I will also present an account of what kind of information context-dependent expressions provide as input to these systems. This account is based on the idea that knowing the meaning of a context-dependent expression involves knowing what it could be used to express. In section IV, I will show how this account deals with “tall”, and also with expressions of quantification other than definites. As a preliminary to the section on definites, I will show how a notion of accessibility based on the logical properties of quantificational expressions can be used to determine what is in the



focus of joint attention, which I have claimed provides a crucial constraint on pronoun interpretation.

In section V, I show how definites (descriptions and pronouns) are to be handled in this framework. I look first at plural definites, and show how to deal with maximal/non-maximal alternation. I look next at singular definites, and show how a uniqueness constraint can be built into the framework. I then turn to the referential use of definites (descriptions in particular), and show how my account can solve some of the standard problems raised by the analysis of referential and descriptive uses of definites. Finally, I tie up some loose ends to do with possessives and non-definite expressions which nevertheless have an implicit 'pronominal' element in their meaning.

## **Section II     The Semantics-Pragmatics Distinction: Classical and presuppositional views**

It has long been recognised that the analysis of context dependence in natural language is intimately related to the issue of how to draw the semantics-pragmatics distinction. In this section, I will look at this distinction from the point of view of both the classical approach to linguistic meaning and more recent dynamic approaches. This will serve as a preliminary to my own account.

### **1     The classical semantics-Gricean nexus**

Let us begin by reviewing how context dependence was treated before the development of dynamic semantics. Consider the discourse in (1):

- (1) *Scenario*: John's father is talking on the phone to John.  
*John's father (to John's mother)*: John wants to go swimming with Bill today.  
*John's mother*: He has a cold.

Let us assume for the purposes of argument that we can treat the pronoun in John's mother's utterance as directly referential, and that Kaplan's treatment of deictic uses of pronouns can be extended to cases where the intended referent is made salient in the circumstances without an accompanying gesture<sup>1</sup>. In a language with indexicals and demonstratives, the meaning of the pronoun is a function from contexts to referents. This can be given as in (2):

- (2) for any  $w$ ,  $\llbracket he_i \rrbracket_{c,w} = \delta_i$  (where  $\delta_i$  is the object of the  $i$ -th demonstration/directing intention of the speaker in  $c$ )

We can then account for the fact that in the scenario in (1), John's mother's utterance expresses the proposition that John has a cold by assuming that the audience can grasp her referring intention. In general, the indeterminacy introduced by referential expressions into the process of determining what is said is entirely uninteresting from this standpoint. The indeterminacy in (1) is a property of strings or utterances. It is no more interesting from a semantic point of view than the fact that (3) poses a disambiguation problem:

- (3) Every bank in Cambridge is flooded.

The existence of indeterminacy may be interesting to those who study the interpretation of utterances, but not to linguistic theories per se. For theories of a language with indexicals and demonstratives, context is defined in relation to indexed referential terms. The logic associated with such a language is defined in relation to this notion of context. One of the features of this kind of approach is that the content of a sentence involving a demonstrative in a given context

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<sup>1</sup> Kaplan mentions similar cases, as when a particularly salient individual has just left the room and someone remarks "I am glad he left."

depends on the indicated object in that context. The hearer can be said to have grasped the proposition expressed by an utterance of such a sentence only if he can identify the object in question.

On the classical static approach, then, the meaning of a linguistic expression is characterised by a theory which explicates how the truth-conditions of the sentences of a language are a function of the meaningful contributions of their parts.

There are several arguments against this traditional approach to linguistic meaning; these have been developed by, among others, Kamp (1979), Wilson & Sperber (1981), Sperber & Wilson (1986/95), Carston (1988) and Recanati (1989) (See Carston 1998 for a review). If one accepts these arguments, one has to cast about for a different view of linguistic meaning; one which interfaces with pragmatics in a more adequate way. I will consider them briefly before looking at possible alternatives.

An adequate theory of meaning and interpretation should meet three conditions. The first is to explicate the 'aboutness' of our understanding of language; that is, how we relate utterances to circumstances in the world. The second is to account for the patterns of inference which speakers naturally recognise as valid. The third is to account for the fact that our understanding of language is largely systematic and productive.

The static approach, which explicates linguistic meaning in terms of a theory which assigns truth-conditions to sentences as a function of the meaningful contributions of their parts, is widely believed to fulfil these conditions unproblematically. The theory is compositional, and therefore fulfils the systematicity and productivity condition. The aboutness condition poses more of a challenge because of the existence of conversational implicature. To see the problem, notice that we would naturally relate the discourse in (4) to sets of circumstances in which I find exactly five pounds, excluding those in which I find more or less than five pounds (say ten pounds or four pounds):

- (4) I needed ten pounds for the concert. I checked my pockets and found five pounds, so I dropped by the bank on the way to the hall.

Such examples can be multiplied at will, and have been used to call into question the most natural analyses not only of expressions like "five pounds" but of logical connectives, such as "or", "and" and so on. If the static truth-conditional theory had to account for judgements about how utterances are related to the world without any appeal to pragmatic or inferential factors, the result would be a massive overgeneration of senses. Inferential pragmatic theories, such as Grice's theory of conversation, enable us to invoke Modified Occam's Razor (Senses are not to be multiplied beyond necessity) and hand over much of the burden of accounting for utterance-world relations to pragmatics. The result is that a static theory of linguistic meaning, together with a Gricean theory of conversation, should be able to deal with the aboutness issue. However, the appeal to Gricean inference does not get the traditional theory out of trouble in accounting for judgements of validity.

Traditional static theories of meaning explicate our judgements about patterns of valid inference in the following way. A sentence has a syntactic structure, and is assigned a set of truth conditions in virtue of that structure. A definition of validity (true in all circumstances) and contradiction (true in no circumstances) can then be provided, and patterns of inference accounted for in terms of the logical properties of sentences of natural language. However, in some cases, it is not sentence meaning alone, as determined by such a theory, which affects our judgements about validity and contradiction, but sentence meaning plus Gricean inference. Some examples involving conjunction, adapted from Carston (1989), Wilson & Sperber (1986), Sperber & Wilson (1997), will illustrate this point:

- (5) (a) It's not true that Mary got angry and Bill left. Bill left and Mary got angry.
- (b) It's always the same at parties: either I get drunk and no one talks to me or no one talks to me and I get drunk.

- (c) If John stopped his car in an illegal position and Bill ran into John, then John is liable for damages.

Bill ran into John and John stopped his car in an illegal position.

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John is liable for damages.

(5a) is generally not perceived as contradictory; nor is the conclusion in (5c) judged to follow from the premises. In (5b), the conclusion is not generally perceived as of the form 'P or P', as it would be on a standard truth-functional account of 'and'. It seems that inferred temporal relations seem to contribute to truth-conditional content.

This kind of data poses a dilemma for the type of semantic theory we have been considering, since Gricean inference seems to be affecting our judgement of validity. The standard truth-functional analysis of 'and' fails to account for the judgements in question since it would claim that a sentence of the form  $[[S_1 \text{ and } S_2] \text{ or } [S_2 \text{ and } S_1]]$  is redundant; and that sentences of the form  $[It's \text{ not true that } [S_1 \text{ and } S_2]]$  and  $[S_2 \text{ and } S_1]$  are contradictory, and so on; and since Gricean pragmatic implicatures, by definition, do not enter into the specification of the truth conditional content (the what is said) of an utterance<sup>2</sup>.

One possible solution would be to abandon a unitary truth-functional analysis of "and", and suggest that it can also mean "and then", "and as a result", etc. However that would contravene Modified Occam's Razor, since the perceived temporal or consequential relations can clearly be explained on Gricean pragmatic grounds<sup>3</sup>. An alternative might be to claim that the sentence embedded under negation in (5b) and the second sentence in (5b) express different propositions because the past tense contains a contextual parameter which refers to some temporal index. The

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<sup>2</sup> Grice himself was aware of these kinds of examples and of the problems they posed for his program of defending a traditional approach to the logical properties of natural language (see Grice Logic & Conversation Lecture VI).

<sup>3</sup> In fact, this would not solve the problem, since as Grice himself pointed out, exactly the same temporal and causal relations can be inferred if 'and' is replaced by a full-stop.

fact that (5b) can be understood as non-contradictory would then be no more remarkable than the fact that (6) can be understood as non-contradictory:

(6) That is not that.

That is, (5b) would be non-contradictory because the deictic components of the past tense morphemes in the sentences in (5b) would differ in character, being functions from distinct contextual features to content. However, it seems clear that the past tense should not be treated as directly referential in this way. It is quite possible to understand a past tense sentence fully without being able to identify the time (period) being referred to. One could, of course, suppose (following Partee (1984)) that past tense is pronoun-like in its meaning, but this could only be so if we understand that proposal in E-type terms (in the sense being argued for here) or dynamic terms; and on either of these accounts, the temporal relation can only be recovered via pragmatic inference.

An alternative solution, which is advocated by Wilson & Sperber (1981), Sperber & Wilson (1986/95), Carston (1988) Kempson & Cormack (1986), Recanati (1989)), Kamp (1979), and Roberts (1990) among others, is to abandon the traditional static view on which the proposition expressed by an utterance is solely determined by the truth-conditional contribution of its linguistic meaning. One possibility is to suppose that the language which supports the logic behind the judgements of validity is an intermediate 'internal' representation system. On this approach, linguistic meaning is characterised by the semantic component of the grammar, which puts syntactic representations into systematic correspondence with internal representations, which can themselves be mapped onto semantic objects in the usual manner. Although it is not an entirely straightforward matter to state the conditions under which pragmatically inferred information of this type enters into the proposition expressed, this alternative to the traditional static analysis at least provides an account of judgements of validity, and does not fall foul of Modified Occam's Razor. I will adopt this position in what follows.

## 2 Dynamic presuppositional alternatives

I suggested above that the temporal relations inferred in the examples involving conjunction could get into the proposition expressed if the anaphoric-like properties of past tense could be analysed along similar lines to descriptive accounts of E-type pronouns. Although I am not aiming to provide an analysis of tense in this thesis, I do not think this suggestion is unreasonable, since the E-type account just is a means to get descriptive content into the interpretation of utterances containing context-dependent expressions. Moreover, accounts of this type can leave the determination of actual descriptive content up to general pragmatic processes, which would explain why reversing the order of conjuncts in event-describing conjunctions is likely to lead to different results.<sup>4</sup> Given a pro-like analysis of tense, it is easy to see why “John left and Mary got angry” is normally understood as expressing the claim that John left at such and such a time and Mary got angry a little bit later than that.

We have already seen in chapter 2 that descriptive content can enter into the proposition expressed by utterances involving context-dependent expressions. This presents problems for the classical static account, which can really only handle context dependence when it is indexical in some way. We have seen in chapter 2 that this type of underspecification in general cannot be characterised in terms of context set variables, since we take an utterance of the second sentence in (7) below to express the proposition that every guest at John’s party (at such and such a time) brought a gift. An analysis based on a context-set variable relativised to a contextually-determined assignment would pick out the guests in the world of the context of the utterance, and the proposition expressed by the second sentence would rigidly depend on those individuals in counterfactual circumstances, contrary to intuition:

(7) John gave a party. Every guest brought a gift.

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<sup>4</sup> See Carston (1988, 1993, 1998) and Wilson & Sperber (1997) for an account of the pragmatics of temporal reference resolution.

Before we consider how to account for the linguistic meaning of context-dependent expressions in general from the perspective of a theory involving an intermediate level of representation, I would like to consider how the phenomenon might be treated within a dynamic framework, since the dynamic approach can normally be implemented with or without an intermediate level of representation.

So far, I have only looked in detail at the treatment of pronominal anaphora within this approach. We saw that even this paradigm case presented problems, and that an E-type approach, if suitably constructed, would be preferable. Nevertheless, I will briefly review some possible analyses of other types of context-dependent expressions in this framework, and outline some criticisms developed in Asher & Lascarides (1998). I will concentrate on definite descriptions, but it should be clear how the arguments would generalise to other cases.

It has often been noted that there is a close connection between dynamic binding and presupposition satisfaction. Indeed, the requirement that the discourse referent introduced by a pronoun be identified with some accessible discourse referent can be construed as just a special case of presupposition satisfaction. In the dynamic approach, the meaning of a sentence is analysed as a relation between input states and output states. Presuppositions are seen as imposing constraints on input states (contexts). Heim (1982, 1983) analyses definite descriptions as carrying presuppositions. Basically, her felicity condition for "the F" imposes the constraint on input contexts that they entail that there is an F. Of course, definite descriptions are often used in discourses which do not antecedently meet this constraint:

(8) Mary took the picnic supplies out of the trunk. The beer was warm.

In such cases, the mechanism of accommodation is invoked. For the discourse in (8), the presupposition that there is beer has to be accommodated in order to satisfy the felicity condition on definite descriptions.



In principle, then, a dynamic theory with presuppositions and an accommodation mechanism should be able to deal with the fact that descriptive material can sometimes find its way into the interpretation of utterances containing definites.<sup>5</sup> However, there are several problems with this type of account as it stands. Firstly, although there has been some discussion of how to constrain the accommodation mechanism (see Heim 1983 and van der Sandt 1992) the existing constraints do not seem to be strong enough<sup>6</sup>. As Asher & Lascarides (1998) note of their example (3) p.2 ((9) below), neither Heim's nor van der Sandt's system of accommodation can predict the difference in acceptability between (9d) and (9c) below in the context of (9a,b):

- (9) a. A: Did you hear about John?  
b. B: No, what?  
c. A: He had an accident. A car hit him.  
d. A: He had an accident. ?? The car hit him.

Such examples pose quite a serious challenge for theories of accommodation.

From the present perspective, another serious problem with the presupposition-accommodation approach is that in cases such as the bridging example (8) above, it yields interpretations which are too weak. We saw in (8) that the presupposition that there was beer must be accommodated in order to satisfy the felicity condition on the definite in the second sentence. However, we normally understand the second sentence to mean, more specifically, that the beer which was among the picnic supplies that Mary took out of the trunk was warm. This is not entailed by a presupposition account. The problem, as Asher & Lascarides note, is that in dynamic theories

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<sup>5</sup> I leave aside the problematic status of the notion of the proposition expressed in a theory which can strictly speaking only define the content of an utterance in terms of the relation between input and output states which is actually instantiated in an utterance circumstance (that is, the difference in information content between the input and output states).

<sup>6</sup> I shall not discuss these theories of accommodation in detail here. Generally, though, the constraints proposed are quite weak. For van der Sandt, there are two: that the result of accommodation should be consistent, and that it should not render any part of the asserted content uninformative.

of presupposition, "accommodation amounts to adding, but not relating, presupposed content to some accessible part of the context" (p.3).

It should be clear from these two sets of examples that our understanding of definites in bridging cases involves some extra-linguistic inferences, which are constrained by some kind of discourse principles. The notion of accommodation sheds no light on what drives these inferences, and it does not succeed in describing what constrains them.

As regards the dynamic notion of presupposition, from one point of view, it is just a statement of the fact that, for instance, "the beer" is used to talk about some beer. Clearly this should follow from any account of the linguistic meaning of the expression. It is also a means of dealing with intuitions about valid patterns of inference, as discussed above. For instance, we understand (10) below as implicitly restricted to cases where the picnic supplies include beer:

(10) If you don't ice your picnic supplies, the beer will get warm.

Such examples are generally seen as involving presupposition projection. They have also been seen as providing evidence for a non-quantificational, presuppositional approach to definites, since the existential implications of the definite in the consequent are not carried by the sentence as a whole. However, (10) is just another case of pragmatic supplementation of content. A presuppositional theory has to invoke accommodation in the antecedent sentence in order to get the facts about presupposition satisfaction/projection right. Similar enrichments of the antecedent are also available in a quantificational approach; as a result, there is no existence implication for the sentence as a whole, and therefore no problem for the quantificational approach.

Dynamic presuppositional theories in general suggest a division of labour in explaining how context-dependent expressions are understood. Specifying of presuppositions amounts to spelling out the information that these expressions carry about their interpretation. The accommodation part of the theory can be seen as an attempt to characterise the discourse principles governing the

interpretation of such expressions on a given occasion of use. As I have shown, the accommodation mechanisms are not fully adequate as they stand.

This same division of labour has long existed in the pragmatic tradition which has emerged since the breakdown of the classical-semantics-plus-Gricean-implicature nexus. In particular, within the relevance-theoretic framework, it has long been argued that understanding an utterance (which includes grasping the proposition expressed) involves both information recovered via the semantic component of the grammar and information recovered via inference. The inferential phase of comprehension is constrained by a pragmatic principle (of relevance) which governs the processing of ostensive stimuli (including utterances). In the next sections, I will propose a treatment of context-dependent expressions within the relevance-theoretic framework.

### **Section III The semantics-pragmatics distinction: The ‘psychological’ view**

#### **1 An intermediate level of representation**

Within the relevance-theoretic framework, the interface between linguistically-derived meaning and pragmatically derived meaning lies at a level of representation which is widely (though by no means universally) seen as the point at which information derived via perception is integrated with information retrieved from memory for purposes of the fixation of belief<sup>7</sup>. On this view, the grammar is one of the modular input systems. It yields representations which can be further processed by more central, inferential systems. In particular, these representations can be embedded in speech-act or propositional-attitude descriptions which provide the premises and conclusions of inferences about the speaker’s informative intention. Often, however, the output representation of the grammar itself has to be enriched in the process of drawing such inferences. To take an example from Carston (1998), an utterance of (1a) by John in a certain situation may

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<sup>7</sup> For a classic statement of this kind of view, see Fodor (1983, 1990, 1998); see also Millikan (1998) among others.

result in the audience making the attributions in (1b,c)<sup>8</sup>:

- (1) a. Mary plays well.
- b. John has said that Mary plays the violin well.
- c. John believes that Mary plays the violin well.

We have already seen the need for such enrichment in cases where ‘accommodation’ is required in the antecedent of a conditional. It is easy to imagine the material conditional in (2) below being uttered in a circumstance where it is assumed that there are picnic supplies, but not necessarily that they contain beer:

- (2) If John hasn’t iced the picnic supplies, the beer will be warm when we get to the beach.

On the assumption that (2) is interpreted via some intermediate level of representation, its antecedent will provide at this level the information that John hasn’t iced the picnic supplies, which include some beer.

In the literature on presupposition, the result of such inference processes is often represented in DRSs. However, if we leave aside the claim that context dependence or presupposition is a dynamic phenomenon (in the sense that it calls for a characterisation of meaning in dynamic terms), there is no reason other than convention for using the language of DRS for this purpose. Instead, I will use a language for a typed lambda calculus to characterise the forms of these representations. At this stage, my main interest is in how we understand what the symbols in this intermediate language are symbols of. To explain this, I need to spell out the connection between these representations and the conceptual systems. This will be the subject of the next section.

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<sup>8</sup> I am assuming that this is not a case of syntactic ellipsis: that is, there is no reconstruction of the second argument at the level of LF.

In the rest of this thesis I will be using a fairly simple version of categorial grammar in describing the mappings from sound to meaning<sup>9</sup>. Further detail will be given in later sections. For present purposes, we need only note that in the type of categorial grammar I will be using, (see Jacobson (1995)) expressions are associated with triples of phonological, syntactic and semantic information. For instance, the verb phrase in the sentence, "John has a cold" will be assigned the triple  $\langle [\text{has a cold}], \text{S/NP}, \lambda x[\uparrow \text{has}'(\text{det}_3(\text{cold}'))(x)] \rangle$ . The first entry contains phonological information, the second categorial information and the third semantic information. In my account, the semantic entry will simply be an expression of a language for a typed lambda calculus. Here, the verb phrase is an expression of type  $\langle e, t \rangle$ . It is a feature of categorial grammars that they make the relationship between the syntax and the semantics transparent. Thus, any well-formed expression of category S/NP will have a semantic entry of type  $\langle e, t \rangle$ . Expressions of this category can, for instance, combine with those of category NP, which are of type  $\langle e \rangle$ , to form expressions of category S, of type  $\langle t \rangle$ . If we associate "John" with the triple  $\langle [\text{john}], \text{NP}, \text{john}' \rangle$ , the rules of categorial and semantic combination allow us to form the triple,  $\langle [\text{john has a cold}], \text{S}, \uparrow \text{has}'(\text{det}_3(\text{cold}'))(\text{john}') \rangle$ .

In the categorial framework, the triples for complex expressions, e.g. verb phrases and sentences, are built ultimately out of *lexical items*. These are themselves triples which are drawn from the lexicon: for instance, "cat" will be associated with the lexical item,  $\langle [\text{cat}], \text{S/NP}, \text{cat}' \rangle$ . How is the semantic entry for "cat" determined? The word is normally associated semantically with the property of being a cat. How does the language user know this? A standard answer is that if we know what "cat" means, we must have a cat-concept which, for instance, enables us to discriminate cats from non-cats, and so on. It is this concept which enables us to determine the

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<sup>9</sup> This is mainly because it will be convenient when we deal with binding. In chapter 2, I used a simplified generative grammar in dealing with plurals. I do not think that there is a great conflict here. Much of what can be said in categorial grammar can be translated into a framework using trees, movement and so on. See Cormack (1995) and Cormack and Breheny (1994) for some work in this line.

extension of "cat" in a given circumstance of evaluation.

In computational-representational theories of mind, concepts are themselves seen as constituents of mental representations, expressing properties, relations and so on. On this approach, certain natural-language expressions (those corresponding to words) can be put into correspondence with concepts via the lexicon. When an expression appears in an utterance, the concept is activated, and it provides the semantic entry for that expression. In computational terms, we can think of the semantic entry as provided by the presence of the activated concept in the audience's representation of the content of the utterance (the proposition it expresses). On this approach, the grammar can be viewed functionally as the mechanism which mediates the construction of such representations. The (cognitive) domain of this mechanism is the set of stimuli defined as well-formed by the phonological and syntactic components of the grammar. The semantic component of the grammar licenses the representations built in response to these stimuli. When an expression is associated with a triple of phonological, syntactic and semantic entries, the semantic entry - presented here in a translational language - is thus meant to reflect the content of the representation licensed by the grammar. I will also assume that these expressions of the translational language reflect the propositional form of the associated representations. In this manner, we account indirectly for the semantics of utterances, via a model theory for the translational-cum-representational language.

To give a flavour of how this works, I will use some principles of the grammar presented in Jacobson (1995) to analyse the sentence "A cat prowls". The first principle shows how expressions from different categories may be combined.

- (3) Given an expression  $\alpha$  with phonology  $[\alpha]$  and category A/B and an expression  $\beta$  with phonology  $[\beta]$  and category B, there is an expression  $\gamma$  with phonology  $[\alpha\beta]$  of category A.

As noted above, it is also a principle of this type of approach that a syntactic category

corresponds to just one semantic type, and that if category A corresponds to semantic type  $\langle a \rangle$  and category B to type  $\langle b \rangle$ , then category A/B corresponds to type  $\langle a, b \rangle$ . Given this, the semantics corresponding to the syntactic rule in (3) can be given straightforwardly in terms of function application, as in (4):

- (4) Let  $\alpha$  be an expression:  $\langle [\alpha], A/B, \alpha' \rangle$  and  $\beta$  be an expression:  $\langle [\beta], B, \beta' \rangle$ . Then there is an expression  $\gamma$  as follows:  $\langle [\alpha\beta], A, \alpha'(\beta') \rangle$ .

Suppose, now, that the lexicon contains the following information:

- (5)  $\langle [a], S/(S/NP)/(S/NP), \text{det}_3 \rangle$   
 $\langle [\text{cat}], S/NP, \text{cat}' \rangle$   
 $\langle [\text{prowl}], S/NP, \text{prowl}' \rangle$

Then the rule in (4) tells us that the following are well formed:

- (6)  $\langle [a \text{ cat}], S/(S/NP), \text{det}_3'(\text{cat}') \rangle$   
 $\langle [a \text{ cat prowls}], S, \text{det}_3'(\text{cat}')(\text{prowl}') \rangle$

The last triple shows that a representation with the form  $\text{det}_3'(\text{cat}')(\text{prowl}')$  would be licensed by an utterance of the sentence "A cat prowls". An individual hearer will be able to make judgements about what kinds of circumstances this representation holds of and what kinds of inferences can be drawn from it, to the extent that he has an adequate grasp of the concepts involved: for example, he can discriminate cats from other creatures, and prowling from other forms of locomotion, and he has the appropriate quantificational concept. I will be assuming that quantificational concepts are definable in terms of the role they play in inference. I will therefore characterise such concepts using the kinds of equivalences I have already set up, e.g. in (7):

- (7)  $\text{det}_3'(\mathbf{A})(\mathbf{B}) \leftrightarrow \{X: \mathbf{A}(X) \wedge \mathbf{B}(X)\} \neq \emptyset$

This is meant to be read simply as a (declarative) characterisation of the inferential role of a quantificational concept in a cognitive system. However, (7) is not necessarily the last word on the specification of this quantificational concept since I am including quantified noun phrases in the class of context-dependent expressions.<sup>10</sup> I now need to describe what happens when such an expression occurs in an utterance.

## **Section IV    The conceptual systems and context-dependence**

### **1        Basic issue**

Having sketched a view of how linguistic stimuli are processed, I can now state the basic issue in the analysis of context-dependent expressions. If the output of the grammar for "A cat prowls" is a conceptual representation of the proposition we intuitively take an utterance of that sentence to express, what is the output of the grammar for a sentence containing a context-dependent expression, for instance, "Mary is tall"? It seems reasonable to claim that our understanding of utterances of this sentence is due in part to our conception of tallness. There is a problem, though. The concept which interprets the word "tall" will have to be such that it expresses a fixed property in a given interpretation, but the concept which does interpret this word will be such that the property it expresses will be different to that which is expressed by the concept which interprets the word on other occasions where it is encountered. I assume that concepts are to be individuated by their content, at least in the sense that different contents imply different

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<sup>10</sup> I hedge here only because the incorporation of noun phrases headed by persistent determiners (e.g. as the existential) into the category of context-dependent expressions is not as urgent as the incorporation of examples with non-persistent determiners. "Some students left" can be understood as expressing a perfectly comprehensible proposition by a hearer who is not in a position to ascertain whether a particular set of students is being talked about, or which one. (Cf noun phrases headed by "every" and "most" etc). Nonetheless, I will be including such expressions in the analysis of context dependence, if only for completeness' sake: "Some students left" is usually understood as talking about a contextually-specified group of students, in spite of the non-necessity of this construal.



concepts.<sup>11</sup> It therefore seems that the conceptual representation constructed in response to an utterance of "That man is tall" will differ with regard the predicative concept from the one constructed in response to an utterance of "That tree is tall".

