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Preface

I completed my dissertation in 1991, and this CSLI edition presents that work essentially unchanged. However, an anonymous CSLI reviewer raised a number of excellent points that led me to add some explanations and some further discussion, and I have made a small number of minor changes here and there as well.

Thanks again to my dissertation committee: William A. Ladusaw (the chair), Peter Lasersohn, and James McCloskey; to Robert C. Moore and my former colleagues at SRI, where I wrote most of the dissertation; and to all of those mentioned in the acknowledgements section of the dissertation. Thanks also to the Linguistics Board at the University of California, Santa Cruz and to the Center for Cognitive Science at Ohio State University for providing funds for distribution of the dissertation manuscript. I am grateful to an anonymous reviewer and to Tony Gee for help preparing the CSLI version.

I would like to mention three of the papers that grew out of my dissertation research. The investigation into the semantics of relational nouns in chapter 2 lead to collaborative work with David Dowty, a part of which has been reported in our 1993 NELS paper 'Non-verbal thematic proto-roles' (A. Schafer, ed., proceedings of NELS 23, GSLA, Amherst); the treatment of donkey anaphora and the proportion problem in chapter 4 gave rise to 'A presuppositional account of proportional ambiguity', to appear in *Natural Language Semantics*; and a recent manuscript proposes an explanation for so-called double genitives (e.g., *a friend of John's*), a topic which completely baffled me at the time I wrote the dissertation. These papers, as well as a prolog implementation of the fragments of the first three chapters of the dissertation, are available by contacting me at barker@ling.ucsd.edu.

Finally, as before, this dissertation is dedicated to Geoffrey K. Pullum, who was so important to my early professional life.

Columbus, Ohio

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Introduction

Possessive descriptions are extremely common. On the front page of today's New York Times,[1] for instance, I counted 23 instances of the possessive construction, distributed in such a way that one out of five sentences contained at least one possessive. As a second kind of example, children acquire the possessive early in the two-word stage, so that by the age of 2 possessives can account for up to twenty percent of a child's productions.[2] In other words, possessives are a basic and important part of the language.

Nevertheless, possessives have not been extensively studied by generative linguists in general and semanticists in particular, especially when compared to other nominal constructions, such as the bare plural, descriptions involving the definite determiner *the* or the indefinite determiner *a*, quantificational descriptions, and so on. Although many authors mention the possessive in passing, no one to my knowledge has ever devoted a full-scale study exclusively to the possessive.

My dissertation, therefore, sets out to investigate the semantics of possessives. What do possessive mean? More precisely, how does the meaning of a possessive depend upon the meanings of its constituents?

One reason that the semantics of possessives have been largely ignored for so long is that many people assume that the answer to this question is trivial, and therefore uninteresting. For these people, possessives seem to be just massively vague, and that is all there is to say. Edwin Williams states this position most clearly in his Det Rule.

(1) The Det Rule (Williams (1982, 283)):

> The relation between the possessive NP and the following N′ can be any relation at all.

In support of this claim, Williams cites examples such as *John's cat*. He points out that this phrase can refer to the cat John owns, the cat that is sitting in John's lap, the cat he just stepped on, and so on, seemingly without limit. I will argue that the Det Rule characterizes only one kind of possessive. Although there is considerable vagueness in some possessives, nevertheless there are strong grammatical constraints on what a possessive can mean. For

[1] 1 May 1991

[2] See section 2.1.

a particularly clear counterexample to the Det Rule, consider the possessives in (2).

(2) a. the table's leg
b. *the leg's table

Although the relation of a whole to a part makes for a perfectly reasonable possessive interpretation, as in (2a), the inverse relation holding between a part and a whole as expressed in (2b) has a very different status. More precisely, the entailment in (2a) that the leg is a part of the table is missing from (2b).

The larger goal of my dissertation, then, is to open a door: to try to establish the possessive as a construction worth investigating. This introductory chapter, then, will survey the results of the dissertation. It will also give a sketch of the main arguments developed in later chapters in support of my analysis of possessives.

So what is a possessive?

(3) a. John's child
b. the man's boot
c. a woman's strength
d. somebody's mother
e. my mother
f. most people's dogs
g. some professors' students' papers

The examples in (3) give instances of what I will take to be the possessive construction. Here and throughout the dissertation, I will use the terminology given in (4) in order to refer to the parts of a possessive.

(4) Parts of a possessive phrase:

[[most people's]	[favorite dogs]]
[[POSSESSOR PHRASE]	[POSSESSEE PHRASE]]

Thus for me a possessive phrase (a 'possessive' for short) is the whole construction, including both the possessor phrase and the possessee phrase.

In addition, I divide possessives into two descriptive classes depending on whether they are quantificational or not. A QUANTIFICATIONAL possessive is a possessive in which the possessor phrase is headed by a determiner with quantificational force (or in which the possessor phrase is itself a quantificational possessive). For instance, the possessive in (4) is a quantificational possessive, since the possessor phrase is headed by the quantificational determiner *most*. Notice that in (3), each possessor phrase is marked by the presence of the possessive morpheme *'s* (except for the suppletive form *my*).

Although the possessive morpheme is related historically to one of the morphemes marking singular masculine genitive inflection in Old English, I assume that there is no genitive case in modern English. Therefore I will always call phrases like *most people's* possessor phrases, and never genitives.

I should mention briefly some constructions that are not possessives on my analysis.

(5) a. the child of John
b. a child of John's

Clearly, (5a) and (5b) each have a reading on which they convey the same descriptive content as (one reading of) the possessive in (3a). This has led many people to call the expressions in (5) possessives. On my account, the prepositional phrase in (5a) is simply a syntactic argument of the noun *child*, and the meaning relation between (5a) and (3a) falls out from the way in which the denotation of the noun *child* contributes to the meaning of the possessive in (3a), as sketched below and developed in detail in chapter 2. Similarly, I analyze (5b), an example of the so-called "double genitive" (see Quirk et al. 1972, 203), as parallel to (5a), except that the object of the preposition happens to be a possessive containing a null category.

The perspective paradox

One of the central problems addressed in this dissertation is what I call the perspective paradox. There is a strong intuition that possessives in general, and quantificational possessives in particular, have at least two distinct kinds of interpretations, depending on what the possessive is "about".

(6) a. Most dissertation students' longer papers are worth reading.
b. John's last paper is worth reading.

The statement in (6a) can either be interpreted as a generalization about dissertation students (some of their papers are worth reading), or as a generalization about papers (at least those ones written by dissertation students are worth reading). By the same token, the non-quantificational possessive in (6b) shows a similar effect, corresponding to whether the point of interest is whether the paper in question is John's (focus on the possessor), or whether it is the fact that the paper is John's most recent effort (focus on the possessee).

What accounts for this intuition? I will argue that possessives are not ambiguous (in any relevant way) in their syntactic structure, nor in their descriptive content, nor in their logical forms. I suggest instead that the perspective paradox, at least as far as the truth conditions of quantificational possessives are concerned, is a special case of the so-called proportion problem. The proportion problem arises whenever a quantifier (in effect) binds more than one variable at a time.

(7) Usually, if a dissertation student writes a longer paper,
it is worth reading.

In this non-possessive example, the quantifier denoted by the adverb *usually* binds the student variable and the paper variable simultaneously.

There is general agreement that the quantification in (7) gives rise to at least two distinct sets of truth conditions, depending on how we calculate the set of cases that are relevant for evaluating the quantification. We can individuate cases solely on the basis of the identity of the student, in which case all of the papers written by a particular student will be lumped together into a single case; or else each distinct student/paper pair can count as a separate case.

The problem of predicting which reading is appropriate is called the proportion problem because what is at issue in this particular situation is whether the proportion of papers written by each student is relevant. That is, imagine that Stuart writes twenty long but boring papers, while his colleagues write at most two papers each. The two readings described here correspond to deciding whether or not Stuart's twenty papers constitute twenty separate counterexamples to the generalization expressed in (7).

I will propose that in the quantificational possessive example in (6a), the quantifier denoted by the determiner *most* also binds two variables simultaneously, namely, the possessor variable and the possessee variable. On my view, then, quantificational possessives naturally would be expected to give rise to different proportional readings, depending on how we chose to lump instances into cases. As in the adverbial example, there will be either one case per student (the POSSESSOR-DOMINANT reading), or one case for each distinct pair consisting of a student and the set of papers possessed by that student (the SYMMETRIC reading). These readings correspond exactly to the two perspectives described above. Thus on my account, the intuition that quantificational possessives can either be viewed as a statement about possessors or as a statement about (a subclass of) possessees falls out from independently motivated assumptions concerning the nature of quantificational binding and the individuation of cases.

The reason I call this a paradox rather than a problem is that even though there is good reason to believe that there are two distinct readings, these readings never lead to a detectable difference in truth conditions. However, note that possessives carry a uniqueness presupposition, just like a definite description. That is, a use of the possessive *John's child* will be felicitous only in a situation in which there is at most one maximally salient child possessed by John. Similarly, (6a) will be felicitous only in a situation in which there is at most one maximally salient set of papers for each student. Because of

this uniqueness presupposition, then, there will always be a one-to-one correspondence between students and their papers. This means that it will make no difference whether we distinguish cases solely on the basis of the identity of the student, or whether each student/paper pair constitutes a distinct case. Either way, the resulting factorization of instances into cases will be identical, leading to identical truth conditions.

Thus I resolve the perspective paradox by showing how a general theory of quantification will predict two kinds of interpretations for quantificational possessives, and then explaining how a special property of possessives (their uniqueness presupposition) always neutralizes the potential for the two readings to give rise to distinct truth conditions.

Syntactic structure

There are at least two logical possibilities for the constituency of a possessive.

		SPEC-OF-DP	POSSESSIVE COMPOUND
(8)	a.	[a lady's] hat	a [lady's hat]
	b.	[most students'] papers	most [student's papers]

I will call these two structures the spec-of-DP analysis and the possessive compound analysis, for reasons that will become clear shortly. I claim that the spec-of-DP analysis is the only fully productive syntactic surface structure for possessives in English.

If there had been an alternative surface structure available, clearly this would have led to a potential explanation for the perspective paradox. In (8b), for instance, the spec-of-DP structure would correspond to a reading on which *most* quantifies (primarily) over students (the possessor-dominant reading), and the spec-of-NP reading would correspond to a reading on which *most* quantifies over student/paper pairs (the symmetric reading).

To see that possessives have only the spec-of-DP structure, consider determiners that govern the number marking of their complements.

(9) a. every man's dogs
b. *every men's dog

(10) a. most men's height
b. *most man's heights

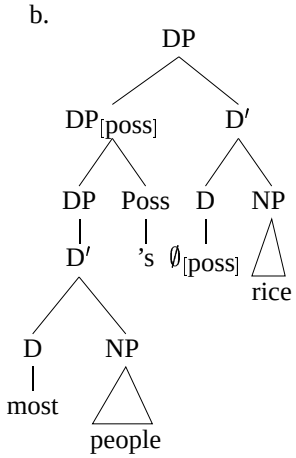
Since the determiner *every* requires a singular complement, (9) shows that it is the number marking on the possessor that matters, and the number marking on the possessee is irrelevant. The obvious conclusion is that the possessor forms a constituent with the determiner to the exclusion of the possessee phrase. Similarly, in (10) the determiner *most* requires a plural complement, and once

again we see that the agreement facts argue strongly in favor of the existence of only a spec-of-DP analysis.

Since I assume a DP structure for nominals as defended by Abney (1987), the resulting syntactic structure for possessives in English is given in (11).

(11) a. most people's rice

b.



Here the possessor phrase is the determiner phrase serving as the specifier to the zero determiner; the possessive morpheme is a phrase-final clitic indicating the presence of a possessive construction; and the possessee phrase is the noun phrase complement to the head determiner. In English, the determiner that occurs in the possessive construction always happens to be a zero form. In other languages, however, a wider range of determiners do co-occur with possessor phrases, notably in Hungarian (see section 1.3).

In any case, given that the determiner *most* has *people* for its complement in (11b), it is easy to see why the quantificational determiner *most* cares about the number marking of the possessor nominal but not the possessee nominal.

I call (11) an example of the spec-of-DP analysis because the possessor phrase serves as a specifier in the determiner projection. Although I maintain that there is no productive syntactic structure for possessives (in English) apart from the spec-of-DP analysis, there is a distinct structure due to noun-noun compounds that involve the possessive morpheme. Two examples appear in (12).

(12) a. every [men's room]
b. designer [children's furniture]

To see that these structures have the constituent structure as indicated by the bracketing, notice in (12a) that *men* is in the plural, and *room* is in the singular, which means that *every* takes *men's room* as a unit for its complement. Similarly, in (12b), there is a reading on which the adjective *designer* modifies the unit *children's furniture*, without entailing that any particular child designs anything.

However, the possessives in (12) are noun-noun compounds. Notice that (12a) has an idiomatic reading on which *men's room* can only describe a bathroom, and in (12b), *children's furniture* serves as the name of a kind of furniture. If we attempt to insert an adjective between the possessor and the possessee, the idiomatic and kind readings disappear. Furthermore, the number agreement facts indicate the presence of only a spec-of-DP reading.

(13) a. every man's clean rooms
b. designer children's modern furniture

Thus whenever we can be sure that we have a syntactic possessive rather than a possessive compound, we can also be sure that we have a spec-of-DP structure as given in (11).

Possessive descriptions: lexical and extrinsic possession

I implied before that no one had studied the properties of possessives in any depth. That is not quite true. There is an extensive literature on the syntax of derived nominals and gerunds that discusses the thematic role properties of possessives in great detail.

(14) a. John's gift
b. John's purchase

In (14a), for instance, *John's gift* can either be the item that John received or the item that John gave away. But in (14b), *John's purchase* can only be the item that John bought, and not the item that John sold. These examples, adapted from Chomsky (1970), provide a clear class of systematic counterexamples to William's Det Rule: the relation between the possessor and a possessee in a derived nominal cannot be any relation at all; rather, it depends strongly on the thematic role structure of the derived noun.

Thus there is a profound difference between the possession relation expressed by William's example *John's cat*, which is massively vague, and the possession relation expressed by *John's purchase*, which is strongly constrained by the nature of the derived noun *purchase*. In my analysis of the descriptive content of possessives, I take for my starting point this insight of Chomsky (1970), namely, that it is the nature of the possessee nominal that is crucial for predicting the syntactic and semantic behavior of the matrix possessive.

More specifically, I propose that some nominals (e.g., kinship terms, body-part terms) denote relations over pairs of entities. When such a nominal occurs in a possessive, then the possession relation entailed by the possessive will express the relation denoted by the possessee nominal. I call such possessives examples of LEXICAL possession, since the possession relation comes directly from the lexical meaning of the noun. If, on the other hand, a possessee nominal simply denotes a set of individuals rather than a relation, then we must resort to some contextually determined relation. I will call such non-lexical possessives examples of EXTRINSIC possession, since the possession relation does not depend on any inherent qualities of the described object.

On my system, then, there is a formal distinction between possessives that express a specific relation as determined by the possessee nominal, and those that express a vague relation.

LEXICAL POSSESSIVES

(15)

a.	John's purchase	Derived nominals
b.	John's child	Kinship terms
c.	John's nose	Body part terms
d.	the table's top	Generalized part/whole relations
e.	the woman's pen pal	Arbitrary relational nouns

EXTRINSIC POSSESSIVES

(16)
a. John's cat
b. John's yogurt
c. John's firetruck

The difference between the lexical possessives in (15) and the extrinsic possessives in (16) is that the possessee nominals in (15) are all relational, and the possessee nominals in (16) are not. To see that *child* is relational, note that if a particular entity is a child, that entails the existence of another entity who is the parent of that child.

Although most authors take the relational nature of some nouns to be more conceptual than grammatical, I have taken a very literal approach on which nominals translate as either two-place predicates or one-place predicates. Thus one of the lexical meanings of the noun *child* can be represented as a two-place relation between a parent and a child, as suggested by (17a).

(17)
a. $[\![\textit{child}]\!] = \lambda x \lambda y [\textbf{child}(x, y)]$
b. $[\![\textit{firetruck}]\!] = \lambda y [\textbf{firetruck}(y)]$

By way of contrast, a non-relational noun like *firetruck* does not have any lexical entailments requiring the existence of any other entity that stands in a specified role towards that firetruck. Therefore it has only a set-denoting translation, as expressed in (17b).

As a test for whether a noun is relational or not that is independent of the possessive construction, notice that whether a noun can take a postnominal prepositional phrase depends (in part) on whether it is relational or not.

(18) a. a child of John.
b. *a firetruck of John.

In (18a), *child* is relational, so it can translate as a two-place predicate that can take the *of*-phrase as an argument. But in (18b), *firetruck* denotes a set of entities, so it translates as a one-place predicate that is not able to take an *of*-phrase argument.

Now we can understand the contrast in (2). The noun *leg* is relational, but *table* is not. More specifically, *leg* denotes a two-place relation between the leg and the entity that the leg is a part of; but the denotation of *table* does not specify any such special thematic argument. That is why in (2a) we have the possibility of a part/whole interpretation based on the lexical meaning of *leg*, but the reversed expression in (2b) cannot entail a part/whole relation, since it can receive only an extrinsic reading.

Of course, if a nominal is lexically ambiguous between a relation-denoting expression and a set-denoting expression, then it will have either a lexical reading or an extrinsic reading when it occurs in a possessive, depending on which lexical sense is chosen. Thus *John's child* can either be John's own child (lexical possession), or it can be the child that John is responsible for at the day-care center where he works (extrinsic reading). In this case, the relational sense of *child* can be distinguished from the set-denoting sense by auxiliary entailments: the set-denoting sense carries the entailment that the described entities are sufficiently young, but for the relational sense, the requirement that the described entity is young is at most an implicature.

(19) a. John's children have children of their own now.
b. John's children try hard to be good when he gets that look.

On the lexical possession reading for (19a) entailing a kinship relation between John and his children, there is no entailment that John's children are young. But on the extrinsic reading in (19b), the entailment that his charges are young are part of the intuitive satisfaction conditions.

Another way to state this observation is to say that the extrinsic possession relation is available only for the (prenominal) possessive construction, so that a postnominal *of*-phrase can only receive a reading that entails a lexical relation. This means that the extrinsic possession reading of *John's child* on which John works for a day-care center is not available for (18a). That is,

we correctly predict that (18a) has only a reading on which it entails a kinship relation between John and the described child.[3]

One empirical domain where the lexical/extrinsic opposition is particular relevant involves the use of a possessive to refer to a novel entity, that is, in contexts in which an individual described by a possessive is not familiar from previous context.

(20) a. A man walked in.
His daughter was with him.

b. A man walked in.
#His firetruck was visible through the window.

In the discourse in (20a), the indefinite expression *a man* introduces a man into the discourse, and we can refer to that man using pronouns in subsequent discourse. The point of interest is that the possessive description *his daughter* can also introduce a novel entity into the discourse. But the possessive in (20b) is not successful. That is, it is odd to refer to a person's firetruck with a possessive description without having mentioned it first in previous discourse.

I claim that the ability to use a possessive description to introduce a novel discourse entity correlates with whether the possessive receives a lexical interpretation or not. In (20a), *daughter* is a relational noun, so that the discourse is perfectly felicitous, even in a neutral context. But in (20b), the noun *firetruck* is not relational, so no lexical possessive is possible, and the discourse is infelicitous (without previous context). The basic idea is that as long as the possession relation is explicitly provided by the denotation of the possessee, there is no difficulty in accepting a definite description whose reference depends on that relation; but if the relevant possession relation is an extrinsic, pragmatically-determined relation, then additional context is needed in order to render a particular possession relation more salient before a definite possessive whose reference depends on that relation will be felicitous.

To summarize, on my analysis many possessives are systematically ambiguous between a lexical possession interpretation versus an extrinsic possession relation, as controlled by the lexical argument structure of the possessee nominal.

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[3] See Partee (1984, 295) for a description of an unpublished analysis very close in spirit to the one developed here.

However, this systematic ambiguity does not help us with the perspective paradox, since possessives can have a possessor-dominant or a symmetric reading independently of whether they receive a lexical or an extrinsic interpretation. For instance, both the possessor-dominant and symmetric readings described above for (6a) assume an authorship relation holds for each student/paper pair (i.e., the possessor-dominant and the symmetric reading are both based on a uniformly lexical possession interpretation).

Logical Form

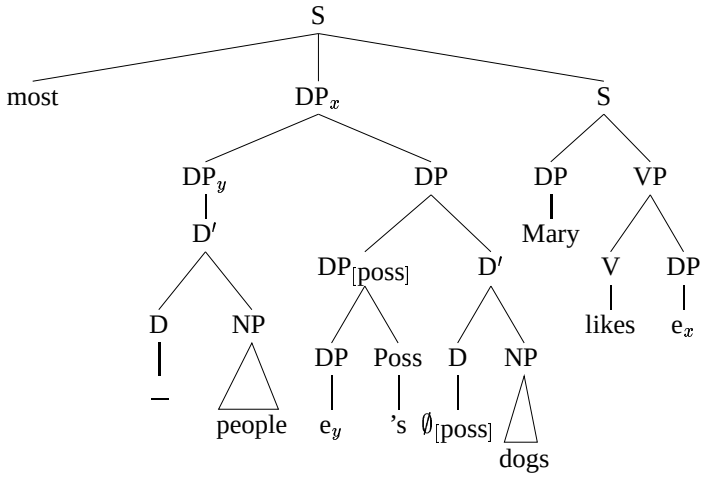
Perhaps possessives are ambiguous at the level of logical form. Then we could hope to explain the perspective paradox as a reflex of the indeterminacy in the logical scope relations due to Quantifier Raising at the level of logical form. However, I claim that there is at most one legitimate logical form for each instance of the possessive construction.

First I will give what I propose as the correct logical form, then I will explain why it is the only logical form possible.

(21) Mary likes most people's dogs.

Here *most* is a quantificational determiner embedded in a possessor phrase. Following May (1985), I assume that not only do quantificational determiner phrases raise to take scope over their minimal clause, quantificational possessors also raise to take scope over their host determiner phrase. These two raising operations applied to the surface structure for (21) give the logical form in (22).

(22)



The entire possessive raises up to adjoin to S, leaving behind a coindexed trace with index x, and the possessor phrase raises to adjoin to DP, leaving behind a trace with index y.

One final adjustment rule shown in (22) modeled on the system of Heim (1982) moves the quantificational determiner up to hang as a sister to its host determiner phrase. This will allow us to view the two sisters of the quantifier as its two logical arguments, traditionally called the restriction and the nuclear scope. In (22), for instance, the determiner phrase with index x characterizes the restriction, and the clause that that determiner phrase is adjoined to characterizes the nuclear scope, as schematized in (23).

(23) $[\![\textit{most}]\!]$ $([\textbf{people}(y) \wedge \pi(y,x) \wedge \textbf{dogs}(x)],$ $[\textbf{likes}(\textbf{m},x)]$
QUANTIFIER (RESTRICTION, NUCLEAR SCOPE).

This is the logical formula generated by my fragment from the logical form in (22). Here π is an indexical variable standing for the extrinsic possession relation that holds between people and their dogs.

I give two main arguments in favor of a logical form like that in (22) in which a quantifier embedded in a possessive raises up to take logical scope over its host determiner phrase.

The first argument involves donkey anaphora. Donkey anaphora refers to a situation in which an indefinite in a quantificational environment seems to bind a pronoun without commanding it.[4]

(24) a. Every [woman who owns a donkey] [beats it].
b. Every [woman's husband] [believes that she loves him].

On the most natural reading of (24a), for instance, there is donkey anaphora between the indefinite *a donkey* and the pronoun *it*: for every choice of a woman, there is a different donkey that she beats. Heim (1982) proposes that donkey anaphora will be possible only if the indefinite occurs in the restriction of a quantificational operator and the pronoun occurs in its nuclear scope. This is the case in (24a), since the phrase *a donkey* is in the restriction of *every*, and the pronoun is in its nuclear scope, as suggested by the bracketing.

In the possessive example in (24b) we have donkey anaphora relating the possessee nominal *husband* with the pronoun *him*. That is, for every choice of a woman, there is a different husband who has a belief about that woman's

[4] Here and throughout this dissertation a node x commands a node y just in case the mother of x dominates y, except that if x is the root node (and therefore has no mother), then x commands all the nodes in the tree. Note that this definition differs from the original definition of command given in Langacker (1969). The version given here is intended as identical to IDC-command as defined in Barker and Pullum (1990).

attitude towards him. Therefore we can conclude that the possessee nominal *husband* must be part of the restriction of *every*. This is exactly what we predict on our assumption that quantificational possessor phrases raise in logical form to take scope over their host possessee determiner phrase.

The second argument in favor of the logical form in (22) comes from the distribution of negative polarity items. Ladusaw (1979) shows that the quantifier denoted by *every* licenses a negative polarity item only in its restriction, and not in its nuclear scope. In (25a), for example, the negative polarity item *any* occurs in the restriction of *every* and is acceptable.

(25) a. Every [woman with any sense] [owns a donkey].
b. *Every [woman] [owns a donkey with any sense].

But in (25b), *any* occurs in the nuclear scope, and the result is ungrammatical.

(26) a. Every [woman's son with any sense] [owns a donkey].
b. *Every [woman's son] [owns a donkey with any sense].

The parallel contrast for the possessive examples in (26) shows that the restriction of *every* in (26) must include the entire possessive determiner phrase.

Thus donkey anaphora and the licensing of negative polarity items support (22) as a logical form for possessives.

Evaluating quantificational possessives

Once we have settled on a logical form for our quantificational possessives, we are ready to investigate their truth conditions. One very important fact that we will need to account for is what I call the domain narrowing problem for quantificational possessives, or 'narrowing' for short.

(27) The domain narrowing problem for possessives:

For a quantificational possessive expressing the possession relation R, only those entities in the domain of R are relevant for determining the satisfaction of that quantification.

To see what (27) is trying to say, imagine for a moment that we live in a solar system very much like our own in which exactly three out of nine planets have rings. Now consider whether (28) is true of this solar system.

(28) Most planets' rings are made of ice.

Most of my English consultants agree that (28) is true, so long as at least two out of three of the planets that have rings have rings made of ice. In particular, there is no infelicity involved in using (28) to describe a solar system in which only some of the planets have rings.

In effect, the quantification in (28) ranges only over planets that have rings, and planets that fail to have rings neither count for or against the truth

of the generalization; instead, planets that fail to have rings are simply ignored. That is, the set of planets that are relevant in the evaluation of (28) automatically narrows to include only those planets that have rings.

In view of the narrowing problem, I have decided to pursue an unselective binding approach as proposed by Lewis (1975) and developed in Heim (1982). On the unselective approach, quantifiers simultaneously bind all of the variables in their logical scope that need binding.

(29)

	planet	rings	made of ice
a.	Saturn	r_1	yes
b.	Neptune	r_2	yes
c.	Uranus	r_3	no
d.	Mercury	——	——
e.	Venus	——	——
f.	Earth	——	——
g.	Mars	——	——
h.	Jupiter	——	——
i.	Pluto	——	——

On the unselective binding approach, the quantifier denoted by *most* binds the variables corresponding to the possessor and the possessee simultaneously (call them the planet variable and the rings variable, respectively). The evaluation of an unselective quantifier, then, will depend on examining assignment functions, where each line in the chart in (29) corresponds to an assignment function. However, the only assignment functions that will be relevant are those that satisfy the restriction. That is, in order to be relevant for the quantification, an assignment function must assign the planet variable to a planet, the ring variable to a set of rings, and the planet in question must stand in the relevant possession relation to the set of rings. This means that only the first three assignment functions suggested by (29) will count as legitimate instances for the quantification. The rest are automatically ignored, since they fail to satisfy the restriction.

Thus the unselective binding approach automatically accounts for the narrowing effect.

The proportion problem

Notice that we have been assuming that for each planet there is a unique set of rings. Unselective binding runs into trouble in situations in which the correspondence between the values of multiple variables is not so well-behaved. Consider again the adverbial quantification given in (7), repeated here.

(30) Usually, if a dissertation student writes a longer paper,
it is worth reading.

In (30), the quantifier denoted by *usually* simultaneously binds the variables corresponding to the student description and the paper description. On the simplest view, we quantify over the set of all assignment functions that satisfy the restriction, as schematized in (31).

(31)

	student	paper	worth reading
a.	s_1	p_1	yes
b.	s_1	p_2	yes
c.	s_2	p_3	yes
d.	s_2	p_4	yes
e.	s_3	p_5	no
f.	s_3	p_6	no
g.	s_3	p_7	no
h.	s_3	p_8	no
i.	s_3	p_9	no

Then the quantification will be predicted true if and only if more than half of the instances charted in (31) are instances in which the paper in question is worth reading. Thus we predict that (30) will be false in this situation, since in 5 out of 9 instances the paper was not worth reading.

Now imagine that whether or not a paper is worth reading depends so strongly on the qualities of the student that we can effectively ignore influences due to the circumstances under which the paper was written. After all, in the scenario diagramed in (31), for any given student, either all or none of their papers were worth reading. On this assumption, we can gather all of the papers of a particular student together and consider them as an indivisible lump, as suggested by (32).

(32)

	student	paper	worth reading	
a.	s_1	p_1	yes	Case I
b.	s_1	p_2	yes	
c.	s_2	p_3	yes	Case II
d.	s_2	p_4	yes	
e.	s_3	p_5	no	Case III
f.	s_3	p_6	no	
g.	s_3	p_7	no	
h.	s_3	p_8	no	
i.	s_3	p_9	no	

Let us call each group of assignment functions a CASE. Each member of a case will be an INSTANCE of that case. Instead of giving each instance

equal status in the quantificational scorekeeping, on this scheme we count only cases.

Then we can keep score for the purposes of evaluating the quantification according to the rule in (33).

(33) A case satisfies the nuclear scope iff
some instance of that case satisfies the nuclear scope.

Thus in (32), case III, the case corresponding to student s_3, is the only one that does not count in favor of the quantification, since none of his papers were any good. Given the case structure in (32), then, we predict that (30) will be true.

Since we have arrived at a different truth value for the same set of facts, this shows how changing the partition of instances into cases can affect truth conditions.

The technique of grouping instances into equivalence classes resembles proposals in Root (1985) and Schwarzschild (1989).

In (32), the set of cases is determined solely by the value of the student variable; that is, there is exactly one case per student. This assumes that the student variable is relevant for distinguishing cases, but the paper variable is not. This contrasts with (31), where there are nine cases: one for each combination of a student and a paper. For this interpretation, both the student variable and the paper variable are relevant for distinguishing cases.

Given an instance of quantification and a situation, how do you decide whether a particular variable is relevant for distinguishing cases? One factor that is certainly relevant is the interpreter's assumptions about causality and genericity and non-accidental generalization. These sorts of assumptions are very difficult to model, however. One simple rule of thumb that am I fairly sure of is given in (34).

(34) The variable corresponding to the surface structure complement
of a quantificational determiner is always relevant
for distinguishing cases.

One consequence of (34) is that for a quantificational possessive, the possessor variable will always be relevant for distinguishing cases. Consider an attempt to express the same generalization stated in (30) by using a quantificational possessive.

(35) Most dissertation students' papers are worth reading.

This means that we predict there will be two interpretations for a quantificational possessive: one in which the possessee variable is taken to be relevant

for distinguishing cases (the symmetric reading), and one in which the possessee variable does not help distinguish cases (the possessor-dominant reading).

However, these two readings will always lead to identical truth conditions. To see this, notice that (35) cannot be used to describe the situation as depicted in (31) and (32). This is because for the adverbial example we could contemplate the relationship between a student and an individual paper on a paper by paper basis. But for the possessive example, allowing the same student to participate in more than one instance would violate the uniqueness presupposition of the possessive in (35). I propose a treatment of this presupposition based on the general proposal for handling uniqueness presuppositions in Kadmon (1987). In particular, in order for (35) to be felicitous, there must be a unique set of papers for each student.

(36)

	student	paper	worth reading
a.	s_1	$\{p_1, p_2\}$	yes
b.	s_2	$\{p_3, p_4\}$	yes
c.	s_3	$\{p_5, p_6, p_7, p_8, p_9\}$	no

Here each instance associates a student with the maximal set of papers that satisfy the descriptive content of the possessive, and the uniqueness presupposition is satisfied.

According to the theory of proportion sketched above, we are still free to split up the set of instances into cases in two ways. Either we can distinguish cases solely according to the identity of the student, or we can treat each distinct student/paper pair as a separate case. On either perspective, however, there will be exactly one instance per case.

Thus a solution to the perspective paradox for quantificational possessives falls out from a general theory of multivariable binding. On this view, the two perspectives on a possessive quantification correspond to two different choices for the set of variables that are relevant for distinguishing cases. The reason that these alternative methods for evaluating a quantificational possessive cannot be detected by examining intuitive truth conditions is because the uniqueness presupposition associated with the possessive construction neutralizes the potential for the possessor-dominant reading and the symmetric reading to give rise to distinct case sets.

Summary

To summarize, I present an account of the semantics of possessives in English which has the main features given in (37).

(37) a. Possessives have a single syntactic analysis (modulo noun-noun compounds) in which the possessor phrase functions as a specifier to a zero determiner.

b. The denotation of possessive descriptions crucially depends on the argument structure of the possessee nominal, giving rise to lexical and extrinsic interpretations.

c. Quantificational possessor phrases raise in logical form to take scope over their host determiner phrases.

d. Unselective binding accounts for the narrowing effect, as well as for the ability of possessives to give rise to donkey anaphora.

e. The possessee variable may or may not be relevant for distinguishing cases, corresponding to possessor-dominant and symmetric interpretations for quantificational possessives.

The picture that emerges is one on which possessives denote descriptions whose descriptive content depends primarily on the lexical properties of the possessee nominal. In quantificational contexts, both the possessor description and the possessee description participate in variable binding and bound anaphora, including donkey anaphora, and the perspective paradox falls out from a general theory of quantification.

1

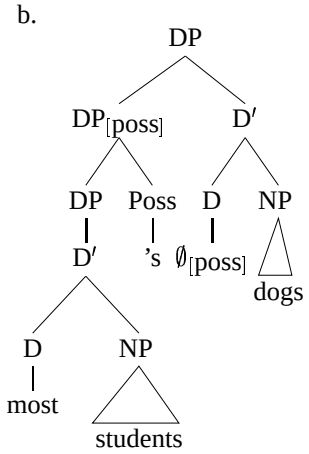
Syntax of possessives in English

0. Introduction

The main construction of interest in this dissertation is the prenominal possessive in English. The ultimate goal is to provide a compositional semantics for this construction. Obviously, this presupposes that we have a syntactic structure for such expressions. The goal of this chapter, then, is to argue for a surface structure for prenominal possessives. A representative example of the structure that I will argue for appears in (1).

(1) a. most students' dogs

b.



Here the possessive morpheme is a phrase-final clitic indicating a possessive construction, so that the possessor phrase serves as a specifier in the projection of a null determiner head. One crucial feature of this analysis for the purposes of the later chapters is that the overt determiner *most* forms a constituent with the possessor nominal to the exclusion of the possessed nominal, that is, the structure is predominantly left-branching.

1. Historical synopsis

The present-day possessive morpheme *'s* comes from the genitive case suffix *-es* originally used for a subclass of masculine nouns in Old English.

(2)

	Nominative	Accusative	Dative	Genitive	
Masculine	stān-∅	stān-∅	stān-e	stān-es	'stone'
Feminine	tal-u	tal-e	tal-e	tal-e	'tale'

The origin of the possessive marker as a case suffix is reflected in the widespread practice of calling modern possessor phrases 'genitives'. This terminology assumes that modern possessor phrases are vestigal examples of the genitive case in the same way that a handful of pronoun forms continue to justify a synchronic distinction between nominative and accusative (see, e.g., Quirk et al. 1972, 192).

I agree with Janda (1980), however, in assuming that the modern *'s* is not a case marker, but rather a phrase-final clitic indicating a grammatical relation in a particular syntactic construction. For instance, if *'s* were a true case marker, then it would presumably appear on the head of the phrase rather than at its rightmost margin (**the man's I saw hat* versus *the man I saw's hat*). In view of this position I have adopted the policy in this dissertation of never referring to a modern English possessive as a genitive.

As for the syntax of the Old English possessives, there were both prenominal and postnominal constructions in which the noun, the determiner, and any modifiers all appeared in the genitive case.[1]

(3) [þæs arwurþ-an wer-es] gebedrædden-e
the.GEN honorable-GEN man-GEN prayer-DAT
'to the honorable man's prayer'

(4) þære gebedrædden-e [þæs arwurþ-an wer-es]
the.DAT prayer-DAT the.GEN honorable-GEN man-GEN
'to the honorable man's prayer'

In these Old English examples the bracketed possessor phrase may appear before the possessee noun as in (3) or after it as in (4). In each case the determiner, the adjective, and each noun or name in the description of the possessor inflects to show genitive case.

There was also a split genitive (the terminology is due to Ekwall (1943)) in which part of the possessive appeared before the possessee noun, and part was extraposed to postnominal position.

[1] Except as noted, sources for the examples in this section can be found in Tabor (1991).

(5) [þæs cyning-es] sweoster [Ecgfrid-es]
the.GEN king-GEN sister.NOM Ecgfrid-GEN
'the sister of Ecgfrid the king'

(6) [Wihtred-es] sun-u [cing]
Wihtred-GEN son-NOM king
'King Wihtred's son'

(7) [þe king-es] broþer [of france]
the king-GEN brother of France
'the king of France's brother'

When English began to lose its case distinctions, some of the earliest examples of the general neutralization of case involved the postnominal portion of the split genitive. In (5), for instance, the postnominal portion shows the genitive suffix, but in (6) and (7), the postnominal portion appears in the neutral form with no case affix.

The neutralization later spread to include determiners in prenominal possessives.

(8) þe-s deofl-es bearn
the-GEN devil-GEN child
'the devil's child'

(9) þe hūs-es þürle
the house-GEN window
'the house's window'

These two examples from the Ancren Riwle (circa 1200) show a stage in the development of English in which the determiner of the possessor phrase begins to lose its genitive marking. Tabor (1991) points out that this is the point at which it first becomes plausible to analyze the genitive ending on the head nominal as a phrase clitic rather than as a case marking, clearing the way for an innovation described immediately below that will allow the possessive morpheme to show that it must be a phrase-final clitic.

The split genitive died out by the middle of the fourteenth century. As the split genitive declined, it began to be replaced by the so-called group genitive (see Jespersen 1909–49, vi:281). The use of 'group' here is metalinguistic, in that the group is a group of words. That is, the possessive phrase is syntactically complex and contains modifying phrases. Thus instead of a split genitive with the modifying material extraposed, as in (7) (a later example from the end of the thirteenth century), we have the modifying material adjacent to the possessee nominal, resulting in the first examples of the possessive morpheme attaching to the right margin of the possessive phrase and not to the possessee nominal.

(10) a. the god of slepes heyr
'the god of sleep's heir'

b. the grete god of loves name
'the great god of love's name'

c. God of loves servauntz
'the God of Love's servants'

The first noted examples are these three phrases from Chaucer. The fact that the possessor nominals do not have genitive marking on their head nouns (in each case, *god*) shows the change in status of the /-z/ morpheme from a genitive case marker to a phrase final clitic.

The development of the possessive morpheme as a phrase final clitic in English can be compared to the situation in modern German and modern Norwegian. German retains the genitive marking on the head nominal of the possessor determiner phrase (as well as on the other subconstituents), but Norwegian, like English, has the possessive morpheme as a phrase final clitic.

(11) German:

Das	Haus	[des	alt-en	Mann-es
the.NOM	house.NOM	the.GEN	old-GEN	man-GEN
mit	dem	Bart]		
with	the.DAT	beard.DAT		

'the old man with a beard's house'

(12) Norwegian:

den	[gamle	mann-en	med	skjegg-et-s]	hus
the	old	man-the	with	beard-the-POSS	house

'the old man with a beard's house'

These examples are from Fiva (1987). Note that in the Norwegian example, the possessive clitic appears outside the definite article clitic, contrary to expectation if the possessive morpheme were a case inflection. Each nominal gets its own article, so that (unlike English) possessive phrases co-occur with articles. Presumably the contrast between possessives in German on the one hand versus English and Norwegian on the other is related to the fact that German has retained a robust four-way distinction in case. So German is presumably what English (or Norwegian) possessive marking would be like if English (or Norwegian) had retained a case system in which the possessive involved a genuine case marker.[2]

[2] I return briefly to the status of the modern possessive morpheme as an edge inflection in section 1.3.

In the mid to late Middle English period, a variant of the prenominal possessive arose in which a possessive pronoun appears where the possessive clitic normally would.

(13)	a.	the Count his gallies	'the Count's gallies'
	b.	my sister her watch	'My sister's watch'
	c.	Mrs Sands his maid	'Mrs. Sands' maid'
	d.	Mars his heart	'Mars' heart'
	e.	Hercules his Pillars	'Hercules' pillars'
	f.	the daulphin of France his power	'the prince of France's power'

These examples are selections from Barber (1976, 200–1), Janda (1980, 248), and Pei (1967, 81). The construction goes back to the thirteenth century at least, and persisted until the beginning of the eighteenth century. Sometimes the feminine pronoun appeared when the possessor would normally control feminine agreement, as in (13b), although an invariant masculine form was also common, as shown by (13c); less frequently, examples with the third person plural *their* show up.

The use of the pronoun rather than *'s* occurred more often after words ending in a sibilant (Pyles and Algeo 1982, 187). A word ending in a sibilant would require the [-Iz] allomorph of the possessive morpheme, which leads to a potential for confusion between the pronunciation of the possessive pronoun *his* (from which the [h] often dropped during this period) and the possessive morpheme in these cases. Indeed, based on this correlation Janda (1980) and Pyles and Algeo (1982) argue that the *his* construction represents a reanalysis of the genitive suffix as a pronoun. This hypothesis has the nice property of explaining the preservation of the genitive suffix as a phrase clitic when all other inflectional case suffixes perished when English lost its case distinctions. Whatever the part the *his* construction played in the development of English, it never supplanted the *-es* possessive, since possessives in *-es* continued throughout the period of the *his* possessive.

There is a construction in modern Norwegian as well as modern colloquial German that is strikingly similar to the Middle English *his* possessive. I will illustrate this construction with examples from Norwegian.

(14) a. Per-s bil
Peter-POSS car

b. bil-en til Per
car-the to Peter

c. Per sin bil
Peter 3s.REFL car

d. bil-en has Per
car-the his Peter

These examples from Fiva (1987, 2) all translate as *Peter's car*. In parallel with English, (14a) corresponds to the prenominal possessive in *'s* (cf., *Peter's car*), and (14b) is a related postnominal construction (cf., *the car of Peter*). In (14c) there is a reflexive pronoun *sin*, very much like the middle English *his* possessive, except that in Norwegian (and colloquial German) the pronoun always agrees with the possessor nominal in person and number. In (14d), the possessive phrase appears postnominally and the linking pronoun is not reflexive. Note that the clitic possessive in (14a) on the one hand and the pronoun construction (14c) and (14d) on the other hand are both fully productive and are completely distinct from each other syntactically and morphologically. I do not know the history of the Norwegian construction, nor what sort of influence there might have been across languages through contact in the first centuries of the millennium; but it seems reasonable that a more detailed comparison with the Norwegian and the German data can potentially shed light on the correct analysis for the Middle English construction.

Thus the historical development of the possessive construction is consistent with the following conclusion concerning the synchronic description of English: the possessive morpheme *'s* is a phrase-final clitic that attaches to right margin of the possessor phrase.

2. What counts as a possessive?

The remainder of this chapter investigates the distribution and the syntactic structure of possessives in (modern) English.

(15) a. John's truck
b. the woman's grandmother
c. every young man's dream
d. most people's favorite color
e. some professors' students' longest papers

The determiner phrases in (15) give examples of what I consider to be syntactic possessive constructions. In each case there is a full determiner phrase in the position normally occupied by a determiner: *John's*, *the woman's*, and

so on. I will call determiner phrases in this specifier position 'possessor' phrases, since they describe the entity that bears the possessor role in the interpretation of the larger phrase. The possessor phrase is always marked by the possessive clitic *'s*, which occurs as the rightmost element in the possessor phrase. What I call a possessor phrase is often called a possessive or a genitive in the standard terminology, but I will reserve the term 'possessive' for referring to the larger expression corresponding to the entire host determiner phrase. Thus in (15a), *John's* is a possessor phrase, *truck* is a possessee phrase, and *John's truck* is a possessive.

For the purposes of this dissertation, I will consider the construction illustrated in (15) as the only genuine syntactic possessive. There are at least two other candidate constructions which could potentially be classed with the expressions in (15) which I would like to mention here in order to set them aside.

First, in addition to the syntactic construction illustrated in (15), the possessive morpheme can also participate in the formation of lexical noun-noun compounds. For instance, there is an idiomatic reading of *men's room* on which it describes a bathroom. Thus *I went to the men's room* is ambiguous between a genuine possessive construction ('I visited the room possessed by some contextually salient group of men') and a lexical compound ('I went to the bathroom'). Although section 1.4 discusses such lexical compounds in more detail, the remainder of this dissertation will concentrate on the syntactic possessive.

The second class of expressions that I would like to exclude from consideration as possessives involve prepositional phrases in *of*.

(16) a. a child of John
b. a child of John's

Such phrases are often, though not always, considered to be types of possessive. For instance, Quirk et al. (1972, 194) call (16a) a periphrastic genitive, which they also call an *of*-genitive. Jespersen (1909–49, vii:310–1; iii:15–23), on the other hand, carefully distinguishes both of the constructions in (16) from the possessive constructions given in (15). I will adopt Jespersen's position, namely, that it is better to reserve the term 'possessive' for the construction in (15), without failing to recognize that there are parallels between the expressions in (15) and those in (16).

The temptation to view *a child of John* as a possessive comes from the strong intuition that it carries the same descriptive content as (one reading of) *John's child* (modulo uniqueness entailments). In classical transformational grammar, this led to various analyses on which possessives and *of*-phrases were related via transformation; see, e.g., the discussion of Smith (1964) and Jackendoff (1977) in section 1.3.

I view the prepositional phrase *of John* as a nominal argument exactly on a par with the prepositional phrases in *the destruction of the city* or *the top of the table*. Chapter 2 will explain in detail how these non-possessive descriptions can mean the same thing as their possessive counterparts.

Note that although the larger phrase in (16b) is not itself a possessive construction, it does contain a possessive as the object of the preposition *of*. That is, I view *John's* in (16b) as a full possessive phrase containing an instance of zero nominal anaphora, exactly as in the sentence *Let's you watch Mary's children, and I'll watch John's*.[3]

The distribution of possessives with zero anaphora is rather mysterious in postnominal prepositional phrases.

(17) a. I saw a child of John's.
b. ?I saw a child of that man's.
c. *I saw a child of every man's.

Why is zero anaphora possible in (17a) but not in (17b) or (17c)? Unfortunately, this dissertation will have nothing further to say about the principles that govern the availability of zero nominal anaphora.[4]

Thus the topic of this dissertation is very narrowly defined indeed from a syntactic point of view. Nevertheless, I hope to show that that the semantic structure underlying the interpretation of possessives is sufficiently rich to justify an extended investigation.

3. The DP hypothesis

In the past thirty years, the field has moved from unanimous agreement that possessives are all derived from other constructions via transformation, to unanimous agreement that they are all base-generated. At least from Lees (1959) until Chomsky (1970), the default assumption was that every instance

[3] One of the difficulties with this approach is that the zero nominal cannot be taken as anaphoric for the *child* nominal, since (16b) does not mean the same thing as *a child of John's child*, which refers to John's grandchild. McCawley (1988, 389), describing work of Narita, is doubtful that (16b) can be successfully analyzed as an example of zero anaphora. Also, see Nerbonne et al. (1989) for a treatment of the semantics of zero nominal anaphora.

[4] Quirk et al. (1972, 203) also distinguish a kind of possessive with a zero possessee phrase that they call a 'local genitive'. For example, the possessive in *I met him at John's* is conventionally interpreted as referring to John's home. I discuss such examples briefly in section 2.4 in the context of exploring the role of conventional expectation in resolving the reference of vague possessives in general.

of the possessive morpheme was inserted by a transformation. We shall see that on the current assumptions, represented here by the DP hypothesis as defended by Abney (1987), all possessives are base-generated.

Smith (1964) gives a particularly detailed transformational account on which *John's hat* is derived by means of at least five discrete transformational steps, beginning with a declarative sentence predicating possession.

(18)	a.	John has a hat.	Base-generated
	b.	The hat is John's.	Genitive transformation on (a)
	c.	a hat which is John's	Relative clause formation
	d.	*a hat John's	Delete "WH is" ('Whiz' deletion)
	e.	a hat of John's	Insert *of*
	f.	John's hat	Reorder, deleting *of*

The complexity of the derivation of *John's hat* was in part justified by the fact that many of the intermediate steps are grammatical stopping points in their own right (viz., (b), (c), and (e)).

The appeal of the transformational accounts is the way that they are able to forge explicit connections between classes of expressions that seem to mean the same thing, for example, *John's hat* and *a hat which is John's*. By the end of the 1960s, however, it became clear that not all possessive could be derived by transformation. In particular, Chomsky's (1970) 'Remarks on Nominalization' ('Remarks') proved to be a crucial turning point in the development of the standard syntactic analysis of possessives. Remarks established a system of limited derivation of possessives: some possessives are derived by transformation, and some are base-generated. In particular, Chomsky distinguishes gerunds, which are produced by transformation from the corresponding verbal construction, from derived nominals, which are base-generated with nominal heads.[5]

One important contribution of Remarks to the study of the semantics of possession was the way it focused attention on the lexical semantic argument structure of derived nominals.

(19)	a.	John's eagerness to please
	b.	*John's easiness to please

For Chomsky, the ungrammaticality of (19b) was due to differences in the lexical properties of the derived nominals *eagerness* and *easiness*. To generalize from this example, it is the lexical properties of the head of the possessee

[5] These so-called derived nominals are "derived" only in the morphological sense by various processes forming nouns from verbs (e.g., *destruction* from *destroy*, *gift* from *give*, *laughter* from *laugh*).

phrase that controls the interpretation of the larger possessive. We shall see in chapter 2 that this insight is crucial in describing the semantics of possessive descriptions.

Jackendoff (1977) further develops some of the arguments in Remarks, as well as adding some new arguments, in support of the idea that at least some prenominal possessives are base-generated.

(20) a. the leg that John has
b. John's leg

For instance, based on this contrast mentioned in Remarks, Jackendoff argues against a transformational account on which prenominal possessives are derived from relative clauses expressing possession. For Jackendoff, (20a) cannot be the only transformational source for (20b), since (20b) has a reading that (20a) does not. That is, (20b) has an interpretation on which the leg in question is part of John's body, the so-called inalienable reading. But this reading is unavailable for (20a). Since transformations preserve meaning, the output of a transformation cannot have any interpretation that its source does not. Therefore if (20b) has a reading that (20a) does not, then (20a) cannot be the sole source for (20b).

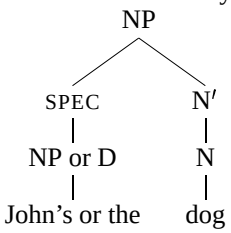
The theoretical progression so far has moved from generating all possessives via transformation (Smith (1964)) to generating some possessives in the base (Remarks), to generating an even larger proportion of possessives in the base (Jackendoff (1977)). At the same time, Schachter (1976) questions whether gerunds, too, cannot be base-generated. The next logical step is taken by Rappaport (1983), in which all possessives are base-generated. For Rappaport, correspondences between thematic role structures in, e.g., active and passive nominals are expressed through 'linking' rules associating functional (semantic) argument structure with overt syntactic arguments. Possessives are at least potentially still subject to various syntactic processes, including movement, merely by virtue of that fact that possessor phrases are determiner phrases (see, e.g., Stowell (1983; 1989)); however, the modern assumption is that all possessives are base-generated, and therefore not created through movement.[6]

[6] Certainly there is little support for a derivational analysis from first language acquisition. Braine (1976, 76) points out that possessives such as *Mommy book* 'Mommy's book' occur at a stage at which there is no sign of a verbal category corresponding to a verb phrase. Brown (1973, 196–7; 312) also points out that not only do the putative clausal sources for prenominal possessives (he mentions sentences in *have*) occur later than possessives, any potential relative clause input to a preposing transformation occur even later. All of the acquisition evidence points to the conclusion that possessives are

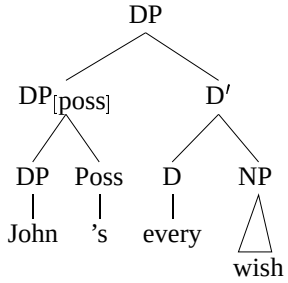
Given that possessives are base-generated, the crucial question now becomes: are possessor phrases specifiers to a lexical category or to a functional category? A lexical category is an open class containing content words, e.g., verbs, nouns, adjectives. A functional category contains only function words, words with fully grammaticized meanings, e.g., complementizers, inflection, and perhaps negation. Put another way, the question becomes: is the head of the nominal *most women* the noun or the determiner? In particular, if possessor phrases are specifiers, are they specifiers in the projection of a noun (yielding a noun phrase) or of a determiner (yielding a determiner phrase)?

Abney, in his (1987) dissertation, defends an idea proposed by Brame and many others (see the citations in Abney (1987, 77)) that what have traditionally been called noun phrases are actually determiner phrases. Obviously this has important consequences for the syntactic status of possessor phrases. On Jackendoff's analysis, for example, possessors are specifiers in the noun projection. On the DP hypothesis, they are specifiers in the determiner projection. On the old view, prenominal possessives are full phrasal categories that share their syntactic position with lexical determiners. On the DP hypothesis, prenominal possessives are still phrasal specifiers, but determiners are heads, not specifiers.

(21) Traditional NP analysis:



(22) The DP hypothesis:



The puzzle on the traditional view is why such different things as possessors and determiners should share a phrase structure position, suggesting in effect

as basic a construction as, say, subject and predicate or nominal and modifier.

that they are a disjunctive natural class. This puzzle is solved on the DP hypothesis: they do not share a position at all, as shown in (22). On the DP hypothesis, then, the entire possessive is analyzed as a projection of a determiner head, and the possessee phrase is a full noun phrase. That is, in the determiner phrase *most women*, *woman* is a full noun phrase serving as the complement to the head determiner *most*.

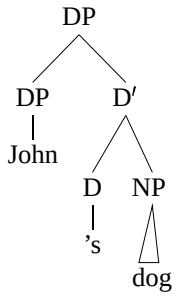
I will use the term 'nominal' as a neutral way to refer to either noun phrases or determiner phrases at any level of projection.

Syntactic status of the possessive morpheme 's

The example in (22) shows a possessor phrase co-occurring with the determiner *every*. The phrase *John's every wish* is useful for illustrating the basic idea of the DP hypothesis, but it would be very misleading to suggest that in general possessor phrases can co-occur with the full range of determiners in English (compare, for instance, **John's some wishes*, **John's a wish*, and so on). For all practical purposes, we can ignore *John's every wish* as a frozen form, and simply assume that a possessor phrase is incompatible in English with the presence of an overt determiner.

One way to resolve this problem would be to decide that the possessive morpheme itself is a lexical determiner that just happens to be morphologically realized as a phrase-final clitic (e.g., see Abney (1987, 44)).

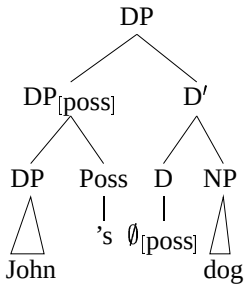
(23)



The fact that the possessive morpheme occupies the determiner position would explain why possessor phrases are in complementary distribution with (other) determiners.

Although I do not know any truly compelling argument against the structure in (23), I will adopt an analysis on which the possessive morpheme is just a syntactic marker, and the head of the possessive determiner phrase is a special zero determiner $\emptyset_{[\text{poss}]}$.

(24)



Given the DP hypothesis, this is the analysis forced by the morpho-syntactic analysis of the possessive morpheme advocated by Nevis as developed by Zwicky, Miller, and others.

Zwicky (1977) argues mainly on morphological grounds that *'s* is an inflectional marker, like the nominal plural marker. However, since the possessive is introduced by the syntax at the phrasal level rather than at the lexical level like other cases of inflection, it is realized on the right edge of a constituent rather than on the head of that constituent. For instance, Zwicky's assumptions about inflection would predict that only one occurrence of the possessive suffix is possible for any given stem, correctly predicting the absence of a double possessive on *the guy I met at John's name*, where *John's* is interpreted as 'John's place' (cf. **the guy I met at John's's name*). Miller (1991) develops and refines this approach so that it correctly predicts forms such as *mine's* and *their's*, as in *a friend of mine's brother*.

Although the status of the possessive morpheme is an interesting one, it is not crucial to the semantic analysis developed in the remainder of this dissertation. As long as possessives are treated as determiner phrases with a determiner head, the semantic analysis proposed here will go through with only minor modification, whether the determiner is taken to be a special zero form (i.e., $\emptyset_{[poss]}$) or the possessive morpheme *'s*.

In any case, I will assume that the possessive morpheme is a syntactic marker and not a functional head, so that simple possessives have the syntactic structure roughly as given in (24) (see section 1.5 for more details).

At this point it is important to ask whether this complementary distribution between possessor phrases and determiners is a special fact about English, or whether it is more universal than that. Abney points out that possessives and determiners do co-occur in other languages, in particular, Hungarian.

In Hungarian, the possessor either appears in the nominative case and follows the determiner, or it appears in the dative case and appears in a variety of positions, typically immediately before the determiner.

(25) a. Peter minden kalapja
Peter every hat
'every one of Peter's hats'

b. Peter ezen kalapja
Peter this hat
'this one of Peter's hats'

c. Peter melyik Kalapja
Peter which hat
'which one of Peter's hats'

(26) a. *Peter's every hat
b. *Peter's this hat
c. *Peter's which hat

The examples in (25) illustrate how a variety of determiners and even question words can co-occur with a possessive in Hungarian. As the attempts to form the same expressions in English in (26) show, this is generally not possible in English. See Szabolcsi (1983) for further details.

If we must posit a syntactic structure for Hungarian in which possessor phrases and determiners can co-occur, then this lessens the awkwardness of proposing such a structure for English.

The main motivation internal to English for the DP hypothesis for Abney is that it explains the parallel between gerundive phrases and full sentences. Abney assumes that clauses are projections of INFL, where INFL is a lexical category that takes a verb phrase for its complement.

(27) a. John was singing
DP INFL VP

b. John's $\emptyset_{[poss]}$ singing
DP D VP

c. the singing
DP D VP

I have included (27c) for comparison in which a determiner appears as a (non-zero) lexical instantiation of the 'D' category.[7]

Abney develops the parallel between verbal structure and nominal structure with examples from other languages, languages in which possessives show agreement in imitation of the verbal paradigm. For instance, in Yup'ik, a Central Alaskan Eskimo language, there is agreement between possessor

[7] If the possessive morpheme is analyzed as a determiner, the parallel between (27a) and (27b) will be even closer, since the possessive morpheme will line up with the auxiliary *was*.

and possessee that is exactly parallel to verbal agreement, even including suppletions in the agreement paradigm.

To summarize this section, I assume that the DP hypothesis is correct. In particular, possessor phrases are specifiers in the projection of a zero determiner. In chapter 2 we shall see that the DP hypothesis provides a syntactic structure that is more congenial to my analysis of the descriptive content of possessives than the traditional analysis. The advantage has to do with the presence of the possessive determiner (whether this determiner is assumed to be a zero form, as I assume here, or whether the possessive morpheme is assumed to fill this grammatical role). When faced with the task of developing a compositional semantics for possessives on the traditional NP analysis, the temptation is to concentrate on the possessor phrase and ignore the possessee phrase. One alternative, for instance, would be to give the possessive morpheme *'s* a meaning that maps generalized quantifiers into functions from properties to generalized quantifiers.

On the DP hypothesis, however, there is a crucial difference: since the determiner forms a constituent with the possessee phrase, this allows us to concentrate on the semantics of the possessee phrase rather than on the possessor phrase. Thus adopting the DP hypothesis emphasizes the importance of the role of the possessee phrase in determining the descriptive content of the possessive.[8]

4. Against syntactic ambiguity

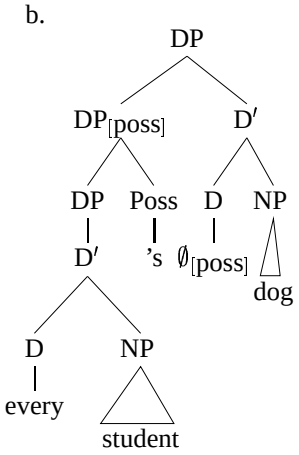
Even assuming the DP hypothesis is correct, there are a variety of more or less reasonable structures for prenominal possessives which are still consistent with most theories of phrase structure.

It is even possible to question the placement of major constituent boundaries. Given the determiner phrase *every student's dog*, is *every student's* a specifier for *dog*, or does the determiner *every* take a complex complement corresponding to *student's dog*?

[8] One additional consequence of assuming the DP hypothesis is that possessor phrases can no longer be thought of as a special kind of determiner. This assumption is crucial to the analyses of determiner properties in Keenan and Moss (1984) and Keenan and Stavi (1986). In particular, the effability result reported in both papers does not go through without the assumption that possessor phrases are determiners.

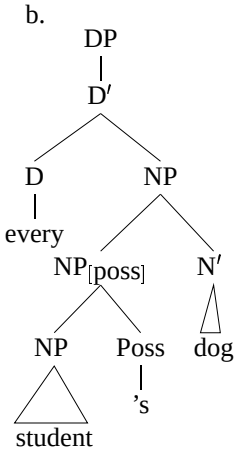
(28) a. [every student]'s dog

b.



(29) a. every [student's dog]

b.



In (28b), the possessor phrase serves as the specifier in the determiner projection. In (29b), the nominal describing the possessor serves as the specifier in a noun projection. Thus I will call these structures examples of the spec-of-DP analysis and the spec-of-NP analysis, respectively.

One immediate problem with the spec-of-NP analysis is that it does not lead to an obvious analysis for possessives like *every student's four favorite dogs*. The problem is that if *four* is an NP specifier, then the nominal *dogs* in this example has two specifiers, namely, *student's* and *four*. On the spec-of-DP analysis, by way of comparison, *every students'* is a determiner phrase in specifier of DP position, and *four* is free to be the sole specifier in the noun

phrase *four dogs*. This is a purely theory-internal problem, of course, so it is not particularly compelling taken by itself.

I am aware of two closely related empirical arguments in favor of the spec-of-DP structure over the spec-of-NP one, and no arguments in the other direction. The first argument involves determiners which subcategorize for complements with a particular number.

(30) a. every man
b. *every men

(31) a. each man
b. *each men

(32) a. *most man
b. most men

(33) a. *all man
b. all men

The determiners *every* and *each* require singular complements, and *most* and *all* require plural complements (restricting attention for now to cases in which the complement of *most* or *all* is a count noun).

(34) a. every man's horse
b. every man's horses
c. *every men's horse
d. *every men's horses

(35) a. each man's horse
b. each man's horses
c. *each men's horse
d. *each men's horses

(36) a. *most man's horse
b. *most man's horses
c. ?most men's horse (cf. *most people's opinion*)
d. most men's horses

(37) a. *all man's horse
b. *all man's horses
c. *all men's horse
d. all men's horses

The grammaticality of the possessives in (34) through (37) varies strongly according to the number of the first nominal, but the number marked on the second nominal is irrelevant. The one solid counterexample to this generalization is the fact that (37c) is ungrammatical (once again ignoring the mass

reading). Apparently in some situations, it is unacceptable to follow a plural possessor with a singular possessee, although I have no idea why (but see examples (44c) and (45c) below, as well as the discussion in section 4.1).

The larger pattern falls out immediately on the spec-of-DP analysis. On the spec-of-DP analysis, the determiner simply governs the number marking on its surface structure complement. But on the spec-of-NP analysis, this pattern of grammaticality is much more difficult to explain, since the determiner and the crucial nominal are not siblings.

The second argument that syntactic possessives have only a spec-of-DP analysis is exactly like the first argument, except that it involves the mass versus count distinction instead of number.

(38) a. every woman
b. *every furniture

(39) a. each woman
b. *each furniture

(40) a. *much woman
b. much furniture

(41) a. *little woman (ungrammatical on the intended reading)
b. little furniture

The determiners *every* and *each* require a count complement, but *much* and *little* require a mass complement.

(42) a. every woman's dog
b. every woman's furniture
c. *every furniture's legs
d. *every furniture's weight

(43) a. each woman's dog
b. each woman's furniture
c. *each furniture's legs
d. *each furniture's weight

(44) a. *much woman's dog
b. *much woman's furniture
c. ?much furniture's legs
d. much furniture's weight

(45) a. *little woman's dog
b. *little woman's furniture
c. ?little furniture's legs
d. little furniture's weight

Once again, a spec-of-DP analysis predicts the observed pattern, but a spec-of-NP constituent structure leads to problems.

And once again, we have the parallel exceptions of (44c) and (45c)). Just as for going from plural to singular, it is difficult to go from mass to count in a chain of nominals in a possessive DP. But again there are examples that are grammatical, such as *some furniture's legs*.

Even taking this semi-systematic set of counterexamples into consideration, the agreement patterns for the number and mass/count distinctions provide compelling evidence in favor of a spec-of-DP structure.[9]

Lexical compounds in the possessive morpheme

I believe that the fully productive syntactic use of the possessive morpheme always involves the spec-of-DP structure. However, some noun-noun compounds require a different constituent structure, one very similar to that provided by the spec-of-NP analysis.

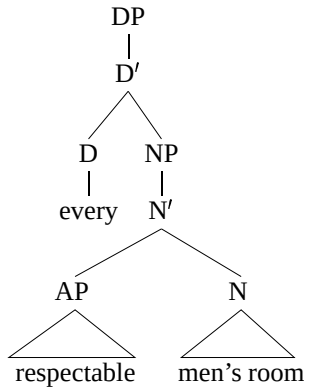
(46) Every respectable men's room is clean.

Note that *men* is plural in (46), even though it is the first nominal after *every*. Furthermore, verb agreement matches the number of the noun *rooms*, the second nominal, not that of *men*. Clearly *men's room* is a constituent, contrary to the expectations of our spec-of-DP hypothesis.

However, I claim that this situation arises because *men's room* is a noun-noun compound.

[9] As additional support that the spec-of-DP structure is correct, consider the words *someone*, *anyone*, *no one*, *somebody*, *anybody*, and *nobody*. On the spec-of-DP analysis, these words are simply lexical determiner phrases like proper names or pronouns. On the spec-of-NP analysis, however, these words could only be determiners, or perhaps nouns. If they were determiners, then *everybody's dog* would require a null NP to serve as the specifier to the head nominal required by the presence of the possessive morpheme: *everybody* [∅*'s dog*]. If, on the other hand, they were nouns, then *everybody's dog* would require a zero determiner with the quantificational force of *every*: [∅ [*everybody's dog*]]. I take it that neither one of these alternatives is particularly attractive, and that the spec-of-DP analysis provides the more elegant account for these words.

(47)



Clearly the N node dominating *men's room* has internal structure at the subword level, but I will assume that the structure of compounds is invisible at the level of syntactic structure (and logical form as well).

To see that *men* and *room* are conjoined at the lexical level and not at the phrasal level, notice that *respectable* can only be taken to modify the nominal *men's room* as a whole, as diagramed in (47). If *men* and *room* were full-fledged phrases, we would expect an adjective to be able to be construed either as modifying the first nominal alone or the combined nominal. By the same token, we would expect to be able to insert an adjective in front of the second nominal, but this is also impossible.

(48) *Every men's favorite room is clean.

The ungrammaticality of (48) would follow from the assumption that *men's room* is a noun-noun compound formed in the lexicon. This would mean that its subparts are not available for syntactic combination with adjectival modifiers as attempted in (48). Thus for noun-noun compounds built from the possessive morpheme, adjectival modification can only modify the entire nominal, as in *designer children's furniture*.

This situation should be compared a genuine syntactic possessive.

(49) Every respectable man's favorite room is clean.

If we have *man* in the singular, in agreement with the requirements of *every*, the spec-of-DP structure is possible: *respectable* can take scope over just *man*, and the second nominal can take a modifying adjective. Nor can (49) be ambiguous between a spec-of-DP structure and a compound structure, since for (49), in contrast to (46), *respectable* cannot be construed as modifying *man's favorite room*. Even more strikingly, when we force a non-compound analysis by inserting adjectives, the idiosyncratic meaning available for *men's room* specifically as a description of a bathroom disappears.

It is clear, then, that a determiner phrase such as *the men's room* is ambiguous between a left-branching spec-of-DP structure and a right-branching noun-noun compound structure. The idiomatic reading cleaves to the noun-noun compound structure. For me, the only fully acceptable noun-noun compounds in the possessive are idioms, but some people allow more or less productive use of the construction. If there is ever any difficulty in determining which construction is involved in a particular example, and there is no idiomatic reading involved, adjectives can be inserted to remove any doubt that the structure is a spec-of-DP structure.

This section has argued against a spec-of-NP analysis in favor of a spec-of-DP analysis throughout the syntax of English, excepting only lexical compounds. Nevertheless, the impression that possessives have a possessee-dominant interpretation analogous to the spec-of-NP structure is pervasive and persistent. Throughout this dissertation I will argue against any structural ambiguity, either in the syntax, or in the logical form. Instead, I will argue in chapter 4 that the intuition that there are different interpretations available for possessives comes from a general account of the interpretation of quantificational expressions.

5. Fragment

This section gives the first of four parts of a formal grammar describing a fragment of English involving possessives. This section simply gives a phrase structure grammar as motivated in the previous two sections. I do not provide any account of the derivational syntax of English (e.g., unbounded dependencies), and I have ignored number agreement. In other words, this limited phrase structure contains only what will be most important for providing a formal account of the examples in the remainder of the dissertation.

(50)	a.	S	→	DP	VP
	b.	VP	→	V	DP
(51)	a.	DP	→	$DP_{[poss]}$	D′
	b.	$DP_{[poss]}$	→	DP	Poss
	c.	D′	→	D	NP
	d.	DP	→	D′	
(52)	a.	NP	→	N′	
	b.	N′	→	N	
	c.	N′	→	N	PP
	d.	PP	→	P	DP

These rules have been divided up into verbal phrase rules (50), determiner phrase rules (51), and noun phrase rules (52), plus one rule for prepositional

phrases in (52d). In principle, I support a theory of phrase structure on which every syntactic formative potentially projects to three bar levels, although the rules given here reflect this assumption only for nouns and determiners. For instance, strictly speaking, the verbal rules ought to include at least an INFL projection; but since this dissertation concentrates mainly on nominal structure, I have omitted the details of the internal structure of verbal projections in an attempt to keep the tree structures as simple as possible.

The phrase structure rules here should be interpreted as describing a set of trees in the normal fashion. The category labels here are atomic, although a more elaborate syntactic theory would surely need to treat them as complex objects, perhaps along the lines suggested in Gazdar et al. (1988). The fact that category labels are atomic is responsible for the clumsy method for expanding the determiner specifier into a determiner phrase followed by the possessive morpheme as shown in (51a) and (51b). There is nothing crucial in this dissertation that depends on having an extra branching node labeled $DP_{[poss]}$ that dominates only a DP and the possessive morpheme. Certainly I do not mean to suggest that the possessive morpheme is a member of any lexical or functional category that would project its own phrasal X-bar structure. It would be better, perhaps, to have complex category labels, so that the syntactic requirement for a possessive morpheme could be expressed as a feature specification that could be transmitted along the right edge of the specifier determiner phrase by means of some feature passing convention. Miller (1991) develops a particular theory giving explicit conventions accomplishing this task, giving special attention to the possessive morpheme in English.

Some representative examples of lexical expressions and their categories appear in (53).

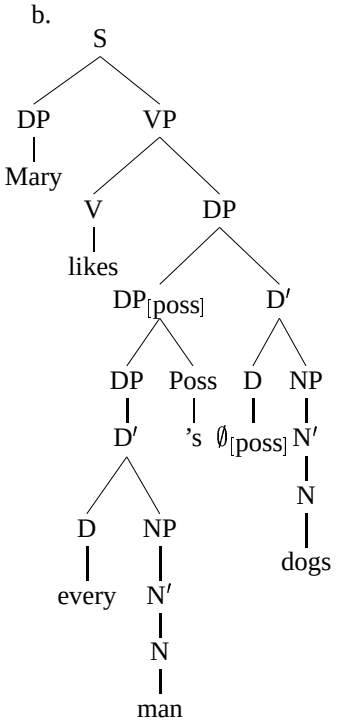
(53)	a.	VP	bite, bark, bray
	b.	DP	John, Mary, you, he, them, everybody, someone
	c.	$DP_{[poss]}$	mine, yours, its
	d.	D	$\emptyset_{[poss]}$, a, the, every, some, most, no, both
	e.	Poss	's
	f.	P	of, for, from, by

For convenience, I allow some lexical items to function as complete phrases. In particular, note that proper nouns such as *John* are lexical determiner phrases here. In a more detailed analysis, one more in keeping with the spirit of X-bar theory, such words would have to be lexical heads which subcategorize for no complements or specifiers.

As an example of the phrase structure analysis given here, the sentence in (54a) will receive a surface structure as given in (54b).

(54) a. Mary likes every man's dogs.

b.



See section 3.3 for the logical form and the logical translation provided by my analysis for an example similar to (54). Other examples of surface structures as described by the rules in this section appear in the chapters below.

2

Possession relations

0. Introduction

The use of a possessive entails that some relation holds between the possessor and the thing possessed. What is the nature of this relation? That is, what can we predict about the possession relations that can be expressed by a particular possessive based on the meanings of its parts? Building on an insight first developed in depth by Chomsky (1970), I will suggest that the descriptive content of a possessive depends primarily on the denotation of the possessee nominal.

(1) a. the man's child
    b. the child's man

For instance, the possession relation expressed by *the man's child* can be a kinship relation, but there is no reading of *the child's man* on which it entails a kinship relation. On the analysis here, the noun *child* is relational, that is, it can denote a two-place relation holding between children and their parents. When the possessee nominal denotes a relation, then the possessive will express that relation directly. Therefore (1a) can express a kinship relation. Since the possession relation comes from the lexical meaning of the possessee nominal, I call this sort of possessive an example of LEXICAL possession.

But the noun *man* is not relational. To see this, notice that *child* can take a postnominal argument (e.g., *the child of John*) but *man* cannot (e.g., **the man of John*). When the possessee nominal occurring in the possessive construction does not denote a two-place relation, then the possessive must resort to a pragmatically-controlled default relation. I call this sort of non-lexical possession EXTRINSIC possession, since the possession relation does not depend on any properties intrinsic to the described entities.

This chapter introduces the notion of possession relations in general and how they are grammaticized through a brief discussion of the acquisition of the possessive by children. I then propose the distinction between lexical and extrinsic possession, and develop the consequences of this idea in some detail. After discussing the uniqueness presuppositions associated with the possessive construction, I go on to show how the lexical/extrinsic opposition is

important in predicting when a possessive description will be capable of introducing a novel discourse entity, that is, a participant in the discourse that is not familiar from previous context.

The formal analysis motivated in this chapter is laid out in detail in section 2.7. Each possessive receives a translation into a logical language. This translation is calculated from the syntactic structure defended in chapter 1, and the logical language, in turn, receives a semantics in terms of a set-theoretic model, so that the English expressions treated by the fragment are associated with set-theoretic denotations in a compositional manner. In particular, possessives denote sets of entities. Thus on this fragment possessives are descriptions on a par with other set-denoting nominals, including definite and indefinite descriptions. Chapters 3 and 4 build on this fragment to provide an interpretation for quantificational possessives.

1. Acquisition

Studying the use of possessives by children can potentially shed light on the semantics of adult use by giving clues as to what sorts of possessive relations are most basic, which ones are learned first. Is it the possessive of ownership? Kinship relations? We shall see that there is no sense in which children use one kind of possessive construction and not another. That is, children cover the full range of adult uses. However, they depend more strongly on contextual clues and less on grammatical structure for associating syntactic elements with the participants in the possession relation. Thus acquisition of the possessive is more a matter of further grammaticization of the correspondence between linguistic structure and context of use than accretion of new interpretations.

Children use possessive constructions early and often. The possessive is one of the first semantic relations produced in early multiword utterances, and in the two-word stage, a substantial proportion of the utterances express possession (Villiers and Villiers 1985, 50; Braine 1976, 15). This is true of children learning English as their first language and of children learning other languages as well. Discussing the sorts of semantic relations children express in their first utterances, Brown (1973) says, “the case for the universal [crosslinguistic] availability of the possessor and possession relation in Stage I [characteristic mean utterance length in morphemes of 1.75] is then among the strongest, ranking with agent and action, action and object, and nomination [naming]” (Brown (1973, 197)). He supports this claim with statistical data drawn from corpora representing the speech of twelve monolingual children learning a variety of languages (Brown (1973, 173–4)).

However, as we shall see, the validity of this claim depends on being able to tell reliably which productions are tokens of a genuine possessive construction.

(2) a. Kendall chair 'Kendall's chair'
b. Daddy book 'Daddy's book'
c. my penny 'my penny'
d. lady hat 'the lady's hat'

These examples are taken from Braine (1976, 15), although the glosses are mine. They record the speech of a 23 month old child (Kendall) learning to speak English.

The examples in (2) are typical of candidates given in the literature for possessives in early speech. Note that they consist of two words with the word describing the possessor first and the word describing the thing possessed second. The possessor most typically is a proper name (2a) or a noun with name-like properties (2b). Less often in earlier speech possessive word pairs occur with a possessive pronoun (2c) or a noun used as a classifier rather than as a name (2d).

There are no instances of the possessive morpheme *'s* in these examples. At this stage of development, there is little or no morphological inflection in general; Brown (1973, 337) asserts that children understand the semantics of possession well before they control the possessive clitic. In particular, there is rarely a possessive clitic on the possessor, and possessive pronouns (e.g., *my*, *your*, *his*) are usually acquired later than the construction involving a full name as a possessor (Howe 1976, 120). In the absence of the possessive clitic, then, how can we be sure that the utterances in (2) correspond to the adult possessive construction?

Brown offers the following comments in favor of attributing possessive meanings to children.

> The high frequency and apparent productivity of the possessive construction in child speech suggests that children are required in their behavior to distinguish between objects belonging to one person or another and objects belonging to no one in particular. Much detailed interaction in our transcripts suggests that children have primitive local notions of property and territoriality which they express with the possessive. The idea seems to be that the possessor has prior rights of use or access to his possessions, rights that supersede those of any other member of the family. This appeared most dramatically in our materials when Adam warned Ursula Bellugi, who was about to sit in Daddy's chair: *No, no Daddy chair, home soon*. (Brown (1973, 195–6))

Bowerman (1976) comments that it is surprising that the ability to express the semantic relation of a possessor to a possession should develop early, since possession relations have nothing to do with the lexical meanings of the words themselves. That is, there is "nothing inherent in the meaning of *Mommy* or *Kendall* that calls for these words to fulfill the roles of actor or possessor" (Bowerman (1976, 103)). This observation is true enough, but not relevant; we will see later in this chapter that it is the possessee nominal, not the possessor, that is the crucial element in a possessive construction. Contra Bowerman, I will argue that part of learning the (linguistic) semantic properties of a noun is learning what sorts of entities can stand in a possession relation to the entities that noun describes.