There are two possible ways of dealing with this. We might treat the output of the grammar as an incomplete conceptual representation, with a variable-like element whose content is fixed differently on different occasions. Or we might treat "tall" as invariably interpreted by an atomic concept, which might differ from occasion to occasion. It is not clear that there is much difference between these two positions, at least in where comparative adjectives are concerned. I will use the second option, mainly because of its general applicability and its use in analysing certain properties of definites and binding; it also fits with the general picture of the conceptual systems and word meaning that I will sketch below. It is perhaps worth noting, though, that on the first option, the variable-like element in the output representation cannot be a variable as such. Rather, it must be something like a variable in a pattern-matching language, so that processing the representation would involve substituting a conceptual representation for the variable. It would not be a matter of finding a value for the variable. This is so since the proposition expressed by "a is tall" generally does not depend on a rigidly defined set to be found in the context. Suppose, for example, that I utter (1) in present-day Britain, of Mary, who is five feet four inches tall.

(1) Mary is tall.

Given the way things are in contemporary Britain, what I have said would probably be counted as false. However, if we consider a counterfactual circumstance in which, for reasons to do with general standards of nutrition, the average height of women in Britain had remained much the same as it was at the turn of the twentieth century (where, apparently, it was below five feet tall),

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<sup>11</sup> I leave open the question of whether same content implies same concept. There may be a case for invoking modes of presentation to deal with cases where extensionally equivalent concepts differ (see Fodor 1998).

the proposition expressed by (1) would be regarded as true. This shows that if the conceptual representation associated with (1) is something like *tall\_for\_X'(m)*, the variable element should not be fixed by taking as the comparison class the women in contemporary Britain as it actually is in the circumstances of my utterance. Instead, the proposition expressed would be captured by a representation in which the variable element is replaced with descriptive content, e.g. *tall\_for\_British\_woman(m)*. In this regard, "tall" behaves like "every guest" did in the example discussed in the last section. I should note in passing that Klein's seminal (1980) analysis of such adjectives makes the choice of comparison class rigid with respect to the context of utterance, thus predicting that the proposition I express by uttering (1) in contemporary Britain would still be false in the counterfactual circumstance described.<sup>12</sup>

Let us suppose, then, that the output of the grammar for my utterance "Mary is tall" is of the form, *tall\_i'(m)*. In interpreting this utterance, the hearer will need to decide whether I intended him to entertain a thought involving a concept (of tallness) drawn from his existing conceptual repertoire, or whether he will have to construct a new meaning for this word. It is possible for an utterance like (1) to be interpreted using the existing conceptual repertoire. The hearer could have a concept of *tallness-for-a-woman* - lexicalised as "tall"- which is just the one I intended. If not, the hearer will have to set up a new conceptual address and construct an associated conception of tallness. This would probably happen in a case where the hearer is not much of a horticulturalist and I draw his attention to a cherry tree, saying, "That cherry tree is tall". The atomic concept approach, then, implies a view of the conceptual system on which new concepts

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<sup>12</sup> See his discussion of comparison classes pp 12-16. Comparison classes are introduced into his analysis via a function,  $Y$ , from contexts to subsets of the universe of discourse which serve as the comparison class. Thus, for a model,  $M = \langle U, F \rangle$ , the valuation of a symbol which is in the class of adjectives is defined according to (a):

- (a)  $Y$  is a function such that whenever  $c \in C$  and  $\alpha \in Adj$ ,
- (i)  $Y(c) \subseteq U$
  - (ii)  $F_\alpha(c) \in \{0,1\}^{(Y(c))}$

are constructed regularly in response to utterances. Given the traditional view of concepts as fixed, stable and common ideas held by a community, an approach along these lines might be seen as stretching the notion of 'concept' beyond reasonable limits, I could be accused of terminological confusion, classifying strictly linguistic phenomena as conceptual.

Regarding the second point, the ability of "tall" to mean different things in different contexts is not a strictly linguistic phenomenon, in the sense that its explanation ought to fall under phonological or syntactic components of the grammar. Notice that in the case of verb-phrase ellipsis, a form of morpho-syntactic identity is required if the construction is to be well formed. If the different senses of "tall" are discriminated at the level of syntax, we would expect (2) to be ill-formed on the intended reading where Mary's son is ten years old:

(2) Mary's son is tall, but then Mary is too.

In fact, though, this example would be quite acceptable on this interpretation. This point is made (for different purposes) by Klein (1980), who also points out that the kind of linguistic parallelism required for ellipsis does not extend to the contextual restriction of the quantified noun phrases either. This was discussed in chapter 2:

(3) On Sunday, John hosted a bridge party while Mary took the children to the beach. At the end of the day, John said that everyone had a good time; and Mary did too.

As regards the objection that the type of analysis envisaged stretches the notion of a concept beyond reasonable limits, I think that it is possible to argue that the stability of a concept is more a matter of degree. This view has recently been defended by Sperber & Wilson (1998) on philosophical and psychological grounds; see also Carston (1996, 1998), Barsalou (1989). I will spend a little time fleshing these ideas out in more detail.

## 2 The conceptual system

If we see the intentionality of human cognition as residing in the conceptual system, concepts will be individuated by their 'wide content', i.e. their information bearing properties. This view has been forcefully argued over the years by Jerry Fodor<sup>13</sup>, and it is one that I am willing to endorse. On this approach, words inherit their content from the concepts which interpret them. But concepts do more than serve as word meanings; indeed many relatively stable concepts may not even be lexicalised.<sup>14</sup>

From a psychological as opposed to a semantic perspective, we are interested in the role of concepts in information processing, storage and retrieval. From this perspective concepts are often thought of as pointers to files where information about the extension is stored. Many more or less permanent files will be set up for different cognitive purposes. One function of concepts (Millikan 1998) is to provide a repository of information useful for re-identifying category members, for processing information about them and storing any new information acquired. Another purpose is to enable inferences to be drawn. This function is emphasised in relevance-theoretic approaches, where the goal of information processing is to enable inferences to be drawn.

The assumptions I am making about concepts, then, are that they may be more or less permanent, they need not be lexicalised and they are purpose specific. Indeed, one reason why a non-lexicalised concept may be relatively long-lasting is precisely because of its utility. For instance, to adapt an example from Carston (1996), if Mary's job involves attending many different committee meetings, board meetings, public meetings and so on, she may develop a fairly well entrenched and purpose-specific conceptual repertoire pertaining to meetings. She may have

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<sup>13</sup> See Fodor (1998).

<sup>14</sup> See Sperber and Wilson (1998), who argue that we may have a non-lexicalised concept of *uncle or aunt*; or of *sibling* which, though lexicalised in English, is not in French. Presumably we do usefully think with these categories, have beliefs involving them, and so on.

fairly stable concepts of certain types of behavioural traits which are useful for predicting the behaviour of others in meetings, and so on. It may be that none of these concepts is lexicalised in the sense that there is a publicly established mapping between a word and a concept. However, this does not mean that Mary cannot describe these properties or communicate thoughts involving these concepts. In appropriate circumstances, she may be able to do this by speaking metaphorically. For example, if Mary and a colleague are discussing the merits of endorsing Bill for chairman of a particular planning committee, Mary may remark, "He'd be a bit of a bulldozer". If her audience already has a concept of the type of chairperson who prefers to push motions through regardless, she can expect him to deploy it in understanding what she means. If she is talking to someone who lacks the relevant background experience, she cannot expect her utterance to be understood in the same way, by deploying an existing concept. Nevertheless, she can expect the novice, using his knowledge of bulldozers, to draw some of the inferences about Bill that the experienced colleague can. The novice may even set up a relatively permanent file for the bulldozer-type, using his encounter with Bill to add information to it and flesh out the picture of what this type is like. In such a case, the novice will be effectively acquiring a new concept through communication, while Mary has acquired it through experience and succeeds in communicating it via language. Of course, many concepts acquired Mary's way will already have a public label, so learning the meaning of a word will often amount to associating the label with a pre-existing concept.

Concepts, then, may be more or less permanent and stable in an individual's mental life. The degree of permanence, and especially of stability, will depend, in part, on the extent to which a community of people share a concept, and communicate thoughts involving it. The fact that concepts are purpose-specific has implications for their analysis. I would now like to argue that, to some extent, the concepts which interpret context-dependent expressions are purpose-specific to communication.

Returning to the novice hearing Mary's utterance "He'd be a bit of a bulldozer", the relevance-theoretic framework has viewed the comprehension process in two different ways. The first view,

set out in Sperber & Wilson (1986/95, 1985/6), is in some ways more classically Gricean, although it departs from Grice's treatment of metaphor in some important ways. On this view, the output of the grammar is a conceptual representation in which the concept which applies to bulldozers (the building machinery) appears. Of course, the hearer does not attribute to the speaker the intention to communicate a belief involving this concept. The assumption is that this concept is used to interpret some related concept that the speaker does have in mind, and does wish to communicate, and that by processing the literal meaning of "bulldozer", the hearer will be able to gain an adequate idea of this related concept's inferential effects. On this view, the speaker does not communicate the proposition expressed, but does intend to communicate enough of its inferential effects to make the utterance optimally relevant.

On the second view, the one sketched above, the novice constructs an ad-hoc concept, based on the existing concept for "bulldozer", and proceeds to inquire into what kinds of characteristics the extension of this new concept has. We can regard this inquiry as guided by a basic *issue*: What must an individual be in order to count as a bulldozer? The process of building up a such conception is much the same as that assumed to take place under Sperber & Wilson's original view of metaphor: a search for inferential effects guided by an expectation of relevance. Except here, one would be making assumptions about bulldozers in general. Of course the relevance of the utterance will still largely turn on attributing properties being filed in this new conception to Bill, since the practical concerns in the circumstance have to do with what we can expect if Bill is made chairman. One difference between the two approaches lies in the fact that the original issue is resolved indirectly by the at least partial resolution of the issue of what a bulldozer is. But the main difference is that in the second approach, a newly-constructed ad hoc concept is seen as contributing to the proposition expressed by the utterance, and therefore to its truth conditions. This presupposes a degree of flexibility which I propose to appeal to in the analysis of context-dependent expressions.

### 3 Context dependence

The flexibility of the conceptual systems is underwritten, I assume, by more basic cognitive abilities. These include the ability to reason spatially, keep track of objects in space and time, make comparative judgements, count, identify individuals and properties and store information about them, think about alternative or potential states of affairs, about other mental states, and so on. These abilities enable children and adults to set up new concepts in order to think more effectively about the world. I have argued that such concepts may be set up either through direct experience with the world or through encounters with language. In the latter case, an encounter with a new word leads to the setting up of a file together with the activation of an issue or issues about the extension of the novel concept. An adequate understanding of a newly-encountered word depends on the ability to resolve the issues thus raised.

On this approach, a word will have a stable meaning in a language community if the members of that community routinely associate the word with the same concept. Notice, though, that we also want to say that words such as "tall", "local", "arrive" and so on have a stable meaning, even though they are understood as communicating different concepts on different occasions of use. This suggests that we will need to invoke a kind of character/content distinction. In the case of words like "cat", the character can be seen as determining the selection of a single concept from the fixed conceptual repertoire on each occasion of use. In the case of context-dependent words like "tall", the character can be seen as determining the choice of a different concept on each occasion of use.

How is the character of these context-dependent expressions to be thought of? We can gain some clues by considering again what happens when a hearer sets up a new file in response to metaphorical language use. I said that this move immediately raises issues about the extension of the concept: In the "bulldozer" case, the hearer starts virtually from scratch. The issue is, what must something be to count as a bulldozer? In the case of words like "tall", "local", "arrive" etc, although a new file is set up, the issues raised are more precisely focussed, and the range of

possible inferences is more tightly constrained. We could suppose that in addition to the setting up of a new file, certain inferences are routinely inserted into the file and certain issues are routinely raised. The resolution of the issues, together with the information already inserted in the file, will lead to an adequate conception of the concept's extension. In order to understand these words, one must realise that they are used to communicate comparative judgements, locational properties, changes of location and so on; but one must also realise that aspects of these judgements, properties, etc. are unknown.

My proposal is that these context-dependent words are associated with schematic concepts. The presence of such a word in an utterance will cause a new concept containing partial information to be set up, and will simultaneously raise issues whose resolution will enable the audience to grasp the novel concept expressed. Thus, specifying the 'character' of these expressions will amount to specifying the nature of these schematic concepts, and spelling out what issues are raised by their use. I will illustrate using "tall" as an example.

#### **4 "tall"**

In this section, I will sketch an analysis of "tall" using this issue-based approach. The intention is not to develop a full-fledged semantics for "tall", but merely to illustrate this approach.

First, we need a framework in which to characterise the issues raised and the conditions under which they are resolved. In developing this framework, I will start by saying something about the basic logic of issues, then show how issue resolution fits into the general picture of utterance processing.



## 4.1 The semantics of issues

In this section, I will set out a basic semantics for issues. Since I will be interested mostly in issues raised for an individual in processing utterances involving novel concepts, I will not propose a full account of the semantics of the question forms in natural language. In what follows, I draw heavily on recent work by Ginzburg (1995) and Asher & Lascarides (1997), which is quite close in spirit to the relevance-theoretic approach to interrogatives outlined in Wilson & Sperber (1988).

In the formal-semantic tradition, the semantics of natural-language interrogative forms (questions) has often been cast in terms of answers: to know the meaning of a question is to know what counts as an answer to that question. This treatment of questions abstracts away from issues of relevance. The form of a question is seen as determining a class of answers, from which relevant answers can be selected by pragmatic means. The form of a question such as "who left?" is generally analysed along the lines in (4a), although for reasons I will allude to shortly, I would favour the analysis in (4b):

- (4) a.  $? \lambda x. \text{left}'(x)$   
b.  $? \lambda P. \text{det}_{\exists}(P)(\text{left}')$

Let us suppose, then, that questions in general have the form in (5):

- (5)  $? \lambda v. \phi$

As noted above, semantic analyses of such forms are generally given in terms of answers. However, there has been some debate about what kind of answers are involved. In particular, there is an issue about whether only strongly exhaustive, exhaustive or non-exhaustive (partial) answers are concerned. A strongly exhaustive answer to "Who left" would be "Only Mary (left)", or "No-one". An exhaustive answer (in a circumstance where only Mary left) would be "Mary".

A non-exhaustive (partial) answer would be "A student". This debate hinges on what Mary is said to know in an utterance of "Mary knows who left". In my view, this utterance would not be false if Mary could not supply a (strongly) exhaustive answer. This point is particularly clear in the examples in (6), which involve other types of wh-question, or negative contexts.

- (6)
- a. Mary knows who sells those computer parts.
  - b. Mary knows where you can buy an Italian newspaper.
  - c. Mary doesn't know who went to the party.
  - d. No-one knows who informed on them.

These examples display the same pattern of maximal/non-maximal alternation seen in definites, which suggests that wh-phrases ought to be analysed as in (4b) above<sup>15</sup>. I would therefore propose that a question of the form in (5) should be defined in such a way that its extension in a circumstance is the set of true propositions (answers) which complete the abstract:

$$(7) \quad \llbracket ?\lambda v. \phi \rrbracket^w = \{p: p := [\alpha/v]\phi \ \& \ \alpha \in \{\beta: w \models [\beta/v]\phi\}\}$$

The intension of a question is then a function from worlds to sets of propositions.

Let us say that a proposition is a response to a question if it answers that question: that is, if it entails an element in the question's extension (i.e an answer). Of course, a response may be more

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<sup>15</sup> As noted above, I do not intend to defend a full analysis of question forms in English in this thesis, even though the patterns of alternation in wh-questions and plural definites are fairly similar. I merely wish to suggest that an account along the lines in (4b) would be a good starting point if we assume that the semantics of wh-words should be treated in terms of the grammar for plurals set out in chapter 2. In that case, given (7), the variable abstracted would be that of a plural predicate. Hence, the set which is the extension of a question will include propositions involving the unit set containing the maximal set of those who left and the set of sets of those who left. Of course "who" in English is grammatically singular, so some argument for treating the form as plural would have to be given. Note also that (6d), the non-maximal interrogative, is of the bound-into variety. The general analysis of binding in the next chapter would give an account of this as well.

or less acceptable. For an uttered response to be acceptable, the audience must be able to grasp the proposition expressed, which must also be relevant in the expected way.

This makes the semantics of questions very weak. For instance, the proposition that at least two students left the talk early would count as an answer to the question "who left the talk early?". But this response could be relevant in a given context, and may well count as acceptable. Embedding constructions, such as "know" and "tell", impose stronger constraints, and these would have to be encoded into the meaning of these verbs (see Ginzburg (1995) for suggestions).

## 4.2 Issue resolution

However weak this semantics, it is adequate to characterise the role of issues in the internal goal-directed reasoning processes that concern me here. For example, if I plan to wear my favourite blue shirt, implementing this plan will involve achieving the goal: locate the favourite blue shirt. I can organise this process around the issue  $? \lambda L.at'(L)(fbs)$ , testing hypotheses about possible answers as they occur to me:  $at'(closet)(fbs)$  etc. In this case, I will have a response when one of my hypotheses gets confirmed, but the response will be adequate only when the information obtained has sufficient bearing on the overall goal of realising my sartorial plans. The issue will finally be resolved when the information obtained enables me either to satisfy my goal or abandon it, in which case, I would have to amend my plan.

In utterance comprehension, the overall goal is to establish the speaker's informative intention. From the relevance-theoretic perspective adopted here, the comprehension process is guided by specific expectations of relevance. Hypotheses about the speaker's informative intention will be evaluated against an expectation of optimal relevance.<sup>16</sup> As the notion of optimal relevance involves considerations of effort, hearers are assumed to test and evaluate hypotheses in order

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<sup>16</sup> The notion of optimal relevance will be discussed in more detail in chapter 5.

of accessibility.

When a hypothesis about the speaker's overall intention satisfies this expectation, the process stops and the intention that the hearer derive the effects that they have is attributed to the speaker. Effects are most often the result of the inferential role that the proposition expressed by the current utterance plays in the context of information that the audience has accessible. Thus, in order that the audience can decide on what the speakers intended effects are, they most often have to decide on what proposition the sentence uttered is meant to express. So a series of sub-tasks are routinely created in the processing of utterances around the goal of determining the proposition expressed. In the case of context-dependent expressions, which may involve the creation of a novel concept, we can think of these sub-tasks as organised around the issues these expressions raise.

To take a concrete example, consider the dialogue in (8):

(8) *Scenario:* A is the coach of the district under-13 netball team. B, a supporter of the team, is a teacher at a local girls' high school. (Note, good goal defence players are usually taller than most other players on the netball field.)

*A:* I'm looking for a girl to play goal defence.

*B:* I have a student in my first-form class who is tall, but I'm not sure if she has ever played netball.

One of A's sub-tasks in processing B's utterance is to decide what she means by "tall". This raises the issue: *what criterion must an individual fulfil to count as being tall?* We can suppose that this issue is routinely raised by use of the word "tall". It might be formulated as in (9):

(9)  $?\lambda C.\forall x\Box[\text{tall}'(x) \leftrightarrow \sim C(\iota z(\text{height\_of}(x)(z)))]$

Two points are worth commenting on here. First, this formulation involves the relation *height\_of* which I assume will be defined as a partial function from extended individuals to a value determined by the equivalence class,  $\lambda x.as\_tall\_as(x)$ . More generally, (9) is a kind of meaning postulate schema. Thus, when the issue is resolved, a particular concept is defined, and we can say that the audience grasps this particular concept on the basis of the schematic concept associated with the word. Although issues are not always definitional in this sense, many of the context-dependent words I will look at will be treated in this manner.<sup>17</sup> Second, abstraction is out of an intensional expression. Thus, possible answers will have to involve intentionally closed expressions, in this case, a property in intension.

Returning to the conversation in (8), it is obvious that, among the possible answers made available by the issue, a potentially adequate one would make the proposition expressed by the utterance directly address the coach's concern with finding a new goal-defence. It is also clear that the coach would be able to infer that her teacher friend can put her in contact with a potentially suitable girl if the issue raised had the answer in (10),

$$(10) \quad \forall x \square [\text{tall}'(x) \leftrightarrow T'(\iota z(\text{height\_of}(x)(z)))]$$

where  $T'$  expresses the property of being greater than the average height of an under-13 girls' netball player. If this answer is supplied and the result satisfies expectations of relevance in the way just described, the answer will be confirmed, and, moreover, the issue will be resolved, since the overall goal of determining the speaker's informative intention would be taken to have been achieved. The audience should therefore take the speaker to have intended to express a proposition involving a concept whose content is defined as in (10).

Notice that there is a difference between finding my favourite blue shirt and processing an utterance. In the first case, issues relating to sub-goals need to be resolved as a precondition for

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<sup>17</sup> A case which raises a non-definitional issue might be "arrive", where the end-point would presumably be formulated as a necessary condition.

achieving other goals. In the second case, a sub-issue relating to one particular aspect of the proposition expressed will only be definitively resolved when the overall goal is achieved. This implies a certain degree of parallelism in utterance processing. In practice, however, tentative resolutions are likely to be made on-line and merely confirmed as the utterance unfolds. The relevance-theoretic comprehension strategy would involve selecting tentative answers on the basis of accessibility or other processing considerations which reduce the effort involved in achieving the overall goal. For instance, the coach may have a ready-made conception of tallness for under-13 netball players, as a result of previous experience. More generally, heuristics or default strategies may be activated by certain types of expressions, which determine the order in which hypotheses are tested.<sup>18</sup>

### 4.3 Descriptive vs. rigid

On the approach just outlined, the 'character' of "tall" involves a definitional frame which comes with a kind of proto-concept that is activated by utterances containing the word. Understanding a use of the word involves, eventually, inserting a concept into the frame. In the example just discussed, the concept inserted was descriptive. Thus, the truth of B's utterance in a counterfactual circumstance will depend on the average height of under-13 girls' netball players in that circumstance. This is what we wanted. There are also imaginable cases where the contextually-supplied criterion is determined by a particular collection of individuals in the circumstance of utterance:

- (11) *Scenario*: The coach of the St Brigid's netball team points at their opponents, from St Catherine's, who are milling around on the court.

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<sup>18</sup> Work in Centering theory and the scenario-based approach of Sanford & Garrod (1981) might be seen as specifying of the strategies and heuristics which are routinely adopted in reference resolution .

- a. One of the tall girls is going to take the jump-offs.

Now suppose that the St Catherine's team members are remarkably tall by the standards of their age group. Then the coach would probably be taken to mean something like *tall by the standards of that very group of girls*, rather than the age group, or St Catherine's teams of that age group, and so on. In this case, the complex concept inserted into the definition will have as a constituent a concept anchored to that set of girls. Grasping an anchored concept involves understanding that its extension is determined relative to some fixed set of individuals in counterfactual circumstances. (See Recanati 1994, Kamp (1990)).

With very few exceptions, context-dependent expressions can be understood either as incorporating purely descriptive content or as incorporating anchored content (often together with descriptive content). Exceptions include words such as "I", "now", etc., whose character requires (part of) the contextually-supplied material to be anchored to features of the actual utterance circumstance. Indexical words like "we" are always anchored, but part of the contextually-supplied material may be descriptive, as in (12):

- (12) Whenever I go out with old school friends, we always get steaming drunk.

With pro-forms such as "she", "that", "those" and so on, the contextually-supplied material can be purely descriptive, partly descriptive and partly rigid, or purely rigid. This is generally acknowledged in the literature. However, the purely rigid cases are often treated as being somehow *linguistically* special. In what follows, I will propose a unitary account of the 'character' of these expressions which leaves it open whether they are descriptive or rigid. The same is true of my analyses of descriptions and demonstratives of the form 'the F', "that F", and so on. Although I will briefly look at some of the objections to this view, the main argument in its favour is that as linguistic expressions, they need not be treated as having different linguistic meanings. There is also a large class of further linguistic expressions with implicit pronoun-like features which can be understood rigidly or descriptively. These include "local", "come", "arrive"

and so on. Consider (13a,b):

- (13) a. A man visited the Eiffel Tower. Later he had lunch in a local cafe.  
b. A man checked into a hotel. Later he had lunch in a local cafe.

These expressions are not generally regarded as ambiguous between rigid and descriptive meanings, and they can be treated in a uniform way in the system being outlined here.

## 5 Quantification

As a preliminary to the treatment of definites, it will be useful to look at other expressions of quantification. We saw in chapter 2 that the context dependence of expressions such as "every boy", "most students" cannot be handled in terms of syntactic ellipsis. The proposal of Westerstahl (1985) was that natural-language determiners should in effect be treated as having a kind of character:

$$(14) \quad D^X(A)(B) \Leftrightarrow D(A \cap X)(B)$$

I argued that this treatment fails to capture the fact that the contextually-supplied material can be descriptive. I would now like to remedy this defect, and to incorporate the treatment of plurals from chapter 2 into the current framework.

Let us start with "every". In chapter 2, the translation of "every" was defined as in (15):

$$(15) \quad \text{every}'(A)(B) \Leftrightarrow |A-B| = 0$$



It follows from the notational conventions adopted there that "every" is associated with a relation between sets of singletons. I noted that this would be ensured in the syntax via a grammatical condition that the head noun of the restrictor not be translated with the pluralising operator, \*.

I will encode this in the lexical entry by subscripting the categorial entry:

$$(16) \quad \langle [\text{every}], S/(S/NP)/(S/NP)_s, \text{every}^{C_t} \rangle$$

The semantic entry in this triple requires a context-dependent determiner to be inserted into the logical form. This comes with the schematic equivalence given in (17), where *every'* is as defined in (15)<sup>19</sup>:

$$(17) \quad ?\lambda C \forall A \Box [\text{every}^{C_t}(A) = \text{every}'(A \cap \check{C})]$$

Thus, in a context where it is clear that I am talking about Cambridge University, my utterance of (18a) will yield the answer in (18b), from which (18c) can be inferred:

- (18) a. Every student is a cyclist.  
 b.  $\forall A \Box (\text{every}^{C_t}(A) = \text{every}'(A \cap \lambda x. \text{at}'(\text{CU})(x)))$   
 c.  $\text{every}'(\text{student}' \cap \lambda x. \text{at}'(\text{CU})(x))(\text{cyclist}')$

We have seen that for non-singular quantifiers, a pluralising operator on the meaning of the common noun-phrase restrictor (\* or ★) was required to get the overall semantics to come out correctly. We defined *det<sub>∃</sub>'* as in (19):

$$(19) \quad \text{det}_{\exists}'(\mathbf{A})(\mathbf{B}) \Leftrightarrow \bigcup \{X: \mathbf{A}(X) \wedge \mathbf{B}(X)\} \neq \emptyset$$

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<sup>19</sup> Recall the convention in the last chapter that upper-case variables are type (e,t). Upper-case bold variables are type ((et)t).

We stipulated that in the case of plurals such as "some men", the translation of "men" was either *\*men'* or *\*men'*. As noted above, although persistent determiners (e.g. the one associated with "some") do not strictly speaking require contextual restriction, we may restrict them anyway, since phrases involving these determiners are generally understood as relativised to context. We now need to guarantee that the pluralising occurs after the contextual restriction: otherwise, we would not be able to account for the fact that "some students" cannot get a maximal reading. Notice that if we were to set up the issue for this determiner as in (20) below, "Some students complained" could in principle be used to express the proposition that all students (in the context) complained:

$$(20) \quad ?\lambda C \forall A \square [\det_{\exists}^{C'}(A) = \det_{\exists}'(A \cap \check{C})]$$

This would allow us to supply as an answer the property which applies to the maximal collection of students in the context. For determiners in general, we want the contextually-determined property to restrict the common noun before the pluralising operator applies. An interim solution would be to specify the issue for "some" as in (22), where  $\det_{\exists}^{C'}$  is the semantic entry for the lexical item:

$$(21) \quad \langle [\text{some}], S/(S/NP)/(S/NP), \det_{\exists}^{C'} \rangle$$

$$(22) \quad ?\lambda C \forall A \square [\det_{\exists}^{C'}(*A) = \det_{\exists}'(* (A \cap \check{C}))]$$

In fact, these rules will have to be complicated somewhat because of a general problem for the treatment of plurals which arises in the case of restrictive relative clauses. Consider (23):

(23) Some students who gathered in the bar after the syntax exam got up a petition about the lecturer.

In general, the head noun has to be pluralised in order to combine with the relative clause (which

we assumed is formed by a lambda operator). Thus, for the schema above, the rule would have to be recast so as to restrict the head noun only.

A similar distinction would be required in the case of numerals. We saw above that there is evidence for a dual treatment of noun phrases involving "two", "three" etc. On one treatment, the numeral is simply a predicate modifier (a cardinality predicate); on the other, it is a determiner. Predicate modifiers such as *two'* combine with symbols which denote sets of sets. Here again, the contextual restriction would have to combine with the head noun before pluralisation.

It seems, then, that contextual restriction should in general apply to the head noun of a plural quantificational phrase. In order to make the relevant adjustments, the simple categorial framework sketched above would have to be enriched so that the semantic entry for a determiner could be made sensitive to the presence of modification, and so that the syntactic material which restricts the determiner flags the head noun.<sup>20</sup> To simplify the exposition, I will ignore these complications here, adopting the definitional schemata in (22).

Some natural-language determiners need to be defined in terms of determiners which are themselves context dependent. Thus they would pose two issues for an audience. We can (roughly) characterise the context dependence of "few" and "many" as in (24) That is, the domain is restricted as in the case of other noun phrases, but there is also the question of what counts as many or few to be settled:

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<sup>20</sup> See Cormack & Breheny (1994) for an analysis of noun phrases and modification using a hybrid categorial/GB approach. There, the basic category/type mapping is preserved as in categorial frameworks, but a notion of projection is introduced into the syntactic analysis, so that information about the structure of a phrase which can be exploited by the semantics can be transmitted.

- (24) a.  $\langle [\text{few}], S/(S/NP)/(S/NP), \text{few}^{C'} \rangle$   
 $\langle [\text{many}], S/(S/NP)/(S/NP), \text{many}^{C'} \rangle$
- b.  $?\lambda C \forall A \Box [\text{few}^C(*A) = \text{few}_n(*(A \cap \check{C}))]$   
 $?\lambda C \forall A \Box [\text{many}^C(*A) = \text{many}_n(*(A \cap \check{C}))]$
- c.  $?\lambda n \forall AB \Box [\text{few}_n(A)(B) \leftrightarrow \text{at\_most\_n}(A)(B)]$   
 $?\lambda n \forall AB \Box [\text{many}_n(A)(B) \leftrightarrow \text{at\_least\_n}(A)(B)]$

## 6 Quantification and the focus of joint attention

The issues raised by context-dependent quantifiers will be resolved by answers involving non-context-dependent quantifiers, *det<sub>∃</sub>'*, *every'* etc. I have associated these with the equivalences discussed in the sections on plurals in the last chapter:

$$(25) \quad \text{det}_{\exists}'(A)(B) \leftrightarrow \bigcup \{X: A(X) \wedge B(X)\} \neq \emptyset$$

The right-hand side of this equivalence can be seen as characterising the inferential potential of the representation on the left-hand side. If the analysis of "many" and "few" in (24) proves adequate, it may be possible to develop an account on which the more basic concepts of quantification employed in our understanding of the ad hoc ones satisfy conservativity and extension<sup>21</sup>. We could then say that these basic quantificational concepts are associated with

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<sup>21</sup> Although my definitions of plural determiners in the last chapter are consistent with this claim, alternative proposals, such as van der Does' (1994) see some versions of plural determiners as non-conservative, where conservativity in general holds of *D* if it satisfies (i):

$$(i) \quad D(Q)(R) \text{ iff } D(Q)(\hat{a}[Q(a) \wedge R(a)])$$

See Westerstahl's (1985a) discussion of these properties as they apply to the context-dependent linguistic expressions "many", "most".

inferential procedures which just compute the truth value of the form as a function of the cardinalities of the extensions in a given circumstance of certain complex concepts. The concepts in question are those of the intersective set and the restrictor set.<sup>22</sup> That is, for  $D(\mathbf{A})(\mathbf{B})$  they are  $\mathbf{A}$  and  $\lambda X. \mathbf{A}(X) \wedge \mathbf{B}(X)$ .

These complex concepts are intimately connected with the notion of *what is being talked about*, which I used in discussing the focus of joint attention in the last chapter. Whatever circumstance is being talked about, certain basic inferences can be made about it using just the concepts of the restrictive and intersective sets. These inferences make available other (complex) concepts which are crucial for the interpretation of later anaphora and definites. If we suppose that what is in the focus of attention is just those things that fall under these concepts in the situation, we can say that these concepts are accessible as answers to the issues raised by later definites. We will see what these issues are shortly. For now, a couple of examples will serve as illustration.

Given an utterance of (26a) in a situation where it is clear that I am talking about Cambridge, a plausible interpretation would be (26b):

- (26) a. Some students rioted.  
 b.  $\text{det}_{\exists}'(*(\text{student} \sqcap \lambda x. \text{at}'(\text{CU})(x)))(*rioted')$

Here, the concept of the intersective set  $\lambda X. *(student \sqcap \lambda x. at'(CU)(x))(X) \wedge *rioted'(X)$ , as well as that of the restrictive set  $\lambda X. *(student \sqcap \lambda x. at'(CU)(x))(X)$ , will be accessible from the focus of attention.

A slightly more interesting case involves relational predicates<sup>23</sup>:

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<sup>22</sup> See van Benthem's (1987) semantic automaton.

<sup>23</sup> Here I am assuming the singular version of the interpretation of "most", as there are no strictly collective predicates (like "competing companies") involved.

- (27) a. Most students threw a rock.  
 b.  $\text{most}'(\text{student} \sqcap \lambda x.\text{at}'(\text{CU})(x))(\lambda y.\text{det}_{\exists}(\text{rock})(\lambda z.\text{threw}(z)(y)))$

Some inferences involving the two basic concepts include:

- (28) a.  $\text{det}_{\exists}(\text{student} \sqcap \lambda x.\text{at}'(\text{CU})(x))(\lambda y.\text{det}_{\exists}(\text{rock})(\lambda z.\text{threw}(z)(y)))$   
 b.  $\text{det}_{\exists}(\text{rock})(\lambda y.\text{det}_{\exists}(\text{student} \sqcap \lambda x.\text{at}'(\text{CU})(x))(\lambda z.\text{threw}(y)(z)))$   
 c.  $\text{all}'(\text{student} \sqcap \lambda x.\text{at}'(\text{CU})(x) \sqcap \lambda y.\text{det}_{\exists}(\text{rock})(\lambda z.\text{threw}(z)(y))) (\lambda y.\text{det}_{\exists}(\text{rock})(\lambda z.\text{threw}(z)(y)))$

(27b) above entails (28a) (that the intersective set is non-empty), from which (28b) and (28c) follow. We will see that the concept of the intersective set in (28b) will provide an answer to the issue raised by the continuation of (27a) in (29a), while  $\lambda y.\text{det}_{\exists}(\text{rock})(\lambda z.\text{threw}(z)(y))$ , in (28c), will play a role in inferring the interpretation of a donkey pronouns (29b), as we will see in the next chapter.

- (29) a. They came from a nearby quarry.  
 b. They got them from a nearby quarry.

To sum up; I argued in a previous chapter that an important requirement on the E-type approach to anaphora is to say something about the constraints on pronoun interpretation in continuous discourse. My claim was that, since pronouns have no descriptive content, the search space for candidate resolutions had to be severely restricted. I invoked the notion of the focus of joint attention, which I characterised in the case of continuous discourse be appeal to an intuitive notion of *What is being talked about*. In this section, I have introduced a related notion of accessibility of concepts, which arises naturally from the inferential procedures which one can assume to be associated with expressions of quantification. It would be tempting to say that, in continuous discourse, material used in pronoun resolution can only come from these inferences.

## Section V    Definites

In this section I will present an analysis which treats definites as a somewhat special class of context-dependent expression. The basic idea is that the definiteness marker signals to the audience that a possibly new, but in any case *atomic* concept is to be inserted in the logical form of the representation constructed in response to the utterance containing the expression. This concept serves to restrict the context-independent existential determiner which is assumed to head the expression (at least when a definite occurs as an argument phrase). The procedure for constructing (or retrieving) such a definite concept involves the grammar making available a representation of the descriptive content (if any) of the definite. This descriptive content is built into a necessary condition on the application of the definite concept. At the same time, an issue is raised. In resolving this issue, the audience reaches an adequate conception of the property expressed by the definite.

This approach, I will argue, has several advantages. It offers a straightforward treatment of the maximal/non-maximal alternation in the interpretation of plural definites. It sheds some light on the status of the uniqueness assumption for singular definites. It allows us to incorporate an adequate treatment of the referential/attributional distinction into a post-Gricean view of pragmatics. It also makes possible a uniform treatment of definites, on which each form is associated with a single procedure. This will be seen in more detail when we come to look at binding.

### 1    Basics

Since I have adopted a fairly simple categorial framework for syntactic purposes, I will have to set aside some issues relating to the internal structure of definite noun phrases. In particular, because there are no features in this framework, I will have to ignore certain aspects of the categorial processing of plurality and definiteness. I will therefore assume that "the F" is treated

by the grammar as involving two lexical entries, one for a determiner and one for its first argument. In the case of plurals, these will be as in (1):

- (1) a.  $\langle [F_{S_{def}}], (S/NP), the\_Fs' \rangle$   
 b.  $\langle [the], S/(S/NP)/(S/NP), det_{\exists} \rangle$

As noted above, I am using a grammar for plurals, so, for example, the category (S/NP) corresponds to type ((et)t). However, we have seen that certain noun phrases are essentially non-collective, including those with "every", "a". I assume that the grammar is sensitive to their morphology, so that the restrictive material is rendered without the pluralising operators. As noted above, this is acceptable from a conceptual point of view since we can think of the extension of *student'* as a set of singleton sets. Because of this, I will sometimes revert to simpler types and lower-case variables (of type (e)) for purposes of exposition.

The semantic entry in (1b) involves a non-context-dependent determiner, and the entry in (1a) involves what I will now call an ad hoc concept. The process of mapping onto an internal conceptual representation is mediated by a procedure in which the issue in (2) is raised:

- (2)  $? \lambda P \forall X \Box [the\_Fs'(X) \leftrightarrow P(X)]$

That is, the use of a definite raises the issue of what property is being talked about. The procedure will also insert the descriptive content into a constraint which will be added to the file associated with whatever concept is constructed or retrieved in interpreting the utterance:

- (3)  $\forall X \Box [the\_Fs'(X) \rightarrow F'(X)]$

In some cases, the descriptive material may be enough to define the property being talked about, in that no descriptively richer complex concept provides the basis for the hypothesised answer to the issue. Even in these cases, though, there is a choice between having the concept pick out



the set of sets which contains only the maximal set of individuals that falls under the description in any circumstance, or having it pick out the set of all sets which fall under the descriptive material. For example, even though we would probably regard the restrictive material in the descriptions in (4a,b) as sufficient to resolve the issue, (4a) is most naturally understood non-maximally, while (4b) would be understood maximally<sup>24</sup>:

- (4) a. The boys that Mary dated in high school gave her LSD and other drugs.  
 b. The pupils at St. Brigid's have been given a meningitis vaccination.

The procedure for constructing the necessary constraint for the definites in (4a,b) will in the first instance construct the set of collections which fall under the descriptive content. For (4a) this will be as in (5):

$$(5) \quad \forall X \square [\text{the\_BTMDIHSs}'(X) \rightarrow \lambda Y. [*boy'(Y) \wedge * \lambda y. \text{dated\_in\_HS}(y)(m)(Y)](X)]$$

On the assumption that the non-maximal reading would here satisfy expectations of relevance, the resolution of the issue raised by use of the definite in the circumstance would be:

$$(6) \quad \forall X \square [\text{the\_BTMDIHSs}'(X) \rightarrow \lambda Y. [*boy'(Y) \wedge * \lambda y. \text{dated\_in\_HS}(y)(m)(Y)](X)]$$

Thus, the translation of the definite noun phrase,  $\lambda X. \text{det}_{\neq}(\text{the\_BTMDIHS})(X)$ , will apply to sets of collections which contain collections of boys that Mary dated in high school.

In the case of (4b), the necessary constraint would be as in (7):

$$(7) \quad \forall X \square [\text{the\_CASBs}'(X) \rightarrow \lambda Y. [*child'(Y) \wedge * \lambda y. \text{at}'(\text{St.B})(y)(Y)](X)]$$

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<sup>24</sup> I will discuss the pragmatics of the choice of maximal/non-maximal readings in chapter 5.

Here, the resolution of the issue raised could in principle involve  $\max(\lambda Y[*child'(Y) \wedge *ly.at'(St.B)(y)(Y)])$ , where  $\max$  is defined as in (8):

$$(8) \quad \max = \lambda X \lambda Y. \forall Z [X(Z) \rightarrow Z \subseteq Y]$$

In certain situations, the audience would be justified in assuming that the answer in (9) was intended if it leads to an overall interpretation which is more relevant than the one based on the non-maximal concept.

$$(9) \quad \forall X \square [\text{the\_CASBs}'(x) \leftrightarrow \max(\lambda Y. *child'(Y) \wedge *ly.at'(St.B)(y)(Y))(X)]$$

We will see that such cases do arise with (4b), so that the maximal reading may be preferred.

The general picture of the interpretation of plural definites, then, looks like this: the issue raised requires an answer involving a concept which expresses a property of collections. The audience is free to construct any answer of this form. Constraints on this process are imposed, on the one hand, by the necessary condition constructed as part of the procedure for interpreting definites, and, on the other, by the general search for an overall interpretation which satisfies the audience's expectations of relevance. This allows for the possibility of constructing either a maximal or a non-maximal concept as part of the answer.

Let us look now at an example where the interpretation of a definite is recovered from previous discourse. In analysing this example, I will show how plural pronouns are treated on my account.

As noted above, some versions of the E-type approach (e.g. Neale (1990) and van der Does (1996a,b)) treat pronouns as definite descriptions lacking descriptive content. I have also defended this approach. I would now like to show how plural pronouns fit into the picture.

The only difference between the procedures for interpreting plural pronouns and plural definites

is that with plural pronouns, no necessary condition is involved. The relevant triples for pronouns are given in (10):

- (10) a.  $\langle [_{def}], (S/NP), pro' \rangle$   
 b.  $\langle [pro], S/(S/NP), det_{\exists} \rangle$

The process of mapping onto an internal conceptual representation raises the issue in (11). No other conditions are imposed:

- (11)  $? \lambda P \forall X \square [pro'(X) \leftrightarrow \sim P(X)]$

Let us consider some examples:

- (12) Some students rioted. They were arrested.

Suppose the first sentence in (12) is interpreted as in (13):

- (13)  $det_{\exists}'(*student)(*rioted)$

This makes accessible the concept,  $\lambda X. *student(X) \wedge *rioted(X)$ . Let us assume that the issue raised by the pronoun in the second sentence is resolved maximally:

- (14)  $\forall X \square [pro'(X) \leftrightarrow \max(\lambda Y. *student(Y) \wedge *rioted(Y))(X)]$

Sometimes, an antecedent sentence will involve a collective predication. In such cases it is possible in principle to construct either a maximal or a non-maximal interpretation of a definite anaphoric on that:

- (15) Some students gathered in the square. They threw rocks at riot police.

The intersective set recovered from the first sentence,  $\lambda X. *student'(X) \wedge gathered'(X)$ , will not on its own serve our purposes, since *gather'* applies to collections without necessarily applying to sub-collections of these. However, on a non-maximal reading of the second sentence, we want quantification over these sub-collections. Thus the answer to the question raised by the pronoun will be as in (16):

$$(16) \quad \forall X \square [\text{pro}'(X) \leftrightarrow (\lambda Y. \exists Z [ *student(Z) \wedge gathered(Z) \wedge Y \subseteq Z ])(X)]$$

This approach assumes a certain freedom in the construction of these answers. The only constraint on the process (apart from those imposed by pragmatic principles) is that, in the case of pronouns, the hypotheses should be constructed from concepts recoverable from the quantificational concepts of the previous discourse.

Finally, consider the discourse in (17):

(17) Most students threw some rocks. They came from a nearby quarry.

The representation for the first sentence is (18a), which entails (18b):

$$(18) \quad \begin{array}{l} \text{a.} \quad \text{most}'(\text{student}')(\lambda y. \text{det}'_{\exists}(*\text{rock}')(\lambda Z. \text{pl}(\text{threw}')(\text{Z})(y)) \\ \text{b.} \quad \text{det}'_{\exists}(*\text{rock}')(\lambda Y. \text{det}'_{\exists}(\text{student}')(\lambda z. \text{pl}(\text{threw}')(\text{Y})(z))) \end{array}$$

The intersective set for (18b) can be represented as  $\lambda X. *rock'(X) \wedge \text{det}'_{\exists}(\text{student}')(\lambda z. \text{pl}(\text{threw}')(\text{X})(z))$ . This can be used in the resolution of the issue raised by the pronoun in the second sentence:

$$(19) \quad \forall X \square [\text{pro}'(X) \leftrightarrow \max(\lambda Y. *rock'(Y) \wedge \text{det}'_{\exists}(\text{student}')(\lambda z. \text{pl}(\text{threw}')(\text{Y})(z)))(X)]$$

Other relevant examples involving definites anaphoric on previous discourse involve binding:

(20) Most students threw some rocks. They got them at a nearby quarry.

A natural interpretation of the second sentence here can be glossed as: The students who threw some rocks got the rocks they threw from a nearby quarry. These kinds of example will be treated in the next chapter. It is also worth noting that the gloss just given involves a description which includes a definite (pronoun) in its descriptive material. In my account, if this gloss were uttered, the construction of the necessary condition for the definite will itself involve a definite. This will raise its own issues for processing, which will have to be resolved in the way already described. The system is in principle fully recursive in this respect. I will demonstrate this in chapter 4.

## **2 Singular definites and partial resolution**

Turning now to grammatically singular definites, we saw in section V of chapter 2 that a uniqueness constraint is required in cases where a singular definite is not dependent (i.e. not bound into in some sense). Let us review the arguments which led to this conclusion.

The main argument for the dynamic binding approach has always been that the discourse in (21) does not imply that just one man walked in the park:

(21) A man walked in the park. He whistled.

This point was developed at length in section II of chapter 2. I also showed, contra the claims of Evans, Kadmon et. al., that the speaker does not even have to be able to provide descriptive material that would identify a unique individual. Appeals to a notion of 'realistic' uniqueness turned out to be inadequate to deal with these cases. Such appeals suggest something like the following strategy: on encountering a singular definite for which they cannot infer or retrieve uniquely denoting predicative material, the audience could just supply the restriction "which the

speaker has in mind". With the second sentence in (21), the result could be glossed as, "a unique man who walked in the park and who the speaker has in mind whistled". This strategy fails to explain why, if I utter (22) when there are two tables covered with books in the room, my utterance is unacceptable:

(22) I cannot find my green pen because the table is covered with books.

The unacceptability clearly results from the fact that my utterance suggests that I am talking about a particular table, and you are unable to figure out which one I'm talking about. Similarly, the realistic uniqueness strategy cannot account for the fact that (24a) below is unacceptable but (24b) is not, even though "a certain" means "one I have in mind":

- (24) a. Most senators interviewed Monica. The senator got her phone number.  
b. Most senators interviewed Monica. A certain senator got her phone number.

The dynamic line has always been that (at least in the case of pronouns) the singular definite needs to be licensed by the presence of a singular indefinite of the form "an F", since this kind of expression introduces a formal (or mental) object with which the object introduced by the definite can be identified. There is no *semantic* uniqueness condition on this account, but there is a *formal* identifiability constraint.

However, the discussion in section V of chapter 2 revealed that the formal mechanisms set up to handle discourse anaphora merely approximate some routine pragmatic inferences. I argued that a better analysis of discourses with singular definites (pronouns) would involve a semantic identifiability constraint, which just happens to be satisfiable by a warranty that a particular individual serves as the ground for use of the singular indefinite. The existence of such a warranty is inferred routinely in the presence of "an F". But the inference is non-demonstrative;

it is not encoded into the singular indefinite form.<sup>25</sup>

My conclusion was that the arguments which have motivated the dynamic analysis over the years (such as those in Heim (1982)) are in fact misguided. In the terms of the framework being presented here, they show merely that the hearer does not have to have a fully determinate conception of the individual that a singular definite is used to talk about. All that is needed is that the utterance comes with a warranty that a particular individual is serving as the speaker's grounds for what she is saying.

The correct conclusion seems to be that the proposition expressed by an utterance of the second sentence in a discourse such as (21) holds of situations at a particular past time in which a certain uniquely instantiated property and the property of whistling are co-instantiated. In the footnote cited from Kamp (1990) in Section V of chapter 2, this is conceded.

An adequate semantic theory should reflect this fact. The information contained in a DRS for the discourse in (21) does not reflect it. As Kamp acknowledges, the DRS contains the information one *gets* from the utterance. That is, the DRS contains information which is inferred about, among other things, the uniquely instantiated property expressed by the restrictor in the singular definite, without necessarily delimiting that property itself. To illustrate this point, it will be useful to draw an analogy between cases such as (21), where uniquely identifying material is not recovered, and the "bulldozer" example discussed above.

Recall my claim that in the "bulldozer" example, there are two ways of processing Mary's utterance "He'd be a bit of a bulldozer". On the 'metaphorical' account, the hearer discounts the assumption that the speaker believes (or intends to communicate) that Bill is literally a bulldozer, but looks for inferences based on this literal concept which he can adopt. On the novel-concept

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<sup>25</sup> This does not mean, of course, that the speaker has to be able to identify the individual in question: she could be uttering (21) on the basis of having been told by a reliable source, who read it in a respectable paper, and so on.

alternative, a new concept is set up and the associated file is fleshed out, guided by the issue of what an individual must be like to count as a bulldozer. In this example, the novice may not fully grasp Mary's concept straight away, but the search for relevance should at least result in a partial resolution of this issue, and a partial conception of this new notion of bulldozer. If that partial information is enough to achieve the overall goal in comprehension, the process stops.

Given the utterance "He whistled" in the context of a discourse such as (21) above, Kamp's proposed treatment amounts to discounting the assumption that the speaker intends the hearer to adopt a thought involving the uniquely instantiated concept, and adopting instead assumptions containing the weaker information that a man who walked in the park whistled, which is implied by the discourse.

To pursue the analogy, we could imagine an alternative mode of processing in which a novel atomic concept is set up for the definite. In a discourse such as "A man walked in the park. He whistled.", the issue related to the goal of grasping the property expressed by the definite is only partially resolved.

I think it is worth considering this strategy, since it enables us to give an account of the linguistic meaning of definites. Let us look more closely at this account before returning to a comparison with dynamic approaches.