Nevertheless, Bowerman's point is well taken in that there is a qualitative difference between possession relations and other grammatically expressed relations. What is different about a possessive relation in comparison with other supposedly basic semantic relations (e.g., the agent/action relation in *Mommy ball* 'Mommy give the ball to me') is that possession relations are relatively abstract. According to adult intuitions, the connection between Daddy and his chair is purely conceptual, and it has no observable physical manifestation in the way that the action of transferring a ball can. Thus, asserting that children use possessives amounts to claiming that children control a linguistic construction expressing essentially intangible relations.

Howe cautions against imputing such abstract thinking to children: "Research based on the assumption that children always intend a meaning adults might express has provided interesting insights into the interpretations adults place upon children's utterances but says next to nothing about the meaning of those utterances" (Howe (1976, 29)). Howe suggests that the utterances that we might be tempted to interpret as possessive actually express a more general relation, one that includes situations that we would characterize as possessive, but which contains other situations as well, in particular, situations that an adult would characterize as locative but not possessive.

> When Gia said *Truck wheel* as she turned the wheels on the underside of a toy car, the decision to regard the utterance as POSSESSIVE, synonymous with *The truck has a wheel*, was contingent, as Bloom pointed out, on the word order. She wrote that if the word order had been *Wheel truck*, she would have regarded the utterance as LOCATIVE, synonymous with *The wheel is on the truck*. (Howe (1976, 41–2); her capitals)

Howe suggests that there is a more general relation that subsumes situations that an adult would consider as possessive and other situations they would

consider as locative. Then the locative situations are perfectly palpable instances of this more general relation, and the abstractness of the possessive uses are no longer puzzling.

Howe is not alone in classing the early use of possessives with locatives.

> Broadly conceived, possession is a locative state in which the Ground is an animate being and the Figure–Ground relation [that is, the possessor/possessee relation] is of an enduring or socially-sanctioned nature [for example, part/whole relations, kinship relations, respectively]. (Slobin (1985a, 1179))

Slobin goes on to describe cases involving German and French in which a child uses a locative preposition to express a possessive meaning.

The Howe/Slobin hypothesis, then, is that the concept of a possession relation develops as a special case of a more general range of locative meanings. The relevant question for the development of possessives, then, becomes one of determining how the various specific possessive meanings become associated with characteristic grammatical expressions.

Towards this goal, Golinkoff and Markessini (1980) report on an experiment designed to test the relationship between word order and children's perception of a possession relation. A parent would show the subject child a page containing a drawing, say, of a boy standing next to a flower and a girl standing next to a second flower. The parent would ask the child to point to an object in the picture described as *the boy's flower*. In order for the child to pick out the correct flower, it must recognize a possession relationship between the referent of the possessor phrase (the boy) and the described object (the flower).

Golinkoff and Markessini are aware of Howe's suggestion that children do not distinguish between one word order and another, as well as the criticism that it is the adult experimenter that interprets one word order as a possessive and the other as a locative. They attempt to investigate this possibility by including what they call 'reciprocal' possessives such as *the mommy's baby*, which they take to express a possessive relationship that is symmetric with *the baby's mommy*.[1] If a child can point reliably to the correct referent given either stimulus, they reason, it shows that it not only understands

[1] The symmetry here is an accident of the meanings of *mother* and *baby*. Other choices for the pair of nominals are not symmetric. Golinkoff and Markessini's example illustrating this fact is *the husband's mommy*, in which the most natural interpretation involves the relation of parenthood, versus *the mommy's husband*, in which the most natural instantiation of the possession relation is matrimonial.

that there is a conventional possession relation between mothers and their babies, but that the correspondence between which entity serves as the possessor and which serves as the possessee is determined by word order. In addition, Golinkoff and Markessini include 'anomalous' possessives in which the typical role of possessor and possessee are reversed (e.g., *the flower's boy* instead of *the boy's flower*, and even **the nose's boy*[2] instead of *the boy's nose*).

Golinkoff and Markessini find that children rely on extra-syntactic cues to determine what elements correspond to the possessor and the possessee roles. For instance, they found that when a child encounters a possessive involving a person and an inanimate object, the person is more likely to be interpreted as the possessor. Their reciprocal examples—which depend solely on word order to determine the correct referent—resulted in significantly more errors than the other examples. Villiers and Villiers (1985, 48) interpret these results as suggesting that Stage I children have a basic understanding of the notion of what objects are likely to be possessions and possessors, but cannot use word order alone to comprehend a possessive relationship. However, by Stage IV (mean MLU [mean length of utterance] in morphemes of 3.44, with a mean age of 2;11), children were able to reliably pick out the referent of an anomalous or reciprocal possessive. Given an overall success rate over 75%, even including the youngest children, Golinkoff and Markessini conclude that "even the young children have a basic notion of the nature of the possessive relationships—at least as expressed linguistically in these two-noun phrases" (126–7).

Although Golinkoff and Markessini present compelling evidence in opposition to Howe's suggestion that children do not discriminate between one word order and its reverse (compelling evidence, at least, for children at stage IV and beyond), they do not address Howe's suggestion that the semantic relation intended by a child is of a different character than the adult notion of what can constitute possession. We have seen that Howe and Slobin specifically propose that there is a more general semantic notion that encompasses both possession and locative relationships. Call this more general relationship 'proximity'.[3]

Since the drawings used in Golinkoff and Markessini's experiment represented possession primarily by means of placement on the page (although in at least some of the drawings, a human also makes a gesture showing that

[2] Golinkoff and Markessini consider this phrase grammatical but strange. I consider it to be ungrammatical (when a part/whole interpretation is intended, as it is here). See section 2.3 for more discussion of attempts to invert possession relations.

[3] I will return to the idea of proximity as a way of thinking about extrinsic possession in section 2.4.

they are consciously aware of the object drawn next to them), their results are perfectly consistent with the notion that children do not distinguish conceptually between a possession and a locative interpretation. This is true also for Golinkoff and Markessini's examples involving part/whole relationships, such as *the boy's nose*. Thus it remains to be shown when exactly a child begins to make a systematic distinction semantically between possessives and locatives.

Golinkoff and Markessini echo a generalization made in Brown (1973, 138; 196) that of the full range of possession relations, children express only what they call alienable possession (*Daddy chair* 'Daddy's chair') and occasionally a part/whole relation (*dog tail* 'the dog's tail'). Brown claims that children do not make use of any of the other more elaborate relations that are conventionally coded by the possessive either prenominally or in a postnominal *of* phrase in adult speech. His example of a relation unavailable to a young child is *the ship's captain*. I am suspicious of this claim, since I believe that *the ship's captain* has exactly the same syntactic and semantic properties as *the lady's hat* (see section 2.7 for a formal system on which these two expressions give rise to parallel interpretations). Furthermore, Golinkoff and Markessini show that such non-kinship non-enduring non-part/whole relationships are easily comprehended by young children (e.g., *the boy's flower*). I suggest, then, that the only difference in likelihood between the observed *lady hat* and Brown's predicted impossible *ship captain* is the difficulty of the vocabulary involved.[4]

In any case, it is clear that English-speaking children, at least, have a possessive construction very early. Note that it also happens that the possessive clitic *'s* is among the first fully productive functional morphemes (i.e., inflection, clitics, function words) acquired by children (Villiers and Villiers 1985, 68).

Certainly the anecdote related by Brown leaves little room for doubt that whatever meaning the child who uttered *No, no Daddy chair, home soon* intended to convey, it certainly encompassed what an adult would understand to be a possession relation between Daddy and his chair. In particular, to the extent that young children have any genuine possessives, they express both lexical possession and extrinsic possession (see the next section for an explanation of this distinction). Acquisition of the possessive, then, amounts to a process of becoming more specialized in the way in which particular uses of

[4] Also—irrelevantly, here—children tend to base part of their recognition of a possessive relation on the animacy of the participants, preferring animate possessors and inanimate possessions over the reverse.

the possessive come to be systematically associated with particular grammatical constructions. The remainder of this chapter explores the details of this systematic relationship in adult use.

2. Relational nouns

The prototypical relation between a possessor and a possession is, of course, legal possession or ownership, as in *John's horse*. But there is a strong intuition that the possessive can express other relations as well that are qualitatively different. For instance, *John's biography* can describe a book about John or a book written by John, in addition to a book owned by John. Which relation is relevant depends in part on the context of use, but this chapter will show that grammatical properties of the possessee phrase also strongly constrain the range of possible possession relations.

In particular, the (partly covert) argument structure of the possessee nominal is especially important in predicting the range of possible possessive interpretations. This section presents an interpretation for possessive descriptions based on the idea that nouns denote relations having different valences. Here the valence of a relation or an operator corresponds to the number of arguments it expects: a predicate requiring a single argument (e.g., the translation of an intransitive verb) is monadic, one that requires two arguments is dyadic (e.g., the translation of a transitive verb), and so on.

Normally, common nouns are assumed to translate as one-place predicates (e.g., Lieber (1983, 257)), so that their extension is a set of entities. For example, the noun *horse* translates as a one-place predicate, so that *horse* denotes the set of horses (for any choice of a possible world and time). I follow, e.g., Löbner (1985) in assuming that the semantic structure of many other common nouns is more rich. More precisely, I assume that the denotations of some nouns are best expressed as relations over pairs of entities. Call such nouns RELATIONAL nouns.

For instance, kinship nouns are prototypical examples of nouns that can denote relations. A person cannot be a grandmother without there being someone that they are the grandmother of. Thus the denotation of *grandmother* must be a relation over pairs of entities: $[\![\textit{grandmother}]\!](x, y)$ will hold just in case x is the mother of a parent of y. From this basic meaning there are derivative meanings which can be represented by monadic properties. For instance, a person has the monadic grandmother property if there exists some other (unspecified) person that stands in the two-place relation to the individual to be described.

Nouns derived from transitive verbs also are systematically relational. In their basic sense, they will have the same number of arguments as the corresponding verbs. Just as the verb *give* denotes a relation between an agent

(the giver), a theme (the gift), and a recipient, an entity will be in the extension of the noun *gift* only if there is a giver and a givee associated with the described object.

One way to draw out the difference between nouns that translate as monadic predicates versus those that translate as dyadic predicates is to compare nouns having equivalent extensions, but which differ in their (grammatical) entailments concerning the existence of other related entities. For example, compare *day* with *birthday*, or *animal* with *pet*: a particular day can be considered a birthday only by virtue of its relation to a particular person, and an animal is a pet only by virtue of its relation to a particular owner. I assume that *day* translates as a one-place predicate on entities, but the translation of *birthday* crucially depends on a two-place predicate expressing a relation between a person and the day of the year on which they were born.

For an independent test for whether a noun is relational, note that relational nouns can often take a postnominal *of* phrase, but a non-relational noun cannot. Thus *the birthday of John* is grammatical, since the logical translation of *birthday* has the proper valence to combine with a postnominal argument, but **the day of John* is not grammatical, since the translation of *day* is not able to combine with an argument.

Many of the examples in the remainder of this section contrast the behavior of the relational noun *child* with the non-relational noun *human*. I assume that *child* and *human* differ in that *child* (in one of its senses) denotes a two-place relation and *human* denotes (only) a one-place relation, a monadic property of entities.[5]

(3) a. $[\![\textit{child}]\!] = \lambda x \lambda y[\textbf{child}(x, y)]$
b. $[\![\textit{human}]\!] = \lambda y[\textbf{human}(y)]$

As shown in (3), then, the extension of (one sense of) the nominal *child* will be the set of all pairs of entities x and y such that y is the child of x. Similarly, the extension of *human* will be the set of entities x such that x is a person.

The logical translations in (3) suggest that *child* and *human* are coextensional. More precisely, the set of entities that can serve as the second argument to the **child** relation will be (roughly) the set of entities that appear as the only argument to the **human** predicate, and vice versa. This is because every human has a parent, and every child is human. We shall see below that *child* has a second sense on which it also entails that the child entity is young, so that not all humans are children, since some humans are not young.

We can now begin to see how the existence of relational nouns bears on the interpretation of possessives. Obviously, the use of a possessive entails

[5] An account of the formal notation used throughout the remainder of this chapter appears in section 2.7.

that some two-place relation holds between the possessor and the possession. Since the sense of *child* given in (3a) is a dyadic relation, it can serve as a possessive relation without further manipulation. Assuming that the grammatical function of the possessor phrase is to identify one of the participants in the possessive relation, we have the following interpretation for one sense of *John's child*.

(4) a. $[\![\textit{John's child}]\!] = [\lambda x \lambda y[\mathbf{child}(x, y)]](\mathbf{j})$
$= \lambda y[\mathbf{child}(\mathbf{j}, y)]$

b. 'the set of entities y such that John is the parent of y'

Note that the possessive determiner phrase in (4) denotes a one-place predicate. On the analysis developed in this dissertation, all possessives are descriptions, so they will always translate as one-place predicates. Also, note that the uniqueness presupposition usually associated with possessives is not represented in the interpretation in (4); uniqueness is the topic of section 2.5.

Since the basic meaning of *child* is a kinship relation, and since the interpretation in (4) shows John standing in that basic relation to the child being described, this interpretation for *John's child* clearly entails that a kinship relation exists between John and the child in question. This interpretation, then, characterizes the most salient reading for *John's child* in a neutral context. We can call the possessive interpretation illustrated in (4) an instance of LEXICAL POSSESSION, since the possession relation comes directly from the lexical relation denoted by the noun.

But what of the denotation of *human*? Since *human* translates as a monadic predicate, its basic denotation is not appropriate for use in a possessive construction directly, since a possessive requires a relation of valence 2.[6] Nevertheless, *human* can participate in a possessive construction, since *John's human* is perfectly grammatical, although it may require some context in order to be felicitous. Since any nominal can occur as the possessee phrase in a prenominal possessive construction (at least, in English), there must be a default possession relation available for those possessives which do not express a lexical relation.

[6] It is not always so easy to decide that a noun has no relational meaning. Jorge Hankamer (personal communication) points out that in the context of a child's television show in which, say, dogs and cats can talk, the pets could refer to their owners as *my human* or *your human* without too much difficulty. To the extent that there would be a certain sort of familial relationship entailed by the use of such a description, I am committed to the claim that *human* becomes (provisionally) relational within the special context of that fictional world.

Although it might be tempting to call this sort of non-lexical possession 'default possession', this term will not generalize to other languages. For instance, Laughlin (as cited by Aissen (1987, 128)) reports that Tzotzil, like many Mayan languages, has a subclass of possessives known as 'inanimate' possessives. This class of expressions corresponds to our non-lexical possessives, and they are distinguished from other possessives by the presence of a special suffix *-al* which is otherwise absent on the possessed noun. For instance, *latzek* is a possessive meaning 'your scorpion', with the understanding that the scorpion is your pet. If the suffix *-al* is added to get *latzek-al*, the translation is still 'your scorpion', but the possessive can only be interpreted as referring to a scorpion that is associated with you in some more transient manner, i.e., the scorpion that you just stepped on, the scorpion that just tried to bite you, and so on.[7]

In other words, in Tzotzil, the presence of the morpheme *-al* guarantees a non-lexical interpretation, so it hardly makes sense to call a non-lexical possessive a 'default' interpretation. Nor is the term 'inanimate' any more appropriate, even for Tzotzil (as Aissen points out), given the fact that scorpions are animate. But notice that the non-lexical relation that holds between you and the scorpion that you just stepped on is an ephemeral one, a relation that holds because of accidental facts about the world, rather than because of some inherent quality that follows from the properties entailed by the lexical meaning of the possessee nominal. Therefore I will call non-lexical possession EXTRINSIC POSSESSION, since it depends for its value on pragmatic factors determined by the context in which the possessive is uttered. The extrinsic possession relation will be represented in the logic by the two-place relation symbol π.

If lexical possession relations come directly from the denotation of the possessee nominal, how does the extrinsic possession relation enter into possessive interpretations? Recall from chapter 1 that possessee nominals serve

[7] The form without the suffix is not necessarily a lexical possessive. I do not know the facts of Tzotzil well enough to judge, but I certainly would not analyze the English noun *scorpion* as relational. Pending further investigation, I will conjecture that although the presence of the morpheme *-al* guarantees a non-lexical interpretation, the converse does not hold, that is, the absence of *-al* does not guarantee a lexical interpretation. Thus *-al* does not mark the lexical/non-lexical opposition, but rather distinguishes between kinds of non-lexical possession. See also section 2.4 for a discussion of pet terms like *dog*, and other non-relational nouns such as *car* that describe objects that are conventionally owned (with respect to a particular culture).

as the phrase structure complement to a zero determiner that governs the possessive specifier. In (4), the denotation of the zero determiner did not contribute any meaning in addition to the kinship relation provided by its nominal complement; that is, for lexical possessives, the possessive determiner is semantically transparent. For extrinsic possessives, I propose that there is a second lexical interpretation for the possessive determiner that takes a predicate of valence 1 and returns a predicate of valence 2 by introducing the extrinsic possession relation π.

(5) a. $[\![\emptyset_{[\text{poss}]}]\!] = \lambda R[R]$
b. $[\![\emptyset_{[\text{poss}]}]\!] = \lambda P \lambda x \lambda y[\pi(x, y) \wedge P(y)]$

Here R is a place holder for a 2-place relation (a predicate of valence 2), and P is a place holder for a one-place relation (a predicate of valence 1). The idea is that when a possessee nominal denotes a relation, it will translate as a predicate which combines with the semantically transparent expression in (5a); but when the possessee nominal denotes a set, then its translation combines with the version of the possessive determiner given in (5b), which introduces the extrinsic possession relation.

The denotation given in (5a) is the semantically transparent sense, and the one in (5b) is the one that introduces the extrinsic possession relation. We shall see momentarily that it is this second sense that accounts for the interpretation of a monadic predicate like *human* when it occurs in a prenominal possessive construction.

Note that on the syntactic analysis adopted in chapter 1, the zero determiner that governs the possessive construction is the head of the possessive determiner phrase, and forms a constituent with the possessee nominal. Thus this analysis locates the factors that decide between a lexical interpretation versus an extrinsic interpretation entirely within the possessee phrase. Put another way, the possessor phrase as a whole, and the possessive morpheme *'s* in particular, plays no role in this semantic alternation.

(6) $[\![[human]_{\text{D}'}]\!] = [\![\emptyset_{[\text{poss}]}]\!]([\![\textit{human}]\!])$
$= [\lambda P \lambda x \lambda y[\pi(x, y) \wedge P(y)]](\lambda y[\mathbf{human}(y)])$
$= \lambda x \lambda y[\pi(x, y) \wedge \mathbf{human}(y)]$

This is the interpretation for a bar-level 1 determiner phrase, that is, the interpretation of a possessive determiner phrase when the possessive determiner has combined with its possessee nominal, but not yet with its possessor phrase. Thus in (6) we see how the second sense of the possessive determiner takes a monadic predicate and returns a dyadic one suitable for a possessive interpretation.

(7) a. $[\![\textit{John's human}]\!] = [\lambda x \lambda y[\pi(x,y) \wedge \textbf{human}(y)]](\textbf{j})$
$= \lambda y[\pi(\textbf{j},y) \wedge \textbf{human}(y)]$

b. 'the set of entities y such that John possesses y and y is a human'

When combined with a possessor phrase, the result is a description in which the described person stands in the extrinsic possession relation with respect to the possessor.

Note that which determiner meaning in (5) is appropriate is determined entirely by whether the possessee nominal is relational or not. Given this predictability, a type-shifting analysis might be preferable. On such an approach, the basic sense of the possessive determiner would be the semantically transparent one appropriate for lexical possessives. If the determiner encounters a non-relational possessee, then a type-shifting operator would step in to give the effect of (5b), that is, it would increase the valence of the possessee nominal translation by invoking the extrinsic possession relation. On the theory presented in Partee (1987), type-shifting principles provide, in effect, a variety of interpretations for various non-possessive determiners—why not for the possessive determiner as well? However, although there may turn out to be theoretical reasons for preferring a type-shifting analysis ultimately, I will stick to the implementation as given on (5) for the purposes of this dissertation.

The extrinsic possession relation π is more vague than lexical possession relations. Thus *John's human* might be the human that John is responsible for helping, or the human that John saw, or any other person who is somehow more closely associated with John than other salient people. Section 2.4 will explore what counts as a measure of closeness in this sense. We shall see in section 2.6 that it is the vagueness of this extrinsic possession relation that accounts for the subtle awkwardness of *John's human* when it occurs in a neutral context. We shall also see that by associating extrinsic possession explicitly with the possessive determiner, we predict that extrinsic interpretations are unavailable for postnominal *of* phrases. This means that we correctly predict that *a child of John* receives only a kinship interpretation, and that **a human of John* is ungrammatical: *human* does not have a relational meaning, and no extrinsic reading is available.

Argument suppression

We have just seen how to deal with the discrepancy between the monadic denotation of *human* and the need for a dyadic relation for building a possessive interpretation. This problem arose from the assumption that some nominals translate as monadic predicates, while others translate as dyadic predicates (or

predicates of even higher valence, as discussed in section 2.3). In fact, splitting up the class of nominal denotations into relations of different valences gives us a problem in two directions: not only must we find a way of increasing the valence of undervalent predicates like the denotation of *human*, we must find a way of decreasing the valence of relational nominals when they occur in non-possessive constructions. In other words, we must have access to a sense of *child* as a monadic predicate that simply picks out the class of children.

The interpretation of *child* as a monadic predicate will be characterized here in part by means of a standard argument suppression operation, much in the way that *eat* can optionally appear without its second argument. I will assume that just as the lexicon provides a variety of senses for verbs like *eat* having different numbers of arguments, it will provide a variety of senses for nouns like *child*. For the sake of concreteness, imagine that predicates are listed in the lexicon with their full set of possible arguments, with optional arguments set off by parentheses.

(8) a. eat: ⟨event, agent, (patient)⟩
b. child: ⟨entity, (parent)⟩

Here I am adapting notation from the LFG tradition. See, e.g., Rappaport (1983) or Levin (1987).

There are two distinct kinds of argument suppression in verbal contexts. On one, the suppressed argument is implicit, i.e., present in the lexical translation and therefore giving rise to existence entailments, but syntactically unrealized. This is the sort of suppression exemplified by *eat*, since if you ate, you necessarily ate something. On the other sort of suppression, the suppressed argument is optional, i.e., giving rise to existence entailments only if the argument is present in the lexical translation. This second sort of suppression is found in middles.

(9) a. John broke the plate.
b. The plate broke.

In (9a) we see that *break* can denote a three-place relation between an agent and a theme and an event. In (9b), the agent argument has been suppressed so thoroughly that there is no entailment that there even exists an agent. I will always intend the first kind of suppression, on which arguments that are not expressed syntactically are still present in the lexical translation and still give rise to existence entailments.

This gives us the following two lexical translations for *child*, one dyadic (involving both roles), and one monadic (suppressing the optional parent role).

(10) a. $\lambda x \lambda y[\textbf{child}(x, y)]$
b. $\lambda y[\textbf{child}(\_, y)]$

I will use an underscore as a place holder to represent an argument that has been suppressed. Assertion of the predicate given in (10b) will entail that there is some entity that fills the parent role; that is, on the monadic use of *child*, if y is a child, there should be an entailment that there exists some x such that x is y's parent. The interpretation of the underscore is discussed from a more technical point of view in section 2.7.

The dyadic denotation given in (10a) leads to the possessive interpretation illustrated in (4), and the monadic one given in (10b) leads to an interpretation in non-possessive contexts.

(11) a. $[\![\textit{the child}]\!] = \lambda y[\textbf{child}(\_, y)]$
b. 'the set of entities y such that somebody is y's parent'

Like the simpler sense of the possessive determiner, the definite (as well as the indefinite) article is semantically transparent (once again ignoring uniqueness presuppositions).

The representation of the truth conditions for *the child* in (11a) are inadequate, since they do not take account of the entailment that a child is young. Although you can point to a middle-aged man at a party and describe him as *John's child* without any difficulty, if you describe him as *a child*, you are implying that he behaves in a manner inconsistent with his age. This shows that the kinship sense of *child* does not have youthfulness as an entailment, but the monadic sense does.[8] I am concentrating here on the predictable aspects of the relationship between the dyadic sense and the monadic sense (for instance, both senses entail the existence of a parent entity). However, I do not mean to imply that either denotation can be predicted solely by examining the other. This partial unpredictability is to be expected given the status of nominal argument suppression as a lexical phenomenon. The correspondence between the different senses of nominals is discussed more fully in the next section, section 2.3.

After suppression of the parent role, the monadic interpretation of *child* has the same valence as the basic denotation of *human*, although *human* and *child* still differ in several ways. Most important for our purposes here, the monadic sense of *child* continues to explicitly entail that there must be an unspecified parent entity out there somewhere. What happens when the monadic denotation of *child* combines with the extrinsic possession version of the possessive determiner?

[8] I am grateful to Bob Moore for discussion that helped clarify my thinking on this point.

(12) $[\![[child]_{D'}]\!] = [\![\emptyset_{[poss]}]\!]([\![child]\!])$
$= [\lambda P \lambda x \lambda y[\pi(x,y) \wedge P(y)]](\lambda y[\textbf{child}(\_,y)])$
$= \lambda x \lambda y[\pi(x,y) \wedge \textbf{child}(\_,y)]$

(13) a. $[\![\textit{John's child}]\!] = [\lambda x \lambda y[\pi(x,y) \wedge \textbf{child}(\_,y)]](\textbf{j})$
$= \lambda y[\pi(\textbf{j},y) \wedge \textbf{child}(\_,y)]$

b. 'the set of entities y such that John possesses y and y has a parent'

Our analysis automatically predicts, then, that there will be a second reading for *John's child* in addition to the kinship reading. But this is a good prediction, since there is such a reading. Imagine that in addition to being a father, John works in a day care center. Then *John's child* may be one of the children that John is responsible for at the day care center. In such a case, the child in question must be associated with John in some way (perhaps the child is assigned to John for the duration of a field trip), but there is no kinship entailment. That is, in a day care environment, *John's child* can refer to a child that is not one of John's natural offspring. On the day-care reading, *John's child* has exactly the same properties as *John's human*, except that the suppressed parent argument of *child* continues to entail the existence of some unspecified parent entity.

To summarize the basic analysis, we predict that possessives involving a nominal that has a monadic predicate for its only lexical translation will give rise to a single somewhat vague possessive interpretation through extrinsic possession; but one involving a nominal that has a dyadic predicate for its basic lexical meaning will be ambiguous between a lexical possession reading (e.g., a kinship reading) and an extrinsic reading involving argument suppression.

(14) a. $[\![\textit{John's human}]\!] = \lambda y[\pi(\textbf{j},y) \wedge \textbf{human}(y)]$ extrinsic only
b. $[\![\textit{John's child}]\!] = \lambda y[\textbf{child}(\textbf{j},y)]$ kinship reading
c. $[\![\textit{John's child}]\!] = \lambda y[\pi(\textbf{j},y) \wedge \textbf{child}(\_,y)]$ extrinsic reading

Thus, recognizing that nominals denote relations of differing valence leads to a distinction between lexical possession on the one hand and extrinsic possession on the other.

Note that the assumption that nominal denotations have varying valence is simply a formalization of the fact that nouns can take different numbers of arguments, just as the verb *eat* must have both a transitive and an intransitive denotation. This observation will be explored in more detail in section 2.3, where we consider possessives involving nominals such as *gift*, *gift from Marie*, *gift to Marie*, and so on. Thus we will see in section 2.3 that in addition to argument suppression, syntactic combination within the noun phrase

can also reduce the valence of a multivalent nominal. Nor is the extrinsic possession denotation of the possessive determiner the only mechanism that can increase the valence of a nominal denotation. We shall also see in section 2.3 that certain adjectival constructions are capable of increasing the valence of their arguments, notably the adjective *favorite*. Thus the assumption that nouns have translations that differ in their valence is needed independently of any stipulations specific to the interpretation of possessives.

What is new here is the idea that this unavoidable distinction in valence among noun denotations can project to the level at which a noun phrase combines with a determiner. Instead of assuming that noun phrases (the equivalent of common noun phrases, i.e., N′ phrases, on the traditional non-DP analysis) uniformly translate as one-place predicates, I am proposing that noun phrases sometimes translate as one-place predicates and sometimes translate as two-place predicates. On the analysis given here, the place at which uniformity of denotation is imposed is at the determiner phrase level, rather than at the noun phrase level. In this dissertation, all determiner phrases expressing descriptions, whether definite, indefinite, or possessive, translate as one-place predicates. (See section 2.7 for the treatment of proper names, which denote entities, and see chapters 3 and 4 for a treatment of quantificational possessives such as *most dogs*.)

3. Lexical possession

The analysis presented in the previous section makes a basic division among possessive interpretations between lexical possession and extrinsic possession. This section will investigate lexical possession in more detail. That is, this section will consider a variety of constructions in which the relation established between the possessor and the thing possessed comes directly from the lexical meaning of the possessee nominal.

In section 2, I motivated the assumption that kinship terms are relational by observing that the fact that a particular entity is a child entails that there is some other entity that is that child's parent. However, it is not in general possible to predict the exact relation denoted by a noun by examining the facts of the world. To see this, notice that if an individual is a child, this actually entails the existence of at least two other individuals, a mother and a father. In fact, a child will also have grandparents and greatgrandparents and so on. It is a grammatical property of the noun *child* that it idiosyncratically selects one of these individuals whose existence is necessarily entailed by the concept of a child as an explicit part of its lexical denotation. Indeed, as far as real-world entailments are concerned, the same set of individuals are entailed by virtue of being human, but the noun *human* does not single out any one of them for special treatment in its lexical meaning.

To develop this observation a little further, consider the noun *grandchild*. Once again we have the same set of individuals entailed by the way the real world works. But now there are two individuals that can be singled out as somehow more important to the notion of a grandchild. If x is a grandparent and y is his grandchild, there there must also be an entity z such that z is a child of x who is also the parent of y. (Usually, given x and y, the choice of z is unique.) It would make sense for the noun *grandchild* to denote a three-place relation over triples $\langle x, z, y \rangle$, where x is the parent of z and z is the parent of y. Call this relation **grandchild**$'$. Assuming that either the grandparent role or the parent role could be suppressed as described in the previous section, we would then predict that *John's grandchild* could refer either to John's son's son (suppressing the parent role: $\lambda y[\mathbf{grandchild}'(\mathbf{j}, \_, y)]$) or to John's son (suppressing the grandparent role: $\lambda y[\mathbf{grandchild}'(\_, \mathbf{j}, y)]$), But *John's grandchild* cannot refer to John's son. Therefore we can assume that the noun *grandchild* does not denote a relation over triples. Rather, it denotes a relation that distinguishes only two individuals, the grandparent and the child.

The point of all of this is that the relations denoted by relational nouns are not predictable by examining the entailments associated with the concept named by that noun. That is, semantic relational structure is an arbitrary linguistic property of words, and cannot be reduced to real-world reasoning. This chapter, then, explores some of the linguistic structure in a number of different classes of nominal expressions.

The prototypical example of a lexical possessive presented above came from kinship terms. It is clear that the argument structure of kinship terms is manipulated by lexical and morphological operations in a semi-productive manner (e.g., *great-great-grandmother* but **great-mother*).[9] Other classes of nouns that give rise to lexical possessives include deverbal nouns, gerunds, de-adjectival nouns, and nouns denoting part/whole relationships. Lexical possessives can also come from certain adjectival expressions, such as *favorite* or *own*.

Derived nominals

Some nouns denote relations with valence greater than two. If the valence of these predicates is reduced through suppression or through syntactic combination, they can give rise to lexical possessives.

For instance, I assume that the basic denotation of a derived noun has the valence of the denotation of the corresponding verb. More precisely, following Rappaport (1983), I assume that some morphologically related verbs and

[9] For an extreme example of a complex system of lexical kinship terms, see Gruber's (1973) description of ≠H`o͡a.

nouns share a functional argument structure that is neutral according to syntactic category, and that there are different grammatical subsystems for nouns and verbs governing the mapping between logical arguments and syntactic role fillers. We shall see that the constraints on the way in which nominal arguments are expressed affect the range of possible possessive denotations.

However, these linking constraints are quite complex. I can only mention some of the difficulties here. For one thing, it is unclear how to predict whether a derived nominal will describe an event or an entity.

(15) a. The purchase occurred on Monday.
b. ?The gift occurred on Monday.

The noun *purchase* in (15a) seems to be able to refer to an event, corresponding to the suppression of all but the event argument, but the noun *gift* does not. That is, *the gift* can only refer to a item that was the theme of a giving event. This reading corresponds to suppression of all but the theme argument.[10]

One clear generalization is that any derived nominal can describe the theme of an event, whether or not it can also sometimes describe the event itself. For instance, a nominal like *the purchase* can also describe the item that was purchased in addition to describing the purchasing event. Furthermore, if a noun does not describe its theme, then it describes the event entailed by its meaning, so that *the purchase* as in (15a) may refer to either the purchased item, or to the event of purchasing, but cannot refer to the agent or the recipient of the purchasing event.

Let us say that any thematic role that can potentially be associated with the entity described by a nominal is a CORE thematic role. Then *gift* has one core thematic role (the theme role), but *purchase* has two core roles (the theme role and the event role).

Then the observation in the previous paragraph amounts to the claim that the event role is only sometimes a core role.

Another important distinction between themes and events is that the theme role can be associated with a possessor, as long as there is an event core role left over to characterize the described entity, but not vice versa.

(16) a. The item's purchase occurred on Monday.
b. *The transaction's purchase was a lovely book.

[10] In view of the contrast in (15), for simplicity's sake, I represent the relation denoted by *give* in my logical language by means of a three-place predicate, where the three arguments correspond to the giver, the gift, and the recipient, without any explicit mention of an event argument. See especially section 2.7.

In (16a), the possessor bears the theme role and the described entity bears the event role. But in (16b), an attempt to link the event role to the possessor at the same time that the theme role is associated with the the described entity results in unacceptability.

The indeterminacy of the role described by the nominal is only one of the difficulties involved in predicting what lexical meaning will be available for a derived nominal. To see how these problems interact with our theory of possessives, consider the phrases in (17).

(17) a. John's gift
b. John's purchase

In (17a), the item referred to can be the gift that John gave or the gift that John received, corresponding to suppression of either the recipient argument or the giver argument. In (17b), however, the item referred to can only be the item that John bought, and not the item that he sold. This means that in the case of *purchase*, for some reason it is not possible to suppress the recipient role without also suppressing the agent role. In our terms, nouns like *purchase* have the property that if you suppress the agent role, you must also suppress the recipient role.

It is unfortunate, then, that I am not in a position to present a complete theory of nominalization, since the lexical thematic role structure of nominals clearly affects the interpretation of possessives. However, whenever a complete theory becomes available, the predictions that it makes will interact in a straightforward way with the treatment of possessive constructions developed here so that the combined theory should predict exactly the right range of interpretations for possessives. In other words, our working assumption will be that the lexicon will provide a set of relations for each noun according to whatever principles govern the arrangements of thematic roles in nominals; our task, then, is to provide an account of which set of possessive interpretations will be available given the correct set of lexical meanings.[11]

Syntactic combination

In addition to argument suppression, it is also possible to reduce the valence of a nominal by combining it with overt syntactic arguments. By assumption, the basic lexical meaning of *gift* is a triadic relation between an agent, a theme, and a recipient. Combining *gift* with a prepositional phrase such as *to*

[11] See, e.g., Dowty (1989) for a pointed survey of some of the possible approaches to the issue of thematic roles, with special attention given to nominals. I intend for my conception of thematic roles here to correspond to the Dowty's notion of a thematic role type. Rappaport (1983) is also particularly insightful on the topic of the thematic roles of derived nominals.

Marie results in a complex nominal with a translation of valence 2, in which only the agent and the theme arguments are left for subsequent filling.

(18) a. $[\![\textit{gift to Marie}]\!] = [\![\textit{gift}]\!]([\![\textit{to Marie}]\!])$
$= [\lambda z \lambda x \lambda y[\mathbf{gift}(x, y, z)]](\mathbf{m})$
$= \lambda x \lambda y[\mathbf{gift}(x, y, \mathbf{m})]$

b. 'the set of pairs $\langle x, y \rangle$ such that x gave y to Marie'

The denotation of the complex nominal, then, (on one reading depicted in (18)) is a two-place relation between an agent x and a theme y.

(19) a. $[\![\textit{John's gift to Marie}]\!] = [\![\textit{gift to Marie}]\!]([\![\textit{John's}]\!])$
$= \lambda x \lambda y[\mathbf{gift}(x, y, \mathbf{m})](\mathbf{j})$
$= \lambda y[\mathbf{gift}(\mathbf{j}, y, \mathbf{m})]$

b. 'the set of objects y such that John gave y to Marie'

When this phrase is combined with a possessor, the result is a description of the set of gifts that John gave to Marie, as shown in (19).

Note that some postnominal preposition phrases in *of* receive an interpretation similar to (one interpretation of) the prenominal possessive, so that *a child of John* has a reading equivalent to one reading of *John's child*. Such prepositional phrases will combine with a nominal predicate as shown in (18) and (19) (see section 2.7 for further details). Some predictions concerning the interpretations of postnominal *of* phrases appear in section 2.4.

Nominals and raising predicates

Consider raising predicates.

(20) a. It is likely that John will leave.
b. John is likely to leave.

(21) a. It's likelihood
b. ?John's leaving's likelihood
c. *John's likelihood to leave

In (20a) the predicate *likely* takes a single argument, namely, the clause *that John will leave*. It has no external argument and the subject position of the clause in which it appears is therefore occupied by the expletive element *it*. That position, being thematically empty, can be the target position for Raising, as shown in (20b). On this view, there is no difference in argument structure between *likely* when it occurs in a Raising construction and the use of *likely* seen in (20a): both take a single internal (propositional) argument.

We can explain the contrasts in (21) as follows. Assuming that the noun *likelihood* shares its lexical argument structure with the verbal predicate *likely*, then *likelihood* will also have for its only denotation a relation between

propositions and truth values. This means that it will only accept as a possessor an entity that represents a proposition. In (21a), the pronoun *it* can refer to a proposition, and (21a) is fully grammatical. To the extent that (21b) is acceptable, we can assume that the nominalization of a clause can also name a proposition. But in (21c), the possessor *John's* is an entity-denoting expression, and the result is completely unacceptable. Thus the view taken here is that any argument-changing operation that takes place entirely within the syntax will not have a corresponding derived nominal.

In particular, this predicts that there is no syntactic nominal passive.

(22) a. The Romans destroyed the city.
b. The city was destroyed by the Romans.

(23) a. the Roman's destruction of the city
b. the city's destruction by the Romans

Whether or not the sentences in (22) are related by syntactic movement, I am committed to the claim that in (23), there must be two distinct lexical translations for the noun *destruction*. One translation will associate its first logical argument with the theme role, and the other translation will associate its first logical argument with the agent role.

(24) a. $\text{destruction}_{\text{of}}$ $\lambda x \lambda z \lambda y [\textbf{destruction}(x, y, z)]$
b. $\text{destruction}_{\text{by}}$ $\lambda z \lambda x \lambda y [\textbf{destruction}(x, y, z)]$

The translation in (24a) is appropriate for interpreting (23a), and the translation in (24b) is appropriate for interpreting (23b). There is certainly a high degree of predictability relating the sense of *destruction* when it combines with an *of* prepositional phrase to the sense of *destruction* when it combines with a *by* phrase. This regularity can still be expressed on my analysis, so long as it is part of the system of rules relating lexical translations, and does not depend on any syntactic operations, e.g., the analysis of passive proposed by Levin (1987). In other words, my analysis is consistent only with a general theory of passive which does not attempt to move determiner phrases into or out of possessor position.

Gerunds

Gerunds systematically denote relations that result in lexical possessive interpretations.