Let us begin with singular descriptions. The relevant lexical entries, constraints and issue are given below:

(25)  $\langle [F_{def}], (S/NP)_s, the\_F' \rangle$   
 $\langle [the], S/(S/NP)/(S/NP), det_{\exists} \rangle$

(26)  $\forall x \square [the\_F'(x) \rightarrow F(x)]$   
 $\square [\exists x [the\_F(x)] \rightarrow \exists x \forall y [the\_F'(y) \leftrightarrow y = x]]$



$$(27) \quad ?P\forall x\Box[\text{the}_F(x) \leftrightarrow \sim P(x)]$$

The second constraint in (26) is the only interesting new feature here. This says that necessarily, if the property expressed by the definite concept is instantiated, it is uniquely instantiated. Singular pronouns differ only in the absence of a descriptive constraint:

- (28) a.  $\langle [\text{def}], (S/NP)_s, \text{pro}' \rangle$   
 b.  $\langle [\text{pro}], S/(S/NP)/(S/NP), \text{det}_\exists \rangle$

$$(29) \quad \Box[\exists x[\text{pro}(x)] \rightarrow \exists x\forall y[\text{pro}'(y) \leftrightarrow y = x]]$$

$$(30) \quad ?P\forall x\Box[\text{pro}'(x) \leftrightarrow \sim P(x)]$$

Let us look at some examples which illustrate the different possible results of processing utterances involving singular definites. In some cases, the uniquely instantiating material may be made explicitly available:

(31) Just one man walked in the park. He whistled.

The first utterance yields an interpretation which entails that the intersective set has a cardinality of one:

$$(32) \quad \text{card}'(\text{man}' \cap \lambda x.\text{walk\_in\_the\_park}'(x)) = 1$$

This makes accessible a full resolution for the issue in (33):

$$(33) \quad \forall x\Box[\text{pro}'(x) \leftrightarrow \forall y[\text{man}'(y) \wedge \text{walk\_in\_the\_park}'(y) \leftrightarrow y = x]]$$

In other cases, a scalar implicature may yield the required answer:

(34) John has a daughter. She is in high school.

The linguistic meaning of the first part of the discourse entails only that the intersective set is non-empty, (35a). However, the complex concept which represents this set makes accessible the conceptual ingredients for construction of the stronger proposition that John has just one daughter, (35b).

- (35) a.  $\text{det}_3(\text{daughter}')(\lambda x.\text{has}'(x)(j))$   
b.  $\text{card}'(\text{daughter}' \sqcap \lambda x.\text{has}'(x)(j)) = 1$

On the assumption that this is communicated, it will provide the resources for resolving the issue raised by the pronoun.

In some circumstances, a full resolution will not be available:

(36) A man walked in the park. He whistled.

Here, a partial resolution, together with the evidential warrant (that the speaker is talking about a particular individual), is enough to achieve the overall goal of comprehension:

- (37)  $\forall x \square [\text{pro}'(x) \rightarrow \text{man}'(x) \wedge \text{walk\_in\_the\_park}'(x)]$

This information will be stored in the file associated with the concept which interprets the pronoun. If the individual is discussed further in subsequent discourse, this concept will be available to interpret those utterances, and any further information can be stored in the file, thus improving the audience's conception of the individual in question.

Although I am using the terminology of files, my account differs substantially from Heim's (1982) file-based dynamic treatment. As noted above, the formal structures used in dynamic

semantics are designed to capture in a rule-based system certain routine patterns of non-demonstrative inference which occur in discourse comprehension.

Moreover, on the dynamic account, the files are seen as containing the information carried by the discourse seen as a composite linguistic structure. On my account, the information carried by the discourse is stronger. It is the sum of the information contained in the independent structures which represent the propositional content of the sentences uttered. My point is that the hearer does not have to fully grasp this content under these special circumstances of the use of singular indefinites in order to satisfy his expectations of relevance. Thus, I would argue, the claim that the information content of (36) is equivalent to  $\exists x[man'(x) \wedge walk(x) \wedge whistle(x)]$  is based on a mistaken identification of the information pragmatically recovered from an utterance with the linguistically determined content of that utterance.

An advantage of this treatment of definites is that we can treat the example in (38) (due to Strawson) in a straightforward manner:

(38) *A*: A man fell off the cliff.

*B*: He didn't fall, he was pushed.

On the traditional E-type approach, the only way to analyse a discourse containing a pronoun anaphoric on an indefinite is to expand the pronoun into a description. For (36), this would yield "The man who walked in the park whistled". This analysis is inadequate for (38), since the result would be contradictory: "The man who fell off the cliff didn't fall". But this discourse is perfectly comprehensible and non-contradictory. The dynamic account would face similar difficulties, since the discourse referent for the pronoun in B's utterance could not be identified with the discourse referent for the indefinite in A's utterance, on pain of contradiction. On my account, B's utterance introduces a concept which raises the issue of what it applies to. The only condition on its interpretation is that if it is instantiated, then it is uniquely instantiated. It is clear that B wants A to entertain the thought that B has a *de re* belief which contains as a constituent a

concept which applies uniquely to the individual who A thinks fell off the cliff. Thus B is implying that A should amend his beliefs about how the property expressed by that concept is instantiated.

### 3 Referential use

In this section, I will propose an analysis of the referential use of definites. Consider the discourse in (39):

(39) John walked in the park. He whistled.

Let us assume that we are capable of entertaining object-dependent thoughts about John. We have a concept of this individual, and this concept has all the formal and semantic properties of referential terms in the sense of Kripke (1977), Kaplan (1989) etc., and can figure as a constituent of a belief. The representation constructed on the basis of an utterance of the first sentence would then be:

(40)  $\text{walked\_in\_the\_park}(j)$

When the second sentence is uttered, the pronoun raises the issue in (41):

(41)  $?P\forall x\Box[\text{pro}'(x) \leftrightarrow \check{P}(x)]$

This issue would be resolved as in (42):

(42)  $\forall x\Box[\text{pro}'(x) \leftrightarrow (\lambda y.y=j)(x)]$

The representation constructed on the basis of an utterance of the second sentence, then, involves

a concept, call it  $pro'_j$ , which expresses the property of being identical to John:

(43)  $\det_{\exists}(pro'_j)(whistled')$

The utterance would then express the proposition that John whistled, and this information can be placed in the audience's file for John. Note, however, that on this analysis pronouns which are normally considered directly referential are not interpreted by concepts with the formal properties of singular terms. Rather, a small amount of processing is needed to get from the representation set up on the basis of the utterance to the representation,  $whistled'(j)$ .

This process is quite general and can therefore apply to descriptions which are 'used referentially'. However, in the case of referentially-used descriptions, the descriptive material forces an extra degree of indirectness. Consider the example in (44). We are at a party, watching a man who is drinking a martini. If I utter (44), your processing of that utterance will result in the representation in (45):

(44) The man drinking a martini is a spy.

(45)  $\det_{\exists}(\text{the\_MDAM}')(\text{spy}')$

This raises the issue in (46), and the restrictions in (47) are introduced into the file associated with the definite concept:

(46)  $?P\forall x\Box[\text{the\_MDAM}'(x) \leftrightarrow \sim P(x)]$

(47) a.  $\forall x\Box[\text{the\_MDAM}'(x) \rightarrow (\lambda z.\text{man}'(z) \wedge \det_{\exists}(\text{martini}')(\lambda y.\text{drinks}'(y)(z))(x)]$

b.  $\Box[\exists x[\text{the\_MDAM}'(x)] \rightarrow \exists x\forall y[\text{the\_MDAM}'(y) \leftrightarrow y = x]]$

One very relevant way of resolving this issue is to utilise your concept of that individual. Let us

use the symbol  $\mathbf{a}$  for this purpose. Then the answer to the question in (46) will be (48):

$$(48) \quad \forall x \square [\text{the\_MDAM}'(x) \leftrightarrow \lambda y.(y = \mathbf{a})(x)]$$

As in the case of pronouns, a small step of processing is required to derive  $\text{spy}'(\mathbf{a})$  from (48), which we are assuming is what I intended you to construct. Let us call this the fast route to a referential interpretation.

The fast route to interpretation, however, still involves an element of indirectness, because on this analysis the concept *the\_M DAM'* would also contain the entry in (49b), derived from processing the descriptive material:

$$(49) \quad \begin{array}{l} \text{a.} \quad \forall x \square [\text{the\_MDAM}'(x) \leftrightarrow \lambda y.(y = \mathbf{a})(x)] \\ \text{b.} \quad \forall x \square [\text{the\_MDAM}'(x) \leftrightarrow (\lambda z.\text{man}'(z) \wedge \text{det}_\exists(\text{martini}')(\lambda y.\text{drinks}'(y)(z)))(x)] \end{array}$$

It would follow that  $\mathbf{a}$  is doomed to drink a martini (at the time and place) in all counterfactual situations. The audience would therefore have to discount the entry placed by the definiteness procedure in the file associated with *the\_M DAM'*. I assume that in at least some cases of referentially-used descriptions, the descriptive material is uttered solely in order to help the audience identify the referent, and that it is thoughts involving  $\text{spy}'(\mathbf{a})$  which are meant to carry the cognitive significance. In this case, we might say that the descriptive condition is ignored as making no contribution to effects.

Of course, there is nothing to stop the audience forming a descriptive concept to interpret the definite in the circumstances described above. This would involve resolving the issue raised in (46) with the material used to translate the description (possibly fleshed out with some contextual information,  $C$ ):

$$(50) \quad \forall x \square [\text{the\_MDAM}'(x) \leftrightarrow \forall z [C(z) \wedge \text{man}'(z) \wedge \text{det}_\exists(\text{martini}')(\lambda y.\text{drinks}'(y)(z)) \leftrightarrow z = x]$$

However, if my intention is to get you to entertain thoughts about **a**, some further processing would be required. The concept would have to be evaluated in the circumstance, leading to the inference that **a** is a spy. This route is a little less direct than the fast route, so the assumption would be that the fast route is favoured if the descriptive material in the definite is used solely to fix the referent. However, if the descriptive material is useful in itself, in the sense that adding it to **a**'s file would increase the cognitive effect of the utterance, the descriptive route may be equally efficient, since in that case, the inference that **a** is drinking a martini is drawn en route to the conclusion that **a** is a spy.

I am assuming that demonstrative pronouns are treated in the same way as personal pronouns. Thus their referential readings, like those of pronouns, involve a small element of indirectness. However, like pronouns, they can be used descriptively, and they can have dependent (bound) readings as in (51):

- (51) a. John has some donkeys which he pampers but he also tends some donkeys belonging to neighbouring farmers. He beats those.
- b. Every farmer who tends donkeys belonging to neighbours as well as his own beats those.

I will therefore assume that an analysis compatible with all types of reading is to be preferred. For demonstratives of the form *that F*, *this F*, *these Fs* and so on, I will retain the standard assumption that, when used referentially, these expressions are to be considered the same as pronouns. They can also receive descriptive interpretations, of course, but so can demonstrative pronouns. My proposal is that in these cases, the descriptive content can 'fall away' once the referent has been identified. For this reason, the procedure for constructing demonstrative concepts will treat them as more like pronouns than descriptions. The descriptive content does not add a necessary constraint which would say that the concept expressed applies in all counterfactual circumstances to things that are F. However, the descriptive material is recovered and exploited as a means of resolving the issue in (54). This is the significance of (53b). Note

that on a referential use of "that F", it will be implied in the circumstance that the speaker thinks that the thing she is talking about is an F. However, this will not be a part of what is said (the proposition expressed), since the demonstrative concept is not necessarily constrained to pick out Fs:

(52)  $\langle [\text{that}_{F_{\text{def}}}], (\text{S/NP})_s, \text{that}' \rangle$   
 $\langle [\text{the}], \text{S}/(\text{S/NP})/(\text{S/NP}), \text{det}_3' \rangle$

(53) a.  $\forall x[\text{that}'(x) \rightarrow F'(x)]$   
 b.  $\square[\exists x[\text{that}'(x)] \rightarrow \exists x\forall y[\text{that}'(y) \leftrightarrow y = x]]$

(54)  $?P\forall x\square[\text{that}'(x) \leftrightarrow \sim P(x)]$

It should be clear from this sketch of an analysis of referential uses of definites that there are other possibilities which can be exploited in the system presented here. For instance, it would be possible to treat demonstrative descriptions in the same way as definite descriptions. I think that for most people, though, referentially-used demonstrative descriptions are just as directly referential as (demonstrative or personal) pronouns. Another possible treatment of referential uses would be to introduce new procedures for interpreting these forms. For instance, there might be two procedures for interpreting pronouns: the one sketched here, which can yield descriptive interpretations, and another one, on which they are interpreted by directly referential concepts, and are therefore not quantified expressions. On this second approach, the issue raised by the pronoun would be as in (55), where *a* would have to be rigid:

(55)  $?a\square[\text{pro}' = a]$

I have no arguments against this dual-procedure approach other than theoretical parsimony. A single 'descriptive' procedure can handle all cases adequately, so there would have to be substantial reasons for introducing a second procedure. At the moment, I know of none.



This concludes my treatment of the referential uses of definites. I do not intend to review the literature on the referential/attributive distinction in any detail. (It is even more vast than the literature on anaphora). I do think however, that this somewhat unorthodox approach to definites can accommodate many of the basic insights and intuitions which have informed the debate on this topic. One insight is that utterances containing pronouns and demonstratives can be understood as communicating object-dependent thoughts, and that these expressions are the canonical means for communicating such thoughts. On my account, utterances containing pronouns and demonstratives can give rise to representations whose content is object dependent. Definite descriptions can also be used referentially. However, I have shown that their referential use involves an element of indirectness which is not present in the case of other referentially-used definites. On my account, this is due to the constraint imposed by the descriptive content. This constraint has to be discounted in order to entertain an object-dependent thought on the basis of the utterance. Alternatively, the audience must take a more indirect route of constructing a descriptive interpretation for the definite, and then inferring that the object-dependent thought was intended. In Neale's (1990) defence of a unitary Russellian analysis of descriptions, it is argued that this should be the only way to communicate object-dependent propositions by use of descriptions. However, that argument relies crucially on the classical semantics-Gricean pragmatic nexus.

On Neale's account, although object-dependent thoughts can be communicated by use of definite descriptions, it does not follow that the proposition expressed by an utterance containing a referentially used description is a singular proposition. Instead, this singular proposition is treated as a Gricean implicature. So if the Russellian analysis is required anyway to deal with non-referential uses, by Modified Occam's Razor, this single analysis should be preferred. However, as Neale (1992) admits, the result of Gricean inferences can enter into the proposition expressed. This considerably weakens the main argument against the dual account.<sup>26</sup>

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<sup>26</sup> See Recanati (1994) for further discussion on this matter.

The fast route to referential readings described above preserves the spirit of Neale's Russellian approach while still allowing us to say that the proposition expressed by an utterance of (44) may be equivalent to the one expressed by an utterance of "a is a spy", or "That man drinking a martini is a spy", or "He is a spy". On the fast route, the representation formed on the basis of "the man drinking a martini is a spy" involves a concept defined by (48) above. This concept applies uniquely to a in every circumstance. Thus, the thought is object-dependent, although it is not identical to the representation constructed in response to an utterance of "a is a spy", because of the difference in linguistic form. In short, the schematic-concept approach is Russellian in spirit, because it is quantificational. Moreover, examples like "the king of France is bald" come out false, as Russell wanted. My account preserves a form of uniqueness in the singular, while allowing "the manager of Liverpool is French" to be true if there are two managers of Liverpool; and it offers a unitary analysis of descriptions, while allowing descriptions to express object-dependent propositions on certain occasions of use. Finally, it enables us to account for the fact that judgements in cases of misdescription are often uncertain. A case of misdescription would arise if I uttered (44) above, mistakenly thinking the spy was drinking a martini when in fact he was drinking water. On my account, judgements about whether what I have said is true are likely to be uncertain because of the two available options for processing the utterance. On the fast route, what I have said will be true if a is indeed a spy. On the descriptive route, it will be false because of the misdescription. Informants are likely to give mixed responses because, on reflection, it is not clear which thought I intended you to entertain. I predict, therefore, that judgements that what is said is false should be firmer if the descriptive material contains relevant information. To demonstrate this, I will adapt an example from Grice (1969): Consider a scenario where a group of people attend a party at Jones' house at which their hats and coats are looked after by a dignified individual in butler's outfit whom they hear Jones addressing as "Old Boy". Among this group, the observant Smith notices this individual discussing the cultivation of vegetable marrow with an old lady. He also notices traces of earth ingrained about his finger nails. Having heard that Jones had come upon hard times, Smith deduces that Jones can no longer afford to retain a butler and must have pressed his gardener into service for the evening. When it is time to leave, the old man has trouble with the

hats and coats, confusing which belonged to whom. As the group stand by watching him, Smith nods in the direction of the old man and utters, "Jones' gardener has got the hats and coats mixed up". Now the less observant members of the group would probably take the descriptive material to be genuinely informative or relevant in the circumstances. That is, they will take it that it was part of Smith's informative intention to inform them that the individual in question is Jones's gardener. Nevertheless, the utterance is also meant to refer to the gentleman standing in front of the group. I would argue that this would be a case of referential use where the fast route would be inadequate since that involves discarding the descriptive content. In that case, the descriptive route would be taken. Now, the claim is that when the descriptive material is itself informative, the judgement that what is said in the case of misdescription is false should be a much clearer. Well let us suppose that in fact the old man is Jones' butler, not his gardener, and that Smith has gotten things round the wrong way. (In fact, Jones had to let his gardener go due to hard times but had pressed his faithful butler into looking after the vegetable patch). In this case, the judgement is quite clear that what Smith has said is false, even though he clearly intended to use the description referentially.

#### 4 Loose ends

I have not yet discussed the treatment of possessive constructions, such as "Mary's book", "Each girl's father", in this framework. It is standardly claimed that "Mary's book" can be glossed as "the book of Mary". If so, the treatment of definites sketched above would apply. However, a case could be made for a slightly more ambitious analysis, designed to capture the fact that the context dependence of possessives is slightly different from the context dependence of "the book of Mary", since what really determines what book is being talked about is some relation which Mary bears to the book. In other words, what is being talked about is  $\lambda x.book'(x) \wedge R(x)(m)$ . An alternative account might then treat possessives as raising the issue of what this relation  $R$  is. I leave this open here.

There is also a considerable range of expressions which have an implicit pro-like feature in their meaning, without being strictly definite. These include words like “local”, “come”, “arrive” etc. Although many of these are usually anchored to some aspect of the circumstance of the utterance (eg the location of the speaker), they do display the ability to have their reference point understood descriptively as well as rigidly. Recall the examples involving “local”:

- (56) a. A man visited the Eiffel Tower. Later he had lunch in a local cafe.  
 b. A man checked into a hotel. Later he had lunch in a local cafe.

I will discuss “local” briefly here in order to illustrate how my account might apply to implicitly pronominal expressions. The analysis is purely illustrative, and gives no more than a general idea. I will use the notion of *local\_to*’, which admittedly is itself context dependent. This notion does not fully correspond to the English form of words “local to”, which seems to express a relation between individuals and locations. For ease of exposition, I will simply assume that *local\_to*’ expresses a relation between two entities of which the first is within a specific radius of the location of the second. We might then treat the issue related to “local” along the lines in (57)

- (57)  $?\lambda x.\forall y\Box[\text{local}'(y) \leftrightarrow \text{local\_to}'(x)(y)]$

It is important to ensure that we get the right kind of answer when “local” is understood relative to a point fixed by description, as in (56b) above. A more circumspect formulation would allow for the implicit pronominal element to be descriptive. In that case, we will need two entries for “local”. The defining entry will contain a pronoun, which would then have to be resolved:

- (58) a.  $\forall y\Box[\text{local}'(y) \leftrightarrow \text{det}_\exists(\text{pro}_L')(\lambda x.\text{local\_to}'(x)(y))]$   
 b.  $?\lambda P.\forall y\Box[\text{pro}_L'(y) \leftrightarrow P(y)]$

The pronoun can be resolved referentially (e.g. as  $\lambda x.x = \text{Eiffel Tower}$ ), in which case the

interpretation of “local” would be anchored to a fixed point, or it can be resolved descriptively, along the lines of “the hotel the man checked into”. It turns out, in fact, that the proposal in (57) is adequate for our purposes, since in these cases of descriptive resolution, a hypothesis of the form in (58a) entails a member of the class of answers; as a result, if it adequately resolves the current issue, a descriptive interpretation will have been communicated. In general, expressions with this kind of implicitly pronominal dimension do not need to be defined in terms which make reference to these definite concepts. Given the ability to form these concepts, and assuming that the resolution of the issue in the case of “local” is only constrained by pragmatic expectations, descriptive interpretations are as good as referential interpretations.

## Chapter 4

### Binding

#### Section I Introduction

In this chapter, I will look at dependent interpretations of context-dependent expressions. Some familiar examples are given in (1-3):

- (1) a. Mary washed herself.  
b. Every girl washed herself.
- (2) a. Every girl thinks she will win.  
b. The father of each girl cheered her.
- (3) a. Every farmer who owns a donkey beats it.  
b. If a farmer buys a donkey, he usually vaccinates it.

(1) involves reflexives, (2) bound-variable pronouns and (3) donkey pronouns. Other less widely-discussed examples include:

- (4) a. Every host received a gift from every guest.  
b. Usually, when John throws a party, every guest brings a gift.
- (5) Most farmers who bought sheep and donkeys at the state fair sold some donkeys in their home town for profit. (That way they covered their expenses).
- (6) a. Every sports fan watched the match in a local bar.  
b. Every netball team nominated a tall girl to take the jump-offs.

Partee (1989), building on work by Mitchell (1986), treats examples like (6a) as cases of binding into expressions with an implicit pronominal element. She argues against analyses based on some kind of covert pro-form at the level of natural-language syntax. (4a,b) and (5), which involve dependent interpretations of quantified noun phrases, make such null pro-form analyses implausible. Even more implausible would be a dissection of "we" into an indexical and a pronominal component at the level of syntactic structure:

(7) Whenever I go out with old school friends, we usually talk about old times.

Of course, definite descriptions, and demonstratives can also have dependent interpretations. (8) illustrates this for definite descriptions:

(8) Every farmer who owns donkeys and goats beats the donkeys.

I would argue that the examples in (9) and (10) illustrate the same phenomenon:

(9) a. Most farmers around here own some donkeys. But they treat them pretty well.  
b. A dog bit a man and then the man bit the dog.

(10) a. If you leave the windows open, a burglar might get in. He would steal the silverware.  
b. Every Swiss male over twenty-one owns a gun. He is required to do so by law.

(11) Last year, the mayor of Boston was a Democrat. This year, he is a Republican.

In the E-type tradition, the second sentence in (9a) is glossed as, "The farmers who own donkeys treat the donkeys they own pretty well", and similarly for (9b). (10a) is a case of modal subordination.

In this chapter, I will develop the account of variable-free binding which has been applied to examples like those in (1-2) in the categorial literature (see Jacobson 1995), and more recently to donkey pronouns (Jacobson 1998). Although I will not be invoking covert pro-forms at the level of syntactic structure, I will argue that all dependent interpretations of an expression involve a lexical entry distinct from the entry for its non-dependent counterpart. Thus, "tall" in (6b) will have a different lexical entry from "tall" in "Mary is tall". This follows from the categorial framework: if two expressions have different semantic types, they have different syntactic categories. As the phenomenon is quite general for context-dependent expressions, I will introduce a lexical rule which transforms the categorial entry of a non-dependent lexical item into a dependent entry. Thus, in principle, any expression can be bound into. In practice, binding will only be possible for expressions which raise issues for their interpretation. There are few exceptions to the generalization that an expression which raises an issue has a dependent interpretation. Exceptions include indexicals like "I", which are anchored by rule to a feature of the utterance situation.

The analyses in this chapter support the proposals of this thesis in two important ways. First, the treatment of context dependence developed in the last chapter makes a general and uniform treatment of dependent interpretations relatively straightforward. Second, my treatment of binding entails that pronouns have a single linguistic meaning based on the procedures they activate. Thus, the form "he" can be given a unitary treatment whether it is referential, bound-variable, a donkey-pronoun or anaphoric on a quantificational expression.

In the next section, I discuss the uniformity issue in relation to non-dynamic approaches to pronominal anaphora. I then review the treatment of some forms of binding on the variable-free approach. I show how this approach can be generalised, using the semantics of the last chapter, to handle all forms of dependent interpretation. In section III, I apply the analysis to donkey pronouns and other data surveyed above.



## Section II Binding into Context-Dependent Expressions

### 1 The uniformity issue

Let us start with the examples in (1) and (2):

- (1) Every farmer who owned a donkey beat it.
- (2) A man walked in the park. He whistled.

A major motivation for the original E-type approaches to pronominal anaphora was that these examples could not be handled using certain fixed assumptions:

- (i) Indefinite noun phrases are interpreted as existential quantifiers.
- (ii) There are two mechanisms for interpreting pronouns: they are interpreted either in the manner of bound variables of formal languages such as the predicate calculus, or as free variables, when they function like referring terms, relative to a context (assignment of values to variables).
- (iii) The scope of binding elements in natural language is determined by c-command.

Given (i)-(iii), the pronoun in (1) cannot be interpreted as a variable bound by its antecedent, because of its surface configuration. Moreover, even if some kind of movement operation could put the indefinite and the pronoun in the correct structural configuration for binding, the existential semantics of the indefinite would yield a counter-intuitive interpretation.

Example (2) poses a similar problem. The pronoun depends for its interpretation on an indefinite in a preceding sentence. Intuitively, the interpretation of the discourse in (2) is equivalent to that in (3):

(3)  $\exists x[\text{man}'(x) \ \& \ \text{walk}'(x) \ \& \ \text{whistle}'(x)]$

Once again, assumptions (i)-(iii) make it impossible to derive this interpretation via the grammar.

The move to a classical E-type account (see chapter 2, section IV) means that in order to preserve the classical treatment of bound and referential pronouns as variables in a logical language, we have to suppose that pronominal forms are in fact ambiguous.

By contrast, dynamic approaches do provide a unitary analysis of pronominal forms. Although pronouns are not treated as identical to variables in a first-order language with standard semantics, they are effectively treated as variables. It's just that the meaning of variables in dynamic approaches is different: essentially, pronouns introduce variables which get bound by (identified with) accessible discourse referents.

However, as we saw in chapter 2, the empirical range of the dynamic approach is somewhat limited. A dual approach seemed to be needed in cases like (4), where the pronoun had to be treated as E-type:

(4) It is not the case that no man was walking in the park. He was lurking in the bushes.