(25) a. John sang the national anthem.
b. John's singing the national anthem

To see that (25b) expresses a lexical possession relation, note that it entails that John must be a participant in the singing event described by the possessive. In fact, there is no extrinsic interpretation possible. That is, imagine that John works in a music studio and is responsible for editing some recorded singing. Even in this situation, there is no reading on which (25b) describes some singing event in which John is not the singer. The absence of a music-studio reading means that lexical suppression may not reduce the valence of a gerund to less than 2. In other words, gerunds do not undergo argument suppression in the lexicon.

Thus gerunds differ from *-ing* nominals, which do have an extrinsic reading.[12]

(26) a. Shakespeare's stabbing of Caesar is more interesting than Marlowe's.

b. Shakespeare's brutally stabbing Caesar shocked the Elizabethan world.

In (26a), the the possessee phrase is an *-ing* nominal and not a gerund, as shown by the presence of the preposition *of* and by the fact that inserting an adverb before the nominal leads to ungrammaticality (**Shakespeare's brutally stabbing of Caesar*). The noun *stabbing* has a two translations, one which denotes a relation, and one on which the agent argument has been suppressed, leading to an extrinsic interpretation. On the lexical relational interpretation, (26a) entails that Shakespeare stabbed Caesar, and on the extrinsic interpretation, there must be some extrinsic relation between Shakespeare and the object described by the nominal; in this situation, the most natural explanation is that Shakespeare is a playwrite who described a stabbing.

In (26b), however, we have a true gerund, as shown by the absence of the preposition *of* and the fact that the adverb *brutally* can appear immediately before the nominal. In this case, there is no extrinsic interpretation possible. That is, (26b) necessarily entails that Shakespeare stabbed Caesar.

It is possible that the inability of gerunds to give rise to extrinsic possessives can be made to follow from independent assumptions. On the theory of gerunds avocated by Pullum (1991), gerundive possessee phrases have the internal syntax of verb phrases. If Pullum's analysis is correct, then the fact that there is only a relational denotation for a gerund could follow from the fact that there is no interpretation for a verb phrase on which the subject argument is implicit. That is, since verb phrases necessarily denote relations (between a subject denotation and an event), gerunds also necessarily denote relations.

[12] Thanks to Jim McCloskey for these examples.

De-adjectival nouns

Nominalized adjectives systematically denote relations.

(27) a. John is tall.
b. John's tallness

The predicate denoted by the nominalization corresponds to the relation between the event described by the adjective and the single participant in that event (conceiving events broadly enough to encompass states as well as more dynamic types of events, such as singing events).

Once again, there is no interpretation of (27b) which fails to entail that John is tall. Thus de-adjectival nouns, like gerunds, also fail to undergo lexical argument suppression.

Part/whole relations

Some nouns denote relations expressing a part/whole relation between the possessor and the possession. Body part terms are the prototypical example of such nouns, but there are many others.

(28) a. the boy's nose
b. the cake's ingredients
c. the table's top
d. the story's end
e. the tree's shape
f. the bird's squawk
g. the country's border
h. the ship's captain
i. the woman's pen pal

There are subtle differences in the relations denoted by the possessee nominals in (28); for instance, I have arranged this list according to my own subjective evaluation of increasing abstractness. The first items are more or less straightforward examples of part/whole relations, but the last items exemplify more arbitrary lexical relations.

Note that the possessor participant invariably corresponds to the whole, and the described participant invariably corresponds to the part. This recalls Slobin's suggestion (see section 2.1) that (part/whole) possessive relations are just lexicalized locative relations in which the possessor is the Ground and the described entity is the Figure.

Lyons (1977, 312–3) notes that lexical relations are not necessarily transitive. That is, *John's hand's shape* is not necessarily the same thing as *John's shape*. Thus what stands in the possessee argument position of the **shape** relation depends on what stands in the possessor argument position.

In fact, the lexical relation denoted by a nominal can impose selectional restrictions on its arguments. Thus the kinship term *husband* denotes a relation between individuals, so that the cognitively rational attempt at a part/whole expression given by *#the couple's husband* is infelicitous on the linguistic grounds that a couple is not an individual. That is, the lexical translation of *husband* has an argument position for a spouse, but no distinguished position for an entity which is a couple, even though the existence of a husband entails the existence of a couple that the husband is a part of.

The alienable/inalienable distinction

It is difficult to get an extrinsic reading for a part/whole possessives, but it is possible. Imagine an art class in which each student has been asked to paint a nose. Then *John's nose* can describe his latest artistic effort. This is traditionally described as an 'alienable' interpretation.

The alienable/inalienable contrast in general is a grammatical distinction made in some languages that is marked by means of various specific morphological or syntactic devices, including special agreement morphemes, classifier morphemes, or syntactic constructions. English shows very little inclination to make a grammatical distinction between alienable and inalienable possession. However, there do seem to be nouns that are obligatorily possessed, such as *forte* (e.g., *John's forte is playing Flamenco guitar*), or *travels*, as in *Tell me about your travels in India*.[13]

In terms of the analysis of possessives developed here, we can speculate on the alienable/inalienable distinction as follows. Typically inalienable nouns, such as kinship terms and body part terms, denote relations, and alienable nominals characteristically denote sets. If a normally relational noun undergoes argument suppression and translates as a monadic predicate and thus requires an extrinsic possession interpretation, presumably it would be marked as alienable in that interpretation. If a noun was ungrammatical except in an inalienable construction, then it would be a lexical exception to argument suppression. In other words, I expect the alienable/inalienable distinction to be a syntactic and morphological grammaticization of the semantic distinction between lexical versus extrinsic possessive interpretations.

Not surprisingly, which nouns count as inalienable differs from language to language, and even within the same language observed at different points

[13] Note that the singular form, *travel*, has no such requirement (witness *Travel broadens the mind*). There are also at least two book titles in which *travels* occurs without an explicit possessor (*Travels with my Aunt*, by Graham Greene, and *Travels with Charley*, by John Steinbeck). See also the discussion of *own* below.

in time. Nida (1958) offers a particularly striking example of a case in which cultural attitudes have resulted in grammaticization of an unusual pattern of alienability.

> An illustration of a close tie between language and culture is provided by the two 'possessive' systems in New Caledonian. These may be roughly distinguished as 'intimate' and 'non-intimate' possession. The first class includes such nouns as those meaning *mother*, *liver*, and *descendents*, while the second class includes *father*, *heart*, and *personal life*. The apparently arbitrary character of the distinction can only be understood if one realizes that New Caledonian society has been traditionally matrilineal, that the liver has been regarded as symbolic of the entire person (the liver is used in sacrifices as symbolizing the victim), and that one's descendants have a more intimate, continuing relationship to a person than even his own life (Nida (1958, 282)).

This example shows that although inalienability does line up with relational denotations, and alienability lines up with monadic interpretations, it is not possible to deduce what nouns will fall in the inalienable class simply by examining their denotative meanings. Presumably even for the modern New Caledonian, both *liver* and *heart* continue to denote part/whole relations. Which one is considered by the language to be necessarily or intrinsically relational, however, is a matter for lexical idiosyncrasy. I would be very surprised, however, if there were a language in which an ostensibly monadic noun received inalienable marking; that is, I predict there is no language in which words corresponding to *human* or *sky* or *firetruck* classify as inalienable without substantial differences in entailments from their English counterparts.

Valence-changing adjectival operators

Certain adjectives give rise to lexical possessive relations. As an example, consider the adjectives *favorite* and *own*. The translation of the adjective *favorite* takes a monadic nominal predicate for its first argument and returns a two-place predicate.

(29) $[\![\textit{favorite}]\!] = \lambda P \lambda x \lambda y [\textbf{favorite}(\hat{}P, x, y)]$

Here **favorite** expresses a relation between entities and their favorite things of a given type. Note the resemblance between the denotation of favorite in (29) and the interpretation of the possessive determiner given in (5b); they differ

only in that the possessive determiner introduces the extrinsic possession relation, while the denotation of *favorite* involves a lexical relation between entities and their favorite objects, as mediated by the property in question.[14]

If we take a naturally non-relational noun like *human* and combine it with *favorite*, we get a two-place relation suitable for a possessive meaning without invoking the extrinsic possession relation.

(30) a. $[\![\textit{John's favorite human}]\!] = \lambda y[\textbf{favorite}(\hat{}\textbf{human}, \textbf{j}, y)]$

b. 'the set of entities y such that y is John's favorite human'

There is a strong intuition that *favorite* carries a uniqueness entailment. However, note that *favorite* rarely occurs except in a possessive construction. If we get *favorite* out from under a prenominal possessive, the uniqueness entailment goes away.

(31) I saw a favorite movie of yours the other day.

Here the experiencer argument of *favorite* has been absorbed by the postnominal *of* phrase through syntactic combination. Since a use of (31) does not entail that the listener has a unique favorite movie, I conclude that any uniqueness entailment for expressions in *favorite* are parasitic on other factors.

Note that there is another reading for *favorite* possessives on which the lexical denotation of *favorite* undergoes suppression in the lexicon, so that *the favorite horse* denotes the horse that is some unspecified group of people's favorite. This predicts that it should be possible to find an extrinsic reading for a *favorite* phrase. This is much more difficult than it is for, say, kinship terms; that is, it is extremely difficult to interpret *John's favorite horse* in such a way that John is not the judger of the horse. However, expressions like *today's favorite horse* show that an extrinsic reading is indeed possible with *favorite*. One way to see that *today's favorite horse* has an extrinsic reading involving suppression is to note that it continues to entail the existence of some unspecified set of people who hold the described horse in high esteem—that is, it isn't the referent of *today* that is the experiencer.

[14] The treatment of *favorite* is the only place in this dissertation where I explicitly give an intensional analysis. This in unavoidable for *favorite*. To see why, imagine that we live in a world in which the cobblers are coextensional with the dart players. Then my favorite cobbler is not necessarily the same person as my favorite dart player. In the classification of adjectives given in Kamp (1975), in addition to being non-extensional (as just shown), *favorite* is non-predicative (there is no independent set of favorite things). Furthermore, *favorite* is affirmative, and therefore non-privative (my favorite cobbler is always still a cobbler), so that $\textbf{favorite}(\hat{}P, x, y)$ entails $P(y)$.

Note that the first argument of the translation of *favorite* must be a predicate of valence 1. An attempt to combine *favorite* with nominals that are obligatorily relational leads to ungrammaticality: **John's favorite travels*, **John's favorite singing loudly in the bathroom*, **John's favorite tallness*. This observation amounts to the claim that the first argument of the **favorite** relation is a property, that is, the sense of a one-place predicate.

As a problem for this claim, note that *John's favorite child* can easily be construed as describing John's own offspring. However, this observation is consistent with the idea that *favorite* only takes a monadic predicate. If so, then the denotation of *child* would have to be the lexically suppressed sense, so that *John's favorite child* picks out one child from among all those related to John by the extrinsic possession relation. (Certainly there must be an extrinsic reading available, since it is not necessary that there be a kinship relation between John and his favorite child.) I claim that John's own children are salient candidates for John's favorites for purely pragmatic reasons. After all, people tend to be especially fond of their own children.

In favor of my position, if we assume that *favorite* takes only a monadic predicate, we have an explanation for the contrast in (32).

(32) a. John's color is red.
b. John's favorite color is red.

Assume that the basic meaning of *color* is a two-place relation between objects and their intrinsic color. In (32a), there is a lexical reading as well as an extrinsic reading involving argument suppression. The lexical possession reading for (32a) asserts that John himself is red, perhaps because he has been lying out in the sun too long, or because he has just embarrassed himself and he is blushing. On the extrinsic reading of (32a), the relationship between John and the color in question is mediated by the extrinsic possession relation π. On this reading, the color could be the one that John picked out to paint his car.

If *favorite* took a dyadic predicate argument, there should be two readings of (32b) that parallel (32a): a lexical reading on which John prefers to be sunburnt, and a monadic reading on which John stands in the **favorite** relation with the designated color, which need not be his own intrinsic color. However, only the monadic reading of *color* is available, as predicted by assuming that *favorite* takes only monadic nominal predicates.

A second argument that *favorite* takes only monadic arguments comes from the adjective *own*. The adjective *own* clearly does take dyadic predicates for an argument. In the discussion immediately above, for instance, I used the expression *John's own children* to distinguish children that he stands in a kinship relation with from those he stands in the more general extrinsic

possession relationship with. In contrast to *favorite*, *John's own color* can describe John's intrinsic color. If *favorite* were able to take a dyadic predicate for an argument, it ought to be able to take expressions involving *own*, but it cannot, although the reverse is possible.

(33) a. *John's favorite own children
b. John's own favorite children

The predicted meaning for (33a) would explicitly restrict attention to John's biological children, among which he has a favorite. But (33a) is not grammatical, as predicted on the assumption that *favorite* takes only monadic arguments (see section 2.7 for technical details on how (33a) is ruled out).

To complete the argument, we must observe that *own* does not undergo suppression, otherwise (33a) would be predicted good under a reading on which the non-core argument of *own* had been suppressed. In general, adjectives can undergo suppression in the lexicon, as argued above for *favorite*, as in *today's favorite horse*. Therefore *own* constitutes an exception to the lexical suppression operation. Thus **the own color* is ungrammatical, since nominals with modification by *own* are obligatorily possessed.

Note also that *own* does not take monadic predicates. This explains why *John's own gift* must involve a situation in which John stands in some lexical relation to the giving event, and not one in which all the non-core arguments of *gift* have been suppressed.

On this analysis, then, *own* is the valence 2 version of a restrictive adjective. A restrictive adjective guarantees that it will map a monadic predicate onto a subset of the objects described by that predicate. That is, a red gun is a kind of gun. A non-restrictive adjective, on the other hand, makes no such guarantee, so that a fake gun is not necessarily a gun. To see that *own* is restrictive, note that *John's own children* is a subset of *John's children*. That is, a pair $\langle x, y \rangle$ will be in the extension of the dyadic predicate denoted by $[\![$*own children*$]\!]$ only if it is in the extension of the dyadic predicate denoted by (the kinship sense of) *children*. The adjective *former* is a candidate for a non-restrictive relational adjective, since a former wife is not necessarily a wife.

General remarks

The subsections above constitute a brief survey of some topics in the lexical semantics of relational nominals and their possessive interpretations. This final subsection gives some more general remarks that apply to all lexical possessives, including the ones mentioned above.

First, note that in each case above, it is the lexical nature of the possessee phrase that controls the interpretation of the resulting possessive phrase, and

never the possessor phrase. This is especially evident in the discussion of derived nouns, as pointed out by Chomsky (1970), since it is the derived noun that is most closely related to the verbal predicate that characterizes the thematic roles available for the nominal interpretation.

The asymmetry of the possessor and the possessee is even more striking for whole/part relations. Nevertheless, when contemplating a description such as *the man's nose*, it is perpetually tempting to focus attention on the man, as if it were men that have noses, rather than noses that have men. To make this point more clearly, note that with respect to the possessive *John's divorce*, it is not people that have divorces—only some people ever get married, let alone ever get a divorce; rather, it is divorces that have people. That is, it is the lexical denotation of *divorce* that entails the existence of a divorcée, and not, say, some slot/filler script associated with the type of object of which John is an instance and that provides for a set of optional attributes including 'has-a-divorce'.

A more forceful demonstration of the relative importance of the possessee nominal over the possessor nominal comes from the non-reversibility of lexical possession relations.

(34) a. the cake's ingredients
b. *the ingredients' cake

The basic lexical translation of the noun *ingredients* is a dyadic predicate expressing a part/whole relationship between the ingredients to be described and the entity they are part of. The noun *cake*, on the other hand, translates as a monadic predicate; if you are a cake, that does not entail the existence of any other entity that stands in a particular relation to you. To see this, compare *cake* to the lexical compound *birthday cake*, which is relational in the same way that *birthday* is. Thus (34a) is fine, but (34b) is ungrammatical on a part/whole reading, because *ingredients* but not *cake* denotes a part/whole relation. Ingredients have cakes, but cakes do not have ingredients.[15]

Of course, the existence of a cake entity will entail the existence of a collection of ingredients that make up that cake. Nevertheless, the lexical denotation of *cake* does not distinguish these entailments by providing them with an explicit argument position, in the same way that the denotation of *grandmother* gives a privileged status to the grandchild role.

There is some experimental evidence that the non-reversibility of at least the part/whole relationship is learned fairly early. In Golinkoff and

[15] Incidentally, as the previous two sentences show, possessive *have* resembles the prenominal possessive in that it prefers to denote the lexical relation expressed by its direct object: compare *Boys have noses* versus **Noses have boys*.

Markessini's (1980) study of the ability of young children to understand possessives, they find that reversed ownership relations such as *the flower's boy* instead of *the boy's flower* are more difficult than the normal configuration, but not nearly so difficult as interpreting a reversed part/whole relation, such as **the nose's boy* instead of *the boy's nose*. It is not until stage IV (mean MLU [mean utterance length] of 3.44, with a mean age of 2;11) that children were able to reliably interpret the anomalous possessives, with a criterion of 75% success. (See section 2.1 for a more thorough discussion of Golinkoff and Markessini's results.)

This non-reversibility is not limited to part/whole relations, but holds of all of the lexical relations discussed in this section, including derived nominals (**the gift's man*), gerunds, (**the singing's man*), de-adjectival nouns, (**the tallness's man*), and adjectival relations (**the favorite horse's man*, which is ungrammatical on a reading that entails that the horse is the described man's favorite). I will return to the topic of the non-reversibility of lexical possessives in the next section.

Second, although the fact that derived nominals and gerunds have a syntactic argument structure is no longer disputed, it is not as universally accepted that non-derived nouns have an argument structure, or if they do, that that argument structure is relevant to formal grammatical description (see, e.g., doubts expressed by Löbner (1985)). The fact that kinship terms, body part terms, de-adjectival nouns, adjectives proper, and part/whole relations in general all participate in a system sensitive to the valence of nominal arguments, especially with respect to possessive interpretations, provides a strong argument in favor of the hypothesis that nominal denotations vary in their valence, and that valence should be explicitly represented in the truth-conditional interpretations of nominal expressions.

Third, and finally, it is important to realize that the effects described here in terms of the interaction of nominals of different valence are not limited to possessive interpretations, but involve at least the thematic role structure of (non-possessive) derived nominals and the semantics of adjective phrases. To the extent that these phenomena are all part of the same system, the stipulations needed to account for them are needed independently of the analysis of possessives, and should not be counted as ad-hoc stipulations adduced merely for the sake of providing possessives with an reasonable interpretation.

4. Extrinsic possession

This section considers the nature of the extrinsic possession relation π. Extrinsic possession is a vague relation that encompasses ownership, creation, control, adjacency, and variety of other distinct pragmatic relationships.

Adapting the ideas of Howe and Slobin discussed in section 2.1 that possession is just a special case of a more general class of locative relations, let us call this general possession relation 'proximity'. The use of an extrinsic possessive entails that the described entity is near to the possessor entity, where the relevant dimension for measuring relative nearness depends largely on pragmatic factors, as illustrated by the following parable.

John is hosting a dinner party. He spent part of his time before the guests arrived preparing some homemade yogurt. But being a prudent fellow, he also bought a large supply of commercial yogurt in case his own yogurt did not gel properly. The homemade batch turns out fine, and John serves it to his guests. In the middle of eating dinner, John utters the sentence in (35).

(35) I'm afraid my yogurt tastes a little funny.

What is the relation between John and his yogurt? The answer to this question depends on which yogurt John is referring to. One guest might suppose that John is talking about the portion of yogurt that John himself is in the middle of eating. That is, perhaps the yogurt fermented in individual servings, and one of the sub-batches of yogurt turned out badly. Another guest might suppose that John is nervously comparing his homemade yogurt to the store bought supply sitting in the fridge. A third guest, unaware that John sometimes makes his own yogurt, might suppose that John is apologizing for the fact that he has no good yogurt anywhere in the house.

The three possibilities for the referent of *my yogurt*, then, are the portion John is eating; the homemade yogurt, as opposed to the store bought yogurt; and all of the yogurt in the house, including the store-bought stuff in the fridge. These different perspectives correspond to the yogurt that is physically closest to John, namely, the portion that he himself is eating; the yogurt that he made himself; and the yogurt that he has ownership control over. These all seem like perfectly acceptable construals of (35).

What does this multiplicity in construal arise from? There does not seem to be any lexical ambiguity. I will assume that the possessive construction is simply vague across those three (or more) possible interpretations. More precisely, I will assume that the extrinsic possession relation is vague in the same way that the use of a personal pronoun can be vague. A use of *she* in the context above would be vague in that it could refer to any of the female guests. Just as John might indicate which guest he means by pointing, he might indicate which yogurt he means by gesturing at his yogurt cup. So, just as an expression involving a free pronoun cannot be evaluated against a model until there is some assignment of variables to entities, an expression involving

the possessive cannot be evaluated until there is some assignment of the possession relation to a particular extension.[16] Thus in the fragment presented in section 2.7, the extrinsic possession relation π is treated as a variable over two-place relations whose value is fixed by the context of use.

Jackendoff (1977, 13) expresses the indeterminacy in the relationship between the possessor and the thing possessed in these terms.

> One [semantic] projection rule for the [prenominal] possessive position can specify a rather loose notion of "intrinsic connection" between the possessive NP [i.e., the possessor phrase] and the object denoted by the larger NP [the host]. This notion would be sharpened by the semantic nature of the larger NP: if it is written material, intrinsic connection denotes the writer; if it is an idea, intrinsic connection denotes the discoverer; and so forth. Placing the burden of specifying intrinsic connection on the semantic component (or preferably on real-world knowledge) . . . explains the creativity in the use of the intrinsic connection: for example, *John's chair* may denote the chair that John owns (alienable possession), or, by intrinsic connection, the chair that John built, designed, or habitually sat in.

Here Jackendoff is describing our notion of extrinsic possession. For him, only one possible interpretation of the prenominal possessive receives an interpretation via his notion of intrinsic connection. For us, this translates as our characterization of the class of possessives that receive an interpretation via the extrinsic possession relation, which expresses an 'intrinsic connection' that we call 'proximity'.

Impossible extrinsic relations

One of the most mysterious aspects of my analysis of possessives is the fact that the extrinsic possession relation π never takes on a lexical relation for its value.

(36) a. the table's top
b. *the top's table

On the analysis here, we predict the contrast in (36) as a consequence of the fact that *top* is a relational noun, so that (36a) has a lexical interpretation entailing a part/whole relation; but *table* is not relational, so (36b) can have only an extrinsic interpretation on which the two-place predicate π takes on a value determined by the context of use.

[16] This fact should follow from a more general theory that predicts which expressions are referring expressions on any given occasion of use.

But why can't the vagueness inherent in the value of the relational parameter π be resolved in favor of a part/whole relation? This potential extrinsic relation would be the inverse of the lexical relation denoted by *top*. That is, we are imagining that π holds between two objects x and y if and only if x is a part of y. It is not surprising that it would be difficult to use a non-lexical possessive to express a particular relation when there is a lexical possessive available that expresses the intended relationship more directly, but I do not understand why it should be impossible.

Certainly our hypothesis that π is a generalized locative relation does not lead to an explanation, since the part/whole relation is an excellent candidate for a kind of locative relation. This was made clear in Howe's discussion (see section 2.1) of the child's production *truck wheel*, which suggests a possessive interpretation ('the truck's wheel') versus *wheel truck*, which suggests a locative interpretation ('the wheel is on the truck'). At this point, I can only observe that the extrinsic possession relation never denotes a lexical relation, without being able to provide an explanation for this fact.

Postnominal of-phrases

Even if we have difficulty guaranteeing that a lexical interpretation will not be possible for an extrinsic possessive, we are better off in our ability predict when an extrinsic interpretation will or will not be possible to begin with. Recall that we associate extrinsic possession explicitly with the possessive determiner. This predicts that extrinsic interpretations will not be available for *of*-phrases in postnominal position.

(37) a. a child of John
b. *a human of John

Since *child* can translate as a two-place predicate, it can absorb the syntactic argument expressed by the prepositional phrase *of John*. And since the parent role of *child* can be filled by a possessor, there is a sense in which (37a) expresses a kind of possessive meaning. Note that since there is no possessive determiner in (37a), (37a) does not have an extrinsic reading; that is, (37a) can only describe John's offspring. This is in contrast to the prenominal version *John's child*, which has both a lexical reading (the kinship reading) as well as an extrinsic reading (the day-care reading). Furthermore, since *human* denotes a monadic predicate to begin with, it does not have sufficient valence to combine with any syntactic arguments, which explains why (37b) is ungrammatical.

Ownership possession

It is not quite true that each of the various intrinsic connections that can be expressed by an instance of extrinsic possession are equally salient. All things

being equal, ownership is the most likely extrinsic possession relation. This effect is especially true for classes of objects that are conventionally owned or possessed, such as cars, cats, pencils, and so on. That is, *John's cat* is more likely as a description of the cat that John owns rather than as a description of the cat that John just stepped on. These nouns are not obviously relational the way that kinship terms or body part terms are. Yet they are more relational than relentlessly monadic predicates such as the translation of *human*: there is no way to guess what the relevant proximity metric is for an expression like *John's human* in the absence of some more specific context. Perhaps *cat*, *car*, and so on are on their way to becoming conventionally relational, so that at some point in the future the noun *cat* will entail the existence of an owner just as strongly as the noun *pet* does today. However, for the sake of making strong predictions, I prefer to class *cat* and *car* and their like as strictly non-relational nouns.

Null possessee phrases and local possessives

Another place where conventional expectations play a part in the resolution of an extrinsic possession relation is when possessives occur with null possessee nominals.

(38) a. I met a child of John's.
b. I met a child at John's.

In both of these examples, I analyze the object in the prepositional phrase as a possessive with a zero pronoun for a possessee phrase, i.e., [*John's* $\emptyset$]. Note that in (38a) the zero pronoun is not anaphoric for the nominal *child*, since (38a) does not have any interpretation on which it means the same thing as *a child of John's child*. Instead, I suggest that there is no restriction on the class of possessee objects, and the restrictive content of the modifier comes entirely from the value of the extrinsic possession relation.

Therefore I claim that (38a) describes a (unique) child that is somehow closer to John in some pragmatically relevant sense. The most natural interpretation of (38a) is that the child is John's biological offspring, but it is also possible to use (38a) as a description of a pupil of John's who is not his own child. To see that a genuine lexical possession interpretation is not possible in this construction, notice that **the top of the table's* is not grammatical.

If the preposition is locative, as in (38b), then the extrinsic possession relation is usually resolved in favor of John's home. This is why the possessive in (38b) is often called the local possessive (Quirk et al. (1972, 203)). However, depending on context, the possessive in (38b) could also be a description of John's restaurant or some other locale that John controls. Thus I am suggesting that the local possessive is not a separate construction, but

is just a conventionally favored interpretation of a more general construction which requires resolution of a vague possession relation.

A discussion of the role of conventional expectations in resolving the vagueness of the extrinsic possession relation appears in section 2.6.

5. Uniqueness presuppositions

Possessives generally carry uniqueness entailments, just like definites.

(39) a. I saw a child.
b. I saw the child.
c. I saw John's child.

In (39a), *a child* is indefinite, and there is no presupposition that the listener or even the speaker has enough information to distinguish the child that was seen from any other salient children. In (39b), however, the use of the definite determiner assumes that the speaker, upon demand, can furnish sufficient details to distinguish the intended referent from any other child. The possessive in (39c) patterns with the definite in this respect. That is, a use of *John's child* must refer to a uniquely determined entity, even if John happens to possess more than one child.

This section, then, will explore a way in which possessives resemble definites. The next section, however, will discuss a way in which possessives resemble indefinites more closely than definites in that possessives are able to refer to novel entities, entities that have not yet been mentioned in the discourse. From the evidence in this chapter, then, possessives can be thought of either as indefinites with a uniqueness entailment, or as (potentially) novel definites. Chapter 4 will argue that possessives are more like indefinites in another way, in that they can serve as donkey antecedents.

I assume that possessives denote descriptions, that is, sets of entities. The most straightforward way of guaranteeing that a prenominal possessive has a uniqueness entailment, obviously, would be to stipulate that a use of a possessive is only felicitous if there is at most one (relevant) entity that satisfies the description it denotes. However, this will not be adequate once we take into consideration possessives involving plural possessee phrases. For instance, if *John's children* denotes the set of all entities y such that John is the parent of y, then any subset of John's children will be in the extension of the description. Thus the uniqueness entailment must be stated in terms of maximality.

(40) Uniqueness/maximality presupposition for possessives:

For a given situation, the use of a possessive is felicitous only if there is at most one maximal entity that satisfies its descriptive content.

Because of the importance of plurals for this issue, this section will begin by discussing the interaction of plurals and possessives, followed by some more detailed comments on the interpretation of the generalization expressed in (40). Further below we will attempt to deepen our understanding of possessives with respect to absolute uniqueness: What does it mean exactly to say that a possessive must be unique? Unique with respect to what? The most obvious hypothesis would be to assume that the selection of the referent of a possessive is uniquely determined by the choice of the referent of the possessor. This is not so. Rather, the selection of the possession must be unique relative to the situation with respect to which the possessive is to be evaluated.

Plurals

A bit of technical vocabulary will help in our discussion of plurals. I will assume that the domain of discourse consists of a set of entities containing atoms and sums, where each sum corresponds to a set of atoms. Then plural definite descriptions like *the unicycles* and *the women* denote sums, and plural common nouns like *wheels* and *pedals* denote sets whose members are sums. Names and singular expressions, on the other hand, typically denote atoms and sets of atoms.

Not surprisingly, possessive relations, like verbal relations, can take proper sums as arguments.

(41) a. John and Bill's home
b. the men's home

I assume here that *home* is a dyadic predicate, so that the possession relation between the possessor and the home in this case is an instance of the lexical relation denoted by *home*. John and Bill can possess a home together even if neither John nor Bill possesses a home on their own. Similarly, if the extension of *the men* in some context is precisely the set consisting of John and Bill, (41b) can involve the sum over all (relevant) men possessing a home even if none of the individual people in the extension of the predicate denoted by *men* happens to possess a home. Assuming that on the relevant construal the conjunction *John and Bill* denotes a sum, and that *the men* also denotes a sum, then π can hold between a sum entity and some other entity without necessarily holding of the atoms dominated by that sum. All this means is that if there is a home which is John and Bill's home, it does not follow that there is any home which is John's home, in the same way that asserting that John and

Bill lifted a piano does not commit you to asserting that John lifted a piano by himself.[17]

Similarly, it is clear that the possessive as a whole can also describe a proper sum.

(42) the home's owners

Here, *owner* denotes a two-place relation. As above, a home may be possessed by Bill and John together without there being any single individual that stands in the ownership relationship to that home.

In general, singular expressions presuppose that the entity they describe is an atom. Thus for *Bill and John's home*, the described entity is presupposed to be a single house. Plurals, on the other hand, only implicate that the entity that they describe is a proper sum. The implication arises from the assumption on the part of the interpreter that if there was a single entity involved, the speaker would have used an expression with singular marking.

(43) a. Most unicycles have wheels.
b. Most unicycles' wheels are round.

To see that the tendency of a plural to denote a proper sum has only the force of an implicature, notice that an assertion of (43a) does not entail that any unicycle has more than one wheel. The same observation is true of the quantificational possessive in (43b).[18]

With these brief comments on plural expressions in possessives, we can continue with our discussion of uniqueness.

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[17] Quirk et al. report that the availability of a distributed reading for a coordinated possessor phrase correlates with whether the possessive morpheme is distributed across both conjuncts. That is, they predict that (41a) can only describe a home owned jointly by John and Bill, in contrast with *John's and Bill's homes*, for which there is only a distributed reading on which John and Bill own homes independently of each other. However, I agree with Jespersen (1909–49, vi:291) that this is a tendency and not an absolute rule. For example, Jespersen cites Austen's *Such a thought would never enter either Sir John or Lady Middleton's head*, which certainly has a lexical possession reading which does not entail the existence of a single head possessed either by Sir John or Lady Middleton.

[18] In the technical vocabulary developed in chapter 4, for each quantificational case, the unicycle variable and the wheel variable will each denote an atom.

Maximality

Now we can see what the effect of the uniqueness/maximality condition will be. Consider the lexical possessives in (44).

(44) a. I saw John's child yesterday.
b. I saw John's children yesterday.

I will assume that both of the possessives in (44) have the same descriptive content, namely, they both describe the set of entities that stand in the **child** relation to John ($\lambda y[\mathbf{child}(\mathbf{j}, y)]$), and differ only in the presuppositions due to the presence or absence of the plural morpheme on the possessee nominal.

In (44a), the fact that the possessee nominal *child* is in the singular carries the presupposition that the entity described by the possessive is an atom. By the uniqueness requirement for possessives, there must be a unique entity that satisfies the descriptive content of the possessive. These two facts in combination entail that John has at most one (relevant) child.

To see that this uniqueness entailment is a presupposition rather than a part of the content of the possessive, notice that the uniqueness entailment continues to go through even when the statement in (44a) is negated.

(45) I didn't see John's child yesterday.

I use of (45) is felicitous only in a situation in which John has exactly one child (unless you are using (45) in a metalinguistic fashion in order to deny the presupposition itself).

Now we are ready to consider the plural in (44b). The plural morpheme allows for the described entity to be a proper sum. This means that the possessive in (44b) can refer to a collection of two or more children. But each subset of these children will satisfy the descriptive content of the possessive. Thus it seems that the uniqueness presupposition is violated, since more than one relevant entity satisfies the descriptive content of the possessive.

How can we resolve the requirements of the uniqueness presupposition with the presuppositions associated with the plural? I will adopt the approach developed in Kadmon (1987) which depends on maximality. That is, I assume that the possessive in (44b) is capable of describing only the maximal set of relevant children. Let the entities a, b, and c be John's children. Then the expression *John's children* (on its lexical reading) can only refer to the maximal set of John's children, namely, $\{a, b, c\}$. One way to understand the effect of the uniqueness condition is to assume that only the maximal set of children is relevant in a given situation. Thus even though the set $\{a, b\}$ also satisfies the descriptive content of the possessive, it cannot be relevant at the same time that the larger set is.

Uniqueness with respect to cases

Judging from the discussion so far, it would seem that given the identity of the possessor, the maximality presupposition uniquely determines the identity of the entity described by a possessive. In general, however, this is not so.

Richard serves coffee and cookies in his office every day at 4 o'clock. His coffee is quite good, so you will always find people packed into his office, filling the chairs, lounging on pillows, and perched on the edge of the desk. In fact, if you arrive much past 4, you are likely not to get a seat at all. One day Tom was ten minutes past the hour. He stuck his head into the crowded office, looked around, and uttered a token of (46) in mock distress.

(46) People are sitting in my seat!

The phrasing of (46) makes it sound as if all of the seats were under Tom's control, when actually none of them were.

But we need to make a more subtle distinction here. Part of the difficulty involved in attempting to comprehend (46) comes from the fact that even if Richard abandoned his first-come-first-serve policy and guaranteed Tom a seat would be held open for him, it would not necessarily be the same seat each day. That is, there is no one seat that would be Tom's. Rather, any seat would (potentially) have been his.

There is a uniqueness entailment for the possessive in (46), yet there is no specific chair referred to. How can we resolve this puzzle? The solution is that the uniqueness is not an absolute function that considers only possessor entities and an (extrinsic) possession relation. Rather, possession here must be relativized to a particular occasion. According to the first-come-first-served principle, for any given instantiation of Richard's coffee, Tom's seat is the seat he chooses out of those available when he walks in the door. Before he arrives, none of the seats is his (the seat assignment function is undefined); when he first walks in the door, any of the unoccupied seats could be his (indeterminate); and when he sits down, exactly one seat is his, say, the small wooden crate near the door that he is sitting on right now (well-defined and unique). Each person in the room is sitting in the seat that would have been Tom's if it had been the last one available when he walked in the door. That is, each person is sitting in a seat which is the potential referent of the phrase *my seat*. Thus the uniqueness in (46) is relativized to possible situations that differ from the actual situation only in those facts necessary to make some seat (or set of seats) free.

The point that I am trying to make is that the uniqueness of a possessive is relative to a particular case, and a single scenario can contain a number of distinct cases (here, one for each seat occupier). This is very much like the discussion of factoring a set of instances into cases discussed in chapter 4 as

part of an account of the proportion problem for quantificational possessives. Therefore I will not develop this discussion further here, except to point out that the account developed in chapter 4 will need to be extended to handle cases such as (46).

Before leaving this topic, however, I will offer another example which I hope will make it plausible that the effect described for (46) plays a part in more mundane uses of sentences.

(47) a. I hate it when my feet get wet.
b. I hate it when my shoes get wet.

In (47a), the referent of *feet* is unique given the referent of the speaker. In (47b), however, there is no entailment that I have a particular pair of shoes in mind. Rather, the most natural interpretation of (47b) asserts that whatever pair of shoes I am wearing, if those shoes get wet, that makes me mad. Since the referent of the first person pronoun does not change from case to case, and since the shoes involved do change from case to case, it follows that the uniqueness of the possession does not depend solely on the identity of the possessor in question. However, note that the shoes are unique and maximal for any given situation. Say that I am in danger of soggy feet when it rains, and at no other time. Then each time it rains, *my shoes* refers to the maximal set of shoes that I am wearing at that time.

Uniqueness and maximality presuppositions will play an important part in predicting the truth conditions that arise from quantificational possessives as explained in section 4.8.

6. Definite possessives and familiarity

Like indefinites, possessives provide an opportunity to refer to an entity which has not been mentioned previously in the discourse.

(48) a. A man walked in.
b. He had his daughter with him.

In (48), the indefinite *a man* introduces a discourse marker for a man into the model, so that a later use of the definite pronoun *he* can refer back to that discourse marker as a familiar entity. Note that in contrast to the indefinite, the pronoun in (48b) would not be acceptable without some contextual clue (such as the indefinite in (48a)) to provide a referent. The possessive in (48b) resembles the indefinite more than the pronoun in this respect: the possessive *his daughter* in (48b) can be felicitous even though its referent has not been introduced by any previous indefinite.

How can possessives get away with referring to novel entities? By establishing a connection between the man introduced in (48a) and the new participant (the daughter), the use of the possessive construction exploits the familiarity of the man in order to be able to refer to the novel daughter as if it were already familiar.

The standard assumption of theories of discourse representation, such as that in Kamp (1981) and in Heim (1982) is that definites and indefinites behave differently with respect to the discourse in which they are embedded. Following Karttunen (1976), we can assume that as part of the process of interpreting a discourse, the user of a language (both the speaker and the listener) will maintain a list of entities that are relevant to the discourse, a list of discourse referents. Definites must refer to a familiar entity, that is, an entity for which there is already a discourse referent in the current list. Indefinites can serve to introduce novel entities into the discourse model.

Thus if possessives are definite, they pose a problem for the standard story, since they seem to be definites which are able to refer to novel entities.

However, the standard story of the familiarity presuppositions for definites depends on a considerable idealization of naturally occurring discourse. Fraurud (1990) gives figures for a corpus of Swedish written texts in which fully two thirds of all definites are first mentions, that is, refer to an entity not yet mentioned in the discourse. Furthermore, a substantial fraction of the indefinites (ten percent) are subsequent mentions, that is, refer to an entity already familiar from previous discourse. Either the standard model is a massive idealization of the facts, or there is rampant accommodation throughout.

Where do possessives fit in the definite/indefinite dichotomy? Are they more like definites, which (characteristically) prefer a familiar referent, or are they more like indefinites, which (characteristically) prefer a novel referent? Whether you think of possessives as definite or indefinite often corresponds to what you are interested in studying. For instance, Kadmon (1987, 154) investigates the uniqueness properties of definite descriptions, so she assumes that possessives (at least those with pronoun possessor phrases) are definite, since they carry a uniqueness presupposition; but Gawron and Peters (1990, 91) are more interested in quantificational binding, so they treat possessives as indefinite, since they have many of the binding properties of indefinites (see chapter 4). This section will support the claim that possessives are neither definite nor indefinite, since they class with either group, depending on the exact situation.

For instance, in (48), a possessive refers to a novel entity, and thus is like an indefinite. But a possessive can refer to familiar objects with equal ease, thus resembling a definite. To see this, notice that it is perfectly natural to continue the discourse in (48) with the sentence in (49).

(49) He seemed happy and relaxed, but his daughter looked terrified.

At this point the referent of *his daughter* is already familiar, having been introduced in the previous sentence ((48b)) (witness the acceptability of using a definite pronoun such as *she* in the place of *his daughter*). Nevertheless, the possessive can refer back to this familiar entity as if the possessive were a definite description. An indefinite such as *a daughter* could not appear in this context with the same interpretation.

So possessives have properties of both indefinites (they can introduce novel participants into the discourse model) and definites (they can refer back to familiar entities). In fact, the examples in (48) and (49) show that the same possessive (namely, *his daughter*) can exhibit either one of these functions on different occasions of its use.

Partly in view of the behavior of possessives, Prince (1978) suggests a more elaborate classification than definite versus indefinite. She proposes at least a three-way distinction between new, unused, and anchored. The referent of a definite possessive is good as a first mention because it is anchored to a familiar object by means of the possessive relation.

This idea is taken up by Löbner (1985) as well as Fraurud (1990) and developed into a theory of the use of descriptions in which possessives refer to a network of discourse entities connected by various relations (see, e.g., Fraurud (1990, 406)). In these theories the relations between the objects are pragmatic, or at best conceptual (i.e., cognitive but non-linguistic). In fact, Löbner explicitly wonders whether the relations involved in these networks are ever grammaticized. The main result of this section will be to show that the ability of a possessive to describe a novel entity depends on the way in which its possession relation is interpreted. Since the possession relation is constrained by grammatical factors (in particular, lexical versus extrinsic possession), it follows that the discourse properties of possessives are also constrained by the same grammatical properties.

Unfortunately, a formal theory of novelty and familiarity is beyond the scope of this dissertation. However, it will be possible to offer some remarks showing that the distinction between lexical possession and extrinsic possession advocated in this chapter will be relevant to any adequate theory of discourse anaphora.

Familiar relations

I claim that a prenominal possessive can refer to a novel participant only if the relation between the possessor and the possession is well-defined—to extend the standard terminology, only if the possession relation itself is familiar. This observation, in combination with the account of lexical and extrinsic possession developed above, gives rise to a number of predictions.

In order for this idea to make sense, I must say a little bit more about what it means for a relation, as opposed to a discourse participant, to be familiar. What I am suggesting is that the discourse model not only maintains a list of individuals that are relevant at any point in the discourse, but also a list of particularly salient relations. Just as for individuals, relations can be nominated as familiar either by certain linguistic expressions, or by non-linguistic context.[19]

The question of familiarity never enters the picture for lexical possessives, since there is no opportunity for vagueness. That is, the translation of a lexical possessive (by definition) is built directly from the relation denoted by the possessee nominal, without the mediation of the extrinsic possession relation π. This is why lexical possession easily gives rise to possessives with novel referents. Extrinsic possessive relation is more vague, and therefore more indefinite. This predicts a contrast in acceptability between a possessive involving lexical possession that is used to describe a novel entity versus one involving extrinsic possession.

(50) a. I saw John's child today.
b. #I saw John's human today.

In a neutral context, unless the individual described by the possessive has been mentioned in previous discourse, the lexical possessive is much more successful at introducing a novel discourse participant than the extrinsic possessive.

As shown in section 2.2, kinship terms such as *child* denote relations, but *human* denotes a monadic predicate and can only serve as a possessee nominal via extrinsic possession. Assuming a neutral context, the lexical possession in (50a) gives rise to a perfectly felicitous possessive that refers to a novel entity. But even assuming that John is familiar from previous context, the possessive in (50) is infelicitous. The listener would probably respond by asking for more information about who this person associated with John is supposed to be—or, more precisely, what the relation between John and the mysterious person is supposed to be.

A related prediction, then, is that possessives that can normally receive either a lexical interpretation or an extrinsic interpretation will resist an extrinsic interpretation in a context in which it introduces a novel entity. Recall that a possessive built from a multi-valent noun like *book* can have a number of interpretations. An expression like *John's book*, for instance, can refer to

[19] In a sense, this is the fundamental assumption of the so-called E-type analysis of descriptive pronouns advocated by Evans (1977), Cooper (1979), Heim (1990), Neale (1990), and others, on which some pronouns denote relations which can take their value from surrounding context.

the book that John wrote (lexical) or the book that John owns (extrinsic). (See section 2.3 for details.) If this possessive is used to introduce a novel entity, however, the extrinsic interpretation is unavailable.

(51) John likes to talk about his book.

In a neutral context, it is very difficult to interpret *his book* in (51) as anything except the book that John wrote (though see below for a discussion of non-neutral contexts).

Why should this be so? That is, why is extrinsic possession unable to license the introduction of a novel participant the way that lexical possession can? As suggested above, part of the way in which a possessive goes about introducing a novel entity into the discourse is through establishing a connection between the novel entity (the possession) and an already familiar entity (the possessor). If the possession involves a lexical relation, then the connection between the possessor and the possession is well understood. If the possession involves the extrinsic possession relation, however, then all of the vagueness and indeterminacy discussed in section 2.4 enters in. To the extent that the extrinsic possession relation for a particular instance of a possessive is more vague, then the connection between the familiar possessor and the novel possession is also vague; and to the extent that that connection is vague, the possessive fails to establish a firm connection between the two objects, and the familiarity by association falls through.

On this view, if the response to a use of *I saw John's human* is "Who??", a satisfactory response would be to provide more information about the nature of the extrinsic possession relation that holds between John and the person that he possesses, e.g., by continuing with "the guy over there that John is studying for his anthropology project. . .". One additional prediction, then, is that if a context can somehow make a particular value for the extrinsic possession relation more prominent, then a possessive with an extrinsic interpretation will become more effective at introducing a novel individual.

(52) a. Look at John and Mary over by those giant rocks!
b. I think John's boulder is staggeringly beautiful.

A use of *John's boulder*, as in *I saw John's boulder yesterday*, would normally provoke an objection from a felicity-minded listener (e.g., *What boulder?*). This is as expected, since *boulder* is a monadic predicate. But the discourse in (52) seems natural enough. The context in (52a) sets the stage by suggesting that the spatial proximity of people and rocks is of interest. This makes it easy to resolve the vagueness of the extrinsic possession relation between John and his boulder in (52b) in favor of the boulder that he is closest to, and this renders (52b) felicitous, despite the fact that *John's boulder* is a first mention. There is a correlation, then, between the constraints a context places

on the extrinsic possession relation, and the ability of a possessive to refer to a novel referent. In other words, in (52) the linguistic context (especially the locative preposition *by*) renders a particular relation between people and rocks salient enough to be counted as familiar, and therefore available as a value for the extrinsic possession relation occurring as part of the translation of the possessive description.

As noted in section 2.4, there is a continuum along which nominal predicates lie, with fully lexicalized relations that do not permit argument suppression, like gerunds and nouns from adjectives on one end, and with relentlessly monadic nouns on the other. In the middle are nouns which are loosely associated with some conventionalized expectation that a particular possession relation will be more relevant than others. This is especially true of nouns that name a class of objects that are commonly owned by a large proportion of the population. For instance, people in this country typically possess cars, cats, and pencils, but not busses, sticks, or squirrels. This fact predicts the following contrasts.[20]

(53) a. I saw John's car yesterday.
b. #I saw John's bus yesterday.

(54) a. John accidentally snapped his pencil.
b. #John accidentally snapped his stick.

(55) a. John is not very fond of his cat.
b. #John is not very fond of his squirrel.

For the classes of objects that are conventionally possessed by the typical modern person (cars, pencils, and cats), possessives even in neutral contexts are acceptable. However, they are acceptable only on a reading on which the possession relation is ownership. In (55a), for instance, John's cat cannot be construed as the cat that John stepped on. (With additional context, perhaps, this disambiguating effect can be defeated.) The point is that possessives are good as descriptions of novel entities only the extent that the nature of the possession relation is made clear, either through lexicalization or through conventionalized expectation. That is, the (a) examples work only to the extent that our expectations make it reasonable for us to assume that we know what the relationship between the possessor and the possession is without needing further inquiry.

[20] These examples were originally inspired by an example of Ellen Prince's involving a contrast between the conventional possessability of cars and firetrucks.

These examples are parallel to the disambiguating effects noted above for lexical versus extrinsic possession. The difference is that the contrast here is not between lexical possession and extrinsic possession, but between extrinsic possession with a conventionalized expectation and extrinsic possession without such expectations. In other words, the contrasts in (53) through (55) are further out along the continuum of grammaticized possession.[21]

Licensing discourse anaphora

So far we have been investigating when a possessive can introduce a novel entity into the discourse. We can ask the same question with respect to the possessor phrase rather than the possessive as a whole. Like indefinites, possessors can refer to a novel entity; are they also able, like indefinites, to nominate their referent for inclusion in the discourse model? That is, can first-mention possessors license discourse anaphora?

(56) a. A man walked in.
b. He began to sing.

(57) a. A man's daughter walked in.
b. She began to sing.

(58) a. A man's daughter walked in.
b. #He began to sing.

On the standard story, the indefinite in (56) introduces a novel discourse marker into the list of familiar objects; that is why the definite pronoun in (56b) is good. In (57), an indefinite possessive can serve the same purpose—as long as it is the referent of the entire possessive that you want to refer to as familiar (in this case, the daughter). If you want to try to refer to the possessor, however, the indefinite in (58a) is inadequate for the purposes of establishing a familiar discourse referent, as shown by the oddness of (58b).

Note that a use of (58a) commits the speaker to the existence of both the man and the daughter equally. Obviously, then, neither the use of an indefinite nor commitment to existence is a sufficient condition to guarantee later familiarity. It seems that the commitment to the existence of the possessor in (58a) behaves like the existence entailments due to multivalent predicates that have undergone suppression. Recall that a use of *John's gift* entails the existence of a recipient, but this entailment does not license subsequent reference by a definite: *#John's gift was terribly expensive, and she liked it* is no

[21] See also section 4.3 for a discussion of the interaction of relational nouns, conventionalized expectation, and the accommodation approach to explaining the use of definites as first mentions.

good in a neutral context even when the pronoun *she* is understood to be the recipient of the gift.

It may be that a theory that makes a distinction between familiarity and salience would be helpful here.

(59) a. A man's daughter was waiting on the corner.
b. He was going to pick her up later.

The pronoun *he* can refer to the father more easily in this example than in (58). It may be that the referents of indefinite possessors do indeed count as familiar, but there is an additional requirement on pronouns that their referent be sufficiently salient. In (59), the man is at least as salient as anyone else that the daughter might be waiting for, so that the pronominal reference in (59b) is felicitous. This would explain the deviance noted in (58), since there is no reason to suppose given (58a) that the man in question is even present in the room, let alone the most likely person to burst into song.

To summarize this section, we have seen that possessives with definite possessor phrases can serve either to introduce a novel participant into the discourse model, or they can serve to describe an entity already familiar from previous discourse. Furthermore, there is a contrast between lexical possessives and extrinsic possessives, in that lexical possessives always succeed at introducing a novel participant, but in order for a use of an extrinsic possessive to be felicitous as a description of a novel participant, the contextually determined extrinsic possession relation expressed by that possessive must be sufficiently salient that the intended referent can be picked out without any difficulty. In view of this systematic contrast, any adequate theory that attempts to predict which expressions are capable of introducing a novel participant into the discourse must take the lexical/extrinsic opposition into account.

7. Fragment

This section summarizes the analysis of non-quantificational possessives motivated and defended in this chapter. Although there is nothing new here which is important from an explanatory point of view, there is substantially more detail concerning the technical implementation of the analysis.

My strategy for providing possessives with semantic interpretations is fairly standard, and proceeds in four steps. First, each expression is associated with one or more syntactic surface structures. Second, each surface structure maps into one or more logical forms. Third, each logical form gives rise to one or more expressions in a higher-order logic. Finally, the logic receives a formal semantics with respect to a set-theoretic model. I will discuss

each of these phases in general terms before presenting the details of the fragment.

I will rely on the phrase structure rules developed in chapter 1 for a surface structure for the non-quantificational possessives considered here. Recall that a possessive expression such as *the men's room* has two structures, one according to the spec-of-DP analysis, and one on which *men's room* is a compound. To a large extent, the regularities in the compositional semantics of lexical possessives explored in section 2.3 carry over to the semantics of possessive compounds. For instance, even though there are idiosyncratic qualities distinguishing a men's room as a bathroom (compound reading), from a room standing in an extrinsic possession relation to the kind named by *men* (spec-of-DP, productive syntactic possessive reading), even on the idiomatic reading there is a possession relation between men and the type of room in question, namely, an extrinsic possession relation involving a proximity metric that depends on exclusive control of a room (exclusive, that is, in contrast to women) . However, these connections between noun-noun compound readings and spec-of-DP readings will not be explored in detail here. This chapter has concentrated exclusively on the spec-of-DP structure, since it is the spec-of-DP structure that is of interest in the subsequent chapters, which explore the interaction of possessives with quantification. Therefore we will consider only spec-of-DP surface structures as provided by the phrase structure given in chapter 1.5.

In general, I assume that there is a level of logical form potentially distinct from surface structure. In chapter 3 I will argue that the expressions involving quantificational possessives such as *most peoples' dogs* crucially involves a logical form distinct from surface structure. In chapter 2, however, there is no pressing need for a logical form distinct from surface structure. The fragment presented here, then, will operate as if the semantic interpretation rules directly interpret the surface structures produced by the phrase structure rules presented in chapter 1. However, since these rules given here will be used in the interpretation of possessives in later chapters, where the distinction between surface structure and logical form is more important, I will adopt the perspective that the semantic interpretation rules in this chapter translate logical forms that accidentally happen to be identical to surface structure.

It is possible in general that a single local tree will correspond to two distinct interpretation rules. This would be appropriate if a single construction systematically gave rise to two distinct interpretations. There is no evidence that this possibility is needed to describe possessives. There are, however, systematic ambiguities that correspond to a particular construction. For instance, the prenominal possessive systematically gives rise to either lexical

or extrinsic possession. However, in the system presented here, this corresponds to a lexical ambiguity in the zero determiner that governs prenominal possessives.

The logic used in the interpretations is a higher-order intensional logic expressed by means of the lambda calculus. It is higher-order because it involves abstraction over predicates as well as over individuals. In addition, the language is partially typed. More specifically, each interpretation rule specifies the valence of the subconstituents mentioned in the rule. The practical importance of the restrictions on valence comes from the fact that some nominals are ambiguous between translations of several valences. For instance, by hypothesis, a nominal such as *gift* is ambiguous between a predicate on one, two, or three arguments, depending on how many arguments have been suppressed. In any given environment, only one sense of *gift* will be appropriate, depending on the number of its arguments which are explicitly associated with the denotations of its neighboring phrases. Thus the valence of the translation of the noun *gift* is 1, 2, and 3, respectively, in *the gift, the gift from Marie,* and *John's gift to Marie.* If the logical language were not typed, we would have to worry about spurious readings arising from accidentally failing to suppress the correct number of arguments. This technical issue will be spelled out in more detail below.

There will be a distinction between the entailments at issue and presuppositions. At-issue entailments are the entailments that follow from the satisfaction conditions due to the expression in question, and presuppositions are the entailments which must be satisfied in order for an occurrence of the expression to be felicitous independently of satisfaction conditions with respect to a model. More specifically, the familiarity/novelty entailments of definites and indefinites are presuppositions. As discussed in section 2.5, the uniqueness entailments of definites and possessives will also be cast as presuppositions. I do not have anything new to say about the projection of presupposition, so I will leave statement of the presuppositions as in section 2.6, where they are interpreted as conditions of use associated with particular occurrences of a construction. However, section 4.9 discusses the interpretation of the uniqueness/maximality presupposition in quantificational contexts.

One of the most important features of the fragment developed here is that I will assume that all descriptions, both definite and indefinite, as well as possessive descriptions, denote predicates on individuals rather than individuals. Thus *the man* denotes the set of men ($\lambda y[\mathbf{man}(y)]$) rather than some unique entity that is a man ($\iota y[\mathbf{man}(y)]$). This enables a uniform treatment of indefinites and possessives, so that *a man* also denotes the set of men ($\lambda y[\mathbf{man}(y)]$), and a possessive like *John's man* denotes the set of men that stand in a possession relation with John ($\lambda y[\pi(\mathbf{j}, y) \wedge \mathbf{man}(y)]$). Thus the difference between a definite and an indefinite will not be evident in their logical interpretation,

but rather in the conditions under which an expression is felicitously used in a particular discourse. Roughly, a definite will be felicitous only in a context in which it is predicated of an entity which is familiar from previous discourse, and an indefinite will be felicitous only in a context in which it is predicated only of entities that are novel in the discourse. As discussed in section 2.6, a possessive is able to describe a novel entity just in case the possessive relation itself is definite. (See section 3.3 for more on context.)

The remainder of this chapter is organized as follows. First I present the logical language used to give interpretations for the logical forms, giving its syntax and its model-theoretic interpretation. Then I give a number of examples illustrating the discussion in the first part of the chapter.

The logic

The syntax of the logic consists essentially of conjunctions of basic formulas augmented by lambda abstraction.

There are arbitrarily many symbols in the language divided into a set of constants and a set of variables. These symbols will be taken to be atomic from the point of view of the logic, except that each symbol will have a superscript taken from the nonnegative integers. These superscript numbers will correspond to the valence of a relation; they will be used to force agreement between the valence expected by a lambda abstract and the valence of its argument. Superscripts will be suppressed when this should not lead to any confusion. Symbols set in boldface represent constants (e.g., **j** and **gift** are constants, but x and y are variables).

Basic formulas: if α^n is a symbol with $n > 0$ and $\phi_1, \phi_2, \ldots, \phi_n$ are any well-formed expressions in the language, then $[\alpha^n(\phi_1, \phi_2, \ldots, \phi_n)]^0$ is a (basic) formula. (The superscript 0 indicates that basic formulas have valence 0, that is, they denote truth values.) Note that the number of symbols appearing inside the parentheses is equal to the valence of the relation symbol α^n. We say that ϕ_i is the ith argument of α^n. In practice, an argument of a basic formula will either be an entity-denoting symbol (either a variable or a constant), a formula, or the sense of a predicate. In fact, an argument will almost always be an entity-denoting expression. The exceptions in this fragment involve the treatment of quantificational possessives given in chapter 3, in which quantificational operators take formulas for their arguments, and the treatment of the adjective *favorite*, which takes the sense of a predicate for one of its arguments.

Lambda abstraction: if α^n is a variable and $[\phi]^m$ is a formula or a lambda abstract, then $[\lambda\alpha^n[\phi]^m]^{m+1}$ is a lambda abstract. Note that the valence of the abstract is one greater than the expression over which the abstraction is performed. That is, lambda abstraction is a valence-increasing operation.

Functional application: if α^n is a symbol and $[\phi]^m$ and $[\psi]^n$ are formulas or abstracts, then $[[\lambda\alpha^n[\phi]^m]^{m+1}([\psi]^n)]^m$ is a well-formed expression. Here the lambda abstract is the functor and the expression in parentheses is the argument. Note that the valence of the argument matches the valence of the distinguished symbol α^n; we shall see that this syntactic matching is what prevents an argument of a particular valence from combining with an inappropriate functor expression. The fact that the valence of the functor is one greater than the valence of the larger expression simply says that giving an argument to a functor decreases its valence by one. That is, functional application is a valence-decreasing operation. Note also that formulas (and abstracts), but not symbols, are allowed as arguments to a lambda abstract.

Logical connectives: if $[\phi]^0$ and $[\psi]^0$ are formulas then the conjunction of two formulas $[[\phi]^0 \wedge [\psi]^0]^0$ is also a formula. Other logical connectives can be defined analogously, but we will only ever need logical conjunction.

Intensional expressions: if ϕ is an expression, then $[\hat{}[\phi]^n]^n$ (the sense of ϕ) and $[\check{}[\phi]^n]^n$ (the extension of ϕ) are well-formed expressions.

The well-formed expressions in the language comprise all and only the symbols and the complex expressions as described above.

The semantics for the logic provides set-theoretic denotations for the well-formed expressions relative to a model M and an assignment function g. A model M is a four-tuple $\langle E, +, W, F\rangle$, where E is a join semilattice having $+$ as join operator, W is a set of possible worlds, and F is the lexical meaning relation. An expression ϕ will have a semantic value only with respect to a model M, a choice of a particular possible world $w \in W$ (where W is the set of possible worlds included in M), and an assignment function g. We will write $[\![\phi]\!]^{M,w,g}$ for the denotation of ϕ with respect to the model M, the possible world w, and the assignment function g. Since the choice of a model and of a reference world will hold constant during the evaluation of most expressions, I will often suppress reference to them in the rules below. For instance, I will write $[\![\phi]\!]^g$ for the denotation of ϕ with respect to the assignment function g when the choice of a model and of a possible world are understood.

The reason for requiring E to be a join semilattice is to provide a rudimentary structure for discussing the denotation of plurals. Singular terms (typically) denote atoms in the lattice, and plural terms (typically) denote proper sums, so that $[\![\textit{John}]\!] = j$, where j is an atom, and $[\![\textit{John and Bill}]\!] = j + b$, where $j + b$ is a sum and $j \leq j + b$, where $\leq$ is the partial order corresponding to $+$. I will often write $\{j, b\}$ instead of $j + b$. This treatment of plurals is standard since Link (1983).

Values for expressions in the logic are built up from the set of entities E and the set of truth values $2 = \{T, F\}$. A formula is true (with respect to a model, a possible world, and an assignment function) just in case it evaluates

to T, and false just in case it evaluates to F. Symbols of valence 0 denote entities, and complex expressions of valence 0 (i.e., formulas) denote truth values. Symbols with valence greater than 0 denote relations of the appropriate valence, so that a symbol α^n denotes the characteristic function of a set of n-tuples. In particular, the lexical meaning relation associates a constant with a set of denotations of the appropriate valence, and assignment functions are functions from variables to denotations of the appropriate valence. Thus if α^n is a constant, then $[\![\alpha^n]\!]^g = F(\alpha^n)$; otherwise, $[\![\alpha^n]\!]^g = g(\alpha^n)$.

There is a special symbol underscore '_' used as a place holder for lexically suppressed arguments. The underscore functions as if it were a variable, each occurrence of which is distinct from all other variables in the translation. This technical device does not prevent an assignment function from assigning the variables corresponding to two distinct occurrences of the underscore symbol to the same entity, however, just as two deictic pronouns can sometimes refer to the same object. For the purposes of this chapter, we can imagine replacing each occurrence of underscore with a unique variable of valence 0 before evaluating the denotation of the expression.[22]

Basic formulas are interpreted as the result of applying the function denoted by the symbol to the n-tuple consisting of the denotations of its arguments. Thus basic formulas denote truth values: $[\![\alpha^n(\phi_1, \ldots, \phi_n)]\!]^g$ denotes that truth value t such that $[\![\alpha^n]\!]^g(\langle [\![\phi_1]\!]^g, \ldots, [\![\phi_n]\!]^g \rangle) = t$.

Lambda abstracts denote functions from the type of the distinguished symbol to the type of the formula abstracted over. Thus the denotation of $\lambda\alpha^n\phi^m$ is a function from the set of n-tuples of denotations to the set of m-tuples. In particular, $[\![[\lambda\alpha^n\phi^m](\psi^n)]\!]^g = [\![\phi^m]\!]^{g'}$, where g' is that assignment function just like g except as required by the fact that $g'(\alpha^n) = [\![\psi^n]\!]^g$. I will take advantage of this equivalence below to simplify instances of functional application by replacing them with semantically equivalent expressions in which the substitution of the denotation of the argument expression for that of the distinguished symbol has been executed in the syntactic representation of the expression. In other words, this equivalence licenses lambda conversion.

[22] Note that this treatment suggests that the variable that serves as the translation of a suppressed argument is free to be bound by a quantificational operator. I will not explore this possibility here, except to note that it might account for sentences like Partee's *Every participant had to confront and defeat an enemy*, in which the suppressed argument of the relational noun *enemy* is intuitively bound by the quantification, and in fact can be identical to the participant variable—that is, for each quantificational case, the participant and the enemy that are relevant stand in the **enemy** relation to one another. See Partee (1989).

Intensional expressions denote functions from the set of possible worlds W into the set of extensional meanings. In particular, $[\![\hat{}\phi]\!]^{M,w,g}$ is that function f such that $f(w') = [\![\phi]\!]^{M,w',g}$ for all $w' \in W$. In addition, $[\![\check{}\phi]\!]^{M,w,g}$ returns the result of applying the intensional function denoted by ϕ to the possible world supplied by the context. That is, $[\![\check{}\phi]\!]^{M,w,g} = [[\![\phi]\!]^{M,w,g}](w)$. Thus $[\![\check{}\hat{}\phi]\!]^{M,w,g} = [\![\phi]\!]^{M,w,g}$, as usual.

As for logical conjunction, $[\![\phi \wedge \psi]\!]^g$ is true just in case $[\![\phi]\!]^g$ is true and $[\![\psi]\!]^g$ is true, and false otherwise.

By placing the burden of lambda conversion on manipulation of the assignment function, it is necessary for assignment functions to take variables of valence greater than 0 as arguments. In particular, the extrinsic possession relation π is a a variable of valence 2, and hence depends for its value on the assignment function against which it is evaluated.

Mapping possessives into the logical language

The mapping from logical form into the logical language is strictly compositional, in that the translation of each constituent depends only on information local to that constituent. More specifically, it depends only on the category of the constituent and the translations of its immediate children. This compositionality will be accomplished by associating interpretation rules with phrase structure rules. Since logical form is identical with surface structure for the purposes of this chapter, this amounts to associating interpretation rules with the phrase structure rules characterizing surface structure given in chapter 1.

The function F giving the interpretations of words and morphemes that serve as terminal nodes in the logical form into (well-formed) expressions in the logic is provided by the lexicon. Some representative translations appear in (60).

		Syntactic formative	Lexical interpretation	
(60)	a.	John	$\mathbf{j}^0$	
	b.	Mary	$\mathbf{m}^0$	
	c.	human	$\lambda y[\mathbf{human}(y)]$	
	d.	child_{of}	$\lambda x \lambda y[\mathbf{child}(x, y)]$	
	e.	child	$\lambda y[\mathbf{child}(\_, y)]$	parent suppressed
	f.	$\text{gift}_{\text{from, of}}$	$\lambda x \lambda y[\mathbf{gift}(x, y, \_)]$	recipient suppressed
	g.	gift_{to}	$\lambda z \lambda y[\mathbf{gift}(\_, y, z)]$	giver suppressed
	h.	gift	$\lambda y[\mathbf{gift}(\_, y, \_)]$	non-core roles suppressed
	i.	$\text{gift}_{\text{from}}$	$\lambda x \lambda z \lambda y[\mathbf{gift}(x, y, z)]$	giver first
	j.	gift_{to}	$\lambda z \lambda x \lambda y[\mathbf{gift}(x, y, z)]$	recipient first

(61)	a.	the	$\lambda P^1[P^1]$	
	b.	a	$\lambda P^1[P^1]$	
	c.	$\emptyset_{[\text{poss}]}$	$\lambda R^2[R^2]$	lexical possession
	d.	$\emptyset_{[\text{poss}]}$	$\lambda P^1 \lambda x \lambda y[\pi(x,y) \wedge P^1(y)]$	extrinsic possession

Note that some formatives, such as *child* and *gift*, have more than one lexical translation, i.e., they are lexically ambiguous. Furthermore, the lexical translations can differ in valence, so that the first sense of *child* in (60d) has valence 2, but the second sense in (60e) has valence 1, since the parent argument is suppressed (recall that this suppression occurs as part of the lexical semantics, and thus falls outside the scope of this fragment). We shall see how different lexical translations lead to different interpretations for more complex phrases below.

Functional categories such as determiners also receive lexical translations into the logic. The determiners *the* and *a* have identical denotations; as mentioned above, the difference between determiner phrases headed by *the* and those headed by *a* is expressed as a difference in the conditions for felicitous use.

The zero determiner that governs the prenominal possessive has two lexical meanings. In one sense given in (61c), it is similar to the determiners *the* and *a*, in that it is the identity function on its argument. The difference is that this sense of the possessive determiner takes arguments of valence 2, not of valence 1 (compare (61a) to (61c)).

The second sense of the possessive determiner given in (61d) is the one that shifts its argument from a predicate of valence 1 to a predicate of valence 2. It also introduces the extrinsic possession relation π. In the fragment given here, π is a variable, and not a constant. That is, the interpretation of the extrinsic possession relation depends on the assignment function against which it is evaluated, so that different occurrences of the extrinsic possession can potentially receive different interpretations. This is an attempt to model the way in which extrinsic possession depends on its context of use for its value. In a more elaborate fragment, it would presumably receive a treatment parallel to other indexical expressions.

It remains to give interpretation schemata for the relevant logical structures. More interpretation rules appear in chapters 3 and 4.

		Logical form construction				Interpretation
(62)	a.	DP	→	$DP_{[poss]}$	D′	$[\![D']\!]([\![DP_{[poss]}]\!])$
	b.	$DP_{[poss]}$	→	DP	Poss	$[\![DP]\!]$
	c.	D′	→	D	NP	$[\![D]\!]([\![NP]\!])$
	d.	DP	→	D′		$[\![D']\!]$
(63)	a.	NP	→	N′		$[\![N']\!]$
	b.	N′	→	N		$[\![N]\!]$
	c.	N′	→	N	PP	$[\![N]\!]([\![PP]\!])$
	d.	PP	→	P	DP	$[\![DP]\!]$

Determiner phrase rules appear in (62), and rules for translating some prepositional phrase nominal arguments appear in (63).[23]

In general, unit productions (i.e., the rules that correspond to local trees with only one daughter: (62d), (63a), and (63b)) pass the translation of the daughter on unmodified. Purely syntactic markers such as the possessive phrase clitic in (62b) or the (governed) preposition in (63d) do not contribute to the interpretation. The translations of the remaining constructions all amount to functional application.

Examples

We are now ready to consider the interpretation of phrases. Unfortunately, we will have to postpone a discussion of clauses and even many types of determiner phrase until the next two chapters. This is because I assume that determiner phrases fall into two classes with respect to their denotations: names such as *John* denote entities, but descriptions, whether they are definite, indefinite, or possessive, translate as monadic predicates. A phrase like *the man*, for instance, denotes the set of entities x such that x is a man (there will also be a presupposition that there is only one such relevant entity). The composition rules are designed as if determiner phrases in argument positions and in specifier positions (including prenominal possessives) uniformly denoted entities. This means that *John's child* will receive a good interpretation, since the determiner phrase in possessor position is a name and denotes an entity,

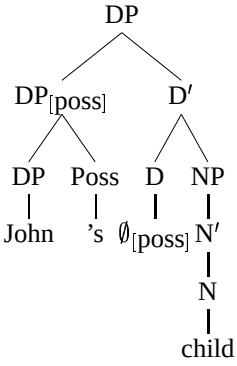
[23] I have used the same denotation operator symbol $[\![\cdot]\!]$ for referring to the denotation of phrases of English ($[\![$*the men*$]\!]$ = the denotation of *the men*), for the interpretation of expressions in the logical language laid out immediately above ($[\![\lambda x P(x)]\!]$ = the denotation of the expression $\lambda x P(x)$), and now for the translation of logical form structures into the logical language ($[\![DP]\!]$ = the denotation of the logical form constituent dominated by the relevant DP node). I hope that the variety of uses of this metalinguistic operator is less confusing than having a different convention for each of these mappings would have been.

but *the man's child* is problematic in that the possessor is a description and denotes a set rather than an entity. The general solution to this problem will be developed in chapter 3. There, Quantifier Raising will raise all descriptions, leaving behind an entity-denoting variable suitable for the translation rules given above. In the meantime, we will make do with using only names in possessor position. This is not such a handicap, however, since most of the analysis developed in this chapter is essentially a theory of the semantics of possessive D′ expressions. [24]

We will begin by presenting the examples given above in (4) and (13) in some more detail.

(64) a. John's child

b.



(65) a. $[\![$*John's child*$]\!]$

b. $[[\![\emptyset_{[\text{poss}]}]\!]([\![\textit{child}]\!])]([\![\textit{John's}]\!])$

c. $[[\lambda R^2[R^2]](\lambda x \lambda y[\mathbf{child}(x,y)])](\mathbf{j})$ senses (61c), (60d)

d. $\lambda y[\mathbf{child}(\mathbf{j},y)]$

e. 'the set of all entities y such that y is the child of John'

Referring to the surface structure/logical form in (64b), the interpretation of *John's child* proceeds in (65) as follows: the interpretation rules for logical form provide the (simplified) compositional structure in (65b); substituting the lexical translations (with the choices for ambiguous items as indicated)

[24] Often is is desirable from a metatheoretical point of view for all determiner phrases to have the same semantic type of denotation, including names, descriptions and quantificational nominals. (Usually the problem is finding a common denotation space for descriptions and quantificational nominals.) Homogeneity of denotation could easily be achieved here by raising the type of proper names from entity-denoting expressions to set-denoting expressions, so that $[\![\textit{John}]\!] = \lambda y[\mathbf{John}(y)]$.

gives (65c); and lambda-conversion gives the simpler equivalent expression in (65d). As promised, possessives are descriptions that translate as predicates of valence 1. A paraphrase of the reading is given in (65e). Thus (65) gives the kinship reading of *John's child*.

If we choose the other lexical interpretation for *child*, we get the day-care reading, the extrinsic possession reading.

(66) a. $[\![$*John's child*$]\!]$
b. $[[[\![\emptyset_{[\text{poss}]}]\!]([\![\textit{child}]\!])]([\![\textit{John's}]\!])$
c. $[[\lambda P^1 \lambda x \lambda y[\pi(x,y) \wedge P^1(y)]](\lambda y[\mathbf{child}(\_, y)])](\mathbf{j})$ (61d), (60e)
d. $\lambda y[\pi(\mathbf{j}, y) \wedge \mathbf{child}(\_, y)]$
e. 'the set of all entities y such that John possesses y and y is the child of somebody'

Note that in (66) we not only selected a different lexical sense for *child*, we chose the other sense for the possessive determiner as well. What would happen if we chose one of the other two possible combinations of senses?

(67) a. $[[\lambda R^2[R^2]](\lambda y[\mathbf{child}(\_, y)])](\mathbf{j})$ (61c, 60e)
b. $[[\lambda P^1 \lambda x \lambda y[\pi(x,y) \wedge P^1(y)]](\lambda x \lambda y[\mathbf{child}(x, y)])](\mathbf{j})$ (61d, 60d)

In each case the valence of the deepest logical argument does not match the valence of the distinguished symbol of the relevant lambda abstract. In (67a), for instance, the valence of the deepest argument is 1, since $\lambda y[\mathbf{child}(\_, y)]$ is formed from a formula of valence 0 by a single instance of lambda abstraction. The relevant symbol is R^2, which has valence 2. The subexpressions of (67b) are similarly mismatched.

According to the syntactic rules of our logical language, the expressions in (67) are not well-formed. I assume that the choice of lexical interpretation is free, so that only some interpretations arrived at by faithful application of the composition rules are well-formed. The rest (such as those in (67)) must be discarded. It would have been possible to allow (67) as logically well-formed, and then to fail to provide interpretations for such mismatches. I would also have been possible to provide a more elaborate logical form in which some sort of syntactic feature matching guarantees a coordinated choice of lexical interpretations, in order to avoid producing ill-formed logical expressions. I do not have a strong preference among these alternatives, but it does seem to me that the one developed here provides a reasonable balance between simplicity and clarity.[25]

[25] By the same token, there is nothing that I have said so far that would prevent a structure just like that in (64b) except that the matrix DP is expanded without a possessor phrase. Then the DP $[\emptyset_{[\text{poss}]}$*child*$]$ would translate as a two-place predicate, namely, $\lambda x \lambda y[\mathbf{child}(x, y)]$. This is harmless, since a

Some further examples appear in (68) through (72).

(68) a. John's human $\lambda y[\pi(\mathbf{j}, y) \wedge \mathbf{human}(y)]$
b. extrinsic reading

(69) a. John's gift $\lambda y[\mathbf{gift}(\mathbf{j}, y, \_)]$ sense (60f)
b. John as giver

(70) a. John's gift $\lambda y[\mathbf{gift}(\_, y, \mathbf{j})]$ sense (60g)
b. John as recipient

(71) a. John's gift $\lambda y[\pi(\mathbf{j}, y) \wedge \mathbf{gift}(\_, y, \_)]$ sense (60h)
b. extrinsic reading

(72) a. the human $\lambda x[\mathbf{human}(x)]$
b. the child $\lambda y[\mathbf{child}(\_, y)]$ sense (60e)

These examples give all of the well-formed interpretations for the phrases shown according to this fragment. In particular, note that the same sort of type matching we saw above in (65) and (66) guarantees that the non-possessive example in (72b) can only make use of the sense of *child* in which the parent role has been suppressed.

(73) a. John's gift from Marie $\lambda y[\mathbf{gift}(\mathbf{m}, y, \mathbf{j})]$ sense (60i)
b. John's gift to Marie $\lambda y[\mathbf{gift}(\mathbf{j}, y, \mathbf{m})]$ sense (60j)

The examples in (73) show how postnominal arguments can adjust the valence of a nominal so as to be appropriate for forming a lexical possessive. The senses of *gift* used in (73) are triadic, but after combination with a prepositional phrase, one argument has been absorbed, reducing the valence to 2, as required.

(74) a. the gift from John $\lambda y[\mathbf{gift}(\mathbf{j}, y, \_)]$ sense (60f)
b. the gift to John $\lambda y[\mathbf{gift}(\_, y, \mathbf{j})]$ sense (60g)

The examples in (74) show the way in which postnominal arguments decrease the valence of the lexical noun denotation independent of any possessive construction.

(75) a. the gift of John $\lambda y[\mathbf{gift}(\mathbf{j}, y, \_)]$ (60f)
b. *the human of John $[\![\textit{the}]\!]([\lambda y[\mathbf{human}(y)]](\mathbf{j}))$

---

predicate of valence 2 will not be able to participate in larger expressions due to valence mismatches. This situation would not even arise on a more detailed syntactic analysis on which we were able to express the fact that the possessive determiner $\emptyset_{[\text{poss}]}$ never occurs except in the presence of a possessor phrase.

The example in (75a) shows how postnominal *of* phrases are treated just like any other syntactic argument, predicting that they will have lexical possessive interpretations but not extrinsic interpretations. In addition, nouns that denote only monadic predicates, such as *human*, are not able to take a postnominal possessive, as shown in (75b). The reason (75b) is ruled out is that the denotation of *the* requires a predicate of valence 1, but the formula given as its argument in (75b) has valence 0.

(76)	a.	John's gift from Marie	$\lambda y[\pi(\mathbf{j}, y) \wedge \mathbf{gift}(\mathbf{m}, y, \_)]$	(60f)
	b.	John's gift to Marie	$\lambda y[\pi(\mathbf{j}, y) \wedge \mathbf{gift}(\_, y, \mathbf{m})]$	(60g)

The fragment also predicts the availability of extrinsic readings for these phrases, as shown in (76). For these readings, dyadic senses of *gift* combine with one postnominal argument and the extrinsic possession sense of the possessive determiner. These readings are more difficult to get, but they do exist.