In the last chapter, I proposed an analysis of pronouns on which both referential and cross-sentential E-type pronouns can be analysed in the same way. In the next sections, I will extend this analysis to deal with bound-variable readings and donkey pronouns.

## 2 Variable-Free Binding

The apparent need to treat pronouns as variables arises from sentences like (5a), with a logical form equivalent to (5b):

- (5) a. Every girl saw herself in the mirror.  
 b.  $\forall x[\text{girl}(x) \rightarrow \text{saw}(x,x)]$

In (5b), the variable "x" appears as the second argument of the relation "saw", and is bound by the universal quantifier. On most views of the interface between natural-language syntax and semantics, the pronoun in (5a) is treated as having the same properties as the expression "x" in the logical language. There is a school of thought, however, which sees no need to treat any natural-language expressions in this way (for an overview, see Jacobson (1995)). To see that pronouns need not be treated as variables, notice first that the natural language sentence in (5a) has a subject-predicate structure. In a given circumstance, the subject denotes a set of sets and the predicate denotes a set: here the set of individuals that saw themselves in the mirror. To show how this may be derived compositionally without variables, we will adopt the binding analysis given in Jacobson (1998). On this approach, pronouns can denote functions from individuals to individuals, as in (6):

- (6)  $\text{herself}' = \lambda x.x$  (type  $\langle e,e \rangle$ )

Binding is effected by the z-rule, which has the general form in (7). The result of applying this rule to  $\text{see}'$  (type  $\langle e, \langle e,t \rangle \rangle$ ) with a view to binding a type  $\langle e \rangle$  dependency is given in (8):

- (7) Let  $f$  be a function of type  $\langle a, \langle c,b \rangle \rangle$ . Then  $z(f)$  is a function of type  $\langle \langle c,a \rangle, \langle c,b \rangle \rangle$  such that:

$$z(f) = \lambda V[\lambda x[f(V(x))(x)]]$$

(for  $V$  a variable of type  $\langle c,a \rangle$ ,  $x$  a variable of type  $\langle c \rangle$ )

- (8)  $z(\text{see}') = \lambda V_{\langle e,e \rangle} \lambda x[\text{see}'(V(x))(x)]$

As noted above, in categorial approaches, the syntax and semantics are set up in tandem. Rules

such as the z-rule above, the Geach rule and type-lifting rules (see below), define well-formed expressions on the basis of existing well-formed expressions, with corresponding adjustments of the semantics. So, for instance, the full z-rule is given in (9):

(9) The z-rule:

Let  $\alpha$  be an expression of the form  $\langle [\alpha], (B/C)/A, \alpha' \rangle$ . Then there is a corresponding expression of the form  $\langle [\alpha], (B/C)/A^C, z(\alpha') \rangle$

Recall that an expression is thought of as a triple of phonological, syntactic and semantic information. The superscript element in a syntactic entry,  $A^C$ , encodes the information that the expression contains an unbound dependency of category C. The reflexive pronoun whose semantics is defined in (6) will have a syntactic entry of this form,  $NP^{NP}$ . Then (9), the z-rule, says that there is an expression "saw" with syntactic category  $(S/NP)/NP^{NP}$  and semantic category  $\langle \langle e, e \rangle, \langle e, t \rangle \rangle$ , whose meaning is defined in (8) in terms of the meaning of the basic transitive verb, *saw'*. The combination of "saw" thus defined and the pronoun is well-formed. This is shown in (10a). Given the syntax and semantics for "every girl", we have a representation of the triple corresponding to the original example in (10b):

(10) a. saw herself:  $\langle [\text{saw herself}], S/NP, z(\text{saw}')(\text{herself}) \rangle$

$$\begin{aligned} \text{where } z(\text{saw}')(\text{herself}) &= \lambda V_{\langle e, e \rangle} \lambda x [\text{see}'(V(x))(x)](\lambda z.z) \\ &= \lambda x [\text{see}'(x)(x)] \end{aligned}$$

b.  $\langle [\text{every girl saw herself}], S, \text{every}^{C_1}(\text{girl}')((z(\text{saw}')(\text{herself}')) \rangle$

Thus, an interpretation of a sentence containing a 'bound-variable pronoun' can be provided without appeal to anything corresponding to a variable.

I now propose to extend this analysis to dependent interpretations of context-dependent expressions in general.

### 3 Dependent interpretations of context-dependent expressions

As suggested in the introduction, if an expression is context dependent, it can generally be bound into. Let us consider in detail the case of "local":

- (11) a. John visited a local bar.  
b. Every sports fan watched the match in a local bar.  
c. Every foreign correspondent who had a contact met him in a local bar.

In (11a), the reference point for constructing an interpretation of "local" must be found in the utterance context (either the place/agent of the utterance itself or some other contextually-supplied reference point). On one reading of (11b), the interpretation of "local bar" must covary with the individuals over which the subject quantifies. (11c) is similar in construction to a donkey sentence. On the reading we are interested in, the interpretation of "local bar" must covary with the individuals being quantified over; however, unlike in (11b), the reference point required to fix the meaning of "local" is not supplied by the individuals being quantified over, but is determined relative to the contact who is related to the correspondent via the restrictor.

Suppose that we want to treat the occurrences of "local" in examples (11b,c) along the same lines as the bound-variable pronouns above. This amounts to supposing that they are of the form  $\langle [\alpha], A^{NP}, \alpha' \rangle$ , where  $\alpha'$  is of the type  $\langle e, a \rangle$  and  $a$  is the canonical type for expressions of category  $A$ . In fact, we need not stop there, since context-dependent expressions can covary in their interpretation with any quantificational element, as in (12):

- (12) When I meet old school friends, we usually go to a local bar.

Here the variation in the non-indexical contextually-determined dimension of "local" depends on the situations (or cases) which "usually" is quantifying over.

There is then an apparent generalisation about context-dependent expressions which we can characterise, in a preliminary way, as follows:

- (13) If a context-dependent expression,  $\alpha$ , of canonical type  $\langle a \rangle$  appears as, or within, an argument of type  $\langle b, t \rangle$  of a functor,  $\beta$ , then  $\alpha$  can be construed as a dependent expression, of type  $\langle b, a \rangle$ .

Let us see how this generalisation can be derived.

First, we need to provide a means of binding into expressions in general. This is made possible in part by the Geach rule (cited from Jacobson 1998):

- (14) The Geach rule (g):

Take an expression  $\alpha$  with the entry  $\langle [\alpha], A/B, f \rangle$

Let  $f$  be a function of type  $\langle a, b \rangle$ . Then  $g(f)$  is a function of type  $\langle \langle c, a \rangle \langle c, b \rangle \rangle$ , such that  $g(f) = \lambda V [\lambda c [f(V(c))]]$  where  $V$  is a variable of type  $\langle c, a \rangle$  and  $c$  is a variable of type  $c$ .

Then the Geached version of  $\alpha$  is  $\langle [\alpha], A^C/B^C, g(f) \rangle$ . (Where category  $C$  corresponds to semantic type  $\langle c \rangle$ ).

This rule is fully general, and effectively allows us to pass a dependency up to any level. The Geach rule, the z-rule and the type shifting operations used here are standard in categorial approaches, and make it possible to do binding without variables. The combined operation of the Geach rule and the z-rule make it possible to bind into an expression from any distance.

In particular, given a dependent expression of type  $\langle b, a \rangle$ , the semantic components of the Geach and z-rules can ensure that the type  $\langle b \rangle$  dependency will be bound if and only if that expression appears as, or within, an argument of type  $\langle b, t \rangle$  of a functor  $\beta$ . If the dependent expression does not appear in a configuration of this type, the sentence cannot be given an interpretation<sup>1</sup>.

What about the syntactic components of these rules? In standard approaches to variable-free semantics, dependent expressions such as "herself" in (5) above are assumed to come out of the lexicon with syntactic category  $NP^{NP}$ , corresponding to its  $\langle e, e \rangle$  type. This is the right category for application of the z-rule and the Geach rule. However, we are interested in deriving dependent interpretations of context-dependent expressions in general, and we must assume that the standard category for an expression like "local" is not of this dependent type. Rather it will be of the category  $S/NP$ .

To extend the variable-free approach to deal with binding into phrases such as "a local bar", we need to propose some mechanism which will transform the standard category for "local" into a dependent category. Unlike the z-rule and the Geach rule, which operate on fully-formed lexical entries, this transformation operation will have to take place in the lexicon. Let us call this the d-rule. We will assume that the d-rule operates freely in the lexicon, and is part of the process of forming lexical items. It simply replaces a category  $X$  in a lexical entry with category  $X^Y$ , for any  $Y$ . To constrain the operation of this rule, we will assume that it is a principle of the lexicon that syntactic categories and semantic types must match. So, for example, an entry with category  $S/NP$  must have type  $\langle e, t \rangle$ , a category of type  $(S/NP)^{NP}$  must have type  $\langle e, \langle e, t \rangle \rangle$ , and so on.

Given the d-rule, we have the categorial means to build dependent expressions. Now suppose that we take the categorial entry for "local" and apply the d-rule in order to get the entry,  $(S/NP)^{NP}$ . In order to produce a well-formed lexical item, we shall need a meaning of the right

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<sup>1</sup> This is not strictly speaking true. If a dependency remains unbound, the sentence in which it occurs will simply be interpreted as a function from something to propositions. However, we are assuming here some principle of language use on which uttered sentences express propositions.

type, i.e.  $\langle e, \langle e, t \rangle \rangle$ . So we need to say something about how the semantic entry is supplied.

On the account outlined in the last chapter, the semantic entries in these triples are provided by concepts which are combined in the representation constructed according to the theory of the grammar outlined there. For non-context-dependent lexical items, the concept is drawn from the fixed repertoire of concepts and combined in the manner specified. In the case of context-dependent expressions such as "local", no fixed concept is generally retrieved and inserted into the representation. Rather, a procedure is activated which constrains the process of determining which concept is associated with the word. In the case of "local", this procedure activates the issue in (15):

(15)  $?\lambda x. \forall y \square [\text{local}'(y) \leftrightarrow \text{local\_to}'(x)(y)]$

This issue is well-suited to the task of providing the semantic entry for the lexical item in (16):

(16)  $\langle [\text{local}], \text{S/NP}, \text{local}' \rangle$

However, d-versions of "local" are also possible, so the lexical entry in (17) could also be constructed:

(17)  $\langle [\text{local}], (\text{S/NP})^{\text{NP}}, \text{local}'_d \rangle$

At this stage, it might be helpful to work through an example in which "local" receives a dependent interpretation, in order to see how the conceptual systems and the lexicon interface in such a case.

Let us look again at example (11), where the expression "a local bar" is given a bound-variable reading. This is repeated as (18):



(18) Every sports fan watched the match in a local bar.

For clarity of exposition, I will represent the meaning of "the match" as  $m'$  of type  $\langle e \rangle$ , although, strictly speaking, this is a quantified noun phrase. The interpretation of "watched the match" will therefore be an expression of type  $\langle e, t \rangle$ , with the meaning  $watch'(m)$ . I assume that the prepositional phrase is of type  $\langle e, t \rangle$ , and that its meaning is something like  $\lambda x[in'(Q)(x)]$ , where  $Q$  is the meaning of "a local bar". This makes  $in'$  of type  $\langle \langle e, t \rangle, t \rangle, \langle e, t \rangle \rangle$ , with a meaning  $\lambda V \lambda x[V(\lambda y[in'(y)(x)])]$  where  $V$  is a variable over generalised quantifiers and  $in'$  is the regular meaning of "in". Finally, I assume that the prepositional phrase is attached to the verb phrase by covert (type-shifted) conjunction. In that case, we can apply the general rule for conjoined predicate phrases:  $\lambda x.\phi \sqcap \lambda x.\psi = \lambda x[\phi \wedge \psi]$ .

We now need to build up the meaning of the noun phrase, "a local bar". I will assume that in this case the context set for the determiner is resolved as the set of all things. Thus, the actual entry for the determiner will be as in (19a). (19b) gives the entry for "bar":

- (19) a.  $\langle [a], S/(S/NP)/(S/NP), det_3' \rangle$   
b.  $\langle [bar], S/NP, bar' \rangle$

When "local" is uttered as part of this phrase, the procedure for constructing/retrieving the relevant concept will involve the activation of the issue in (15). However, we also want it to be possible to construct a concept which can provide a semantic entry for the d-version lexical entry, repeated in (20). The concept in question would have to be of a relation (type  $(e, (e, t))$ ):

- (20)  $\langle [local], (S/NP)^{NP}, local_d' \rangle$

With the example in (18), we need to ask ourselves what salient individual or individuals can provide a basis for resolving the issue in (15). Since the first part of the sentence talks about the set of individuals who are sports fans, in any circumstance, each member of this set could

provide a reference point. However, on this basis, we cannot formulate an adequate conception of a property *local'*, since we do not have enough information to discriminate among sports fans.<sup>2</sup> We do, however, have enough information to set up an adequate conception of a concept *local<sub>d</sub>'* of type (e(et)). This conception will be adequate, because the relation will be defined for elements of its range which are sports fans:

$$(21) \quad \forall x \forall y \square [\text{sports\_fan}'(x) \rightarrow \text{local}'_d(x)(y) \leftrightarrow \text{local\_to}(x)(y)]$$

It follows that we can achieve an adequate understanding of a representation into which *local<sub>d</sub>'* is inserted as long as we can bind off the range in such a way that we only ever have to evaluate the relation with respect to sports fans. The mechanisms of the grammar make it possible to do this in the context of the sentence in question, as the following argument shows.<sup>3</sup>

As *local<sub>d</sub>'* will form part of the meaning of a modified noun phrase, we will assume that the adjective and noun are mediated by "\$"<sup>4</sup>. As in the case of VP adverbial modifiers, "\$" is of category (S/NP/S/NP)(S/NP), and has the meaning of type-shifted conjunction,  $\lambda P \lambda Q [P \sqcap Q]$  (type  $\langle\langle e, t \rangle, \langle\langle e, t \rangle, \langle e, t \rangle \rangle\rangle$ ). Without going into too much detail, we can arrive at a meaning for "local bar" by type raising *bar'* to mean  $\lambda V [V(\text{bar}')] ]$ , where V is a variable of type  $\langle\langle e, t \rangle, \langle e, t \rangle \rangle$ . We then need a Geached \$' and /bar' to apply in turn to  $\lambda x \lambda y . \text{local}'_d$ . This is shown in (22a), which is equivalent to (22b):

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<sup>2</sup> There could, of course, be contexts in which this is possible: for instance, if we know that the type of sports fan being quantified over always includes a unique head-honcho sports fan, and the tradition is that they gather in a bar local to that person to watch the match.

<sup>3</sup> Cf Heim's (1990) E-type analysis of donkey sentences using partial functions to interpret donkey pronouns which are only defined for the individuals in the denotation of the restrictor (the farmers who own donkeys). In this system, the semantics is total, so there is no issue about truth-value gaps, and no problems for the logic which partial functions bring to a language. Here partiality is epistemic, not semantic.

<sup>4</sup> See Cormack and Breheny (1994) for an analysis of the syntax of modification using \$.

$$\begin{aligned}
(22) \quad a. \quad & \mathbf{g}(\uparrow \text{bar}')(\mathbf{g}(\$)(\lambda x \lambda y. \text{local}'_d(x)(y))) \\
& = \lambda V \lambda z [\uparrow \text{bar}'(V(z))](\lambda x [\$'(\lambda y. \text{local}'_d(x)(y))]) \\
& = \lambda x [\uparrow \text{bar}'(\$(\lambda y. \text{local}'_d(x)(y)))] \\
b. \quad & \lambda x \lambda y [\text{bar}'(y) \wedge \text{local}'_d(x)(y)]
\end{aligned}$$

This would make the contextually-determined meaning of "local bar" something of type  $\langle e, \langle e, t \rangle \rangle$ . Let us represent the meaning of this phrase as *local-bar'*. We now need to apply the Geach rule to  $\text{Det}_3$  in order to pass the dependency up. This is shown in (23a). When we apply this to *local-bar'*, we get (23b), of type  $\langle e, \langle \langle e, t \rangle, t \rangle \rangle$ :

$$\begin{aligned}
(23) \quad a. \quad & \mathbf{g}(\text{det}_3) = \lambda V \lambda x [\text{det}_3(V(x))] \quad \text{where } V \text{ is type } \langle e \langle e, t \rangle \rangle \\
b. \quad & \mathbf{g}(\text{det}_3)(\text{local-bar}') = \lambda V \lambda x [\text{det}_3(V(x))](\text{local-bar}') \\
& = \lambda x [\text{det}_3(\lambda z. \text{local-bar}'(x)(z))]
\end{aligned}$$

If we now apply the z-rule to *in'*, and then apply  $z(\uparrow \text{in}')$  to the meaning in (23b), we will achieve binding into the noun phrase  $[_{NP}[\text{det}_3][a \text{ local bar}]]$ . This is shown in (24):

$$\begin{aligned}
(24) \quad & \mathbf{z}(\uparrow \text{in}') = \lambda V \lambda x [\uparrow \text{in}'(V(x))(x)] \quad V \text{ is type } \langle \langle e, \langle \langle e, t \rangle, t \rangle \rangle \\
& \mathbf{z}(\uparrow \text{in}')(\mathbf{g}(\text{det}_3)(\text{local-bar}')) \\
& = \lambda V \lambda x [\uparrow \text{in}'(V(x))(x)](\lambda y [\text{det}_3(\lambda z. \text{local-bar}'(y)(z))]) \\
& = \lambda x [\uparrow \text{in}'(\text{det}_3(\lambda z. \text{local-bar}'(x)(z)))(x)]
\end{aligned}$$

$\mathbf{z}(\uparrow \text{in}')(\mathbf{g}(\text{det}_3)(\text{local-bar}'))$  now applies to the individuals that we are quantifying over in the context (i.e. sports fans) who are in one of their own local bars, as required. Using the conjunction rule mentioned above, the whole modified VP meaning looks like (25):

$$(25) \quad \lambda x [\text{watch}'(m')(x) \wedge \uparrow \text{in}'(\text{det}_3(\lambda z. \text{local-bar}'(x)(z)))(x)]$$

This is what is required to get the dependent "bound variable" interpretation of (18).

Let us look more closely at the assumptions underlying this result. The grammar makes available the mechanisms for binding into the prepositional phrase. This appears as part of the verb phrase, which constitutes the  $\langle e, t \rangle$  argument of the  $\langle \langle e, t \rangle, t \rangle$  subject. Consequently, any expression of category  $X^{NP}$  and type  $\langle e, x \rangle$  within the prepositional phrase can be interpreted as bound by the subject. We assume that the standard syntactic entry for "local" in the lexicon is S/NP. The d-rule allows us to transform the canonical entry from S/NP to  $(S/NP)^{NP}$ . So the grammar would allow binding into the d-version of "local", as long as we can find a meaning of the right type, i.e.  $\langle e, \langle e, t \rangle \rangle$ . As we saw above, an object of this type is made accessible in the course of processing the utterance via the procedure for "local". In general, interpreting expressions associated with concept schemata mandatorily involves the task of solving for whatever parameters are involved. So, in the general case, there will be a salient relation available as a result of processing this expression if the parameter in question can be fixed relative to the objects over which we are quantifying. This relation can serve as the meaning for the d-version of this expression. Thus the dependent ('bound variable') interpretation of a context dependent expression is achieved.

Let us now try a donkey sentence:

(26) Every farmer who owns a donkey beats it.

Again, let us assume that the issues raised by  $every^{Ct}$  and  $det_{\exists}^{Ct}$  are resolved in terms of the property which picks out the universe of discourse. In a grammar for plurals, the restrictor of the subject noun phrase has the form in (27):

(27)  $\lambda x. \text{farmer}'(x) \wedge \text{det}_{\exists}(\text{donkey}')(\lambda y. \text{own}'(y)(x))$

The issue raised by a singular pronoun is given in (28):

(28)  $?P \forall x \square [\text{pro}'(x) \leftrightarrow \check{P}(x)]$

As the pronoun here is singular, the constraint in (29) will be activated:

$$(29) \quad \square[\exists x[\text{pro}(x)] \rightarrow \exists x\forall y[\text{pro}'(y) \rightarrow y = x]]$$

However, this constraint will eventually be discarded when the decision is taken that the pronoun here is dependent. The reason is that the constraint in (29) is for an interpretation of the pro-form as a property. Since the dependent interpretation involves a relation, the constraint cannot apply. Moreover, the relation can in principle be between collections, so the condition that the concept which interprets the pronoun should be a property of singletons can be altered. In any case, a potential resolution of the issue is made available via the inference in (30) about instantiations of the restrictor in (27):

$$(30) \quad \text{all}'(\lambda x.\text{farmer}'(x) \wedge \text{det}_{\exists}(\text{donkey}')(\lambda y.\text{own}'(y)(x))) (\lambda x.\text{det}_{\exists}(\text{donkey}')(\lambda y.\text{own}'(y)(x)))$$

That is, for every individual being quantified over, the set of donkeys they own is non-empty. As it stands, this information cannot be used to set up a semantic entry for the non-dependent lexical item "it". However, it can be used to provide a semantic entry for the dependent version in (31):

$$(31) \quad \langle [\text{def}], (\text{S/NP})^{\text{NP}}, \text{pro}'_d \rangle$$

$\text{Pro}'_d$  is of the type  $((\text{et})((\text{et})t))$ , that is, a relation between collections. As we have seen, it is possible to infer that the first part of the sentence is talking about sets of donkeys which are owned by farmers. Thus, as in the "local" case above, we can set up an entry which will provide an adequate resolution for  $\text{pro}'_d$ . Assumptions such as those in (32), given the mechanisms we have at our disposal for binding, will give us an adequate understanding in the context of the sentence:

- (32) a.  $\forall x \forall Y \square [\text{farmer}'(x) \wedge \text{det}_{\exists}(\text{donkey}')(\lambda y. \text{own}'(y)(x))$   
 $\rightarrow \text{pro}'_d(x)(Y) \leftrightarrow \lambda Z [* \text{donkey}'(Z) \wedge \text{pl}(\text{own}')(\text{Z})(x)](Y)]$
- b.  $\forall x \forall Y \square [\text{farmer}'(x) \wedge \text{det}_{\exists}(\text{donkey}')(\lambda y. \text{own}'(y)(x))$   
 $\rightarrow \text{pro}'_d(x)(Y) \leftrightarrow \max(\lambda Z. * \text{donkey}'(Z) \wedge \text{pl}(\text{own}')(\text{Z})(x))(Y)]$

Recall that:

- (33) a.  $* = \lambda X \lambda Y. Y \subseteq X \wedge Y \neq \emptyset$
- b.  $\max = \lambda X \lambda Y. \forall Z [X(Z) \rightarrow Z \subseteq Y]$

Thus, assumption (32a) will give rise to the non-maximal reading, and (32b) will give rise to the maximal reading. Note that, as with cross-sentential anaphora, there is a degree of freedom in constructing these assumptions: the only constraint is that we use (possibly complex) concepts made accessible by our understanding of what is being talked about. In this case, the inference in (30) can be elaborated upon:

- (34)  $\text{all}'(\lambda x. \text{farmer}'(x) \wedge \text{det}_{\exists}(\text{donkey}')(\lambda y. \text{own}'(y)(x))) (\lambda x. \text{det}_{\exists}(* \text{donkey}')(\lambda Y. \text{pl}(\text{own}')(\text{Y})(x)))$

This tells us that in a given circumstance, the set of individuals being quantified over is such that for each member, at least one member of the set of collections of donkeys is among the set of collections of things they own. This is the basis for the assumption in (32a). For (32b), we are free to provide an alternative on which  $\text{pro}'_d$  applies to pairs of individuals and the maximal collection of donkeys they own.

As  $\text{pro}'_d$  now expresses a relation, its combination with  $\text{det}_{\exists}$  can be achieved by passing up the dependency using the Geach rule, in the manner described above. The dependency can subsequently be bound off by the z-rule at the appropriate level.

I will illustrate how these mechanisms apply to the harder case in (35):

(35) A lot of farmers around here own some donkeys. They vaccinate them.

Among the many potentially available readings of the second sentence is the maximal-maximal reading, which is distributive in both arguments. This might be glossed as, "All the farmers around here who own donkeys each vaccinate each of the donkeys which they own." I will show how this reading is derived and then make some comments on the derivation.

First, we need to adapt the system for introducing distributivity into a sentence set out in section III of chapter 2. There we employed empty categories in a basic generative framework. Recall that, for a doubly distributive reading of "vaccinate", we would have the structure (36):

(36)  $[d_s [\text{vaccinated } d_o]]$

This indicates that two distributivity operators have to be inserted into the translation. One way of interpreting this is given in (37):

(37)  $\uparrow_o \text{vaccinated}_{o,s} = \lambda Q \delta \lambda X Q (\delta (\lambda Y . * \text{vaccinated}(Y)(X)))$

Recall that  $Q$  is a variable over type  $((ett)((ett)t))$ , and  $\delta$  is the distributivity operator defined in (38):

(38)  $\delta = \lambda Y \lambda X . AT(X) \subseteq Y$   
 $AT(X) = \lambda Y . Y \subseteq X \wedge |Y| = 1$

Recall also that in the system outlined in chapter 2, the subscript on the type-shifting arrow indicates which of the noun phrases takes narrow scope. The subscript on the type-shifted relation itself indicates where to insert the distributivity operator. I will use  $*$  instead of  $pl$  on relational predicates for readability. In the categorial system being used here, we do not have the luxury of empty categories, so these distributivity operators have to be inserted by other means.

I have no option at this level of description but to stipulate that a type-shifted version of "vaccinated" comes out of the lexicon with distributivity in the object noun phrase inserted. That is, I am supposing that this can be formed by a lexical process. This is not optimal, since type shifting for the purposes of scope, at least, should really be a syntactic process proper. However, the present crude system does not readily allow me to tease these factors apart. I will therefore help myself to a lexical item of the semantic form in (39):

$$(39) \quad \uparrow_o \text{vaccinated}_o = \lambda Q \lambda X Q (\delta (\lambda Y. * \text{vaccinated}(Y)(X)))$$

The subject distributivity operator will be inserted after (39) has applied to the meaning of the object noun phrase.