Notice that I have been careful to arrange things so that the denotation of the object of the preposition *to* will always correspond to the third argument of **gift**, the recipient argument. Similarly, the object of the preposition *from* always matches up with the giver argument. I have crudely indicated how this could be worked out in the syntax by annotating the various senses of *child* and *gift* with subscripted prepositions. These annotations should be interpreted as specifying that if the verb sense in question combines with a prepositional phrase, then that PP must be headed by the indicated preposition (or one of the prepositions, in the case of (60f)). Thus for the sense of *gift* given in (60f) in which the first argument is interpreted as the giver, the noun can combine with a prepositional phrase only if that prepositional phrase is headed by *from* or by *of*, as illustrated in (76a).

I will end this section with a brief comment on the uniqueness presupposition discussed in section 2.5. On this fragment, possessives translate as descriptions, that is, predicates of valence 1. Such predicates can be true of more than one entity. For instance, $[\![\textit{John's children}]\!] = \lambda y[\mathbf{child}(\mathbf{j}, y)]$ can be true of any collection taken from John's children. If John's children are Doug and Simona, then $[\![\textit{John's children}]\!]$ is true of the entities d, s, and their sum, $d + s$. But since possessives are felicitously used only of the maximal entity in their extension, $[\![\textit{John's children}]\!]$ is felicitously used only as a description of the sum $d + s$.

Similarly, *John's child* used in this situation would also be predicted to refer only to $d + s$ as far as the descriptive content of the possessive construction is concerned. Such a use is ruled out by the fact that the singular marking on *child* presupposes that the described entity is an atom, so that *John's child* is infelicitous in a situation in which there is more than one salient child of John's.

Thus on the formal analysis presented here, names denote entities, and possessives uniformly denote sets of entities. We shall see in the next chapter how to interpret possessives with a description for a possessor phrase (instead of simple examples in which the possessor is a name, as in the examples in this chapter); and in chapter 4, we will see how to interpret possessives containing quantificational possessor phrases.

3

Logical Form for Quantificational Possessives

0. Introduction

One of the most mysterious features of the semantics of possessives is the way in which the properties of the possessor project to control the properties of the host determiner phrase. For instance, ability to appear in an existential *there* construction depends on the properties of the possessor phrase.

(1) a. There is a man in the garden.
b. *There is the man in the garden.

(2) a. There is a man's dog in the garden.
b. *There is the man's dog in the garden.

Determiner phrases headed by *the* are unacceptable in an existential construction, as shown by (1). The choice of determiner continues to determine acceptability in (2) even when it is embedded in a possessor phrase. This is despite the fact demonstrated in chapter 2.6 that possessives such as *the man's dog* are capable of describing a novel entity, just as if it were an indefinite description. Note that I am assuming here that the so-called definiteness effect depends at least partially on the semantic properties of the post-copula determiner phrase.

For a second example of the way that the semantic properties of a possessor control the semantic properties of the host possessive, note that quantificational determiners can stand in a binding relation with a pronoun even when the determiner in question is embedded inside of a possessor phrase.

(3) Every woman's father loves her.

Here the quantifier denoted by *every* binds the variable denoted by *her* even though *every* is embedded within the possessor phrase, and therefore does not command the pronoun in surface structure.[1]

In chapter 2, we saw that the possessee phrase was the most crucial element in determining the descriptive content of a possessive. In general, however, the most important factor in determining the semantic properties of the

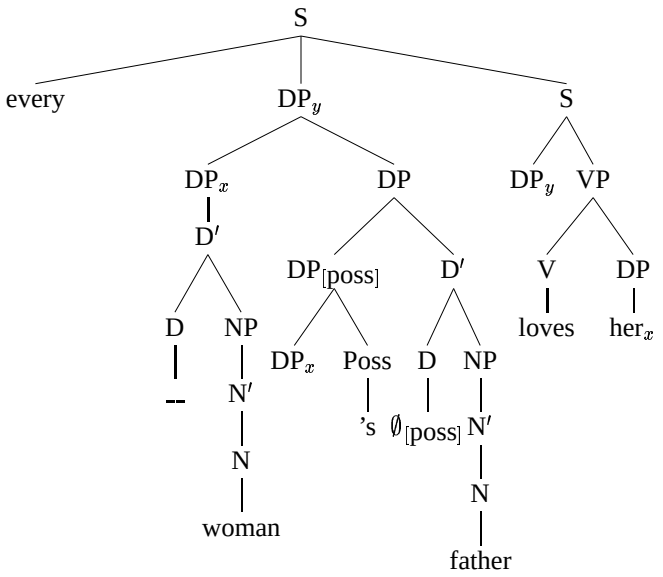
[1] Recall from the introduction that a node x commands a node y in a tree structure (roughly) just in case the mother of x dominates y.

entire possessive phrase apart from its descriptive content is the identity of the most deeply embedded determiner.

The goal of this chapter is to develop a logical form for expressions containing possessives which reflects the way in which an embedded determiner projects its semantic influence far beyond its surface structure position. This will be accomplished primarily through a rule of quantifier raising, which will raise embedded possessor phrases so that they have logical scope over their surface structure host determiner phrases.

In other words, the logical structure of a possessive will potentially be substantially different from its surface structure. For instance, here is the logical form I propose for (3).

(4)



Note that in addition to raising both of the possessive phrases, the quantificational determiner has been raised to a position in which it has the entire quantificational clause in its scope.

Since chapter 4 will investigate the interpretation of possessives in quantificational contexts, I will concentrate here primarily on the behavior of quantificational determiners when they are embedded in possessor phrases. Unfortunately, I will have nothing further to say about the projection of the definiteness effect in the existential construction, though I have every reason to believe that the analysis of quantification developed in chapters 3 and 4 will be consistent with an adequate theory of the definiteness effect.

One of the conclusions of this chapter, then, will be that it is insightful to have a level of logical form distinct from surface structure. There are at least three main sorts of arguments in favor of a logical form distinct from surface structure that will be mentioned in this introductory section. First, and most importantly, the logical scope of quantifiers in general does not always match up with the surface structure position of the element that gives rise to the quantificational operator. The example in (5), for instance, involves the quantificational adverb *usually*.

(5) a. If a man owns a donkey, he usually beats it.
b. usually(if a man owns a donkey)(he beats it)

In (5), the quantifier denoted by the adverb *usually* has influence over the interpretation of the entire sentence, despite the fact that syntactically it is embedded as a verb phrase adjunct in the second clause. That is, the interpretation of (5a) must be as sketched in (5b), in which *usually* has scope over both the conditional clause and the consequent clause.

We shall see that quantifiers denoted by determiners embedded in possessive specifiers shows a similar mismatch between their surface structure position and their logical scope.

(6) a. [[Most professors'] wives] believe that he loves them.
b. most(professors' wives)(believe that he loves them)

Despite the fact that *most* is embedded inside the possessor phrase in subject position, it has the logical structure shown in (6b) (compare (6b) to the structure in (4)).

The main goal of this chapter, then, is to describe the relationship between a quantificational determiner embedded in a possessive and the domain over which the quantifier denoted by that determiner has logical scope.

So once we have decided to raise quantificational possessives out of specifier position, the question becomes one of deciding where exactly it will move to. That is, what is the scope of a quantificational determiner embedded in a possessive? I will give two arguments that the correct scope corresponds to the maximal host nominal. The argments come from donkey anaphora and the licensing of negative polarity items. These arguments support the conclusion reached by May (1985), namely, that quantificational possessor phrases raise to adjoin to their (maximal) host DP rather than to adjoin to S.

The second sort of argument in favor of a logical form comes from the fact that it is convenient for technical and conceptual reasons to avoid interpreting quantificational nominals in argument position. Instead, quantificational nominals raise up in logical form in order to take scope over a clausal constituent, leaving behind a variable. If, for instance, the quantificational determiner phrase occurs as the direct object of a transitive verb in surface

structure, this means that in logical form, the transitive verb takes an entity-denoting variable as its argument. This allows verb meanings to be expressed as relations over entities. This treatment differs from the standard Montagovian approach (e.g., Montague (1970)), where intensional verbs crucially take the sense of a generalized quantifier as an argument.

Thus one motivation for a raising rule is to create a logical form in which predicates take entities for their arguments. I show that this motivation holds for possessive contexts as well, since it is not possible to interpret correctly a prenominal possessive in which the specifier denotes a generalized quantifier. Instead, we are much better off raising the quantification nominal out of specifier position so that the specifier contains a variable in logical form. That way the problem of interpreting the possessive construction reduces to the situation for which we developed the interpretation scheme in chapter 2, which dealt with possessives with entity-denoting possessors.

The third sort of argument in favor of logical form, and perhaps the most familiar, comes from the desire to model quantifier scope interactions. Relative scope ambiguity will not be part of the main development of this dissertation.

It is possible to provide a coherent account of the truth conditions of quantificational possessives interpreting the surface structure directly; but I do not see how to do it in a way that is at all appealing. Some of the technical difficulties involved in in-situ interpretation of quantificational possessives are discussed in chapter 4, especially section 4.4.

Although I will not discuss the definiteness effect mentioned above for existential constructions, a second important theme of this chapter and of the dissertation is the status of possessives with respect to the more general distinction between definiteness and indefiniteness. We saw in chapter 2 that possessives have presuppositions like a definite, but discourse properties more like an indefinite. In this chapter we will see that possessive phrases have properties similar to indefinites with respect to donkey anaphora and negative polarity licensing. In order to truly be able to compare possessives with indefinites we must have a semantics in which all three sorts of objects are treated in a similar fashion. The details of the interpretation of quantificational operators will not be discussed until chapter 4. However, this chapter can still compare the behavior of possessives with proper indefinites with respect to the syntactic distribution of donkey anaphora and negative polarity licensing.

A secondary goal of this chapter is to introduce the donkey anaphora problem for possessives, the resolution of which will be the central issue of chapter 4. In this chapter, evidence from donkey anaphora will provide evidence in favor of the logical form proposed. Additional evidence will come from the licensing of negative polarity items such as *any* or *ever*, which also

depends (in part) on the logical scope of quantificational operators. The importance of the donkey anaphora problem for possessives is that once we decide to treat possessives as equivalent to donkey anaphors, choosing an interpretation for possessives becomes tantamount to deciding on an approach to donkey anaphora. In particular, we must make sure that our analysis of quantificational possessives does not fall prey to the proportion problem. These issues will be discussed extensively in chapter 4.

The previous chapter presented a simple compositional logic for representing the interpretation of possessives. The next chapter will extend the logic to treat quantificational possessives. The current chapter, then, is a bridge between the two. In chapter 2, the interpretation of possessives interpreted surface structure. More precisely, we assumed that the logical forms of the examples under investigation were coincidentally identical to their surface structure. For quantificational possessives, this assumption is not appropriate. This chapter, then, will propose a logical form for quantificational possessives distinct from their surface structure. The logical form proposed will then serve as the input to the interpretation procedure developed in chapter 4.

1. Donkey Anaphora

Donkey anaphora occurs when an indefinite controlled by a quantifier seems to bind a pronoun that it does not command.[2]

(7) Every woman who owns a donkey beats it.

On the most natural reading of (7), for instance, there is donkey anaphora involving the indefinite *a donkey* and the pronoun *it*: for every choice of a woman, there is a potentially different donkey that she beats.

It is crucial for distinguishing donkey anaphora from normal anaphora that the indefinite fails to command the pronoun. Otherwise, the binding would be perfectly normal quantificational binding as in (8).

(8) a. Every New Yorker believes that he is suave.
b. Every woman gave a donkey a blanket to keep it warm.

Note that there is quantificational binding in (8a) linking the choice of a referent for *he* to the choice of a particular New Yorker. On the traditional account, the pronoun denotes a variable which is bound by the quantifier denoted by *every*. If the antecedent commands the pronoun, as in (8b) (the direct object *a donkey* commands the purpose clause including the pronoun *it*), then presumably there is nothing to prevent the alleged donkey antecedent from binding the pronoun through a normal binding relation.

[2] This is a particularly liberal definition of donkey anaphora.

Actually, the relationship between donkey anaphora and traditional quantificational binding is more complicated. Although it is clear that traditional quantificational binding will not generalize to donkey anaphora (since traditional binding requires that the antecedent command the pronoun), most analyses of donkey anaphora will automatically account for traditional binding. In fact, on Heim's (1982) analysis, the relationship between *a donkey* and *it* in (8b) can only be established through the mediation of a quantificational operator, since for her, descriptions such as *a donkey* do not have any quantificational force of their own.

The other position to take, of course, is that traditional binding, when properly implemented, automatically extends to cases of donkey anaphora. On this view, there need not be a command requirement between a binder and its anaphor. On certain proposals (e.g., Barwise (1986), Groenendijk and Stokhof (1991)), an indefinite like *a donkey* can denote an existential quantifier which can "bind" a pronoun that it does not command, even across sentences. The fragment developed in chapter 4 will be more like the Heimian (1982) alternative, in that the binding of all pronouns will be accomplished through unselective binding.

In any case, there is a correlation between the logical scope of a quantifier and the distribution of donkey anaphora. The correlation works in both directions: certain quantificational operators allow for donkey anaphora between elements in their logical scope, and certain configurations of quantificational operators prevent the formation of donkey anaphoric links. For instance, there cannot be a donkey anaphora relation between a donkey anaphor and its antecedent that crosses the logical scope of *every*.

(9) Every man who believes that
[every time a woman owns a donkey, she beats it]
wants to feed it carrots.

The indefinite *a donkey* is within the logical scope of the quantifier corresponding to the adverbial expression *every time*, and it cannot serve as a donkey antecedent for the second occurrence of the pronoun *it*. Thus the logical scope of *every time* is a donkey anaphora island.[3]

I will demonstrate the correlation between logical scope of a quantificational element and the availability of donkey anaphora first for non-possessive examples, and then for possessive examples. There will be two

[3] However, note that Roberts (1987) describes systematic cases involving quantificational subordination and modal subordination in which a non-quantificational anaphoric link crosses what would normally be a donkey anaphora island boundary.

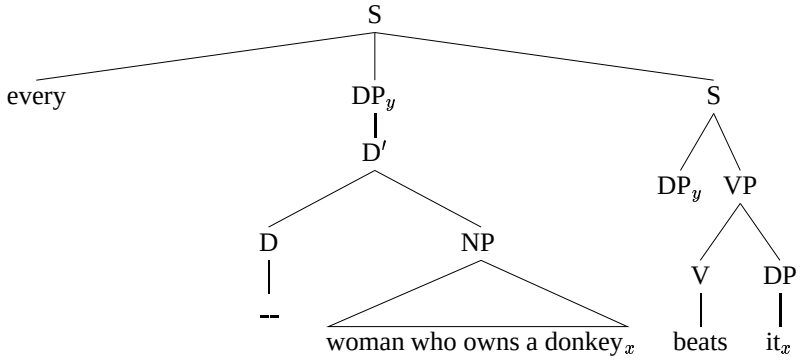
general conclusions: first, that quantificational determiners embedded in possessor phrases have scope over a broader domain than their surface structure command domain; and second, that possessee phrases resemble indefinites in their ability to serve as donkey antecedents. The next section will provide a very similar set of arguments with respect to the licensing of negative polarity licensing.

First, some working vocabulary. Donkey anaphora involves interactions among three main ingredients. Consider again *Every woman who owns a donkey beats it* (example (7)). There are indefinite phrases, such as *a donkey*, which I will call donkey antecedents; there are the pronouns whose reference depends on a donkey antecedent, such as the pronoun *it*, that is, the donkey pronouns; and there are the quantificational operators, such as *every*, that play a part in determining the relationship between the donkey antecedents and the donkey pronouns.

It will help in understanding the donkey anaphora data to sketch the semantic analysis to be given in chapter 4. Following Heim (1982), I assume that donkey indefinites (and all indefinites) translate as open formulas containing a free occurrence of a variable; the donkey pronoun, like all pronouns, denotes a variable, potentially coindexed with other variables in the scope of a quantifier; and certain quantificational operators can take scope over and bind any number of free variables. The donkey indefinite only seems to bind the donkey pronoun, when actually it is the quantificational operator that simultaneously binds them both.

(10) a. Every [woman who owns a donkey] [beats it].

b.



In this sort of analysis, the quantifier denoted by *every* quantifies over cases, where each case specifies a value for the woman variable as well as for the

variable shared by the donkey description and the pronoun.[4] Since the quantifier denoted by *every* commands both the description of the donkey as well as the pronoun, it can bind both occurrences of the variable x in the resulting logical translation.

We will actually need to be more precise concerning the constituency of the logical form in (10b). Note that *every* has two siblings corresponding to the bracketed phrases in (10a). In the terminology of Heim (1982), quantifiers take two logical arguments called the RESTRICTION and the NUCLEAR SCOPE. The restriction (partially) characterizes the set of relevant cases, and the nuclear scope divides the set of cases into two parts based on some discriminating property. In (10), the restriction requires that any relevant case must involve a woman and a donkey such that the woman owns the donkey, and the nuclear scope distinguishes among those cases on the basis of which women/donkey pairs are such that the woman beats the donkey. I will refer to the combination of the restriction and the nuclear scope of an operator as its LOGICAL SCOPE. The logical scope of an operator, then, consists of all and only the material that the operator commands at the level of logical form.

Obviously, in order to be a donkey pronoun, you must be in the scope of the quantifier that controls the quantification. Therefore the existence of donkey anaphora (or any kind of quantificational binding) will give an indication of the domain over which the quantifier in question has logical scope.

I will also assume that in order to be a candidate for a donkey antecedent, a variable must be introduced by a description in the restriction of a quantificational operator. Thus if we have an instance of donkey anaphora, we can deduce that the donkey antecedent must be a part of the restriction of the quantifier in question. The donkey anaphora test will play a crucial role below in determining the extent of the restriction of quantifiers that arise from quantificational determiners embedded in possessives.

The donkey data

We now consider the question of how possessives participate in donkey anaphora.

(11) Every woman's donkey believes that she likes it.

We can tell that the denotation of *every* has the possessee phrase *donkey* in its restriction because there is a reading of the pronoun *it* on which it is bound by

[4] Actually, in the fragment developed in chapter 4, cases are sets of assignment functions, so it is the choice of a particular instance of a case that fixes the value of the variables in question.

the description of the donkey. That is, the referent of the pronoun is potentially different for every case involving a different women and her donkey. This is not, strictly speaking, donkey anaphora, since the antecedent (*donkey*) commands the pronoun, but it does suggest that the quantificational determiner embedded in the possessive must somehow be able to encompass the possessee phrase in its restriction.

(12) Every woman's donkey's veterinarian believes that she likes it.

To see that the possessee phrase of a quantificational possessive can also serve as a donkey antecedent, note that (12) has a reading on which the pronoun *it* refers to a donkey, and on which its referent co-varies along with the choice of a woman. The point of (12) is that the entire possessive *every woman's donkey* is itself embedded as a possessor phrase in order to guarantee that the possessee description does not command the pronoun.

So the evidence from donkey anaphora presented so far argues that the logical extent of the embedded quantificational determiner extends at least at far as the sentence over which that quantifier has scope. Furthermore, we can guess that the restriction of the quantifier extends at least as far as the end of the chain of host nominals that it is embedded in. More evidence concerning the exact domain of the restriction will appear in the next section.

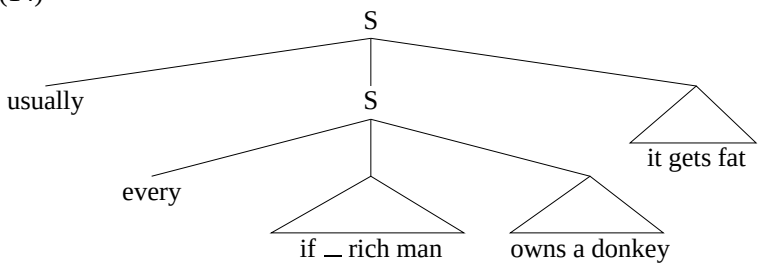
We will now turn to evidence that the effects noticed above do not extend beyond the end of the clause over which the quantifier has scope. This will be accomplished by considering quantificational possessives embedded in larger structures, as well as the possibility of donkey anaphora in discourse continuations.

It turns out that indefinites in the scope of some quantifiers cannot serve as donkey antecedents for donkey pronouns outside the scope of that quantifier. The contrast in (13) shows that *every* denotes such a quantifier.

(13) a. Usually, if a rich man owns a donkey, it gets fat.
b. Usually, if every rich man owns a donkey, it gets fat.

The indefinite *a donkey* in (13a) can serve as a donkey antecedent for the pronoun *it* in the consequent clause. That is, there is a reading of (13a) on which it entails that for each donkey owned by a rich man, that donkey gets fat. In other words, the choice of an entity asserted to be in the extension of the predicate denoted by *get fat* varies with the choice of the rich man. In (13b), however, the donkey anaphora does not work. The only reading available is one where *it* is deictic and refers to some fixed entity (perhaps a donkey, perhaps not). Assuming that *every* has scope only over the condition clause (its closest dominating clause), then the pronoun in the consequent is not inside its scope.

(14)



So the logical scope of *every* is an island for donkey anaphora: there cannot be donkey anaphora between an indefinite inside the scope of *every* and a pronoun outside the scope. This means that in the diagram in (14), there cannot be a donkey anaphora relation between the pronoun *it* and the indefinite *a donkey*. In general, quantifiers allow for donkey anaphora only within their scope.

The same island effect occurs with quantificational possessives.

(15) a. Usually, if every man likes his donkey, it gets fat.
b. Usually, if every man's donkey eats a lot, it gets fat.

There are no readings involving donkey anaphora in (15a), despite the ease with such a reading can be imagined. When the possessive occurs in the logical scope of *every*, as in (15b), it cannot serve as the donkey antecedent for a pronoun outside the scope of *every*.

The same generalization that quantifiers create donkey anaphora islands governs anaphora across sentences.

(16) a. Every rich man likes a donkey. It gets fat.
b. Every man's donkey is happy. It gets fat.

The examples in (16) show that neither indefinites nor possessives inside the scope of *every* can serve as antecedents for pronouns in a continuation in a discourse.[5]

Whether or not there exist quantifiers that do not create bound anaphora islands depends on what counts as a quantifier. On the dynamic logic theory advocated by Groenendijk and Stokhof (1991), for example, the indefinite determiner *a* has quantificational force, yet the indefinite can serve as an antecedent for an anaphor outside the logical scope of the indefinite determiner. In the terminology of Groenendijk and Stokhof, the quantifiers that create anaphora islands are dynamically closed. On the system developed in

[5] Once again, there is an irrelevant deictic reading for the pronoun on which it can refer to a single donkey that is owned by every man.

this dissertation, however, the indefinite determiner does not have any quantificational force. In fact, on the system developed here, all quantifiers are dynamically closed, that is, there can never be a bound anaphora relation between a description that is bound by a quantifier and a pronoun that occurs outside the logical scope of that quantifier (modulo modal subordination).

Restriction versus nuclear scope

Now we will introduce the issue of how the logical scope of a quantificational possessive is split up into a restriction and a nuclear scope.

As mentioned above, I assume that donkey antecedents occur only in the restriction of a quantifier. For instance, in *Every women who owns a donkey beats it*, the restriction of the quantifier corresponds to the surface structure complement of the quantificational determiner, that is, to *women who owns a donkey*, which contains the donkey antecedent. In the corresponding possessive example *Every woman's donkey believes that she likes it*, the donkey antecedent is either the possessor description or (one of) the possessee descriptions. This suggests that the entire possessive phrase is part of the restriction of the quantifier, and therefore (presumably) not a part of its nuclear scope.

Compelling evidence that the restriction of a quantificational possessive contains at most its host determiner phrase is difficult to come by based on donkey anaphora possibilities alone. Better evidence in support of this hypothesis comes from the behavior of possessives with respect to negative polarity licensing, as discussed in the following section.

2. Negative Polarity Licensing

The evidence presented in the preceding section suggests that quantificational determiners embedded in possessives must raise up to have scope at least over the most closely dominating clausal constituent. This section will offer evidence in the same direction. Furthermore, evidence from contrasts in the acceptability of donkey anaphora also shows that possessives are in the restriction of a quantificational determiner, and not in its nuclear scope. This section offers more detailed evidence from the licensing of negative polarity items that arrives at the same conclusion.

Negative polarity licensing and downward entailments

Ladusaw (1979) shows that negative polarity items such as *any* and *ever* are acceptable only when they appear in the scope of a downward-entailing operator. An operator is downward-entailing (decreasing monotonic) with respect

to an argument when satisfaction for one property entails satisfaction for all more specific properties.

(17) a. No cats fly.
b. No cats fly swiftly.

(18) a. Most squirrels fly.
b. Most squirrels fly swiftly.

Since the set of creatures that fly swiftly is necessarily a proper subset of the set of creatures that fly, the predicate *fly swiftly* is more specific than the predicate *fly*, where a predicate P is more specific than a predicate Q just in case it is necessarily true that the extension of P is contained in the extension of Q. That is, if something flys swiftly, it is necessarily true that that entity flies. This shows that the quantifier denoted by *no* is downward entailing with respect to its second argument, since (17a) entails (17b). The quantifier denoted by *most*, in contrast, is not downward entailing, however, since (18a) does not entail (18b). In fact, *most* is upward entailing (monotonic increasing) with respect to its second argument, since (18b) does entail (18a).

The prototypical downward-entailing operator is sentence negation, of course. As such, sentence negation is always a potential licenser for negative polarity items, as in *I didn't ever steal any candy when I was young*. But since we are interested in the logical structure of determiner phrases, we will restrict our attention to nominal operators, or more specifically, to quantifiers from quantificational determiners.

The prediction, then, is that negative polarity items can appear in the nuclear scope of *no*, but not in the nuclear scope of *most*, and this is indeed the case.

(19) a. No cat ever has any reason to complain.
b. *Most cats ever have any reason to complain.

The negative polarity items *ever* and *any* in (19a) are acceptable when they appear in the nuclear scope of *no*, but not when they appear in the nuclear scope of *most*.

The entailment properties of the quantificational determiners, then, will allow us to predict where to expect a negative polarity item.

(20)

	Quantifier	Restriction	Nuclear Scope
a.	some	upward	upward
b.	not every	upward	downward
c.	every	downward	upward
d.	no	downward	downward

See Barwise and Cooper (1981) for a more detailed justification of this classification.[6]

Here are some non-possessive sentences bearing out the predictions embodied in the chart in (20). Each sentence attempts to introduce a negative polarity item in either the restriction (the (a) sentences) or in the nuclear scope (the (b) sentences). In each case the restriction and the nuclear scope have been marked with brackets.

(21) a. *[Some child with any sense] [stole some candy].
b. *[Some child] [ever stole any candy].

(22) a. *[Not every child with any sense] [stole some candy].
b. [Not every child] [ever stole any candy].

(23) a. [Every child with any sense] [stole some candy].
b. *[Every child] [ever stole any candy].

(24) a. [Most children with any sense] [steal candy].
b. *[Most children] [ever stole any candy].

(25) a. [No child with any sense] [stole some candy].
b. [No child] [ever stole any candy].

I have used sentences expressing a habitual meaning since, to my ear, negative polarity items in sentences with nominal quantification sound best when they help characterize a habitual situation. This reflects the fact that the strategy behind the experiment we are engaged in requires giving negative polarity items their best chance at acceptability, up to the choice of a nominal quantifier. As expected, the pattern of acceptability is as predicted by the chart in (20), with negative polarity items happily occurring only in downward-entailing contexts.

Unfortunately, (24a) is an exception to this generalization. The quantifier *most* is not downward entailing with respect to its first argument, since

[6] Note that I have included the expression *not every* in the chart in (20). I do not mean to suggest that *not every* corresponds to a basic logical quantifier. Presumably the logical characteristics of expressions containing *not every* are predictable from the properties of *every* in combination with the influence of the nominal negation, so that *not every* is not a semantically simplex construction. I do claim, however, that whatever the correct analysis of such constructions, expressions in *not every* will be consistent with the conclusions reached in this section. In anticipation of the correct analysis, I include *not every* here for the sake of completing the square of opposition. The evidence below is compelling enough even ignoring the examples involving *not every*.

most people are women does not entail *most men are women*, since it can be true that there are more women than men at the same time that there aren't any men at all who are women. However, this exception does not affect the main argument here, which is that the restriction of a quantificational determiner includes the entire host determiner phrase of a quantificational possessive. Given that negative polarity items can somehow occur in the restriction of *most* despite the fact that this is not a downward-entailing environment, we shall see that the distribution of negative polarity items in quantificational possessives containing *most* behaves exactly as predicted.

It is important to be aware that occurring in a downward-entailing context is a necessary but not a sufficient condition on the licensing of negative polarity items. For example, embedded quantifiers can create islands within a larger downward-entailing constituent in which a negative polarity item cannot appear, in the same way that embedded quantifiers can create islands for donkey anaphora, as described in the preceding section.

(26) *No man genuinely believes that every woman ever paid him any attention.

The negative polarity items *ever* and *any* in (26) are not acceptable. This is despite the fact that they occur in the logical scope of *no*, which is generally a downward entailing context and a fine place to find a negative polarity item. However, they also appear in the nuclear scope of *every*, which is not a downward entailing context. In such cases, the entailment properties of the closer quantifier win, and the embedded quantifier from *every* casts an upward entailing shadow over part of the nuclear scope of the quantifier denoted by *no*.

This means that the tests below are only valid on the assumption that there is no other factor that might obscure the ability of a particular operator to license a negative polarity item. This is something of an idealization, since some of the examples below contain possessives with postnominal modifiers, which render those examples less than perfect. However, even after factoring out this effect the residual contrasts are robust enough to justify the conclusions expressed below concerning the logical structure of quantificational possessives.

Negative polarity items in possessives

Now we are ready to repeat the examples in (21) through (25), but with the determiner in question embedded inside of a possessive.

(27) a. *[Some addict's child with any sense] [stole some candy].
b. *[Some addict's child] [ever stole any candy].

(28) a. *[Not every addict's child with any sense] [stole some candy].
b. [Not every addict's child] [ever stole any candy].

(29) a. [Every addict's child with any sense] [stole some candy].
b. *[Every addict's child] [ever stole any candy].

(30) a. [Most addicts' children with any sense] [steal candy].
b. *[Most addicts' children] [ever stole any candy].

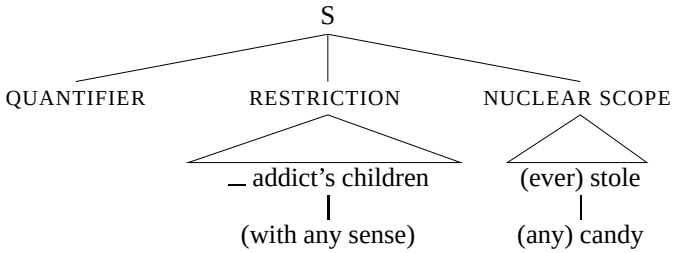
(31) a. [No addict's child with any sense] [stole some candy].
b. [No addict's child] [ever stole any candy].

The pattern of grammaticality in (27) through (31) exactly matches that in the non-possessive examples in (21) through (25). This immediately leads to two conclusions concerning the logical scope of these determiners.

First, the fact that negative polarity items in the verb phrases remain acceptable exactly when they were before in the non-possessive examples shows that the logical scope of the quantifiers denoted by the determiners extends at least as far as the end of the sentence, despite the fact that the determiner has been embedded inside of a possessor phrase. Thus the logical scope of the determiner must be greater than its surface structure command domain, as predicted by an analysis which raises quantificational possessors in logical form to have scope over its minimal clause.

Second, the restriction of these quantifiers must extend to the end of the entire host determiner phrase, including all possessee phrases. This hypothesis has been indicated by the bracketing in the examples above. This leads to hierarchical relationships at the level of logical form as diagramed in (32).

(32)



Since the acceptability of negative polarity items occurring in the possessive phrase pattern as predicted for elements in the restriction of the quantifiers, and not at all as predicted for elements in the nuclear scope of the quantifiers, the simplest hypothesis is that the possessee phrase is part of the restriction of the quantifier corresponding to the quantificational determiner embedded in the possessor phrase. The examples in (29) and (30) are especially striking: if the possessee phrase were part of the nuclear scope and not part of the restriction, we would expect the pattern of acceptability of these four examples would be exactly the reverse of the observed pattern.

Given the importance of this conclusion, it is worthwhile to make sure that we are indeed dealing with a spec-of-DP syntactic structure and not a possessive compound.

(33) a. Every poor man's hungry child with any sense steals candy.
b. *Every poor man's hungry child with empty pockets ever steals any candy.

(34) a. Most poor men's hungry children with any sense steal candy.
b. *Most poor men's hungry children with empty pockets ever steal any candy.

In each case, the preferred reading has *poor* modifying the possessor nominal only, while the adjective *hungry* and the postnominal *with* phrase modifies the possessee nominal only. This reading is consistent only with a spec-of-DP structure, as discussed in section 1.4. The resulting sentences are slightly awkward, but the grammaticality pattern is nevertheless exactly as predicted assuming that the possessee nominal is part of the restriction of the quantifier in question, and not part of its nuclear scope.

It is interesting that when the possessor is a lexical DP with quantificational force, then these tests do not work exactly as predicted.

(35) a. ?Everybody's mother with any sense has a savings account.
b. Nobody's mother with any sense has a savings account.

Since *everybody* has the same properties with respect to downward entailments as *every* does, we expect that (35a) should be as good as (35b). I suspect that (35a) is indeed well-formed from the point of view of the licensing of negative polarity items, but that it is unacceptable for independent reasons. More specifically, I claim that restrictive modification on the possessee phrase is inconsistent with the implication carried by *everybody* that the only restriction on the set of possessor entities is that they be a person.

(36) ?Everybody's mother with a steady income has a savings account.

Here the restrictive modification on the possessee phrase renders (36) as bad as (35a), but without there being a negative polarity item involved. This suggests that we cannot tell whether a negative polarity item is acceptable when it occurs inside a possessive having a lexical DP for a possessor phrase.[7]

Notice that the effects described here generalize to sentences involving an arbitrary number of embedded possessives.

[7] The way in which restrictive modification in the possessee phrase restricts the set of relevant possessors in quantificational contexts is discussed in section 4.2.

(37) a. Every professor's wife's relatives who have any sense hate him.
b. *Every professor's wife's relatives ever have any sense.

In this example, there are two levels of embedding separating the quantificational determiner from the possessee phrase containing the negative polarity items. Nevertheless, the grammaticality of the sentences continues to suggest that the possessee is part of the restriction, so that the restriction of the determiner extends all the way to the end of the maximal host determiner phrase for a quantificational possessive.

Additional levels of embedding make it possible to wonder about the behavior of negative polarity items in the intermediate possessee phrases. If the restriction of the determiner does extend all the way to the end of the largest containing possessive, then presumably negative polarity items in the intermediate possessee phrase will be acceptable according to whether or not the quantifier in question is downward entailing with respect to its first argument position.

(38) a. *Some professor's wives who have any sense's relatives are nice.
b. Every professor's wife who has any sense's relatives are nice.

Unfortunately, it is very difficult to get postnominal modifiers inside of intermediate possessee nominals. To the extent that there is a contrast in acceptability as indicated between the two sentences in (38), these examples support the claim that the middle possessor phrase is also part of the restriction of the embedded quantificational determiner.

We shall see in section 4.4 that analyzing the possessee as part of the restriction rather than in the nuclear scope of a quantificational possessive is important for deciding between alternative semantic analyses for the truth conditions for possessives. It is worthwhile, therefore, to reconsider the set of assumptions that lead us to that conclusion here. The crucial assumption is that quantificational determiners always denote generalized quantifiers that take (exactly) two logical arguments. This is the assumption that allowed us to generalize from the behavior of quantificational determiners as negative polarity licensers in simple non-possessive sentences to the more complex sentences involving possessives.

But it is at least conceivable that the negative polarity facts can be predicted without raising the quantifier to have logical scope over the whole clause. Recall that the distribution of negative polarity items follows from the distribution of downward entailment patterns. Quantificational determiners license negative polarity items only indirectly, by means of creating downward entailing contexts. In other words, all that is necessary in order to predict the distribution of negative polarity items in possessives given Ladusaw's (1979) theory is an explanation for the behavior of quantificational determiners in non-possessive contexts (which is not a problem), and a semantics for

the possessive which guarantees the entailment relationships of the following sort.

(39) a. Every professor's child loves him.
. b. Every professor's son loves him.

(40) a. Every professor's child loves him.
b. Every professor's child loves him dearly.

In (39), the (a) sentence entails the (b) sentence. We expect this on the raising analysis, since the possessee nominal is analyzed as part of the restriction of the quantifier, and *every* is known to be downward entailing with respect to its first argument. Similarly, in (40), sentence (a) does not entail sentence (b), since *every* is upward entailing and not downward entailing with respect to its second argument.

If these entailments can be shown to follow in general from the semantics of the possessive, then the correct predictions about the licensing of negative polarity items could be potentially maintained without assuming that the possessee phrases are necessarily part of the restriction (the first logical argument) of the determiner denotation.

Even though such a system in which monotonicty projects in the appropriate fashion might be descriptively adequate, it would obscure the fact that the monotonicity relationship between a nominal quantifier and its possessee denotations are always identical to the relationship between the quantifier and its possessor denotation. This correspondence falls out immediately from the assumption that possessees and possessors alike are part of the logical restriction of the quantifier, as predicted by the quantifier raising analysis. Also, it is not clear how such a theory would predict the way in which closer quantifiers shadow more distant ones, as described for the example in (26). Some further objections to such a theory are given in section 4.4.

For now, let us simply assume that quantifier raising raises a quantificational possessor so that it has scope over its entire (maximal) host determiner phrase. Certainly this will explain the distribution of negative polarity items noted above.

To conclude this section, we have seen a second set of facts entirely independent of the donkey anaphora facts which agrees in suggesting that the logical scope of a quantificational determiner embedded in a possessor phrase takes the maximal host determiner phrase as its restriction and the logical scope of the host DP as its nuclear scope.

3. Fragment

This section adds to the fragment developed in the previous two chapters by specifying how to calculate a logical form given a surface structure. Since

Quantifier Raising involves coindexed traces, and since these traces will influence interpretation into the logic, this section also specifies the way in the indexing scheme works. The resulting fragment will be able to provide logical forms for any of the examples in this dissertation that receive formal analyses. It will also provide a mapping into the logical language. The resulting logical expressions will receive a denotation, except for examples that contain a quantifier. The extension of the fragment to handle quantificational formulas is the topic of the fragment section of chapter 4. The fragment described in this section will allow us to give a denotation only to non-quantificational expressions such as *The man's child bit the lady's dog*.

Indexing

As part of the mapping between surface structure and logical form, every determiner phrase receives an index taken from the set $\{x_1^0, x_2^0, \ldots\}$. That is, each index x_i^0 is simply an entity-denoting variable symbol from the logical language described in section 2.7. (The superscript 0 will be omitted below.) In general, there are various binding principles that constrain the distribution of indices, in particular, which determiner phrases can or cannot receive identical indices. For the sake of simplicity, I will assume that indexation is entirely free. (The interpretation of the indices will be discussed below.) Basically, a determiner phrase will be construed as describing the entity denoted by its index.

Technically, we will imagine that if a node in surface structure is labeled DP, then it will correspond in logical form to a node that has the label DP_x. In particular, I will assume that pronouns can translate as any variable; see section 4.6. Labels on nodes in logical form will be suppressed unless they are of special interest to the discussion at hand. In addition to providing an explicit connection between a raised determiner phrase and its trace, in chapter 4 we will see how indexing will allow pronouns to be bound by quantifiers.