We now need to look at the antecedent sentence, to see what information is made available for interpreting the pronouns. The intersective set for this sentence will be as in (40), assuming that distributivity is present here too:

$$(40) \quad \lambda X. * \text{farmer}(X) \wedge (\delta (\lambda U. \text{det}_{\exists}(* \text{donkey})(\lambda Y * \text{own}(Y)(U))))(X)$$

This denotes the set of collections of farmers who each own some donkeys. The issue raised by the subject pronoun in the second sentence in (35) can be resolved along the lines in (41):

$$(41) \quad \forall X \square [ \text{they}'(X) \leftrightarrow \max (\lambda X. * \text{farmer}(X) \wedge (\delta (\lambda U. \text{det}_{\exists}(* \text{donkey})(\lambda Y * \text{own}(Y)(U))))(X))$$

The form of the subject, given in (42), will then give rise to a maximal reading:

$$(42) \quad \lambda X. \text{det}_{\exists}(\text{they}')(\mathbf{X})$$

In order to resolve the object noun phrase, we will be looking for a definition of the d-version of the pronoun, *them*'<sub>d</sub>. By the same reasoning as in previous cases, we can deduce that, in any



circumstance, for the maximal set of farmers who own donkeys, for each of those individuals, there is at least one collection of donkeys among the things they own. We can therefore make the assumption in (43), which will give us an adequate understanding of *them<sub>d</sub>'* in the context of the sentence:

$$(43) \quad \forall X, Y \square [\text{they}'(X) \rightarrow \forall U [(|U| = 1 \wedge U \subseteq X) \rightarrow \text{them}'_d(U)(Y) \leftrightarrow \lambda V. \max(\lambda W. *donkey'(W) \wedge *own(W)(V))(U)(Y)]]$$

In other words, what is known about *them<sub>d</sub>'* is that in any circumstance, it pairs individuals who are among the maximal set of farmers who own donkeys with the maximal set of donkeys they own.

We can now combine this dependent form with the determiner, using the Geach rule:

$$(44) \quad \text{gdet}'_{\exists}(\text{them}'_d) = \lambda X. \text{det}'_{\exists}(\lambda Y. \text{them}'_d(X)(Y))$$

This is of type ((et)((ett)t)). The form with which this will combine in (39) is (((ett)t)((et)t)). We will want to effect binding at this level before the distributivity operator applies. We will therefore need to apply the z-rule. This is shown in (45), where the variable *V* is of type ((et)((ett)t)):

$$(45) \quad z \uparrow_o \text{vaccinated}_o = \lambda V \lambda X. [\uparrow_o \text{vaccinated}_o(V(X))(X)]$$

Combining (44) and (45), we get (46):

$$(46) \quad \begin{aligned} z \uparrow_o \text{vaccinated}_o(\text{gdet}'_{\exists}(\text{them}'_d)) \\ &= \lambda V \lambda X. [\uparrow_o \text{vaccinated}_o(V(X))(X)](\lambda U. \text{det}'_{\exists}(\lambda V. \text{them}'_d(U)(V))) \\ &= \lambda X. [\uparrow_o \text{vaccinated}_o(\lambda U. \text{det}'_{\exists}(\lambda V. \text{them}'_d(U)(V))(X))(X)] \\ &= \lambda X. [\uparrow_o \text{vaccinated}_o(\text{det}'_{\exists}(\lambda V. \text{them}'_d(X)(V)))(X)] \end{aligned}$$

$$\begin{aligned}
&= \lambda X.[\lambda Q\lambda WQ(\delta(\lambda Y.*\text{vaccinated}(Y)(W)))(\text{det}'_3(\lambda V.\text{them}'_d(X)(V)))(X)] \\
&= \lambda X.[\lambda W.\text{det}'_3(\lambda V.\text{them}'_d(X)(V))(\delta(\lambda Y.*\text{vaccinated}(Y)(W)))(X)] \\
&= \lambda X.[\text{det}'_3(\lambda V.\text{them}'_d(X)(V))(\delta(\lambda Y.*\text{vaccinated}(Y)(X)))]
\end{aligned}$$

The form in (46) will then combine with the distributivity operator before combining with the interpretation of the subject noun phrase:

$$(47) \quad \text{det}'_3(\text{they}')(\delta(z \uparrow \text{vaccinated}_o(\text{gdet}'_3(\text{them}'_d))))$$

As only the maximal set of farmers who own donkeys satisfies *they'*, in order to verify (47) we will need to check that each member of this set satisfies the predicate in (46). This will happen as long as these individuals vaccinated each member of the maximal set of donkeys they own. And this is what we required.

Several features of this treatment are worthy of comment. First, discourses of the form in (48) are open to a variety of readings, maximal or not, distributive or not, with the possibility of scope permutations. Each of these is obtainable in the system outlined here:

$$(48) \quad Q_1 R_1 Q_2. \text{ They } R_2 \text{ them.}$$

In many cases, however, there is a basic derivation which may give an adequate understanding of such discourses. This is made possible by the meaning postulate associated with the pluralising operator proposed in chapter 2, section III:

$$(49) \quad \forall X, Y[(\text{pl}(\mathbf{R}))(X)(Y)] \rightarrow \exists C_1[C_1 \text{ covers } X \wedge \forall U \in C_1 \exists V \subseteq Y[\mathbf{R}(U)(V)]] \wedge \exists C_2[C_2 \text{ covers } Y \\ \wedge \forall V \in C_2 \exists U \subseteq X[\mathbf{R}(U)(V)]]$$

In the case of (35), the basic interpretation would involve resolving for "they" as the (maximal) set of farmers who own donkeys and for "them" as the (maximal) set of donkeys owned by

farmers. In that case, there would be no binding. The set or sets falling under the restrictor of the pronouns would be related to each other directly, and the pluralising postulate will tell us that the relation holds between these sets if there is a cover of the first such that each member of the cover bears the relevant relation to a part of the second; and there is a cover of the second such that each member of that is in the relation with a part of the first. This representation would apply to many sets of circumstances, including those described by the above interpretation with binding and distributivity. However, the basic interpretation may be adequate in many contexts. For example, consider (50):

(50) Many people bought sandwiches at the kiosk. They ate them in the park.

Here, the basic interpretation would usually be adequate: the audience would not normally be wondering whether people bought sandwiches individually or chipped in with others to buy some, how the people divided up around the park, whether they shared their sandwiches, or even whether all the people who bought sandwiches ate them in the park, or whether all of the sandwiches bought were eaten, and so on.

Even when it is clear that the type of situation described could be represented with a form involving binding and distributivity, the basic interpretation might still be adequate, since other available possibilities might be ruled out on grounds of plausibility:

(51) Many students wore rings to school. They took them off before assembly.

However, although this basic derivation, which yields a fairly weak reading, may be adequate in many cases, I do not want to say that the grammar gives only this reading, and that the others are inferred. In that case, we would be unable to explain how stronger interpretations are ever derived. On the assumption that the basic form is intended, if the circumstances described by stronger readings are not implausible, it should be inferred that the stronger readings are false, or that the speaker does not know whether they are true. In short, the other readings have to be

derivable from the grammar.

It is also worth noting that in the derivation of the full distributive/distributive, maximal/maximal reading of (35) just discussed, the dependency in the object pronoun was bound off before the application of the second distributivity operator. It would have been possible to pass the dependency up beyond this operator. However, this would have given rise to the form in (52):

(52)  $\lambda Z. [\delta(\lambda U. \text{det}_3'(\lambda Y. \text{them}_d(Y)(Z))(\delta(\lambda W. *vaccinated(W)(U))))(Z)]$

When this applies to the maximal collection of farmers who own donkeys, we cannot evaluate the result, since this would require evaluating  $\text{them}_d(Y)(Z)$ , where  $Z$  takes on the value of the maximal collection of farmers who own donkeys. The assumption in (43) only tells us about the relation when single farmers among this collection are involved. The result would be a form we do not understand.

There is a naturally arising interpretability condition in cases where these singly dependent plural donkey pronouns are anaphoric on maximal definites which dictates that they must co-occur with a distributivity operator. It is only when this operator is present and the dependency is bound off as in (46) that these sentences are interpretable.

To conclude this section, I will show how bound-variable interpretations are derived, and comment on some other features of the analysis. Consider (53):

(53) Some students ate their pizzas straight away.

Notice that there are two salient readings of this sentence. On one reading, there are pizzas which are collectively possessed by students, and students who collectively possess pizzas ate them straight away. On the other reading, pizzas are individually possessed by students, and individual students tucked into their own pizzas straight away. This second reading is distributive in the

subject position. The first reading is not. (53) also contains a bound-variable pronoun which is part of a possessive construction, which is itself definite. At the end of the last chapter, I looked briefly at possessives and noted that the conservative analysis would be to treat "their pizzas" as "the pizzas of them". I will adopt this analysis here. As the bound-variable pronoun is itself part of a definite, it will be interpreted only as part of the descriptive restriction of the possessive. But since the pronoun will be interpreted as dependent, the possessive will be interpreted as dependent, so the pronoun's dependency will be passed up in the construction of an entry for the possessive.

The treatment of bound-variable readings of pronouns should now be obvious. For the pronoun in (53), the appropriate assumption would be as in (54):

$$(54) \quad \forall X, Y \square [ *student(X) \rightarrow them_d(X)(Y) \leftrightarrow Y = X ]$$

This will provide an understanding of the pronoun in the necessary condition constructed for the conditional:

$$(55) \quad \forall X, Y \square [ the\_POT_d(Y)(X) \rightarrow pizza'(X) \wedge \uparrow of(\det_{\exists}(\lambda U. them_d(Y)(U)))(X) ]$$

In the circumstance, no further enrichment of the descriptive condition is required to get an adequate resolution for the possessive. Thus:

$$(56) \quad \forall X, Y \square [ the\_POT_d(Y)(X) \leftrightarrow pizza'(X) \wedge \uparrow of(\det_{\exists}(\lambda U. them_d(Y)(U)))(X) ]$$

When the z-rule is applied to *late*, we get (57), having passed the dependency up past the determiner via the Geach rule:

$$(57) \quad z(\uparrow ate)(g(\det_{\exists})(the\_POT_d)) \\ = \lambda X. \det_{\exists}(\lambda U. the\_POT_d(X)(U))(\lambda Y. ate'(Y)(X))$$

We can optionally apply the distributivity operator to (57), with the result in (58):

(58)  $\delta(z(\uparrow \text{ate})(g(\text{det}_{\exists})(\text{the\_POT}_d)))$

If we take a collection of students and apply the non-distributive (57) to it, the result will be true when that collection ate the pizza(s) collectively belonging to them. If we apply (58) to a collection, the result will be true if each member of that collection ate his own pizza(s), as required.

This concludes the general discussion of binding. More could be said about the derivation of the different readings for plural dependent definites. However, I think that the system is general enough to handle any kind of reading. It may be, however, that with a richer syntactic system, certain constraints on the occurrence of distributivity and so on could be introduced. I leave this to further research.

To sum up:

- There is an open class of context-dependent expressions which can be subject to bound-variable interpretations.
- I have tried to generalise the variable-free approach to the treatment of binding for all context-dependent expressions.
- I have added the d-rule to the lexicon.
- I have assumed that the conceptual systems supply the semantic entry for a lexical item.
- I have assumed that context-dependent expressions are associated with interpretive procedures which raise issues.
- The semantic entry for the d-version of a context-dependent expression can be identified if the parameter(s) of its associated concept schema can be fixed relative to the objects quantified over.

I will now turn to the somewhat special case of conditional donkey sentences.

### Section III Conditional Donkey Sentences

In this section, I will apply the proposals developed above to conditional donkey sentences. There are two issues to be addressed. On the one hand, we need to consider the maximal/non-maximal alternation, illustrated in (1):

- (1) a. If a farmer owns a donkey, he beats it.
- b. If a customer had a credit card, she payed her bill with it.

On the other hand, there are issues involving symmetric and asymmetric readings. There are two types of asymmetric reading, subject and object. These show up most clearly in the presence of "usually". (2a,b) illustrate subject asymmetric readings with maximal and non-maximal readings:

- (2) a. If a farmer owns a donkey, he usually beats it.
- b. If a customer had a credit card, she usually paid her bill with it.

Subject asymmetric readings can generally be glossed with sentences involving "most", where the subject is the head noun, as in "Most farmers who own a donkey beat it." Object asymmetric readings are most salient in examples like (3):

- (3) Usually, if an artist lives in a town, it is pretty.

We can gloss (3) as, "Most towns in which an artist resides are pretty." Symmetric readings arise when we count farmer-donkey pairs. For instance, if (4) is uttered by a tax expert to a regional finance minister, it would most likely receive a symmetric reading, on the assumption that the minister is interested in how much tax revenue he will receive from his region's farmers:

- (4) If a farmer owns a donkey, he usually counts it as a tax-deduction.

These readings cannot be glossed using "most" sentences. For instance, "Most farmers who own a donkey count it as a tax deduction" simply counts farmers who own donkeys; it would thus be false in a circumstance where there are five farmers, one of whom owns ten donkeys and claims on all of them, while the other four own one each and don't bother to claim. By contrast, on the symmetric reading, (4) would be true in that circumstance.

It would be possible to treat some conditional donkey sentences as involving the material conditional. However, as a rule, conditional donkey sentences involve adverbs of quantification. Heim (1990), following Kratzer (1989), treats all conditional donkey sentences in this way. She sees (1a,b) as involving an implicit universal adverb of quantification. As I need to treat sentences with adverbs of quantification anyway, I will follow her in this.

An appealing idea, and one which has become quite popular (see Heim and references therein), is to think of these adverbials as expressing relations between sets of situations. We can then import the machinery of Generalised quantifiers into their analysis. Unfortunately, the notion of a situation is not entirely clear in a framework employing a total semantics. Kratzer (1989) proposes to analyse situations as parts of worlds. This suggests that we can classify them using sentences of certain types. To simplify matters somewhat, in order to use sentences like "a farmer owns a donkey" to classify situations, I will abstract over a position in the verbal domain and other relevant domains of the structure. That is,  $\lambda s. det_{\exists}'(farmer'(s))(\lambda x \uparrow owns'(s)(det_{\exists}'(donkey')))$ . We will see that context-dependent expressions can be dependent on such indices, and will be bound into by the lambda operator in such cases.

If we take "always", "usually" and so on to be associated with forms of type  $((s,t)(s,t)t)$ , where  $s$  is the type of these situations, we will need to say something about what intersection of sets of situations amounts to. An influential proposal in Heim (1990) (based on Kratzer and Berman (1987)) is to relate situations by using the notion of containment,  $\leq$ . Heim's truth conditions for a sentence involving *usually* are given in (5):



$$(5) \quad \llbracket [\text{usually}_{s_1} \text{ if } \alpha]_{s_2} \beta \rrbracket^{\mathcal{P}} = \text{True} \text{ iff } |\min\{s_1: \llbracket \alpha \rrbracket^{g[s_1 \setminus s_1]} = \text{True}\} \cap \{s_1: \exists s_2: s_1 \leq s_2 \ \& \ \llbracket \beta \rrbracket^{g[s_1 \setminus s_1, s_2 \setminus s_2]} = \text{true}\}| > \frac{1}{2} |\min\{s_1: \llbracket \alpha \rrbracket^{g[s_1 \setminus s_1]} = \text{True}\}|$$

For a set of situations,  $S$ ,  $\min S$  is the set of minimal elements in  $S$ :  $\min S = \{s \in S: \neg \exists s' \in S [s' \leq s \ \& \ s' \neq s]\}$ .

General misgivings have been expressed in the literature about this kind of situational approach (see Chierchia (1992), von Stechow (1996) for discussion). These have to do in part with sentences like (6):

(6) When a formal system is complete, it is usually compact.

The problem, as Chierchia notes, is that such sentences should not come out meaning: "On most occasions when a formal system is unique, it is compact", since being complete is a property such that, if a formal system has it, it has it in all parts of a world (and in all worlds). On the situation account, this sentence should come out sounding as odd as (7):

(7) Usually, if Felix is a cat, it likes Whiskers.

Similar considerations originally prompted Lewis (1975) to adopt the unselective binding approach, in which adverbial quantifiers bind into indefinites, treated as open sentences. Chierchia, along with Kamp & Reyle (1993) suggests a system where these adverbs can bind into anything in the antecedent sentence, including eventuality and temporal positions. However, these are only suggestions, and a definitive theory along these lines has not been developed. As regards the problematic status of (6) for the situation approach, I am inclined to think that the difference between (6) and (7) lies in the possibilities of pragmatic enrichment of (6). It is clear that we understand this statement as implicitly restricted to cases where we come across a formal system which is complete, or devise one which is complete, and so on. In these cases, an utterance of (6) is informative. On this construal, the proposition expressed would be similar to

the one expressed by an utterance of "Most formal systems which are complete are compact." So a situation-based approach may be defensible. At least it should remain a live possibility if we allow for pragmatic enrichment, which we must in any case.

However, I think that Heim's notion of minimal situation which she uses in her formulation of the truth conditions in (5) is problematic. For example, the set of situations picked out by the antecedent in (8) includes all those in which a woman lives with a cat - including situations in which multiple women live with cats and/or the same woman lives with multiple cats:

(8) Usually, if a woman lives with a cat, she talks to it.

However, according to Heim, the minimal situations in this set only involve exactly one woman and exactly one cat. It should follow that if I offer you a tray of canapes, there are multiple minimal situations involved in which I offer you a canape. In that case, given the truth conditions in (5), (9) will come out as false in a circumstance where I offer around trays full of canapes, and on almost all offerings, one is taken:

(9) Usually, when I offered a canape, it was taken.

But this is clearly true in such a circumstance. I think that though some notion of minimal situation must be invoked in order to constrain this situation-based approach enough to make it interesting, the formulation given above is a little too strong. Following Berman (1987), one could possibly get around this problem by making the notion of minimality context dependent. In the case of offering trays of canapes, the minimal situation would involve the whole trayful of canapes. In the case of a woman living with a cat, the minimal situation would be the general domestic scenario, perhaps involving more than one cat. In the case of a farmer claiming a donkey as a tax deduction, the minimal scenario would involve a unique farmer-donkey pairing, even if the farmer in question owns more donkeys. In what follows, I will adopt a situation-based approach to conditional donkey sentences in which the context dependence of what we are

counting is assumed to be built somewhere into the meaning of the adverbs. My main aim in analysing these examples with is to show how context-dependent expressions fit into the picture. The issue of adverbial quantification is more complex than the analysis here suggests. Nevertheless, some novel suggestions for dealing with symmetric and asymmetric readings will be made.

The general strategy here, as elsewhere, is to provide an analysis of a sentence type in such a way that the various possibilities for interpretation are left open to contextual specification. In the case of conditional donkey sentences, we need to capture both the maximal/non-maximal alternation and various symmetric and asymmetric readings. Let us begin with (10):

(10) If a farmer owns a donkey, he usually beats it.

Probably the most salient reading of this sentence is the so-called subject asymmetric, maximal reading. This could be glossed simply as "Most farmers who own a donkey beat it". To derive this, two forms of pragmatic reasoning must be invoked. Firstly, the antecedent form has to be enriched so that it classifies situations in which a unique farmer owns some donkeys. That is, the abstract which is input to *usually'* is as in (11):

(11)  $\lambda s. \text{det}_3'(\text{farmer}'(s))(\uparrow \text{own}'(s)(\text{det}_3'(\text{donkey}') \wedge \text{card}(\text{farmer}'(s)) = 1$

*usually'* needs to pick out the minimal situations from this class. Note that, for each farmer, there will be as many situations in the extension of (11) as there are non-empty sets in the power set of donkeys he owns. Just as we wanted the minimal situation in the canape-offering case to be the one which included all of the canapes on a tray, so the easiest minimal situation to construct without any further contextual input would be one in which a farmer is in the *owns*-relation with all of his donkeys. I will assume that this is what is chosen here.

We then need to construct the set of situations which extend these minimal situations. This is

where the choice between maximal and non-maximal readings is made via the construction of an interpretation for "it". The abstract formed on the basis of the second argument for "usually" will have the form in (12), where the pronouns have to be resolved:

$$(12) \quad \lambda s. \text{det}_3'(\text{he}_d(s))(\uparrow \text{beat}'(s)(\text{det}_3'(\text{it}_d'(s))))$$

According to Heim's proposal in (5), the sentence will be true iff more than half of the minimal situations described above are contained in a situation in the class in (12). As we shall see, the link between the sets will be created by the pronoun on which the asymmetric reading depends (in this case, the subject). The maximal/non-maximal alternation will depend on the interpretation of the other pronoun. This will be dependent on both the situation variable and the first pronoun.

The antecedent form makes available a ready resolution for "he", according to the assumption in (13):

$$(13) \quad \forall x \forall s \square [\text{farmer}'(s)(x) \wedge \text{det}_3'(\text{donkey}')(\lambda z. \text{own}(s)(z)(x)) \rightarrow \text{he}_d'(s)(x) \leftrightarrow \text{farmer}'(s)(x) \wedge \text{det}_3'(\text{donkey}')(\lambda z. \text{own}(s)(z)(x))]$$

We can then make the donkey pronoun anaphoric on this (with the maximality option taken up in this derivation):

$$(14) \quad \forall x \forall Y \forall s \square [\text{he}_d'(s)(x) \rightarrow \text{it}_d'(s)(x)(Y) \leftrightarrow \max(\lambda V. * \text{donkey}(V) \wedge * \text{owns}(s)(V)(x))(Y)]$$

Given all this<sup>5</sup>, the form in (12) will pick out situations in which at least one farmer who owns

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<sup>5</sup> I will omit the derivation of the form in (12). This would go in much the same way as above. The only novelties would include multiple applications of the Geach rule to the determiner for "it" in order to pass up two dependencies. We would also have to invoke the Montague rule (or the combinator S) in order to combine things of the type (s(a,b)) and (s,a) to give (s,b). The product would be a form with an unbound s-dependency which would be the argument for

a donkey beats the maximal set of donkeys he owns. Among this class of situations will be those involving a unique farmer in the owns-relation to all his donkeys beating all the donkeys he owns. These situations extend situations in the minimal set picked out from the antecedent set. The truth conditions in (5) tell us that in the circumstance of evaluation we can expect to find more than half of the minimal situations to be extended in this way, as required.

An example with an asymmetric reading is (15):

(15) Usually, if a farmer owns a donkey, he claims it as a tax deduction.

Here, the abstract formed from the antecedent would be pragmatically enriched to include only those situations in which a unique farmer is in the *owns*-relation to a unique donkey. The abstract formed in (12) would still serve as the second argument for *usually*' in this case since the class of situations it denotes will again include a single extension to each of these minimal situations in which a unique farmer claims on a unique donkey.

With object asymmetric readings, the object will be made unique in the restrictor class and things would go much as in the subject asymmetric case.

We can now say something about the treatment of the contrast mentioned in chapter 2, section IV between examples such as in (16a,b):

- (16) a. Every boy left school early. He wanted to go swimming.  
b. Each candidate will be debriefed by Mrs Hendrix. He will be given some advice on how to tackle the press.

It was suggested that the felicity of such examples depends on the extent to which we can

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*usually*.

construe the second sentence as involving implicit quantification over some kind of index. In chapter 2, I suggested that this would be motivated in the case of (16b) as we would derive some extra information concerning standard procedure for debriefings. We might think of a gloss of our understanding of the second sentence in this example as in (17):

- (17) In all situations where a candidate is debriefed, he will be given some advice on how to tackle the press.

In that case, the pronoun would be understood to be dependent on the index. The analysis would be straightforward given the above discussion. It is also possible that other examples discussed in chapter 2 involve more of a modal flavour:

- (18) Every Swiss male over the age of twenty one owns a gun. He is required to do so by law.

In this case, we might be inclined to assume that the second sentence understood modally. This would then be a case of modal subordination, as in Robert's (1990) example:

- (19) If you leave a window open, a burglar might get in. He would steal the silver.

According to Roberts, understanding the second sentence in (19) involves recovering some restriction on the modal operator from the context. Thus, the second sentence is understood as "If a burglar gets in, he would steal the silver". For (18), the contextually recovered restriction would be something like "if a Swiss male is over the age of twenty one". The modal base would include worlds in which Swiss law holds and so on.

I have not included an analysis of modals or modal subordination in this chapter. However, it seems reasonable to extend the Heim/Kratzer treatment of quantification over situations as involving a relation between classes of situations, seen as parts of worlds, to modals, where the operator in question denotes a relation between sets of worlds. This is indeed the basis of

Roberts' (1990) treatment of modal subordination. I leave this issue here noting again that the treatment of dependent context-dependent expression proposed in this chapter could be incorporated into such a framework.

This concludes my sketch of the analysis of conditional donkey sentences. It is only a sketch, because I am not sure that the situation-based approach to these sentences is correct. Still, I believe that the issue of how to treat adverbs of quantification can be kept separate from the issue of how to treat anaphora in these cases. The fact that definites in these examples are subject to maximal and non-maximal readings is unsurprising given the systematic way in which this alternation occurs in all contexts in which definites are used. As regards the symmetric/asymmetric alternation, it is widely agreed that in principle these sentence forms are open to all three types of construal, and that the preference of one construal over another depends on contextual factors. I have suggested, within a slightly modified situation-based framework, that the possibility of these different readings depends on the possibility of pragmatic enrichment in general. This phenomenon is pervasive in natural-language use, particularly in these conditional constructions which are themselves context dependent in any case.

The alternative to the situation-based approach involves abstracting over time or eventuality variables. The treatment of binding here will allow for the appropriate interpretation of definite forms if this alternative turns out to be correct. In any case, I assume that definites can be dependent on temporal and other indices. This is presumably what is going on in (20):

(20) Last year, the mayor of Boston was a Democrat. This year, he is a Republican.

I would analyse these examples by treating both the definite and the pronoun as dependent on a temporal index. Without embarking on a full analysis of tense, we might pick up on Partee's suggestion that tense is pronominal. (This is implicit in Kamp & Reyle except, of course, that on their account, pronominal elements introduce discourse referents). We might further suppose that temporal adverbs can bind into these elements. Thus, the scope of "Last year" would be of

the form  $\lambda t.\phi(t)$ . This form could be constructed by combining things of the form  $\lambda t.det\_the\_MOB'(t)$  and  $\lambda t.was(t)(democrat')$ . The interpretation of the definite would be grasped via (21) below, where *mayor'* would itself be an ad hoc concept of a three place relation of mayorhood at a time and of a place:

$$(21) \quad \forall x \forall t \square [the\_MOB(t)(x) \leftrightarrow \forall y [mayor'(t)(B)(y) \leftrightarrow y = x]]$$

This makes a concept available for the interpretation of the pronoun in the second sentence:

$$(22) \quad \forall x \forall t \square [he_d'(t)(x) \leftrightarrow the\_MOB'(t)(x)]$$

The temporal dependency here could then be passed up and bound off by the temporal adverbial in the second sentence.



## **Chapter 5**

### **Pragmatics**

#### **Section I      Overview**

##### **1      Introduction**

In this chapter, I will bring together a number of pragmatic issues that have been touched on in earlier chapters, and discuss them in more detail.

##### **2      The semantics-pragmatics interface**

In chapter 3, I presented an account of the semantics of context-dependent expressions in general, and definites in particular in a framework which uses an intermediate level of representation. The introduction of this level of representation was largely motivated by the collapse of the classical semantics-Gricean pragmatics nexus. In the theory outlined in chapter 3, as in DRT-based theories, the intermediate level of representation serves two purposes: on the one hand, it represents the information conveyed by utterances and the logical properties we attribute to them; on the other hand, it is a locus for cognitive processes underlying the production and comprehension of communicative behaviour.

It is reasonable to assume that these processes are governed by a variety of psychological principles, including the theory of grammar and discourse or pragmatic principles. Ultimately, if the study of language is regarded as a psychological enterprise, its goal must be to elucidate the nature of these principles. However, as these principles govern processes which interface with one another in some way, progress can only be made by developing an adequate theory of

this interface. On the assumption that our understanding of utterances is the outcome of processes which operate in different cognitive domains, the study of this phenomenon becomes an interface study par excellence. On this approach, linguistic meaning will be seen as what determines the input from linguistic processes to discourse or pragmatic processes.

Although dynamic semantic theories have emerged in response to the breakdown of the classical semantics-Gricean pragmatics nexus, they do not always adopt this approach. Hans Kamp and his followers explicitly use an intermediate level of representation. In DRT, linguistic meaning can be thought of in terms of the algorithm which maps syntactic structures onto DRSs. These structures represent information conveyed by utterances. Generally, these representations are the combined result of the mapping algorithm plus accommodations or other inferences drawn in order to satisfy presuppositions and/or other discourse principles. This DRS language also supports inference. By contrast, the more conservative versions of dynamic semantics, sketched in Groenendijk and Stokhof's (1990, 1991) dynamic predicate logic, treat natural-language structures as the bearers of (dynamic) information content and thus as the locus of inference. Although I have not discussed this version of dynamic semantics in any detail, there may well be reasons for rejecting it on methodological grounds.

In section V of chapter 2, I looked generally at the dynamic treatment of singular pronouns anaphoric on singular indefinites of the form "an F". My conclusion was that the process treated in dynamic theories as involving dynamic binding of a pronoun by an indefinite via the mediation of a discourse referent in fact depends on a non-demonstrative inference about the speaker's grounds. To assume that the meaning of the indefinite form (and singular pronouns) can be described in terms of this dynamic process is to make the kind of methodological mistake that Grice's Modified Occam's Razor was designed to exclude: The conservative view of dynamic semantics treats as linguistically-encoded information what is really the product of non-demonstrative inference processes. To preserve the conservative dynamic approach to indefinites, one would have to allow information recovered via non-demonstrative inference processes into the domain of semantic theories for natural language. Unless it is possible to draw

some principled distinction between the different types of information recovered via inference, the conservative dynamic approach would have to account for all such information, which would lead to a massive proliferation of senses. As far as I know, there is no principled way to draw such a distinction. This suggests that the conservative dynamic approach to indefinites should be abandoned. As noted in chapters 2 and 3, the only such phenomenon which dynamic theories handle without resorting to an accommodation theory is the (singular) indefinite-(singular) pronoun anaphoric dependence. We saw that the presupposition-accommodation approach sheds little light on how linguistic meaning constrains interpretation.

It would be possible, of course, to accept these arguments against conservative dynamic theories and still use Kamp's discourse representation structures as the interface medium. On this approach, linguistic meaning would be described in terms of the mapping from syntactic structures to possibly underspecified DRS's, and discourse or pragmatic principles could be set up to refer to these intermediate forms. There is no bar to using DRS even if one does not accept the treatment of indefinites and anaphoric pronouns which dynamic theories of all stripes propose. However, as this intermediate language is specifically geared to the dynamic analysis of these forms, it is not necessarily optimal for developing alternative proposals. In chapter 3, I reverted to a more traditional language as my intermediate level of representation. I also tried to shift the focus of discussion from the question of how discourse provides context for utterance interpretation to the question of how the problem of underspecification might be tackled.

The relevance-theoretic framework in which my proposals were cast treats the semantics-pragmatics interface as the level at which information derived from the language module is integrated with information derived from other input modules and from memory. The medium for the integration of information is an internal conceptual representation system, or 'language of thought' (Fodor 1975), whose formulae are capable of being true or false and of acting as the input to logical computation. The content of a conceptual representation is individuated in externalist, informational terms. One's grasp of this content depends in part on one's ability to grasp the content of the constituent concepts of this representation. I proposed that, in the case

of context-dependent expressions, the characterisation of linguistic meaning would involve procedures for determining which concept is to be inserted into the corresponding conceptual representation.

This process is related to a pragmatic theory in which it is assumed that the processing of utterances, taken as manifestations of speakers' communicative intentions, is governed by principles which constrain the determination of these intentions. On this approach, comprehension is a relatively specialised form of goal-directed, practical reasoning; it is a form of inference to the best explanation constrained by domain-specific principles of communication. In the context of this kind of theory of utterance interpretation, I proposed to analyse context-dependent expressions as raising certain issues for comprehension. The issues are related to the sub-goal of determining the proposition expressed. An adequate resolution of these issues is achieved when a hypothesis about the speaker's intentions is confirmed. Alternative hypotheses are evaluated by use of a pragmatic criterion derived from the pragmatic principles which govern the overall comprehension process. In the next section, I will outline the relevance-theoretic view of utterance interpretation in more detail.

### **3 Relevance theory**

In Sperber & Wilson's (1986/95) relevance theory, the pragmatic criterion used to evaluate alternative hypotheses about the speaker's informative intention derives from a communicative principle of relevance. This is stated in (1):

- (1) **The Communicative Principle of Relevance:** Every act of ostensive communication communicates a presumption of its own optimal relevance. .  
(Sperber & Wilson 1986/95: 260)

- (2) **The presumption of optimal relevance:**
- (a) The ostensive stimulus is relevant enough for it to be worth the addressee's effort to process it.
  - (b) The ostensive stimulus is the most relevant one compatible with the communicator's abilities and preferences. (ibid: 270)

Together, the communicative principle of relevance and the definition of optimal relevance justify the following comprehension procedures, which will be automatically applied to the interpretation of utterances:

- (3) **Relevance-theoretic comprehension procedure**
- Follow a path of least effort in computing cognitive effects:
- (a) Consider interpretive hypotheses in order of accessibility;
  - (b) Stop when your expectation of relevance is satisfied.<sup>1</sup>

Cognitive effects are the result of interaction between newly-presented information and a context of existing assumptions: implications, contradictions and strengthenings, for example. The least-effort condition, which follows from clause (b) of the definition of optimal relevance, means that some cognitive notion of accessibility of information plays an important role in the theory. At a given time, certain assumptions will be cognitively more accessible, and hence cheaper to construct or retrieve, than others. The more accessible assumptions are more likely to be used as part of the context for processing new information. So the relevance-theoretic comprehension procedure consists in testing interpretive hypotheses in order of accessibility, in search of an optimally relevant interpretation.

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<sup>1</sup> The expectation of relevance can be described in more or less sophisticated terms. At its simplest, it is an expectation of *actual* optimal relevance; in other situations, it may be an expectation of *attempted* optimal relevance or *purported* optimal relevance. I will ignore these complications here (for discussion, see Sperber 1994; Postface to Sperber & Wilson 1995).

To illustrate how the theory works, I will analyse some examples from chapter 3. First, consider the example of the netball coach:

(4) A is the coach of the district under-13 netball team. B, a supporter of the team, is a teacher at a local girls' high school. (Note, good goal defence players are usually taller than most other players on the netball field.)

*A:* I'm looking for a girl to play goal defence.

*B:* I have a student in my first form class who is tall, but I'm not sure if she has ever played netball.

In chapter 3, we were concerned with resolution of the issue raised by "tall". Let us look more closely at how A's interpretation of B's utterance might go. A has just expressed an interest in finding a girl to play goal defence. In doing so, she has made certain practical concerns of hers both mutually manifest and very salient: she would like to get in touch with potential candidates of the right age group in order to offer them a trial, and so on. According to the relevance-theoretic comprehension procedure outlined in (3), A's search for cognitive effects from B's utterance should follow a certain path. A should construct or retrieve contextual assumptions, following a path of least effort deriving cognitive effects in the context of these assumptions, and stopping when her expectation of optimal relevance is met. At the outset, the accessing of contextual assumptions is part of a process of hypothesis formation. The hypothesis will be treated as confirmed only if the resulting effects meet A's expectations of relevance. As we saw in chapter 3, part of the hypothesis-formation stage involves testing answers to the question raised by "tall". However, other assumptions also need to be made. For instance, on the assumption that the girl is the right age, A will be able to conclude that she can get in touch with a candidate goal defence player as long as B is willing to act as intermediary. Thus, A will be able to derive effects relating to her own expressed goal of finding a certain player, as long as these extra assumptions about the girl's age and B's willingness to act as intermediary are made. If these effects are sufficient to satisfy A's expectations of relevance, they will be taken to be

intended. B will also be taken to have intended A to make the assumptions necessary to derive these effects, viz that the girl is of the right age group, that she is tall by the standards of under-13 netball players, and that A is willing to co-operate if the coach is interested in offering her a trial. The first and third assumptions are classical Gricean implicatures, the second follows from the resolution of the issue raised by "tall".

This example is in many respects similar to Grice's gas-station example, given in (5) below (Grice (1989: 32):

(5) A is standing by an obviously immobilised car and is approached by B; the following exchange takes place:

*A:* I am out of petrol.

*B:* There is a garage round the corner.

Grice's gloss on this example is given below:

"B would be infringing the maxim "Be relevant" unless he thinks, or thinks it possible, that the garage is open and has petrol to sell; so he implicates that the garage is open, or at least may be open, etc." (ibid.)

One of the differences between Grice's treatment of this kind of example and the relevance-theoretic treatment is that the relevance-theoretic account allows us to say something about how the choice between candidate interpretations is made. To illustrate this aspect of the framework, as well as the workings of clauses (a) and (b) in the definition of optimal relevance above, I will discuss another example from chapter 3:

(6) *Scenario*: John's father is talking on the phone to John.

*John's father (to John's mother)*: John wants to go swimming with Bill today.

*John's mother*: He has a cold.

I think it is fairly uncontroversial to say that in this scenario, John's father would most naturally understand John's mother to be referring to John. Moreover, he would understand her to be implicitly refusing permission to swim, on the ground that John has a cold. To derive this implicature, John's father would have use the assumption in (7b) as well as (7a):

- (7) a.  $\forall x \square_{he'}(x) \leftrightarrow \lambda y[y = j](x)$   
b. John's having a cold is sufficient ground for John's mother refusing John permission to go swimming.

With these assumptions, John's father could infer that John's mother is refusing him permission to swim. This is likely to yield enough effects to satisfy his expectation of relevance and the intention to communicate it will be attributed to John's mother. The Gricean account of the implicature in (7b) would be much the same as in the gloss for the gas station example above. (Grice did not attempt to deal with reference resolution in the framework of his theory of conversation.)

Notice that in this scenario, there is an alternative set of hypotheses that John's father could make, which would equally well satisfy Gricean expectations. These are given in (8):

- (8) a.  $\forall x \square_{he'}(x) \leftrightarrow \lambda y[y = b](x)$   
b. Bill's having a cold is sufficient ground for John's mother refusing John permission to go swimming.

There is no obvious way of choosing between these two interpretations on the Gricean account.



In the relevance-theoretic framework, with its definition of optimal relevance, a number of factors favour the choice of (7).

In Sperber & Wilson's theory, relevance is comparative notion which incorporates the twin factors of processing costs and cognitive benefits. The greater the cognitive effects, and the smaller the processing effort needed to achieve them, the greater the relevance. Clause (a) of the presumption of optimal relevance in (2) sets a threshold below which the utterance will not be relevant enough. Clause (b) introduces a least-effort factor, which warrants the comprehension procedure in (3).

In interpreting the utterance "He has a cold" in (6), John's father has to make an assumption which resolves the issue raised by the pronoun in such a way as to satisfy his expectation of relevance. According to the relevance-theoretic comprehension procedure, he should test the most accessible hypothesis, and reject it only if it fails to satisfy his expectation of relevance. Since there are two potential referents for the pronoun "he", one could imagine a parallel search for contexts which would combine, on the one hand, with the assumption that she is referring to John, and, on the other, with the assumption that she is referring to Bill.

The literature on anaphora resolution also suggests that potential antecedents may be more or less accessible. For example, there is a tendency to choose an antecedent in subject position, other things being equal.<sup>2</sup> We can interpret these findings as suggesting that heuristics are used in the search for an interpretation when pronouns are involved. Whatever form these heuristics take, it seems clear that a certain degree of parallelism in the search for referents and contexts is possible. It could be that the bias toward antecedents in subject position reveals a simple strategy for English speakers in picking out potential antecedents by matching morphological features on

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<sup>2</sup> See for instance, Gordon, Grosz and Gilliom (1993) and Garrod and Sanford (1994) for discussion. In fact, the story is not as simple as that depicted in the text. For instance, there is a stronger tendency to choose antecedents involving names rather than descriptions. The discussion in the text is merely intended to illustrate how, if there are heuristics involved in pronoun resolution, they would fit into the overall relevance picture.

the pronoun with those recovered from immediately preceding utterances on a first to last basis. Matches would trigger a search for an interpretation on the hypothesis that this is the intended referent, while the string would still be searched for more matches. Alternatively, it could be that more processing effort is allotted to trying out interpretations involving the subject because of the tendency in English sentences for the subject to be the agent of the relation expressed by the verb, and the generalisation that agents of actions receive more attention. In any case, if there are heuristics of this nature, they will have a bearing on the interpretation process by altering accessibility. Nevertheless, the hearer will ultimately choose the resolution which leads to an overall hypothesis which satisfies expectations of relevance. For this, appropriate contextual assumptions are needed.

The assumption in (7b) above, that John's having a cold is sufficient ground for his mother refusing him permission to swim, would be derived from common-sense assumptions about the inadvisability of swimming when one has a cold, together with the fact that mothers are generally concerned with their children's welfare, aware of their current state of health, and so on. The assumption in (8b) would be derived from the less accessible and less well-founded assumption that when one goes swimming, one is more likely to catch a cold together with assumptions about the transmission of the illness, the fact that mothers may know about the state of health of their children's friends, and so on. If the first set of assumptions is more accessible, so that the hypothesis in (7b) is the first to come to mind, the result will satisfy the hearer's expectation of relevance, and the hypothesis in (7b) will be confirmed.

This concludes the introductory discussion of relevance theory. In the next sections I will look more closely at some of the pragmatic issues raised in previous chapters. I will begin with a discussion of how pragmatic unacceptability, or infelicity, might be handled in the relevance-theoretic framework. I will then discuss the marble example and related cases. I will go on to look at the distribution of readings for definites, and conclude with a comparison with coherence-based approaches.

## Section II Infelicity and Gratuitous Effort

### 1 Pointing and focus

In this section, I will apply the treatment of infelicity outlined for the case of focus in Breheny (1996, 1998) to the marble examples and related issues. In the focus case, I argued that an utterance can be found less than acceptable if the audience is put to gratuitous processing effort in arriving at an interpretation.

A paradigm example of pragmatic unacceptability of this type involves misuse of pointing. Compare the following two examples:

- (1) *Scenario:* Mary is showing John around her garden. They are both gardening enthusiasts. At one stage, she points towards the foliage of a honeysuckle plant, which is in a parlous state:

*Mary:* The hot summer this year really took its toll on the honeysuckle.

- (2) *Scenario:* Mary is showing John around her garden. They are both gardening enthusiasts. At one stage, she points towards the (perfectly healthy) foliage of a nearby rose bush and utters:

*Mary:* The hot summer this year really took its toll on the honeysuckle.

In (2), try as John might, he will be unable to relate anything made salient by Mary's gesture to her utterance. However, he will try, since pointing mandates a shift in the focus of joint attention. The process is almost automatic: If you point up, I look up. If we treat the pointing and the uttering in (2) as a single, composite stimulus, we can say that the result is less than acceptable because it puts the audience to gratuitous effort in achieving the intended effects.

Utterances with misplaced focal stress can have a similar effect on judgments of acceptability. Consider (3), where small caps indicate focal stress:

- (3) a. A: What did Mary do to John?  
B: She kissed JOHN.
- b. A: Who did Mary kiss?  
B: MARY kissed John.
- c. A: Who did Mary kiss?  
B: She KISSED John.

Let us assume a Rooth-style analysis for the semantics of focus. According to this analysis, focus placement leads to the computation of a set of alternatives. For simplicity, I will assume here that this just means alternative propositions. Thus, in (3a), focus on "John" will yield the set of alternative propositions of the form *Mary kissed x*. Rooth (1992) makes the following generalisation about the relation between what the focus semantics computes and the context of the utterance: Some subset of the set of propositions *P* (or a set of some other type of semantic object) which the focus semantics computes for a sentence will be present in the context in which the sentence is uttered. In the case of (3a) above, say, the question determines a set of propositions of the form *Mary kissed x*. So this set is present in the context for B's utterance in (3a). In his (1992) paper, Rooth treats the focus as introducing a semantic variable into the analysis of a sentence. In the case of (3a), the structure would look like (4):

- (4) [[Mary kissed John<sub>F</sub>] ~ C]

The variable must be bound in the context, in the sense that it must be identified with another object. There is also a further constraint that it must be identified with a subset of the set determined by the semantics of focus. Rooth notes the similarity between this analysis and the presuppositional analysis of definites, although he does not pursue it.

In Breheny (1996, 1998) I argued that the Rooth-style semantics for focus and Rooth's generalisation was already implicit in Wilson & Sperber's (1979) and Sperber & Wilson's (1986) treatment of focus. Viewed procedurally, focus indicates the direction in which the audience should search for cognitive effects; the focus semantic value of Rooth's theory restricts the search space. I also argued that this treatment is better from a pragmatic point of view than a presupposition-accommodation approach, for much the same reasons adduced by Asher & Lascarides in arguing against a presupposition-accommodation approach to definites and bridging (see chapter 3, section II). In the case of overt question-answer pairs, such as those in (3), the antecedent for Rooth's semantic variable has been introduced into the discourse overtly. However, there are cases where the required object is implicit. Consider (5):

- (5) *Scenario:* Teacher and student are discussing the reading list for the advanced syntax course.

*Teacher:* So what have you read?

*Student:* Well I READ "Bare phrase structure"

Here, the teacher's question determines a set of propositions of the form *you have read x*. The focus on "read" in the student's reply determines a set of the form *I have R-ed "Bare Phrase Structure"*. So the set of propositions determined by the question would not satisfy the presupposition. In this example, it is implicated that the student has read but not understood the paper in question. Such contrastive implicatures can be analysed as a special type of scalar implicature. Focus makes the alternative *I have read and understood BPS* accessible. As it is natural for a teacher to wonder whether this stronger assumption is true, and as the student has only said that he read BPS, while ostentatiously drawing the teacher's attention to the alternative, then via familiar reasoning of the type invoked in analysing standard scalar implicatures, the teacher can conclude that the student has not understood the paper. As in the case of definites, an accommodation approach to focus gives results that are much too weak. All that follows from a presupposition-accommodation approach is that some set of propositions of the required form

must be present in the context. This requirement could be satisfied by any number of assumptions: for example, that the student has a copy of Bare Phrase Structure.

As in the case of definites, the accommodation account is also too weak to exclude many infelicitous use of focus. Consider (6):

- (6)           *A*: What did Mary do to John?  
#           *B*: She touched JOHN.

As there is no overt antecedent for focus in this discourse, the accommodation approach says that it can be accommodated<sup>3</sup>. Since there is nothing to stop us accommodating into the discourse context the assumption that Mary has touched something, the presupposition should be satisfiable on this account, and the discourse should be as acceptable as (5) above.

The reason for the contrast between (5) and (6) is obvious. In (5), we can get extra effects from the placement of focus, in the form of a kind of scalar implicature. In (6), the best we can make of the utterance is that it is intended as an answer to *A*'s question. Nevertheless, the placement of focus has caused us to expend processing effort in the fruitless search for effects in another direction. Thus, as in the pointing example above, the audience is put to gratuitous effort in deriving the intended effects, hence the judgement of reduced acceptability.

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<sup>3</sup> Recall that various constraints on accommodation have been proposed. For example, in van der Sandt's system (1992), it is required that accommodation should not render the discourse logically inconsistent, and that it should not make the asserted content uninformative. The second constraint is a version of the constraint originally suggested by Lewis (1979) that what is accommodated should not be controversial. None of these constraints is violated by the proposed accommodation for the example under discussion.

## 2 Marbles

In chapter 2, I discussed the problem raised by marble examples for the free pragmatic approach to pronoun resolution. A typical example is given in (7):

(7) I dropped ten marbles and found nine of them. It was under the sofa.

This discourse poses a problem for free approaches to anaphora resolution, since the first sentence clearly implies that exactly one marble remains unaccounted for. On a free pragmatic approach, the question is why the speaker cannot use (7) and expect the audience to make a bridging inference as in the case of descriptions:

(8) Mary took the picnic supplies from the trunk. The beer was warm.

If pronoun resolution is genuinely free, why can't the pronoun in the second sentence in (7) felicitously refer to this marble? The conclusion has been that some kind of formal constraint must be operating on pronoun resolution. The constraint could be grammatical: for example, it might be claimed that a linguistic form of the appropriate type has to be present in the discourse to licence the presence of the pronoun. Alternatively, the constraint could be dynamic: it might be claimed that the discourse referent associated with the pronoun must be identified with an accessible discourse referent in the representation of the discourse.

The challenge for a free approach, as I see it, is to provide some theoretically adequate notion of salience, and to explain why, if the process is genuinely pragmatic, the result should be unacceptable if the referent of the pronoun falls below some threshold of salience. For example, in (7) above, it does not take much to infer that there is one marble still to be accounted for, and to decide that this must be the intended referent of the pronoun in the second sentence. We can see what the speaker meant, so why should the discourse be unacceptable? Mustn't there be some kind of linguistically imposed constraint on pronoun resolution?

In chapter 2, I argued against linguistically imposed constraints by giving some examples in which the missing marble can be referred to by a pronoun. In certain types of dialogical example, where the missing marble has had time to become the focus of joint attention, the use of a pronoun is fine:

- (9) When John came into the room, he found Mary holding a bag of marbles and staring intently at the floor. "What's up?", asked John. "I had ten marbles in this bag, but I dropped them." replied Mary, lifting up the rug. "How many have you found?". "Nine". "Bummer". Now both John and Mary began searching the nooks and crannies of the room. After half an hour's searching, John turned to Mary, "Do you think it could have rolled into the next room?"...

I argued that a pronoun can only be used to refer to objects in the focus of joint attention. I also claimed that in continuous discourse, for instance in the classic marble examples, only what is being talked about can be in the focus of joint attention. In chapter 3, I clarified the notion of what is being talked about in continuous discourse in terms of the concepts used in the inferences determined by the logical properties of interpretations for the noun phrases used. For a form  $D(A)(B)$ , these will involve the concepts  $A$  and  $\lambda X.A(X) \wedge B(X)$ . The idea is that only the concepts involved in these entailments are accessible as answers to the issues raised by pronouns. Although this notion of accessibility is defined in terms of the inferences associated with noun phrases, the notion is not a formal one, as in DRT. Rather, it is intended as a more detailed specification of the psychological notion of the focus of joint attention as it applies to continuous discourse.

Using this notion of accessibility, we can now describe the procedure for searching the focus of joint attention in the case of continuous discourse. On encountering a pronoun, the expectation will be that the related issue can be resolved using concepts made accessible by previous utterances. This process might involve consulting both the syntactic and conceptual representations still left over in short term or working memory after the interpretation of previous



discourse. If this expectation is not fulfilled, the procedure will result in wasted effort. Thus even if, as in the case of (7), the audience can see what the intended interpretation must be, if it cannot be recovered from accessible concepts, the audience will have been put to gratuitous effort in arriving at the intended effects. Hence, as in the pointing and focus cases, some degree of unacceptability will be perceived.

This account of marble examples satisfies the two desiderata for a free pragmatic approach to pronouns mentioned above: it provides a theoretically adequate notion of salience, and it explains why salience matters even though pronoun resolution is entirely free.

It is worth pointing out that the notion of accessibility developed here can deal with many antecedents not dealt with by the formal notion of accessibility used in DRT. In particular, for a discourse such as (10), the DRS for the antecedent sentence makes no discourse referents formally accessible for subsequent identification:

(10) Few congressmen still support Clinton and they are junior.

As noted in chapter 2, Kamp & Reyle (1993) have to stipulate that a special abstraction process can be used to introduce an accessible discourse referent for the plural pronoun in the second sentence. This abstraction process basically sets up a plural discourse referent which picks out the intersective set of congressmen who support Clinton. Thus the formal notion of accessibility in DRT cannot handle objects which are intuitively highly accessible for pronoun resolution. On my account of accessibility, both types of case can be handled.