Quantifier Raising

In view of the arguments in the previous two sections, I will assume that quantificational possessives have a logical form distinct from their surface structure in which the quantificational determiner has scope over its logical arguments. This logical form will be arrived at from surface structure by means of Quantifier Raising. Despite its name, Quantifier Raising traditionally raises all determiner phrases except for pronouns and names. As mentioned in section 3.0, this allows verbs to denote relations over entities, rather than relations over property sets, so that non-quantificational determiner phrases having descriptions for possessor phrases receive an interpretation by the same rules required for quantificational determiner phrases. All determiner phrases

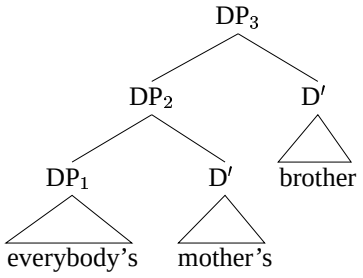
that are not names, then, raise to adjoin to S (if they are arguments) or to DP (if they are possessor phrases) leaving behind a coindexed trace. This results in a system very much like that in May (1985), where possessor phrases also adjoin to DP.[8] [9]

In addition to Quantifier Raising, I will propose a rule of Quantificational Determiner Raising, or Determiner Raising for short. Like Quantifier Raising, Determiner Raising partially characterizes the relationship between surface syntactic structure and a certain class of logical forms. The idea of Determiner Raising is borrowed from Heim (1982, 133), where it is called Quantifier Construal. This rule simply moves a quantificational determiner to attach it to its logical scope.

Even though the order of raising determiner phrases is always free, the requirement that a raised DP must command its trace will have the effect of strictly ordering the raising of possessor chains. The reason is that if an embedded possessor DP is raised before the DP that contained it in surface structure is raised, the second movement will transport the first trace outside of the command domain of the first DP. Therefore the resulting logical form will contain a determiner phrase that does not command its trace.

The tree in (41) gives the surface structure for *everybody's mother's brother* (I have suppressed the syntactic structure due to the possessive morpheme for the sake of clarity).

(41)

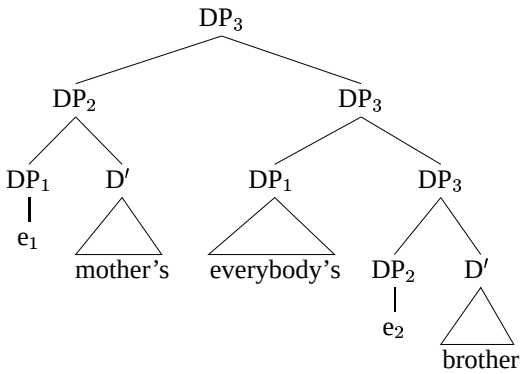


[8] If a determiner phrase adjoins to an S node that has already been the landing site of an adjunction, then there will be choice of which S node to adjoin to. I will follow May (1985) in assuming that the nodes along the spine of an adjunction structure constitute different segments of a single node, so that each new adjunction inserts new structure only at the topmost node of a previously formed adjunction structure.

[9] This analysis allows for only the inverse linking reading for DPs such as *the mayor of every city*: after Quantifier Raising, the DP *every city* is adjoined to the matrix DP, so that the entire DP has truth conditions equivalent to (the lexical possession interpretation of) *every city's mayor*.

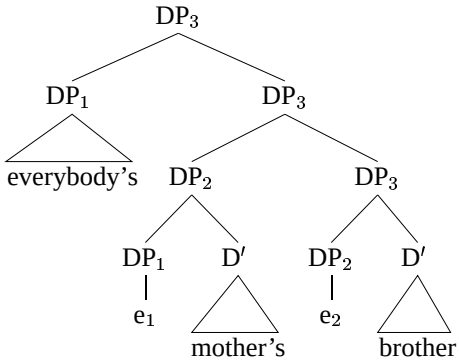
The tree in (42) gives the result after attempting to raise DP_1 first, and then raise DP_2.

(42)



The result is ill-formed, since DP_1 does not command its trace e_1. However, if we raise DP_2 first, and then DP_1, as in (43), we get a legitimate structure in which both DPs command their traces.

(43)



Thus even assuming that multiple possessor DPs can raise, and that they are free to raise in any order, there is still only one legitimate resulting logical form as long as we require that a raised constituent commands its trace.

The free application of quantifier raising can result in different logical forms, however, when the two determiner phrases to be raised are both verbal arguments. For the structure for *the dog bit the woman*, for instance, there will be two distinct logical forms, one in which the subject phrase raises first, and one in which the object phrase raises first. In the resulting logical forms,

then, one raised DP will command the other. This indeterminacy in the construction of logical form is traditionally used to represent differences in relative scope for quantificational determiner phrases. But since this dissertation does not discuss relative scope, this feature of the construction of logical form is never exploited here.

After raising all non-name DPs, all that remains for producing a logical form in which the logical arguments of a quantificational determiner are made clear is to raise the quantificational determiner itself to attach to its closest S. This will allow for its sister constituents to denote its restriction and its nuclear scope. Note that this final adjustment rule will have to be allowed to move the quantificational determiner across one (multi-segment) DP node. In the place of the raised determiner, we will leave a special symbol e_D, which will receive a semantically transparent translation exactly like that of the determiners *the* and *a*.

Interpretation

I will now explain how to translate the derived logical forms into the logical language. Although the logical forms described above are created from the surface structure via movement and adjunction, it will be convenient to describe the compositional translation of a logical form into a logical expression as we did in chapter 2, that is, by phrase structure rules associated with interpretation schemata. The phrase structure rules in (44), then, characterize possible logical form structures. Put another way, the phrase structure rules in (44) generate a superset of the class of legitimate logical forms. By giving a translation algorithm for the larger class of structures, we necessarily provide an algorithm for translating the set of legitimate logical forms arrived at from surface structures via movement.

The new constructions include adjoined structures and traces.

		Logical form construction					Interpretation
(44)	a.	DP	$\rightarrow$	DP_x	DP		$[\lambda\alpha[[[\![\mathrm{DP}_x]\!](x)] \wedge [[\![\mathrm{DP}]\!](\alpha)]]]^1$
	b.	S	$\rightarrow$	DP_x	S		$[[\![\mathrm{DP}_x]\!](x) \wedge [\![\mathrm{S}]\!]]^0$
	c.	S	$\rightarrow$	D	DP_x	S	$[\![\mathrm{D}]\!]([[\![\mathrm{DP}_x]\!](x)], [[\![\mathrm{S}]\!]])$
	d.	e_D					$\lambda P^1[P^1]$
	e.	e_x					x

The translation of a DP adjunction structure in (44a) is a description (i.e., a set-denoting expression), where α is a variable which is unique for each instance of adjunction. The lambda abstract in the translation of the DP adjunction shows that the entity described by the whole possessive DP is the same entity described by the possessee phrase; that is, *the man's dog* describes a dog. The translation of an S adjunction structure in (44b) is a formula (i.e.,

a truth-value-denoting expression). The functional application in both (44a) and (44b) in which the translation of the raised DP takes its own index for its argument guarantees that the raised DP describes the same entity mentioned by its coindexed trace. The functional application also reduces the valence of the raised DP to that of a truth-value-denoting expression suitable for conjunction with another truth-value-denoting expression.

One point worth mentioning here in anticipation of the analysis in chapter 4 is that there is no mechanism here for keeping track of the index of the possessor phrase from which a quantificational determiner moves when it adjoins to S to take scope over its restriction and nuclear scope. This would have been necessary on an analysis where quantifiers bind at most a single variable. However, since I will be developing an unselective binding theory, this is not necessary. Chapter 4 will explain in detail how it is that these quantifiers can bind all of the variables in their logical scope that need binding.

The structure resulting from Determiner Raising in (44c) is very much like the (44b), except that the translation of the determiner phrase serves as the restriction of the quantificational determiner and the translation of the S serves as the nuclear scope. The trace left behind after Determiner Raising translates as if the determiner had been *the* or *a*, as specified in (44d). Clearly, in order for the coindexing scheme to work, traces must translate as their variable index, as shown in (44e). Finally, the translation of sentences and verb phrases is simple functional application as detailed in (45).

(45) a. S → DP VP ⟦VP⟧(⟦DP⟧)
b. VP → V DP ⟦V⟧(⟦DP⟧)

These rules say that sentence translations are built through functional application in the normal fashion.

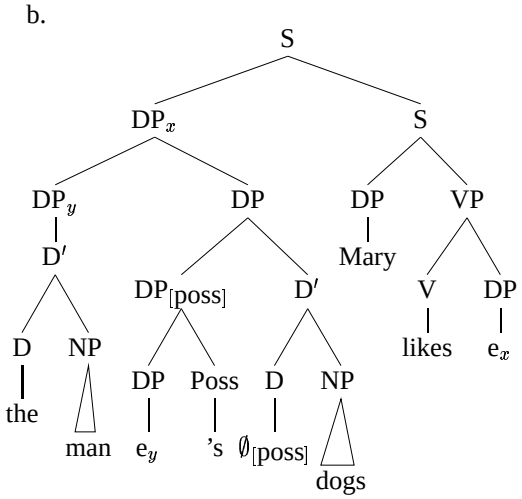
As for new lexical translations, they will be similar to those in chapter 2, except that intransitive verbs translate as predicates of valence 1, and transitive verbs translate as predicates of valence 2.

Examples

The result of these operations applied to a particular example is shown here.

(46) a. Mary likes the man's dogs.

b.



There are two instances of Quantifier Raising for this logical form, one for the description in object position (index x), and one for the description in possessor position (index y).

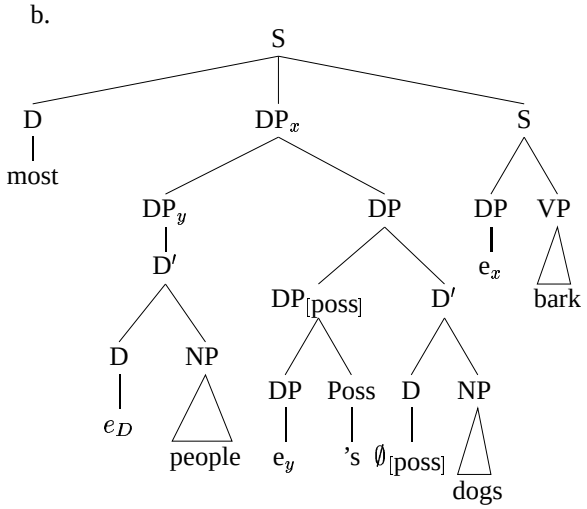
(47) $[\![$*Mary likes the man's dogs*$]\!] =$
$\mathbf{man}(y) \wedge \pi(y, x) \wedge \mathbf{dogs}(x) \wedge \mathbf{likes}(\mathbf{m}, x)$

The logical form in (47) predicts that (46a) will be true just in case it is evaluated against an assignment function that assigns the variable y to a man and the variable x to a sum of dogs such that the man possesses the dogs and Mary likes the dogs.

Now for a quantificational example.

(48) a. Most people's dogs bark.

b.



Here the logical form makes it clear that the restriction for the quantifier denoted by *most* takes *people's dogs* for a restriction and *bark* for its nuclear scope.

(49) $[\![$*Most people's dogs bark*$]\!] =$
$\mathbf{most}([\mathbf{people}(x) \wedge \pi(x,y) \wedge \mathbf{dogs}(y)], [\mathbf{bark}(y)])$

Note how the variable of which $[\![$*dogs*$]\!]$ is predicated is the same variable that appears as the subject argument of $[\![$*bark*$]\!]$.

In order to give a set-theoretic denotation to the logical translations of quantificational possessives, we will need to augment the semantic rules given in section 2.7. The nature of these new evaluation rules is the topic of chapter 4.

Truth

Readers familiar with the formal system presented in chapter II of Heim (1982) will recognize the fragment developed here as quite similar in spirit. (One important technical difference is that Heim does not provide an explicit mapping from logical form to a logical language, but rather describes how to interpret the logical forms directly.) I have chosen this representation of the semantics of these expressions because it allows a formal treatment of the truth conditions of descriptions that is neutral between definites, indefinites, and possessives, and because it leads to a particularly simple unselective binding system for describing the behavior of possessives in quantificational contexts.

Before going on, however, I should mention how this approach affects the notion of truth. Standard theories (e.g., PTQ in Montague (1970)) define 'truth' as derived from the more basic notion of 'truth with respect to an assignment function': a sentence ϕ is true given a model just in case $[\![\phi]\!]^g$ evaluates to true for every choice of an assignment function g. This only gives the desired result when $[\![\phi]\!]$ is guaranteed to contain no free variables; in PTQ, this is achieved in part by treating definite and indefinite descriptions as quantificational. In the fragment here, of course, many sentences translate to logical expressions containing free variables; for instance, *A man lived* might translate to $\mathbf{man}(x) \wedge \mathbf{live}(x)$. This logical expression might easily be true when evaluated with respect to one assignment function *g* (more specifically, whenever $g(x)$ happens to be a man who lived), but false when evaluated with respect to some other assignment function f (imagine that $f(x)$ is a potato). Therefore a PTQ-style definition of truth would incorrectly predict that *A man lived* is false even when the model contains an entity who is a man and who lived.

Heim provided a mechanism called "existential closure" which guaranteed that any free variables would eventually be bound by some existential quantifier, and similar rules could be added here if desired. However, I would like to emphasize the way in which assignment functions behave in this fragment as a rudimentary approximation of a discourse context. (In this connection, recall from section 2.7 that one job of an assignment function is to provide a value for the contextually-determined possession relation π.) Therefore I will not provide any notion of a sentence being true simpliciter. Rather, only a token of a sentence can be true, and then only with respect to its context of use. If a context *g* (technically, an assignment function) maps the relevant variable onto a man who lived, then a use of the sentence *A man lived* is true in this context. In the parlance of Discourse Representation Theory (Kamp (1981) et seq.), we can say that the assignment function *g* (when viewed as a context) ANCHORS the variable x to its discourse referent. Similarly, (given a suitably extended fragment) a discourse such as *A man walked in. He sat down.* will receive its most natural interpretation only under the appropriate assumptions about the continuity of the contexts (assignment functions) against which the individual sentences are evaluated. (See also the discussion in section 3, especially subsection 3.1, of chapter III of Heim (1982, 326).)

4

Interpreting Quantificational Possessives

0. Introduction

This chapter seeks to provide an account of the truth conditions arising from quantificational possessives like *most students' dogs*. The last chapter proposed a logical form for quantificational possessives on which the embedded possessor phrase raises in order to take scope over its host's command domain. This chapter, then, will provide an interpretation for the logical forms developed in chapter 3.

The formal treatment of quantification developed in this chapter begins with the idea of Lewis (1975) that adverbial quantification ranges over sequences of individuals rather than over a single distinguished variable. Lewis's quantificational adverbs bind any number of free variables in their scope indiscriminately, hence the name 'unselective binding'. I will continue to use this term, although we shall see that so-called unselective quantifiers bind only those variable in their scope that need binding (as noticed by Lewis).

It is helpful to think of unselective quantifiers as quantifying over sequences of individuals, where a sequence of individuals corresponds to the values given to the bound (i.e., selected) variables for each instance of the quantification. In the fragment developed below, a sequence of individuals is simply a standard assignment function mapping variables onto entities. As a first approximation, a sequence of individuals will be relevant for the interpretation of a particular quantificational expression only if the entities it assigns to variables results in the satisfaction of the restriction of the quantifier.

Although adverbial quantifiers are often treated as unselective quantifiers, the technique of quantifying over sequences of individuals is not as popular for nominal quantifier such as *every* or *most*. There is a long tradition in which nominal quantifiers quantify over sets of individuals, and there is a strong inclination to continue in that tradition. However, Heim (1982), Schwarzschild (1989), Chierchia (1988; 1990), and others have argued that nominal quantifiers as well as adverbial ones can be viewed as quantifying over sequences of individuals. The motivation for applying unselective binding to nominal quantification comes primarily from donkey anaphora facts,

and, I will argue here, from the interpretation of possessives. Therefore those who would like to maintain a univariable account of nominal quantification must account not only for the donkey anaphora facts, but for possessive interpretations as well.

Towards the goal of a modern univariable analysis, Groenendijk and Stokhof (1991) and Chierchia (1990) and others have developed a dynamic logic in which donkey anaphora can be accounted for in a system in which quantifiers quantify over one variable at a time. In their system, indefinites give rise to an existential quantifier which is capable of dynamically binding variables not in its logical scope. The domain over which these dynamic operators are active is constrained in part by the dynamic closure properties of other quantificational operators. Heim (1990) also advances a univariable account of donkey anaphora based on E-type pronouns. For her, donkey pronouns denote functions from entities to entities. The relationships established by these functions strongly resemble the possession relations discussed in chapter 2. In a sense, then, possessives denote what E-type pronouns are supposed to denote. The analogy between quantificational possessives and E-type pronouns is developed further in section 4.4.

I have opted for an unselective account for possessives for the following reason. The main problem with the single-variable quantification accounts with respect to the interpretation of possessives is that it is not clear to me how a single-variable analysis can account for the narrowing effect described in section 4.2, in which the entailments of the possessee phrase constrain the interpretation of the possessor phrase. However, I do discuss one possible approach to the narrowing effect that is consistent with a univariable analysis in section 4.3. This potential solution is based on accommodation, and I do not find it very promising.

In section 4.4 I explain why narrowing is a problem for single-variable analyses. I then go on to develop an unselective analysis in terms of sequences of variables which accounts for the narrowing effect in a straightforward fashion. Thus I will argue in favor of a refinement of Heim's (1982) unselective binding approach and against a univariable approach such as that in Heim (1990).

One potential weakness of the unselective analysis is that it makes notoriously bad predictions concerning the truth conditions of proportional quantifiers. The problem with the unselective binding approach with respect to proportion is that the set of all sequences that satisfy the restriction of a quantification is too large and fine-grained. Clearly each such sequence is somehow relevant for the quantification, but they do not all have equal weight when it comes time to count up the number of cases that satisfy the nuclear scope. Therefore I propose that sequences must be grouped into classes,

where each class of assignment functions gets only one vote in the quantification. I will call such a class of sequences a 'case', so that each assignment function is just a particular instance of a more general case. Then quantifiers in general and nominal quantifiers in particular quantify over cases. On this view, the proportion problem reduces to predicting how a set of relevant sequences will factor into cases. I briefly discuss a general principle for separating assignment functions into cases based on whether a given variable can be demonstrated to be relevant to the outcome of the quantification.

Thus I hope to show that an approach based on the unselective binding idea continues to be viable. If nothing else, the resulting system has the virtue of being relatively simple in its overall structure. At the very least, then, this chapter will make clear what a single-variable analysis must accomplish with respect to the interpretation of possessives.

1. Asymmetric quantification

The discussion in this section and the next one will introduce the main facts to be accounted for in our formal analysis. This section will introduce the proportion facts for quantificational possessives, and the next section will introduce the narrowing problem.

Tony and Simona are trying to explain what it's like to be a graduate student. Tony tries to convey a sense of the penury of student life in general by asserting the following generalization.

(1) Most students' cars are old and decrepit.

Unfortunately, it is part of Simona's nature to disagree with Tony. "No, that's not true!" she would undoubtedly say. In addition to simply contradicting Tony, depending on the capriciousness of her mood, she might continue with any one of four statements.

(2) When I was an undergraduate, I drove a brand new Porsche.

This response is natural enough, and it does provide relevant information; but the counter-assertion in (2) is more of an irritation to Tony than a real threat to his generalization. By the Gricean maxim of Quantity, we can infer that all of Simona's cars since the Porsche have been clunkers, so that far from providing a legitimate counterexample, Simona's personal experience tends to confirm the larger pattern asserted by Tony.

One particularly interesting aspect of the response in (2) that I will elaborate on in section 4.7 is that Simona is distinguishing between cases on the basis of the choice of a car. That is, she is emphasizing the possibility that the same student may have one car at one point in time that is old and decrepit, and another car that is not at some other point in time.

On another occasion, Simona might respond instead with (3).

(3) I personally have never owned a car that was more than two years old.

This response is more serious. Presumably Simona has owned several cars, and (she claims) none of them was dilapidated enough to count as old and decrepit. Then Simona stands as a clear counterexample to the generalization. Tony's expected counter-response would be to say that Simona is an atypical instance of the class of students. Note that (3), unlike (2), does not attempt to distinguish between cases on the basis of the choice of a car. That is, (3) is consistent with assuming that any given students' cars are either all old, or all new.

If Simona is feeling particularly contrary, she might even say (4).

(4) Peter has a nice car, Louise drives that new Saab, Robin just bought a Honda . . .

Suppose that Simona continues her list until she has established that at the utterance time, more than half of the current batch of graduate students possess new cars. Unlike (2) and (3), (4) is potentially sufficient to falsify (1). The success of (4) depends in part on how reasonable it is to assume that the current state of the local graduate program is a faithful representation of the typical situation. Put another way, Simona is inviting the listener to assume that if a student owns a nice car at some randomly picked moment in time, then she probably would own a nice car at any reference point. Thus (4), like (3), is consistent with assuming that the quality of the set of a student's cars is homogeneous across time.

Unfortunately, Simona's unstable personality is such that she would probably respond to Tony's statement with (5).

(5) Stuart has bought and wrecked more new sports cars in the past five years than the total number of cars the rest of us have owned put together.

Unlike the previous three, this continuation is crazy. Like (3), it provides a clear counterexample to the generalization, since Stuart is an example of a student who always buys new cars. What is crazy about (5) is that it implies that the absolute number of new cars that Stuart has owned is relevant—that an additional instance of Stuart owning a new sports car has the same status with respect to providing a counterexample to the generalization that a different graduate student would.

Any theory that provides for distinguishing among cases on the basis of the choice of a car in addition to distinguishing on the basis of the choice of

student runs the risk of incorrectly predicting that the truth of (5) would falsify (1). Since Kadmon (1987), this has been known as the proportion problem, since it crucially depends on how the total number of cars is distributed among the students involved.

Note that Tony's original statement involves a possessive. If the uniqueness presupposition associated with the prenominal possessive really were absolute uniqueness relative to the possessor entity, then it would be impossible to imagine distinguishing between cases solely on the basis of the car involved, since (1) would entail that for each student there is some unique car that they possess. One factor that mitigates the inflexibility of the uniqueness entailment in this example is that although students typically have at most one car at a time, they also typically own several cars in succession. Thus at any particular moment, there is a unique car for each student, but if the generalization is taken to quantify across time, the mapping from students to their cars is one to many.

Choosing a domain of quantification

The example above is a rather fancy one, in which the uniqueness presupposition normally associated with a possessive is bent by linking the evaluation of the possessive description to an implicit time variable. The remainder of this section goes on to make the same basic point—that possessives usually do not give rise to proportional readings in which the possessee description dominates over the possessor variable—but with some more quotidian examples.

Let us begin by adopting the traditional assumption that nominal quantifiers quantify over at most a single variable and see where it leads us. For instance, in *most dogs bark*, the quantifier denoted by *most* quantifies over the set of dogs. What set, then, do quantifiers from quantificational possessives quantifier over? To make this question a bit more concrete, imagine a situation in which (6) is true.

(6) Three students' dogs were barking last night until 2 AM.

The possessive sentence in (6) entails that there are at least three objects in the domain of discourse that have a certain property involving barking. What must there be three of? Must there be three students? Or three dogs?

The reason this question is difficult to answer is that by its nature possession establishes a link between the possessor and the possessee. Temporarily idealizing the linguistic facts a little bit, if the entailments of (6) required the existence of three students, there would also have to be three dogs for them to own; and if the entailments required three dogs, then there would likewise

have to be three students to own them. It may even turn out that for possessives, quantification is neutral, and merely requires the existence of three student/dog pairs.

If, on the other hand, the entailments prefer either the possessor or the possessee over the other, then we have an asymmetric reading. If a use of (6) commits the speaker to the existence of three students with a certain property, and the existence of dogs for them to own is ancillary, then we have an asymmetric reading in which the possessor description dominates. If it is the existence of the dogs that is required, and the existence of the student owners that is a consequence, then we have an asymmetric reading in which the possessee description dominates.

I will argue that possessives usually give rise to an asymmetric reading in which the possessor phrase dominates. For univariable analyses of quantification, this will mean that the distinguished variable will always correspond to the possessor description. For the unselective binding analysis developed below, this will mean that the variable corresponding to the possessor description will have a special status with respect to the principles for selecting an appropriate proportional reading.[1] In addition, there will also be a symmetric reading on which the possessor variable and the possessee variable have exactly the same status with respect to determining proportionality.

The fact that it is the possessor description and never the possessee description that dominates may be a little bit surprising, since the first reaction to a sentence such as (6) is generally that it entails the existence of at least three dogs, that is, that the quantification ranges over the set of dogs. After all, it is the dogs that are doing the barking.

In support of this intuition, there will be situations in which quantificational possessives can justify reasoning about the cardinality of the possessee set. Furthermore, in chapter 3 we saw that the restriction of the quantification in (6) must be the entire subject determiner phrase, including the possessee. In all other cases of quantification, quantification always ranges over the set of entities described by the restriction. Since the restriction describes dogs, once again it makes sense to expect that the dominant element in the quantification will be the set of dogs.

This intuition that (6) is somehow 'about' dogs—more precisely, that (6) is somehow a statement about dogs that are owned by students—is just a different form of the intuition that there is a possessee-dominant structure to possessive examples in which *most* [*student's dogs*] corresponds to a quantification over the set of dogs owned by students. In chapter 1, I argued that

[1] In the terms developed below in section 4.7, the possessor variable will always be relevant for the outcome of the quantification, by virtue of being the surface-structure complement of a quantificational determiner.

there is no (productive) syntactic analysis other than the spec-of-DP analysis. Here, I will go on to argue in the same vein, that there are no possessee-dominant readings either, despite basic semantic intuition. More specifically, I will argue that (6) involves quantification over (a restricted subset of) the set of students, and the existence of a certain minimum number of dogs follows from the nature of possession.

Notice that if the quantification in (6) did in fact range over dogs, a use of (6) should be consistent with a situation in which there were only two students who owned dogs, so long as the total number of dogs owned by those two students is at least three. This reading is marginally possible, but only on a reading on which *student's dogs* is an extemporaneous possessive compound naming a kind of dog (see section 1.4).

I wish to exclude lexical compounds from consideration. Therefore it will help to consider an example for which there is no possibility of such a reading.

(7) Most people's favorite color is blue.

The presence of the adjective *favorite* guarantees a spec-of-DP structure for (7). In (7), the quantification ranges over people, not over colors. That is, a use of (7) can be true even if blue is only one of several candidate favorite colors. To see that this is so, imagine a situation in which more than one person has the same favorite color.

(8)

	Person	Favorite color
a.	Simona	red
b.	Tony	green
c.	Lola	blue
d.	Max	blue
e.	Sandy	blue

There are three colors in this tiny model: red, green, and blue. Only one of these colors is blue. If the denotation of *most* quantified over the set of favorite colors, we would predict that (7) would be false, since only one out of three of the colors is blue. If a possessee-dominant reading were systematically available, we would expect (7) to be ambiguous; but clearly the only possible judgement is that (7) is true in this situation, since more than half of the people in our model have blue as their favorite color.

It is suggestive that the possessee nominal is singular in (7) where it was plural in (6). In order to see that this difference is not crucial, consider the following examples.

(9) a. Most people's favorite colors are blue and green.
b. Most countries' policemen speak an Indo-European language.

As was the case for (7), (9a) will be true according to the proportion of people who favor blue and green over all other colors, regardless of the number of distinct color combinations under consideration. Similarly, (9b) can be true even if the policemen in China outnumber the policemen in the rest of the world put together, and no Chinese policemen happens to speak an Indo-European language. What is important in (9b) is the proportion of countries with Indo-European speaking policemen.

It should also be noted that it is difficult to find grammatical examples in which the possessor is plural and the possessee phrase is singular, as discussed in section 1.4.

(10) *Three students' apartment burned down last night.

I don't fully understand why examples like that in (10) are so bad, but I can suggest a basic approach as expressed in the terms of my treatment of proportion given in below. The quantificational use of *three* presupposes the existence of three (potentially) independent cases; but in any situation for which (10) would be felicitous, there must be a single apartment possessed by all three students jointly. Either that one apartment building burned down, or it didn't; either way, there is at most one distinct case per situation, leading to a violation of the presupposition that there must be exactly three separate cases.

In view of the examples in (7) and (9), it is clear that possessor-dominant asymmetric quantification is possible. In section 4.8, I will suggest that there is also a symmetric reading for quantificational possessives on which the identities of the possessor and the possessee are both relevant for distinguishing cases. However, the symmetric reading for quantificational possessives will always have truth conditions identical to the possessor-dominant reading, thanks to the uniqueness presuppositions for possessives.

I conclude that possessives have only a spec-of-DP structure in which the possessor is dominant over the possessee description, or at the very least equally important in distinguishing between relevant cases. This means that for a theory on which (nominal) quantifiers quantify over a single variable only, it must always be the variable corresponding to the possessor description; for unselective analyses, the possessor must always be relevant for distinguishing cases with respect to proportion. We will return to the issue of proportionality of possessives in section 4.8, where I will present a more precise version of the generalizations stated here, after building some formal machinery. The next sections explain why quantifying over the possessor variable leads univariable analyses into trouble.

2. The narrowing problem for possessives

The narrowing problem for possessives is my name for the way in which the domain of quantification of a quantifier in a possessive is systematically restricted by the possessee description.

(11) Most planets' rings are made of ice.

We already know from the previous section that the quantification in (11) ranges over planets, and not rings. But which set of planets?

If the quantification in (11) has for its domain of discourse the set of planets in general, then it would surely be false in the actual world. The reason is that of the nine planets in our solar system, only three planets even have rings in the first place (say, Saturn, Neptune, and Uranus), let alone have rings made of ice.[2] But most speakers I have consulted agree that (11) is a true and felicitous description of the solar system that we live in. Therefore the quantification in (11) must range only over planets that have rings. Assuming that at least two out of three of the planets that have rings have rings made of ice, we correctly predict that (11) is true.

Somehow the entailments due to the possessee description—roughly, an entailment that each entity described by the possessor phrase has the property of possessing rings—in effect constrains the context in such a way that the only relevant planets are the planets that have rings. That is, the entailments of the possessee phrase narrows the domain against which the possessor phrase is evaluated.

The narrowing effect occurs for any nominal quantifier occurring in a possessive.

(12) a. Nobody's brother was ever that kind and gentle.
b. Someone's bicycle is blocking the driveway again.
c. Every woman's dream is to become a merchant marine.
d. Not every school's linguistics program is as good as that one.
e. Most countries' coastlines have a resort town on them somewhere.

For existential examples such as (12b), it is not clear that the description corresponding to *someone* is constrained to choose only from among people that possess a bicycle. However, in (12c) is is clear that quantification ranges only over women who have a dream. Similarly, the quantification in (12d) and (12e) quantify only over schools that have linguistics programs and countries

[2] I am ignorant of the precise astronomical facts, but I am confident that if I am slightly confused about numbers and types of planets, I am at least describing a solar system very much like the one we live in, and that will be sufficient for our purposes.

that have coastlines. Thus all of the examples in (12) either require narrowing or are consistent with a narrowing hypothesis.

How can we account for this narrowing effect? Note that this narrowing is very much like the sort of domain narrowing that is implicit in any use of a description. For instance, a use of a sentence like *I put the children to bed* does not assert that all of the children in the world have been tucked in; rather, it refers only to some salient group of children, perhaps the children that were playing on the rug a few minutes ago. The difference between this general pragmatic contextual narrowing and the narrowing exemplified in (11) is that contextual narrowing is intractably vague and subject to pragmatic variability; but the narrowing of the domain of the possessor is completely predictable and fully grammaticized.

The next section will sketch an account of possessive domain narrowing based on the concept of accommodation, an account which will prove to be unsatisfactory. The next section after that, section 4.4, will explain why narrowing is difficult to manage for a single-variable analysis of nominal quantification. The remaining sections will go on to develop an unselective binding approach to quantification in general and the interpretation of quantificational possessives in particular on which the narrowing effect falls out from general principles.

3. Accommodation

One possible approach to explaining narrowing depends on accommodation. Accommodation is the name given in Lewis (1979) for what happens when the presuppositions of an utterance do not agree with the discourse model constructed so far, but the listener is willing to accept and process the utterance anyway. What happens, Lewis suggests, is that the listener accommodates the otherwise infelicitous utterance by modifying the model in such a way that the utterance would no longer be infelicitous.

I will first illustrate how accommodation works with respect to a non-quantificational example. My excuse for this digression is that I will claim that the lexical/extrinsic opposition developed in chapter 2 will be relevant for predicting when accommodation will be possible. Then I will explain how a specific version of accommodation can potentially lead to an account of the narrowing effect. Finally, I will raise some objections to the accommodation account that will cause me to abandon it.

Roughly, the accommodation story goes as follows. The use of a possessive presupposes that the possessor stands in the described possession relation to some entity described by the possessee phrase. It is possible, therefore, that in order to accommodate the use of a quantificational possessive in the face of this presupposition, a cooperative listener will assume that the person who

uttered *most planets' rings are made of ice* really meant to say *most planets that have rings have rings made of ice*.

Accommodation of novel definites

Here is a simple (non-possessive) example requiring accommodation.

(13) a. Abu slaughtered a goat yesterday.
b. I bought the liver from him.

Heim (1982) argues that the use of a definite description like *the liver* presupposes that the described entity is familiar from context. However, there is no reason to suppose that there is a discourse marker corresponding to any particular liver by the time that (13b) is uttered. Nevertheless, the discourse is perfectly natural.[3] The discourse in (13) only makes sense if you assume that the liver in question is the liver of the goat that was slaughtered. On this view, *the liver* has the same descriptive effect as *the liver of the goat that Abu slaughtered yesterday*. That is, *the liver* is a sort of a description of laziness (on analogy with pronouns of laziness).

One way of conceiving of the way that accommodation works would be to imagine inserting additional content into the interpretation of the mysterious definite. Since definites presuppose their descriptive content, the accommodating listener need only adjust her model by assuming the (interpolated) presupposed material. In Kadmon (1987), for instance, uniqueness presuppositions can justify copying part of a logical representation and incorporating it into a different part of the logical representation of an expression.

There are two main problems with accommodation stories in general. The first is that it is difficult to predict in advance how to calculate what material needs to be interpolated. Minimality and naturalness provide two guiding principles: accommodate only as much as you need to, and interpolate material that makes the best fit with expectations. The second main problem with accommodation is that it is difficult to tell when a listener will be willing to accommodate an infelicity. Sometimes a listener will reject an utterance on the grounds that it violates a presupposition, and in another context she will happily accommodate.

These two problems are somewhat interrelated.

(14) a. Abu slaughtered a goat yesterday.
b. #I bought the pasture from him.

The continuation in (14) is not felicitous, so for some reason accommodation is not possible here. Notice, however, that buying a liver is a much more natural part of the script associated with slaughtering an animal than buying the

[3] I am indebted to Russell Schuh for this example.

pasture where the animal grazed. Presumably there is a cost associated with interpolating a less than perfectly natural assumption, so that those instances of accommodation that obey minimality and naturalness are those most likely to be acceptable. (See the discussion of the interaction of conventionalized expectation with vague relations with respect to possessives in section 2.6.)

The analysis of lexical versus default possession developed in chapter 2 can shed some light on this particular pair of examples. Note that *liver* is a body part and denotes as one of its meanings a part/whole relation. Since it is used without an overt possessor in (13b), its non-core argument has been suppressed, so that the interpretation of *the liver* in (13b) is $\lambda y[\textbf{liver}(\_, y)]$, where y is the liver and the underscore represents the suppressed possessor of the liver. In other words, the lexical denotation of the noun *liver* entails the existence of an owner for that liver. Given this analysis, the accommodation needed in (13) amounts simply to assuming that the underscore variable refers to the goat mentioned in the previous sentence. This would certainly be an assumption in line with minimality and naturalness, so it ought to have a rather attractive price for a listener willing to spend a little effort on accommodation.

In example (14), however, the noun *pasture* is not a body part term; in fact, it is not relational at all, so that it translates only as a set-denoting expression. The translation of *the pasture*, then, is $\lambda y[\textbf{pasture}(y)]$, where y is the pasture and there is no explicit mention of any possessor of the pasture. This makes it much more expensive to accommodate (14b), since the existence of a relation between the pasture and the goat will have to be interpolated in addition to the assumption that the identity of the individual that stands in the interpolated relation happens to be the slaughtered goat.

Thus I am suggesting that the contrast between (13) and (14) is exactly parallel to the familiarity contrasts for possessives discussed in section 2.6.

(15) a. I bought its liver from him.
b. ?I bought its pasture from him.

As predicted, the lexical possessive in (15a) works fine as a description of a novel entity (assuming that the referent of the pronoun *it* is already familiar). But the possessive in (15b) is an extrinsic possessive, and its felicitous use in this context depends on whether (i) the pasture in question is already familiar from surrounding context (perhaps I am pointing to it as I speak), or (ii) there is a mapping from goats to pastures that counts as familiar (perhaps we have been talking about overgrazing in the neighborhood). In other words, in parallel with (13), the lexical possessive is easy to accommodate, and in parallel with (14), the extrinsic possessive (in a neutral context) requires more accommodation.

Accounting for narrowing

How can we use accommodation to account for narrowing in possessives? First we must decide what the relevant presupposition will be. In chapter 2, we observed that the use of a possessive description committed the user to the existence of both the possessor and the possessee. That is, a use of *John's dog* presupposes that John possesses a dog.

(16) The use of a possessive construction presupposes that each member of the extension of the possessor phrase possesses some entity in the extension of the possessee phrase.

Since John is the extension of the possessor phrase in *John's dog*, this principle entails that John possesses some entity in the extension of the possessee phrase *dog*.

Now consider again our original narrowing example.

(17) Most planet's rings are made of ice.

Ignoring the quantificational determiner for the moment, the extension of the possessor phrase in (17) is the set of planets. One reasonable construal of the stipulation in (16), then, is that a use of (17) will presuppose that all planets have rings. If not every planet has rings, then (17) will be infelicitous, since the presupposition described in (16) will fail. If the listener chooses to accommodate (17), she can assume that only those planets that have rings are relevant, which is a fairly minimal assumption and perfectly natural.

So goes the accommodation story. On this perspective, just as the possessive construction automatically triggers accommodation of the presupposition of familiarity, a possessive construction can also automatically trigger accommodation of possessors that violate (16).

The accommodation approach seems like a plausible candidate analysis for possessive narrowing. I am reluctant to pursue it further primarily because accommodation by its very nature does not lead to firm predictions of the entailments of possessives. If this vagueness in the way that accommodation operated corresponded to an observed vagueness in the narrowing effect, I would be more content to follow the accommodation path; but I find that narrowing in possessives is absolutely systematic. That is, the narrowing effect is more thoroughly grammaticized than an accommodation analysis would suggest.

A second example of true accommodation will help show just how regular possessive accommodation is by way of contrast.

(18) a. Most dentists chew Trident.
b. Most dentists chew gum.

In the non-possessive example in (18a), the presupposition due to the predicate *chew Trident* narrows the domain of dentists in a way that is strongly reminiscent of the narrowing effect for possessives.[4] That is, given a reasonably cooperative listener, (18a) cannot be falsified by pointing out that more than half of the dentists in the world don't even chew gum. Surely this is a good candidate for an accommodation story: in order to accommodate (18a), the listener assumes that the relevant set of dentists is the class of dentists that chew something.

But notice that in (18b), there is no such presupposition. That is, there is no presupposition that dentists chew anything in (18b), and in this case the statement will be falsified if fewer than half of the dentist chew gum. Of course, with a preamble about the relative hygenic merit of chewing gum versus chewing tobacco, (18b) can be understood to be provisionally restricted to a world in which every dentist chews something.

The point of the examples in (18) is that true accommodation is sensitive to knowledge about the real world. Typical expectations and contextual contrast sets are both relevant. However, the narrowing effect for possessive is much more systematic.

(19) a. Most dentists' Porsches are extremely expensive.
b. Most dentists' cars are extremely expensive.