Finally, I should mention that nothing I have proposed so far rules out the discourse in (11):

(11) Every boy left school early. He wanted to go to the beach.

Recall that this kind of anaphoric dependence is acceptable when understood as a joke:

(12) Every Mandelson supporter was at the reception, but he was pretty lonely.

Let us assume that although the first sentence in (11) does not entail that there is more than one boy, the use of "every" generally raises the expectation that there is more than one boy. I do not think there is any principled reason for this: it seems to be just another case where choice of a certain form of words creates expectations, perhaps due to inferences of a trans-derivational nature. A similar phenomenon seems to be involved in the case of indefinites. (13) below is usually taken to imply that some man other than John swore at John's wife, even though the discourse would be perfectly coherent without this assumption:

(13) John was angry. A man swore at his wife.

In the case of "every" we might say that English language users assume that if just one individual were involved, the speaker would more helpfully have used a more precise form of words. If this is the expectation, it would be confounded in the examples in (11) and (12), and some extra processing would be involved in deriving an interpretation. In the felicitous case, in (12), this is offset by the effects of the joke; in the infelicitous case, in (11), there is no such compensation, and the utterance is judged less than fully acceptable.

### **Section III Justifying the Strongest Meaning**

#### **1 Default-based strategies**

One fact about the interpretation of definites I still have to account for involves the distribution of readings of plural definites. I argued at length in chapter 2, section III that the alternation between maximal and non-maximal readings for plural definites derives from the contextual specification of the restrictor of the definite itself. In reviewing the literature on plurals and on

definites, we saw that almost everybody who has looked at plural definites has assumed that their semantics is strictly maximal. As a rule, those who have noticed the obvious counter-examples have tended to explain them away by appeal to the vagueness of plural predicates. I have tried to show in chapter 2 that this strategy is just wrong: there is a clear asymmetry in the behaviour of plural definites and other plural noun phrases. My only explanation for the very strong tendency among researchers to cling to the maximality hypothesis has to do with the distribution of readings of plural definites. Plural definites not embedded in negative contexts tend to get a maximal reading:

(1) Most farmers around here own some donkeys. They buy them at the state auction.

The subject pronoun in the second sentence tends to be understood as talking about all of the farmers who own donkeys, while the object picks out all the donkeys owned by these farmers.

It was shown in chapter 2, that remarkably enough, almost no one seems to have noticed that plural definites in negative contexts cannot always receive their *any*-reading with a maximal interpretation of the definite:

(2) No farmer around here beats his donkeys.

The assumption seems to be that these readings can be obtained with maximal semantics. We saw in chapter 2 that this assumption is also incorrect.

In any case, in negative contexts, there is a tendency for plural definites to be read non-maximally. Taking this together with the tendency toward maximality in positive contexts, we might say that in general, there is a tendency to infer the strongest interpretation for plural definites. We will shortly examine exactly what this tendency amounts to.

We have looked at a couple of proposals designed to capture this pattern of readings for plural

definites. In the case of donkey pronouns, Lappin & Francez (1994) incorporate a rule prescribing a default to the maximal interpretation, in the two sets of truth conditions they give for donkey pronouns. In discussing their proposals in chapter 2, section IV, I argued that their treatment of negation was problematic: for instance, their account of the *any*-reading of plural definites in negative contexts was not really viable. I also looked at the somewhat more radical proposal of Krifka (1996) (which is inspired by Lappin and Francez). Krifka took the alternation between maximal and non-maximal seriously, and proposed a theory of plural predication in order to deal with it. His aim was to locate the alternation between maximal and non-maximal readings in the semantics of plural predication itself. However, we saw that his proposal entailed that (3a) could be true if only Mary contested the final; and that (3b) could in principle be true if only one woman carried the package:

- (3) a. Mary and Jane contested the final.
- b. Two women carried that package upstairs.

Krifka's semantic proposal was accompanied by a pragmatic proposal in the form of a strategy, repeated in (4). Although, as we saw in chapter 2, section III, even with this pragmatic strategy, Krifka's proposal is seriously inadequate, it is worth repeating it here, because it illustrates a general tendency in semantic research:

- (4) If grammar allows for a stronger or weaker interpretation of a structure, choose the one that results in the stronger interpretation of the sentence, if consistent with background assumptions! (Krifka (1996) p146)

Divorced from Krifka's semantic proposal, this pragmatic proposal might help to account for of the pattern of readings, even though we are now deriving the alternation in readings from the interpretation of the definite form rather than the semantics of predication. (4) is, in fact, an instantiation of what we might call the Strongest Meaning Hypothesis, which has recently also surfaced in analyses of reciprocals (Dalrymple et al 1996) and conjunction (Winter 1996). The

version proposed by Dalrymple et al is given in (5):

- (5) A reciprocal sentence  $S$  can be used felicitously in a context  $c$ , which supplies non-linguistic information  $I$  relevant to the reciprocal's interpretation, provided the set  $S_c$  has a member that entails every other one:

$S_c = \{ p \mid p \text{ is consistent with } I \text{ and } p \text{ is an interpretation of } S \text{ obtained by interpreting the reciprocal as one of the six quantifiers [above]} \}$

In that case, the use of  $S$  in  $c$  expresses the logically strongest proposition in  $S_c$ . (Dalrymple et al 1996: 31)

More generally, the strategy based on the Strongest Meaning Hypothesis can be stated as in (6):

- (6) If  $\alpha$  is an expression whose meaning underspecifies its interpretation, and whose candidate interpretations would result in propositions which can be ordered in terms of logical strength, choose the interpretation which results in the strongest proposition which is consistent with background assumptions (world knowledge).

I think that the Strongest Meaning Hypothesis is mistaken. Moreover, I think that the tendency to use default rules (of which the SMH is an example) to account for this kind of interface phenomenon is also mistaken. This tendency dates back at least to Levinson (1987) and Horn (1984) (see Carston 1990 for discussion), who proposed default rules for deriving scalar implicatures. In what follows, I will argue against the Strongest Meaning Hypothesis. Instead, I will propose the Strongest Justified Meaning Hypothesis, given in (7):

- (7) If  $\alpha$  is an expression whose meaning underspecifies its interpretation and whose candidate interpretations would result in propositions which can be ordered in terms of logical strength, choose the interpretation which results in the proposition which satisfies expectations of relevance and which is moreover the strongest such proposition which is justified.

In (7), "relevance" is meant in the technical sense of relevance theory. I will argue that the pattern of readings for plural definites is consistent with the strongest justified meaning hypothesis. But I would also argue that this is not a default strategy. Rather, it follows naturally from the relevance-theoretic comprehension procedure as applied to the interpretation of underspecified expressions. In the next section I will look more generally at how the choice among candidate interpretations is made, and show that the SMH cannot possibly be right, but that the pattern fits with the SJMH. I will then go on to consider plural definites.

## 2 Which strategy?

I remarked in chapter 2, section III that there is a correlation between contexts which give rise to the maximal reading for definites and those which yield scalar implicatures for indefinites. Notice that in (8a) below, the maximal reading is preferred, while in (8b), there is a scalar implicature to the effect that not all the lectures were in French:

- (8) a. Jacques gave a course in French syntax. The lectures were in French.  
b. Jacques gave a course in French syntax. Some lectures were in French.

Similarly, in cases where the non-maximal reading is favoured, no scalar implicature is derived:

- (9) a. The burglar was able to get in because the windows were open.  
b. The burglar was able to get in because some windows were open.

As we shall soon see, this is no coincidence. In relevance-theoretic terms, the reasoning underlying the derivation of scalar implicatures is based on clause (b) of the definition of optimal relevance. Let us look at some examples from Sperber & Wilson (1986/95) to see why this is so:

(10) a. *Henry*: If you or some of your neighbours have pets, you shouldn't use this pesticide in your garden.

*Mary*: Thanks. We don't have pets, but some of our neighbours certainly do.

b. *Henry*: Do all, or at least some, of your neighbours have pets?

*Mary*: Some of them do.

In (10a), the inference that not all of Mary's neighbours have pets would not be drawn, whereas in (10b), it would. We can explain this in terms of the issues addressed by Mary's utterances in (10a) and (10b). In (10a), the issue is whether there are pets in the vicinity that might be harmed by the pesticide. In (10b), the issue is explicitly presented as whether some of Mary's neighbours have pets or whether all them do. Let us assume that cognitive effects can be derived by resolving salient issues. The form of reasoning which leads to scalar implicatures of the "some/not all" variety in the above examples goes as follows: In the utterance situation, the same context of assumptions in which "some" achieves adequate effects would also give rise to more effects for relatively little more effort, if the information that "all" was available. Given the presumption of optimal relevance and the assumption that the speaker would have been willing to give this information if she had had it, we are entitled to conclude that the speaker was unable to give the more relevant information because she regards it as false. Usually, a context in which "all" gives rise to more effects than "some" is also a context in which "some but not all" gives rise to more effects than "some". In other words, the question "whether *some and all* or *some and not all*" is relevant. In this situation, the implication "not all" would increase the relevance of the utterance, and by clause (b) of the definition of optimal relevance, it would be implicated.

The interesting thing about this pattern of reasoning is that it requires a context of assumptions

which is more or less fixed, but in which an alternative, minimally different, stronger formulation would give rise to more effects. Our concern here is with the resolution of issues raised by context-dependent expressions. As we saw in the examples discussed above, these issues are resolved in such a way as to satisfy expectations of relevance. Let us return to the swimming example:

(11) *Scenario*: John's father is talking on the phone to John.

*John's father (to John's mother)*: John wants to go swimming with Bill today.

*John's mother*: He has a cold.

Two possible interpretive hypotheses were discussed:

- (12) a.  $\forall x \square \text{he}'(x) \leftrightarrow \lambda y [y = \mathbf{j}](x)$   
b. John's having a cold is sufficient ground for John's mother to refuse him to go swimming.
- (13) a.  $\forall x \square \text{he}'(x) \leftrightarrow \lambda y [y = \mathbf{b}](x)$   
b. Bill's having a cold is sufficient ground for John's mother to refuse John permission to go swimming.

I argued that the hearer would tend to prefer the interpretation based on (12) because the information which supports this hypothesis is more accessible, so the choice of referent for the pronoun is determined by the accessibility of other information.

A slightly different example which has a bearing on the maximal-non-maximal alternation, involves a range plausible resolutions of an issue raised by a context-dependent expression within the same context of accessible information. Consider (14):



(14) *Mary*: We have to travel 300km before lunch!

*John*: Don't worry, I have a fast car.

Here, given Mary's expressed concerns, a very accessible contextual assumption would be something like  $q_2$  below. In the context of this assumption, the interpretation of "fast" given in  $q_1$  would lead to an overall interpretation which should satisfy Mary's expectation of relevance:

(15)  $q_1$ :  $\forall x \square [\text{fast}'(x) \leftrightarrow C_{300K}(x)]$

where  $C_{300K}$  expresses the property of being at least fast enough to travel 300km before lunch

$q_2$ : If John's car is fast enough to travel 300km before lunch then we will make our appointment on time.

Notice that we could make an alternative assumption,  $q_1'$  below, about the content of "fast", which would give rise to a stronger proposition but would yield no more effects in the context of  $q_2$ :

(16)  $q_1'$ :  $\forall x \square [\text{fast}'(x) \leftrightarrow C_{400K}(x)]$

where  $C_{400K}$  expresses the property of being at least fast enough to travel 400km before lunch

$q_2$ : If John's car is fast enough to travel 300km before lunch then we will make our appointment on time.

Although  $q_1$  and  $q_1'$  are both compatible with the contextual assumption, it is clear that we would only be justified in making the hypothesis in (15), rather than the one in (16). This can be explained in the following way: In the situation, Mary has very salient concerns. These make highly accessible the assumption in ( $q_2$ ). The fact that John's car might be more than fast enough

to answer Mary's concerns would give rise to no more effects in this highly accessible context and would make no additional contribution to satisfying Mary's expectations of relevance. Consequently, we have good evidence that John meant  $q_1$  by his utterance and no evidence that he meant something stronger.

Notice that the Strongest Meaning Hypothesis would lead us to interpret John's utterance in (14) on the basis of  $q_1'$ , assuming this is a plausible assumption. This interpretation is not justified in the circumstances.

Now let us consider an alternative scenario which has a structure more like the scalar implicature case:

(17) *Mary*: It turns out that we have to be in Manchester by 12:00! And I'd really hoped to stop for a bite to eat along the way.

*John*: Don't worry. I have a fast car.

Once again, there is a range of potential resolutions of the issue raised by "fast". However, here there are multiple issues which are among Mary's concerns. As a result a variety of interpretive hypotheses could be made:

(18)  $q_1$   $\forall x \square [\text{fast}'(x) \leftrightarrow C_M(x)]$

where  $C_M$  expresses the property of being at least fast enough to travel to Manchester by noon.

$q_2$  If John's car is at least fast enough to get to Manchester by noon, we will make our meeting on time.

(19)  $q_1'$   $\forall x \square [\text{fast}'(x) \leftrightarrow C_{M+F}(x)]$

where  $C_{M+F}$  expresses the property of being at least fast enough to travel to Manchester by noon allowing time for something to eat.

$q_2'$  If John's car is at least fast enough to get to Manchester by noon allowing time for something to eat, we will make our meeting on time and I won't have to wait until this evening to eat.

Here, the preferred interpretation would be the one based on (19). We can account for this as follows. In this example, Mary's expressed concerns make assumptions  $q_2$  and  $q_2'$  both highly accessible. Let us assume that the interpretation in (18) would give rise to adequate effects, and would therefore satisfy clause (a) of the definition of optimal relevance. Still, clause (b) says that the stimulus is the most relevant one compatible with the speaker's means and goals. In this circumstance, there are at least two ways of resolving the issue raised by the context-dependent expression "fast". Choosing  $q_1$  would give rise to some effects, but choosing  $q_1'$  would give rise to more effects in what is, by hypothesis, an equally accessible context. In this case, Mary would be justified in choosing the stronger interpretation of "fast car", as it would lead to a more relevant interpretation in a way that the speaker could manifestly have foreseen.

The correct generalisation about these scalar cases of context dependence seems to be that one goes for the strongest resolution which is justified in the most accessible context. Justification is made in terms of the definition of optimal relevance. The strongest meaning hypothesis would predict that one should adopt the strongest resolution consistent with background knowledge in all cases. This seems to be incorrect.

### **3 Maximal/Non-maximal**

We are now in a position to account for the distribution of readings for plural definites. The strategy should be clear enough. I assume that with plural definites, the audience is free to resolve the issue raised by these forms in a way which gives rise to either the maximal or the non-maximal reading. In positive contexts, the maximal reading yields a stronger proposition, and should only be chosen when it leads to a more relevant overall interpretation. In negative

contexts, the non-maximal reading yields a stronger proposition, and should only be chosen when it leads to a more relevant overall interpretation. In what follows, I will review some data which illustrate the alternation, and provide a classification of cases. I will argue that in many cases, the strongest meaning conjecture makes the wrong predictions. I will then suggest an explanation for the general tendency to choose the strongest resolution.

Let us first consider some cases where the choice of reading seems to be determined by plausibility:

- (20) a. Every farmer who abused his donkeys was prosecuted.  
b. Every farmer who vaccinated his cows received a clean bill of health from EC agricultural commission.
- (21) a. Every customer who had a credit card payed her bill with it.  
b. John took some credit cards and cash on his trip. He paid most bills with the/his credit cards.

Consider the pair in (20). Here, the plural definite is found in a downward entailing context, so the strongest proposition would result from a non-maximal interpretation. This is prominent in (20a), but not in (20b). In (20b), the maximal reading is most prominent. However, the choice of reading in these cases simply seems to be a product of accessible world knowledge. Normally, animal protection laws are such that any abuse is punishable. It would be very unusual that only those farmers who were thoroughly systematic about their abuse were prosecuted. But this is what (20b) would imply on the maximal reading. Things are otherwise with (20a). Normally, one gets a clean bill of health only if one has been systematic about one's vaccinations. So the non-maximal reading would be less accessible.

In some contexts, the reading of the plural definite derives from the interests of the audience. This can be shown if we consider (22) below in two different scenarios:

(22) No customer who was given free samples used them within the week.

Suppose firstly that (22) is reported at a meeting of marketing people who are interested in getting feedback about a certain product which they are testing by giving out free samples. In this scenario, their interest would be in whether there is any feedback at all and thus whether customers have used any of the samples they were given. In this case, the plural pronoun would most naturally be understood non-maximally.

Now suppose that instead, the marketing people are interested in something like the rate of consumption of the product which they are testing; and their expectations had been that the samples which were distributed would be consumed within the first week. In that scenario, the weaker, non-maximal reading would be favoured.

In this latter case, it is not plausibility which determines the reading but specific expectations of the audience. The reading of (22) in the second scenario is not predicted by the Strongest Meaning Hypothesis which just says choose the interpretation of the definite which results in the strongest proposition expressed, unless that reading conflicts with background assumptions. For our second scenario, it could be perfectly consistent with background assumptions that the customers used none of the samples. The SMH says that in that case, the non-maximal reading should be favoured. By contrast, the Strongest Justified Meaning Hypothesis says that the weaker, maximal construal of the utterance should be favoured.

Note that, the second scenario has a similar structure to the first "fast car" example discussed above. In the context of very specific concerns about how many people used all the sample within the first week, the weaker maximal understanding of the definite would be sufficient to resolve this question. The stronger non-maximal understanding would also resolve this question, but in that context, it would have no more effect. So, the audience would be justified in assuming that the speaker intended the maximal understanding, but they would not be justifying in attributing to the speaker anything stronger.

This kind of counter-examples to the SMH (where the choice of the stronger reading would not conflict with background assumptions but it is not favoured) can be multiplied at will in discourse contexts. Let us consider some examples, mentioned in chapter 2, where informants generally judge that the plural definite receives the non-maximal interpretation:

- (23) a. {Note, there are three elephants at the zoo: Jumbo, Mumbo and Dumbo}  
Johnny was naughty because he fed the elephants chocolate.
- b. Mary cannot come to work today because her children are sick.
- c. John bought some really nice plum tomatoes yesterday. I used them to make a gazpacho last night. It was delicious.

At a given point in continuous discourse, the audience's expectations are generally conditioned by what has been conveyed up to that point. It is often most natural to characterise these expectations in terms of the issues which previous discourse raises in the audience's mind. It is often the case that a variety of issues are raised by a discourse segment and the audience's expectations are that at least one of the issues raised will be resolved by what follows. In some cases, however, a discourse segment may make one or two issues more salient than any other. For instance, saying that Johnny was naughty most naturally raises the issue of in what way he was naughty. In the discourse in (23a), the speaker signals by the use of the connective that she is addressing this issue. In this circumstance, the issue would be equally adequately resolved on the non-maximal or the maximal reading. Again, we have an example where the reasoning is much the same as the first "fast car" example. The stronger interpretation, though plausible, would give rise to no more effects (resolve no more issues) than the non-maximal reading. Thus the audience would not be justified in assuming that this is the understanding which the speaker intended. The example in (23b) would be accounted for similarly.

The statement made in the first sentence in (23c) raises an issue of justification, among other things, and the rest of the discourse can be taken as justifying the claim made in the first sentence. Again the non-maximal interpretation is favoured since the stronger construal would

not give rise to any more effect than the weaker, and so there would be no evidence that the speaker intended anything stronger.

As we have seen in the first scenario for (22), in some circumstances, the audience may have specific expectations which only the stronger reading will meet. In other circumstances, the audiences expectations may be such that a weaker construal would give rise to adequate effects, but a stronger construal would give rise to more. Consider the variant of (23c) in (24):

(24) *John*: I am wondering what happened to the nice plum tomatoes I bought yesterday. I don't suppose you've eaten any of them, have you?

*Mary*: Yes. I used them to make a gazpacho last night. It was delicious.

This example has the structure of the scalar implicature example discussed above as well as the second "fast car" example. Here John is clearly concerned about all of his tomatoes, but he has signalled in his question that he would be satisfied with information about any of them. Thus, the non-maximal construal would meet expectations of relevance. However, it would be clear to both participants that a maximal reading would give rise to an interpretation which is manifestly more relevant. Thus John would be justified in assuming that Mary intended him to understand the definite maximally.

I think that the general tendency to interpret plural definites maximally in positive contexts and non-maximally in negative contexts has to do with the fact that in many circumstances (especially the kinds of discourse examples which are usually considered in the literature on definites) there are no overriding or specific expectations and the choice of the stronger reading often adds a little more effect in a context which exploits the same information (or just as accessible information) as the weaker reading requires. Consider, for instance, (25):

(25) John bought some sheep in the Spring. He sold them in the Autumn.

The first part of this discourse raises an array of issues, none of which are particularly pressing: Why did he do that? What did he do next? and so on. In this kind of case, it is manifest that the speaker cannot be sure exactly how the audience might exploit what is said. It is also manifest that they have used a form which can be understood maximally or non-maximally. Thus it will be assumed that the audience can generally extract a little more effect from the utterance if it is given its more informative construal. Given clause (b) of the presumption of optimal relevance, the audience would generally feel justified in assuming that the speaker intended the stronger reading.

Note that in different circumstances this assumption would be justified to a greater or lesser degree. In conversation, at least, the audience might be inclined to check:

(26) *Mary*: I think that John will be angry with me because he bought some nice salad tomatoes but I used them in a pasta sauce.

*Bill*: What, all of them?

I think that lack of evidence often gives rise to uncertainty in informants judgements when they reflect on donkey sentences. If you present an example such as (27) to an informant, then they might doubt that anything more than a non-maximal reading would be intended. After all, it is shocking enough that a farmer beats any of his donkeys:

(27) Every farmer who owns a donkey beats it.

But there are other factors present in donkey sentences which tend to sway the reading toward the stronger reading. As Kanazawa (1994) notes, the maximal reading of donkey sentences with "every" and the non-maximal reading of those with "no" are 'easier to think with'. Kanazawa's observation is that informants judgements of maximal and non-maximal readings of donkey sentences shows a tendency to attribute readings which preserve the inferential patterns that hold



in non-donkey sentence. For example, since *every'* is  $\downarrow\text{Mon}\uparrow^4$ , the inference in (28) is valid due to the fact that the determiner is  $\downarrow\text{Mon}$ :

(28) Every farmer who owns a donkey is rich.

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Every young farmer who owns a donkey is rich.

If we take a donkey sentence and try the same pattern, we do not always get a valid inference unless the donkey pronoun gets a universal reading:

(29) Every farmer who owns a donkey beats it.

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Every farmer who owns and feeds a donkey beats it.

For instance, *every farmer who owns and feeds a donkey beats some of the donkeys he owns and feeds* does not follow from *every farmer who owns a donkey beats some of the donkeys he owns*.

The same applies to sentences with "no" except in that case, because *no'* is  $\text{Mon}\downarrow$  as well as  $\downarrow\text{Mon}$ , the pattern is preserved with an existential reading:

(30) No farmer who owns a donkey beats it.

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No farmer who owns and feeds a donkey beats it.

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<sup>4</sup> I follow here a convention of indicating (anti-) persistence of a determiner with the left-hand arrow and upward (downward) monotonicity of with the right arrow. A determiner  $D$  is  $\uparrow\text{Mon}$  iff if for every  $A, B, C \subseteq E$ ,  $D(A)(B)$  and  $A \subseteq C$  implies  $D(C)(B)$ .  $D$  is  $\downarrow\text{Mon}$  iff for every  $A, B, C \subseteq E$ ,  $D(A)(B)$  and  $C \subseteq A$  implies  $D(C)(B)$ .  $D$  is  $\text{Mon}\uparrow$  iff for every  $A, B, C \subseteq E$ ,  $D(A)(B)$  and  $B \subseteq C$  implies  $D(A)(C)$ .  $D$  is  $\text{Mon}\downarrow$  iff for every  $A, B, C \subseteq E$ ,  $D(A)(B)$  and  $C \subseteq B$  implies  $D(A)(C)$ . Note that  $\uparrow\text{Mon}\downarrow$  is to be read as a conjunction of two statements.

Kanazawa suggests, rightly in my opinion, that if contextual factors do not strongly bias one reading over another, then they choose these readings because the information is easier to process. This is explicable in relevance terms since a cheaper to process interpretation would increase the overall relevance of the utterance.<sup>5</sup>

#### 4 Summary

This concludes my discussion of pragmatic matters. Clearly there is more that could be said here. In particular, I have not included a discussion and comparison of the closely related work of Asher & Lascarides (1998, in press) in this chapter. Their approach is based on coherence theory (see Hobbs 1979) and so a comparison between this and a relevance treatment of these pragmatic issues would no doubt be enlightening. However, I suspect that that would constitute a substantial project in its own right. I do however concur with Asher & Lascarides (1998) that the different approaches could usefully be merged to deal with pragmatic phenomena in discourse. For one thing, something like the relevance treatment of scalar phenomena, of which the patterns of readings of plural definites is an instance, would be required in addition to a coherence based approach since it involves no notion of informativeness. On the other hand, it was mentioned that, in continuous discourse, the audience's expectations are usually centered around the issues raised by immediately preceding segments. These issues are just those characterised in coherence relations: explanation, justification and so on. It would be interesting to discover whether and to what extent certain discourse issues are routinely raised and therefore affect audiences' expectations.

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<sup>5</sup> Kanazawa also suggests that hearer's 'blindly' assume that the patterns of inference which apply to non-donkey sentences apply to donkey sentences, due to their simplicity and importance, giving rise to an initial impression that, for instance, an "every"-donkey sentence has a maximal reading. This may be a contributing factor in the pattern of informants judgements. In this case, the preferred readings may just be the first to occur to the audience, and they may process the utterance no further.

What both approaches have in common is that they make a clear distinction between pragmatic processes and the principles which govern them, and linguistic processes and principles. I hope that in this thesis I have made the case clear enough that these processes and principles are quite distinct and that it is not sufficient to simply look at transitions between states and conduct semantic investigation as a form of backwards engineering. Ultimately, one has to face the fact that the study of language is a psychological investigation and that language use and interpretation is a product of more than one psychological faculty.

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