Perhaps an accommodation story that explained the narrowing effect in (18a) could generalize to account for the narrowing effect in (19a), in which having a particular brand of car (i.e., a Porsche) is as specific as having a particular brand of gum (i.e., Trident). But then we would expect to be less certain about the narrowing in (19b). However, it is just as clear in (19b) that the possession relation restricts the set of relevant dentists, since (19b) cannot be falsified merely by observing that half of the world's dentists fail to possess a car. In other words, only dentists who own cars are relevant for the purposes of the quantification in (19b).

Thus narrowing in quantificational possessives contrasts with the narrowing observed in (18), since the narrowing effect for possessives is absolutely automatic. Therefore possessive narrowing deserves to be represented in our truth conditions, rather than over-burdening the accommodation mechanism.

If an accommodation account were the only attractive treatment, then we would have no choice but to adopt it. But the remainder of this chapter will demonstrate that the narrowing effect can be explained entirely within a suitable characterization of truth conditions without hypothesizing any unobservable infelicities.

[4] Thanks to Ivan Sag for this example.

Before going on to develop a truth-conditional account of narrowing, I would like to make an observation that might potentially give a formal analysis of accommodation trouble. The problem is that the information needed in order to perform accommodation is contained in material that follows the possessor. This means that accommodation can't be as simple as attempting to evaluate a sentence, recognizing an infelicity, backing up to the point in the processing immediately before the beginning of the infelicitous expression, changing the discourse model as necessary, and restarting.

(20) Most professors' sons' sons love her.

On the relevant reading, this sentence asserts that female professors tend to be appreciated by their male grandchildren. As long as the implementation of (16) recognizes that all the material in the restriction, including both possessee phrases, constitutes part of the presupposed material, then the accommodation story will correctly predict that the extension of *professors* in (20) will be narrowed to the intersection of the set of professors with the set of grandparents.

However, now consider the extension for the predicate *son*, beginning with the first occurrence. The entities described by the possessor phrase *most professors' sons* must not only have a professor for a parent, they must also themselves be fathers of male children. The accommodation account would need to provide a model, then, in which the extension of *son* is narrowed to include only those males whose mother is a professor and who have male children.

But now consider the second occurrence of the noun *son*. The entities described by the larger possessive *most professors' sons' sons* must meet an independent set of requirements. It is not necessary that they have a professor for a parent, and it is not necessary that they themselves be fathers. In fact, the only way that a single individual could have properties consistent with both descriptions is if that individual had a son of his own, and both his mother and his paternal grandmother were professors.

So consider what the infelicity/accommodation/repair mechanism must accomplish in order to provide an appropriately narrowed extension for the first occurrence of *son*: it must recall the interpretation of the possessor phrase, in order to narrow to the children of professors; it must look ahead arbitrarily far (given examples involving further levels of embedding), as far as the end of the chain of possessors, in order to narrow to the set of fathers (or grandfathers, or great-grandfathers, . . .); and it must undo the narrowing before moving on to the next possessee phrase, just in case that phrase contains another occurrence of the same noun.

On the theory developed below, we shall see that the assumptions that are needed to account for the narrowing effect are needed independently simply in order to characterize the set of relevant cases. Thus the unselective analysis developed here guarantees that the narrowing effect will be automatically reflected by the predicted truth conditions for quantificational expressions.[5]

[5] Many people have been quick to challenge the suggestion that narrowing may be at least partially distinct from accommodation, though no one has yet explained away the technical difficulties for accommodation raised here. The only substantive argument I am aware of is due to an anonymous reviewer for the CSLI version based on the sentence *Every man likes his dog*. As pointed out by the reviewer, this sentence can be taken as quantifying only over men who are dog owners. According to the fragment developed here, the descriptive content of *his dog* is not part of the restriction of *every*. This means that as far as what has been said so far, my formal analysis will not automatically restrict attention only to those instances in which a man is a dog-owner. In fact, I agree that what seems to be a narrowing effect for this sentence is due to "standard" accommodation. More specifically, it is well-known that definite descriptions in general presuppose their descriptive content (see, e.g., section 5.1 in chapter III of Heim (1982, 365), and compare (16) above). Therefore in order for a use of this sentence to be felicitous, the listener must accommodate a presupposition that men possess dogs, upon pain of encountering a quantificational instance which violates Heim's Extended Familiarity Condition. If accommodation is needed for possessives containing bound pronouns anyway, the reviewer remarks, why not let it cover quantificational possessives as well? But note that if my claim is correct that narrowing for quantificational possessives is more systematic, i.e., more grammaticized, than accommodation in general, this predicts a subtle difference in status between the following two sentences:

(i) Most lawyers's gynecologists fear lawsuits.
(ii) Most lawyers respect their gynecologists.

In (i), narrowing automatically restricts quantification only to female lawyers (since male lawyers do not have gynecologists), and (i) is predicted to be perfectly felicitous even in a context containing male lawyers. A use of (ii), however, requires accommodation (though perhaps only temporary accommodation) of a presupposition that all lawyers possess gynecologists. That is, the prediction is that (ii) more than (i) will suggest that only women are laywers.

4. Against univariable analyses

The conclusion reached at the end of the last section was that accommodation is too vague as a grammatical principle, that we need a way to represent the narrowing effect in the truth conditions for a quantificational possessive. How, then, are we to arrive at a representation of the truth conditions for quantificational possessives?

This section will consider a representation in which quantifiers from quantificational possessives quantify over a single variable, namely, the variable corresponding to the possessor description. This will be inadequate, since it will not lead to an attractive account of the narrowing phenomenon.

In fact, there are two standard model-theoretic approaches to representing the denotation of quantificational determiners that I will consider here. Both are inadequate as a treatment of possessives, but in slightly different ways.

Generalized quantifiers

The first approach I will call the generalized quantifier approach, and I will take Barwise and Cooper's (1981) analysis of nominal quantification as representative of this approach. Generalized quantifier theory is based on the idea that quantificational determiners denote relations over pairs of sets.

(21) a. Every man is mortal.
b. Most cats eat turnips.

In (21a), the two relevant sets are the set of men and the set of mortal things, and the denotation of *every* requires that the first set be a subset of the second. In (21b) (abstracting away from genericity), the denotation of *most* requires that at least half of the elements in the set of cats are members of the set of turnip eaters.

The first set is the domain of quantification, and the second set is the predicate that divides the elements of the domain of quantification into two parts. In the terms of chapter 3, the restriction characterizes the first set, and the nuclear scope characterizes the second set. In non-possessive constructions, the method for reducing the restriction to a set is easy: take the surface structure complement of the determiner (which will be a set-denoting nominal), and the domain of quantification will be the extension of that complement. In (21a), for instance, the restriction of *every* is the nominal *man*, so that the domain of quantification is the set of men.

The method for reducing the nuclear scope is a bit more complex. In (21a), the nuclear scope amounts to the predicate *is mortal*.

(22) Mary loves every man.

In (22), however, the predicate characterizing the second set is the property of being loved by Mary. Calculating this property requires examining the logical form for (22), in which the quantificational determiner phrase has raised to adjoin to S (see the logical form given in section 3.3 for a similar example). Since the quantificational determiner phrase *every man* adjoins to S, its complement is a truth-value-denoting expression. If we abstract over the variable left behind by Quantifier Raising, then we get a property characterizing a set of entities, as shown in (23).

(23) $[\![\textit{every}]\!](\lambda y[\mathbf{man}(y)])(\lambda y[\mathbf{love}(\mathbf{m}, y)])$

To see what goes wrong when we take the generalized quantifier approach to quantificational possessives, imagine taking the recipe for the nonpossessive cases and applying it to a possessive example.

(24) a. Every student's dogs bark.
b. $[\![\textit{every}]\!](\lambda y[\mathbf{student}(x) \wedge \pi(x, y) \wedge \mathbf{dogs}(y)])(\lambda y[\mathbf{bark}(y)])$

The problem arises from the fact that there are two candidates for a variable to abstract over: one for the variable associated with the possessor description, and one for the variable associated with the whole possessive DP. The representation in (24b) attempts to abstract over the variable corresponding to the whole possessive. The result is a set of dogs and a set of things that bark. As shown in section 4.1, quantifying over a set of dogs is not a viable interpretation for the possessive (recall that it predicts inappropriately strict truth conditions for examples like *most people's favorite color is blue*).

Quantifying over the other variable, the one associated with the possessor phrase, at least provides a domain of quantification containing students, which is a step in the right direction. However, abstracting over the student variable leaves us without a coherent property to use for the denotation of the nuclear scope. That is, the nuclear scope is a predicate on things that bark, not a predicate on students.

This naïve attempt at finding a generalized quantifier representation for the truth conditions for (24a) gives a clear idea of what the representation should be.

(25) $[\![\textit{every}]\!]$ $(\lambda x[\mathbf{student}(x) \wedge \exists y[\pi(x, y) \wedge \mathbf{dogs}(y)]]),$
$(\lambda x \exists y[\pi(x, y) \wedge \mathbf{dogs}(y) \wedge \mathbf{bark}(y)])$

The representation in (25) says that (24a) will be true just in case the set of students that own dogs is a subset of the set of entities that possess dogs that bark.

So the problem with the generalized quantifier approach is that there is no clear way to get from the logical translation in (24b) to the desired truth conditions as in (25). The point of (25) is that the desired truth conditions

involve copying a certain amount of material from the restriction—namely, the remainder of the host after the possessor phrase has been removed—and placing it in the position of the variable left behind by Quantifier Raising in the nuclear scope.

Restrictive quantification

The second approach to a logical representation for sentences involving quantificational determiners that I would like to consider here also recognizes the distinction between the restriction and the nuclear scope. It does not involve abstraction over the restriction and the nuclear scope, but rather abstracts over both expression translations at once. I will call this the restricted variable approach, as exemplified, e.g., by McCawley (1988, chapter 18) or Gawron and Peters (1990).[6]

(26) $[\![\textit{Mary loves every man}]\!] = [\![\textit{every}]\!]_y\ (\mathbf{man}(y)), (\mathbf{love}(\mathbf{m}, y))$

The idea is that (26) will be satisfied just in case every way of assigning an entity to the variable y which satisfies the proposition expressed by the restriction (here, the proposition that y is a man) also satisfies the proposition expressed by the nuclear scope (here, the proposition that Mary loves y). There is no separate abstraction for the nuclear scope, which is simply a truth-value-denoting expression which just happens to have a free occurrence of the restricted variable.

The advantage for this approach for possessives is that there is no worry about choosing a variable to abstract over for the nuclear scope; instead, we just leave the nuclear scope as an expression denoting a truth value and let it be satisfied or not according to the quantification of the larger formula.

(27) $[\![\textit{every}]\!]_y \quad (\mathbf{student}(y) \wedge \exists x[\pi(y, x) \wedge \mathbf{dog}(x)]),$
$(\mathbf{bark}(x))$

The truth conditions for (27), then, come out as requiring that for any way of assigning an entity to the variable y that satisfies the proposition that y is a student who owns a dog, that assignment also satisfies the proposition that some entity x barks. However, the fact that the entity of which barking is predicated somehow depends on the choice of the student under consideration

[6] These references have been chosen somewhat at random; there are many important differences between the conception of quantification in those works and the characterization of restrictive quantification given here.

is lost, since the existential quantifier inserted in the restriction in (27) does not have scope over the occurrence of y in the nuclear scope.[7]

To summarize the situation so far, the problem with both the generalized quantifier approach and the restricted quantifier approach is that abstraction distinguishes a single variable when there are always at least two variables that are crucial to the interpretation of a possessive. I will suggest below a system for representing the denotations of sentences involving nominal quantification which combines the strengths of both of these approaches: quantificational determiners denote generalized quantifiers, that is, relations over pairs of sets; and membership in the sets is determined by means of satisfaction of propositions with respect to an assignment of entities to variables.

Before leaving the topic of univariable analyses, I would like to make one additional point. One particularly popular first approximation to the semantics of quantificational possessives holds that the quantifier abstracts over the variable corresponding to the possessor (so far so good), and the second argument combines the content of the possessee phrase with the remainder of the nuclear scope.

(28) a. Most planets' rings are made of ice.
b. most(planets(x), have-rings-made-of-ice(x))
c. most(planets-that-have-rings(x), have-rings-made-of-ice(x))

In (28b), the second argument builds a complex property out of the possessee phrase and the nuclear scope. That is, on the syntactic analysis of chapter 1, *rings* and *ice* are never part of a constituent that does not also include *planets*. Thus the semantic constituency suggested by (28b) and (28c) goes against the syntactic constituency argued for in chapter 1, and goes against the logical form constituency arguments in chapter 3 as well. To the extent that the arguments in those chapters are valid, these analyses are non-compositional as they stand. Furthermore, in order to explain the narrowing effect, the approach in (28b) would have to appeal to the accommodation story, with all of the problems that would carry with it as described in the previous section. The representation in (28c) would at least build the narrowing effects into the truth conditions, but at the cost of copying material so that it appears twice in the logical representation.

[7] But see the dynamic logic proposed by Groenendijk and Stokhof (1991) for a potential solution to this puzzle on which an existential quantification can, in effect, bind occurrences of a variable not in its logical scope.

Sharpening the donkey anaphora parallel

I would like to suggest that the tension in the interpretation of quantificational possessives between the characterization of the domain of quantification versus the set described by the restriction is analogous to the donkey anaphora problem.

(29) Usually, if a woman owns a donkey, it brays.

Consider the donkey anaphora in (29). Each case that is relevant for the quantification must somehow specify the identity of the woman variable and the donkey variable.[8] If the pronoun *it* happens to translate as the donkey variable, we get a donkey anaphora reading on which the denotation of the pronoun varies with the choice of a donkey for each case in the quantification.

(30) a. Most women's donkeys bray.
b. [Most women's donkeys]$_y$ [y bray].

Now consider the quantificational possessive example in (30a). Quantifier raising will raise the quantificational possessive, leaving behind a coindexed trace, as indicated in (30b). As for the donkey anaphora example, each case that is relevant for the quantification must somehow specify the identity of the woman variable and also of the donkey variable. Since Quantifier Raising automatically coindexes the trace left behind in the subject position of *bray* with the donkey variable, then for each case, the entity that is asserted by the nuclear scope to bray will be the same entity that is asserted by the restriction to be a donkey.

[8] Here I mean for "the woman variable" to refer to the variable corresponding to the logical translation of the indefinite expression *a woman*. In order to make this way of speaking more precise, recall from chapter 3 that descriptions all receive a unique index in logical form. The index is chosen from the set of variable symbols in the logical language, and the translation rules are designed so that the index of a description will be incorporated into the translation of the description as the variable whose value is to be described. Thus if the description [*a woman*]$_x$ receives the index x in logical form, it will translate as the logical expression $\lambda x[\mathbf{woman}(x)]$. Thus in this situation, "the woman variable" refers to the variable x. Similarly, "the donkey variable" refers to the index of the closest DP node dominating the nominal *donkey* in logical form. Perhaps a more intuitive way to think of this terminology would be to think of the woman variable as the variable for which the expression in question entails that the entity denoted by that variable is a woman. I will often use this less precise but more convenient way of naming variables throughout the remainder of the dissertation.

From this perspective, the main difference between the donkey anaphora and the quantificational possessive example is that in the donkey anaphora example, the pronoun is only bound accidentally, while in the possessive example, the mechanics of Quantifier Raising automatically guarantee that the variable in subject position will be bound by the quantification.

What can we make of this formal parallel between donkey anaphora and quantificational possessives? Clearly any formal account of donkey anaphora that can account for the truth conditions of (29) will be capable of describing the truth conditions of (30). For a particularly intriguing example, consider the E-type analysis of donkey anaphora as advocated by, e.g., Heim (1990). On her theory, the donkey anaphora reading of (29) is available only when the pronoun *it* in (29) is an E-type pronoun, in which case it denotes a function that maps each woman to her donkey. The function denoted by an E-type pronoun formalizes the intuition that the relationship between some key individual (the woman) and the referent of the E-type pronoun (the donkey pronoun) holds constant across all of the cases of a quantification. For quantificational possessives, the possession relation between the possessor and the possessee is just such a function. If we attempt to extend the E-type account of donkey anaphora to the interpretation of quantificational possessives, however, we must stipulate that Quantifier Raising leaves behind an E-type pronoun denotation instead of a trace when it raises a quantificational possessive.

In any case, the next sections present a theory of quantificational binding which treats the binding of donkey pronouns and quantificational possessives as two aspects of the same mechanism.

5. Unselective binding

In the previous section we saw how the behavior of possessives in quantificational contexts is part of a more general phenomenon in which quantificational operators bind more than one variable at a time. In particular, we saw that donkey anaphora and quantificational possessives both require some sort of analysis on which a single quantifier can, in effect, bind more than one variable. I showed that (non-dynamic) univariable analyses will have difficulty accounting for the narrowing effect for quantificational possessives. Therefore I will go on in the next three sections to present an analysis that depends on unselective binding, in which a single quantificational operator can simultaneously bind several variables at once. I have no doubts that dynamic univariable analyses (see especially Chierchia (1990)) can provide an adequate account of narrowing. I have decided to pursue an unselective binding approach, then, mostly because it provides a particularly simple framework for describing the facts.

Unselective binding was proposed by Lewis (1975) and developed in Kamp (1981) and Heim (1982). In univariable analyses, an indefinite description such as *a donkey* translates as a truth-value-denoting expression in which an existential quantifier ∃ binds the described variable. One consequence of this strategy is that the described variable is not free, and therefore cannot be bound by an superordinate quantifier. On the unselective binding approach, descriptions also translate as truth-value-denoting logical expressions, but the variable corresponding to the described entity is not bound. Because the described variables are free, quantificational operators can bind any description in their logical scope. The basic idea of unselective binding, then, is that a quantifier can potentially bind several free variables at once.

On the simplest version of this approach, a quantificational operator will bind all of the free variables in its scope. This is what makes the binding 'unselective': any free variable will be bound without prejudice. We shall see that this is an oversimplification. Not every variable which can potentially be bound will be bound for any given reading of a quantificational expression. For instance, on Heim's system, variables corresponding to indefinites could be bound, but not variables corresponding to definites. Thus a better name for the system developed here would be selective binding, with the understanding that a quantifier can select more than one variable at a time. However, I will continue to use the term 'unselective' for the sake of tradition. The next section will briefly discuss how to predict which descriptions will be bound, paying special attention to possessive descriptions.

Perhaps the main empirical problem for the unselective approach comes from the proportion problem. Therefore I will devote section 4.7 to a refinement of the unselective binding approach which is suitable for describing the proportion facts. Then in section 4.8, I will go on to show how the proposed account of the proportion problem in general makes good predictions with respect to quantificational possessives. In particular, I will argue that a properly designed theory of proportion will explain the perspective paradox without the need for any stipulations specific to the possessive construction.

Quantifying over assignment functions

One way of viewing the main innovation of unselective binding is that quantifiers no longer quantify over individuals, they quantify over sequences of individuals. This is what allows a quantifier to bind several variables instead of just one. I will model sequences of individuals as assignment functions, so that technically quantifiers quantify over assignment functions. The next section will explore a slightly more complicated system on which quantifiers quantify over sets of assignment functions (but all of the formal machinery introduced in this section will carry over into the next).

To see why Lewis proposes that some quantifiers quantify over sequences of individuals, consider the quantificational expressions in (31).

(31) a. Usually, if a woman owns a donkey, she beats it.
b. Most women who own a donkey beat it.
c. Most women's donkeys are beaten by them.

(32) For at least half of the pairs $\langle x, y \rangle$ such that
x is a woman and y is a donkey and x possesses y,
it is also true that x beats y.

In (31a), *usually* is an adverbial quantifier with the *if* clause for its restriction and the main clause for its nuclear scope. For Lewis, the quantifier denoted by *usually* unselectively binds both the woman variable and the donkey variable. Thus on one of its readings, (31a) has the paraphrase in (32).

Heim (1982) shows that if unselective binding is extended to nominal quantification, as in (31b), it provides a general account of donkey anaphora. In (31b), for instance, the pronoun *it* can denote a variable bound by the quantifier. On the reading where *it* translates as the same variable described by *a donkey*, the quantifier binds both occurrences of the variable. Similar remarks apply to the interpretation of the pronoun *she*. This is how there is a interpretation on which there is an entailment that the women who owns the donkey beats the donkey that she owns.

What I am proposing here is that the same unselective binding provides an interpretation for the quantificational possessive in (31c). Here the quantifier simultaneously binds both the possessor variable and the possessee variable, so that (31c) also has a reading as paraphrased in (32), just like (31a) and (31b).[9]

Let us see how unselective binding works in a little more detail, and then see how the narrowing facts described in section 4.2 fall out.

Lexical versus extrinsic readings

Imagine that we are talking about kindergarten teachers and their dictatorial ways.

[9] For some speakers, (31b) may carry an additional entailment that each (relevant) woman owns at most one donkey. See Kadmon (1987), especially chapters 10 and 11, for discussion. Also, notice that (31c) contains the plural pronoun *them*. There are many difficult problems involving the grammatical number of anaphoric pronouns that I am ignoring here. See, e.g., Roberts (1987) and Root (1985). The same point could be made here using only singular pronouns by replacing *most* with *every*, although this would remove the crucial proportionality due to the truth conditions of *most*.

(33) Most teachers' children obey them.

Notice that the pronoun *them* is a donkey pronoun anaphorically related to the *teacher* description. Thus we would like to make sure that our truth conditions for (33) guarantee that the person that each set of children is asserted to obey turns out to be the same teacher denoted by the possessor.

Given the analysis of lexical versus extrinsic possession developed in chapter 2, we would expect (33) to have at least two readings, due to the ambiguity of the nominal *child*: either *child* denotes a two-place relation between a parent and a child, or it simply denotes a set of children (but continues to entail the existence of some unspecified parent for each child).

(34) a. $[\![\textit{most}]\!]([\textbf{teachers}(x) \wedge \textbf{children}(x,y)], [\textbf{obey}(y,x)])$.

b. $[\![\textit{most}]\!]([\textbf{teachers}(x) \wedge \pi(x,y) \wedge \textbf{children}(\_,y)], [\textbf{obey}(y,x)])$.

Recall from chapter 3 that the quantificational determiner *most* embedded in the possessor phrase raises to take scope over the entire sentence, as indicated in these two logical expressions provided by our fragment.

The logical formula in (34a) gives the lexical reading for *children*, on which there is an entailment that there is a kinship relation between the teacher and the children. This reading is appropriate if we are commenting on how even when a kindergarten teacher has trouble controlling his students at school, he can still maintain control in his own home.

Let us concentrate on this reading first, and then return to the extrinsic reading in a moment. Assume that the quantifier denoted by *most* binds both the teacher variable and the child variable. Then the quantification will need to keep track of all of the various assignment functions that assign x to a teacher and y to a set of children.

(35)

	x	y	$[\textbf{teachers}(x) \wedge \textbf{children}(x,y)]$	$\textbf{obey}(y,x)$
a.	t_1	c_1	yes	yes
b.	t_2	c_2	yes	yes
c.	t_3	c_3	yes	no
d.	p_1	t_4	no	——
e.	t_1	c_2	no	——

In this tiny model, in two out of three situations involving a teacher and their children, the children obey the teacher.

Recall from section 2.7 that an assignment function satisfies a formula just in case it assigns entities to the variables that are free in that formula in such a way that the formula is true. For instance, the translation of the restriction of the quantification of (33) will be satisfied by any assignment function that assigns x to a teacher and y to a set of children such that x is the parent of

y. Similarly, the translation of the nuclear scope will be satisfied just in case y obeys x.[10]

The other two assignment functions illustrated in (35d) and (35e) are not relevant for the quantification. This is because they do not satisfy the restriction. Take (35d) as indicating that the fourth assignment function assigns the x variable to a potato and the y variable to a set of tables; then clearly the restriction will not be satisfied by this assignment function. Similarly, in the assignment function suggested by (35e), x is assigned to a teacher and y is assigned to a set of children, but they do not stand in the relevant possession relation.

In general, then, an assignment function will be ignored if it doesn't satisfy the restriction. There are a variety of other technical details involved in specifying exactly which assignment functions that are relevant for a quantification that will be addressed below. For now, assume that we have a system that will correctly predict that (33) will be true based on the information depicted in (35).

Notice that we are comparing the satisfaction of the restriction to the satisfaction of the nuclear scope with respect to each assignment function one at a time. This means that the value of the variables in the nuclear scope will take on the same values they did for the restriction for each line in the chart. This is what guarantees that the donkey anaphora works out correctly, so that we only examine whether two entities stand in the **obey** relation if they are the same entities that we just verified also stand in the possession relation.

Now it is clear how the extrinsic reading for the possessive given in (34b) will lead to different truth conditions for the quantificational expression. On the extrinsic reading, there is no kinship entailment. This reading would be appropriate for (33) if we were commenting on the fact that kindergarten children are for the most part well-behaved in school. Here, the possession relation is a pragmatically determined proximity relation between teachers and children. Assume in this context that a teacher's children are the students of that teacher. Then a different set of assignment functions will satisfy the restriction. In particular, the assignment function in (35e) might satisfy the restriction on the extrinsic reading, and the assignment functions in (35a), (35b) and (35c) most likely would not (since it is rare that kindergarten teachers teach only their own children).

This means that the lexical reading and the extrinsic reading will be logically independent of one another. Imagine that kindergarten teachers fall into two classes: either they are kind, in which case their own children obey them

[10] In section 4.8, we will define how a set of assignment functions can satisfy a formula along the same lines: if some member of a set of assignment functions satisfies the formula in question, then the whole set does.

but they can't control their students; or they are mean, in which case they can keep their students in line, but their own children rebel. Then the satisfaction of (33) will depend on which kind of teacher is more common. If most teachers are kind, the lexical reading will be true and the extrinsic reading will be false, but if most teachers are mean, the opposite will hold. If there are exactly as many kind teachers as mean ones, then neither set will have a majority, and the quantification will be false on either reading.

It is important to notice that there is no reading of (33) in which we can mix the kinship relation with the extrinsic teacher/child relation. That is, it would be possible to imagine constructing a characterization of the truth conditions for (33) on which the possession relation holding between the teacher and the set of children could vary with each choice of a teacher. Then the nuclear scope would be satisfied just in case for each teacher there was some set of children, either their students or their own children, that obeyed them. That would predict that in the situation just described, in which half of the teachers are kind and half are mean, the quantification could be true, since for any given teacher there is some potentially relevant set of children that are obedient.

This reading is not available, however. In some sense, you have to specify what possession relation you have in mind before you begin to examine particular cases to see whether they serve to confirm or disconfirm the quantified assertion. In the system presented here, this is guaranteed by the fact that the quantifications are evaluated with respect to logical forms like that in (34) in which the choice between a lexical reading and an intrinsic relation depends on which lexical sense of the possessee nominal is chosen.

In other words, the choice of a possession relation holds constant across a quantification. It is easy to imagine that any detailed account of the semantics of possessives could guarantee this uniformity, but it is good to convince ourselves that the analysis we have is one that gets this fact right.

Narrowing

Now we are ready to see how unselective binding automatically predicts the narrowing effect for quantificational possessives.

(36) a. Most planets' rings are made of ice.
b. $[\![most]\!]([\mathbf{planets}(x) \wedge \mathbf{rings}(x, y)], [\mathbf{made\text{-}of\text{-}ice}(y)])$

On the simple theory of unselective binding described above, then, (36) will be true just in case at least half of the assignment functions that satisfy the restriction also satisfy the nuclear scope.[11]

[11] Quantifiers other than *most* will have similar satisfaction conditions, as detailed in section 4.9.

It is immediately clear how this accounts for the narrowing problem.

(37)

	planet	rings	made of ice
a.	Saturn	r_1	yes
b.	Neptune	r_2	yes
c.	Uranus	r_3	no
d.	Mercury	——	——
e.	Venus	——	——
f.	Earth	——	——
g.	Mars	——	——
h.	Jupiter	——	——
i.	Pluto	——	——

The facts reported in (37), then, are consistent with a solar system in which Saturn and Neptune have rings made of ice, but the rings of Uranus are made of methane.

By construction, the outcome of the quantification depends only on those assignment functions that satisfy the restriction. Only the first three planets listed in (37) even have rings, so outcome of the quantification depends only on the assignment functions suggested by (37a), (37b), and (37c). Since two out of three of the assignment functions that satisfy the restriction also satisfy the nuclear scope, we correctly predict that (36) will be true in the situation depicted in (37). Since the other six assignment functions do not satisfy the restriction, they are ignored.[12] In effect, the domain of quantification automatically narrows to consider only those planets that possess rings.

Before we can turn our attention to the proportion problem, we must first say a little bit more about how to decide which variables will be bound by a quantifier.

6. Absorption

Which variables in the scope of a logical operator get bound? If quantificational binding were truly unselective, then every description in the logical scope of an operator could potentially give rise to a variable bound by that quantifier. However, in general, only some of those variables will in fact be bound. I will not attempt a complete account of variable binding here, of course, but some general remarks are in order. In particular, we shall see that

[12] Technically, these assignment functions (and all assignment functions) will still assign some entity to the ring variable, it's just that this value will not satisfy the restriction: either it will be an entity that is not a set of rings, or it will be a set of rings that is not possessed by the planet in question.

possessives, both quantificational possessives and non-quantificational possessives, pattern with definite descriptions with respect to binding.

Assume that we have some token of a quantificational expression in mind. Then let V be the set of bound variables for that instance of quantification. I will assume that each member of V occurs at least once somewhere in the translation of the restriction or the nuclear scope. We can divide the expressions that give rise to potentially bindable variables into pronouns, indefinite descriptions, definite descriptions, and possessives.

Pronoun variables can either be bound or not, subject to a complex set of syntactic binding constraints. When a pronoun is not bound by a quantifier, it is deictic.

(38) a. Every woman liked her.
b. Every woman believes she is intelligent.

In (38a), the pronoun *her* cannot be bound by the quantifier denoted by *every* because of a syntactic constraint that would require a reflexive in this position. Since it is not bound, its referent is fixed independently of the quantification, leading to the entailment that there is a particular woman who was liked by all the women. In other words, the pronoun in (38a) is deictic.

In (38b), the pronoun *she* occurs embedded in a complement clause, and it can optionally be bound by the matrix quantifier. If it is not bound, we get a deictic reading similar to that in (38a) on which there is a single woman who is widely admired. If it is bound, then (38b) entails that each woman holds her own cleverness in high regard. One way to be sure that a pronoun can fail to be bound by a quantifier is that it can be bound by a second quantifier.

(39) Most boys believe that every sensible man believes he is intelligent.

The variable denoted by the pronoun *he* can be bound either by the quantifier denoted by *most* or by *every*. On the reading on which *he* is bound by the *most* quantifier, (39) claims that most boys think that they are universally admired by their elders.

We assumed in the fragment in chapter 3 that a pronoun can denote any variable at all. This assumption leads to overgeneration, but it will serve our purposes here as a simple first approximation. If the pronoun translates as the variable that indexes the man description, it will be bound by the same quantifier that binds the man variable. If, on the other hand, the pronoun translates as the variable that indexes the boy description, it will be bound by the same description that binds the boy variable. (If the pronoun translates as neither of these variables, it will be deictic.) We will use the ability of a variable to be bound by either one of a pair of quantifiers as a diagnostic for whether that variable is necessarily bound by the closest commanding quantifier.

I will not attempt a full characterization of when a pronoun can or cannot be bound. However, it is especially important to realize that a pronoun can only be bound if it denotes a variable that is bound independently of the pronoun.

(40) Most men believe that she is intelligent.

Because of the entailments due to gender marking, the pronoun *she* cannot translate as the man variable. The point of interest is that the pronoun variable cannot be bound by the quantifier denoted by *most*. That is, (40) only has an interpretation on which *she* is deictic; there is no reading of (40) on which the choice of woman varies with each choice of a man.

As for indefinite descriptions, as far as I know an indefinite variable (i.e., a variable indexing an indefinite description) can always be bound.

(41) Most women believe that every man admires a character on Dallas.

The indefinite *a character on Dallas* is in the logical scope of both *most* and *every*. It can be bound by either one, leading to one reading on which each women has a particular star in mind (i.e., the character variable bound by the matrix quantification), and one on which each woman has a belief that each man has his own personal favorite, without believing that the men all like the same actor (i.e., the character variable bound by the lower quantifier).

Whether or not a definite variable is bound depends on the structure of the definite. Usually, definites are not bound. But if the translation of a definite description contains a bound variable, then the definite variable will also be bound.

(42) a. Usually, if a woman hates the donkey that she owns, she beats it.

b. Usually, if a woman hates her hair, she cuts it.

In (38a), the definite description *the donkey that she owns* contains the pronoun *she*. On the reading on which *she* denotes the variable that indexes the woman description, the referent of *the donkey that she owns* will potentially vary with each choice of a woman. Similarly for the possessive in (42b): if the pronoun *her* is bound, then each woman cuts her own hair.

Heim (1982) explains such examples by stipulating that a new donkey is accommodated for each instance of the quantification. Instead, I will adopt the strategy of Gawron and Peters (1990), who take the examples in (40) as demonstrating that some definites can be bound. They describe the class of definites that will be bound by means of a principle which they call the Absorption principle. I have adapted their insight for my own purposes here, although I have kept the same name.

(43) Absorption:

If the translation of a description with index x
contains an occurrence of a variable $y \in V$, then $x \in V$.

That is, if a description contains a bound variable, that description is bound by the same quantifier. (See also Gawron, Nerbonne, and Peters (1991) for a discussion of absorption and its consequences for donkey anaphora.) According to the Absorption principle, the reason that the definite in (42a) is bound by the quantification (on the relevant reading) is that its translation contains a pronoun that happens to be bound (namely, *she*). By the same token, the reason that the possessive in (42b) is bound is because its translation contains a bound pronoun (namely, *her*).

In the case of possessives, there is another factor that determines when variables in the translation of a possessive will be bound.

(44) The variable corresponding to the surface structure complement of a quantificational determiner is always bound by the quantifier denoted by that determiner.

This rule is just an explicit statement of the fact that in the sentence *Every woman snores*, the woman variable is necessarily bound by the quantifier due to *every*.

(45) Every woman's dog snores.

Similarly, in the quantificational possessive in (45), the possessor variable will be bound, since *woman* is the surface structure complement of *every*. Furthermore, thanks to the Absorption principle, the variable corresponding to the entire possessive will be bound, since the translation of the possessive contains a bound variable. Thus (44) in combination with the Absorption principle predicts that the quantification in a quantificational possessive will bind all of the possessee variables, in addition to most deeply embedded possessor variable.

To summarize this section, we can predict which variables will be in the set of bound variables V as follows: indefinites prefer to be bound, but need not be bound; definites (including possessives) will be bound only if their translation contains a bound variable; and a pronoun will be bound just in case it translates as a variable which is bound for independent reasons. In addition, the surface structure complement of a quantificational determiner always describes a variable bound by the quantifier. By virtue of the Absorption principle, this means that all possessee variables in a quantificational possessive will be bound.

Obviously, this characterization is a very rough approximation at best, but a more accurate theory would takes us far away from our main interest.

What is important for the interpretation of possessives is that a possessive description (including quantificational possessives) will be bound by a quantifier just in case its denotation depends on a variable that is bound by that quantifier.

7. Cases and the proportion problem

One of the main objections to the unselective binding approach is that it does not make good predictions in certain kinds of situations. On the simple version of unselective binding presented in section 4.5, any assignment function will participate in the evaluation of a quantifier, so long as that assignment function satisfies the restriction. Often there are too many such assignment functions. That is, often there are more distinct assignment functions than there are intuitively distinct cases in the quantification. Since Kadmon (1987), this has been known as the proportion problem, because it arises in situations in which the set of distinct assignment functions are distributed across the set of bound variables in a lopsided fashion. (This characterization of the proportion problem will be explained in detail shortly.) Clearly, distinct assignment functions do not always count as independent cases for a quantification. Instead, some assignment functions must be grouped together and counted as a unit.

For any given use of a quantificational expression, the way in which assignment functions are grouped together depends partly on the entailments of the expression, and partly on the facts of the world as reflected in the model against which the expression is to be evaluated. In other words, predicting the readings of quantificational sentences depends partly on the grammatical properties of the sentence, and partly on the facts of the world. In this section, I will comment on how assumptions about the way the world works can influence the availability of proportional readings, and I will also suggest two specific rules that will partially characterize the way that grammatical properties of a quantificational expression also constrain the availability of proportional readings; although I can hardly attempt a complete account of the proportion problem here, these two rules will be sufficient for our larger purpose, which is to investigate the properties of quantificational possessives.

Once we have some understanding of the range of possible proportional readings in general, section 4.8 will return to the interpretation of quantificational possessives. We will see that quantificational possessives have more than one proportional reading, just like any quantificational expression involving multiple binding, and that this is what accounts for the intuition that there are multiple perspectives on the quantification arising from a quantificational possessive. In particular, we shall see that there is a possessor-dominant interpretation, and a symmetric interpretation.

Cases

The proportion problem has been discussed in detail by Heim (1982), Bäuerle and Egli (1985), Kadmon (1987), and many others. Kadmon observes that in general, a quantifier that binds two variables will give rise to at least three distinct interpretations.

(46) a. Usually, if a woman owns a donkey, she is happy.

b. Usually, if a drummer lives in an apartment complex, it is half empty.

c. Usually, if a man meets a child, they smile at each other.

These three sentences are designed to render each of the three kinds of interpretation more prominent. In each example, the adverbial quantifier binds two variables, but the variables have a different status in each of the sentences. In (46a), the quantification intuitively quantifies only over women, so that the number of donkeys each woman owns is irrelevant. In (46b), the quantification intuitively quantifies only over apartment complexes, so that the number of drummers that live in each apartment complex is irrelevant. In (46c), the quantification ranges over situations in which a man meets a child, so that if a particular man meets a number of children, each encounter is relevant for the quantification; that is, in (23c), both variables are relevant. If one variable is irrelevant for distinguishing cases, following Kadmon, we will call such a quantification ASYMMETRIC. Thus the preferred readings of (46a) and (46b) are asymmetric readings. In (46a) the woman variable dominates over the donkey variable, and in (46b) the apartment variable dominates over the drummer variable. In contrast, the quantification in (46c) is SYMMETRIC, since the man variable and the child variable are equally important for distinguishing cases.

The problem with simple unselective binding is that it is capable of representing only the symmetric reading, since it gives equal weight to each assignment function that satisfies the restriction. Consider the truth conditions for (46a) in the situation depicted in (47).

(47)

	woman	donkey	happy
a.	w_1	d_1	yes
b.	w_2	d_2	yes
c.	w_3	d_3	no
d.	w_3	d_4	no
e.	w_3	d_5	no

In this situation, one women (namely, w_3) owns more donkeys than the rest of the donkey-owning women combined.[13] If we count assignment functions, as suggested in the previous section, then we have two assignment functions satisfying the restriction for which the nuclear scope is true, versus three for which it is false. Thus we predict that the generalization expressed by (46a) is false in this situation. But the normal intuition is that on the preferred reading of (46a), the number of donkeys per woman is irrelevant; we ought to predict that (46a) will be true in this situation, since two out of three donkey-owning women are happy. Because the unselective scheme does not know which assignment functions listed in (47) to ignore, it can predict only the symmetric interpretation.

Similar remarks hold of the asymmetric quantification in (46b).

(48)

	drummer	apartment	half empty
a.	d_1	a_1	yes
b.	d_2	a_2	yes
c.	d_3	a_3	no
d.	d_4	a_3	no
e.	d_5	a_3	no

The fact that one apartment building (namely, a_3) houses more drummers than the other apartment buildings combined is irrelevant. Once again the unselective approach incorrectly predicts that (46b) should be false in this situation.

Only for the symmetric case does the unselective system give good predictions.

(49)

	man	child	smile
a.	m_1	c_1	yes
b.	m_2	c_2	yes
c.	m_3	c_3	yes
d.	m_4	c_4	no
e.	m_4	c_5	no
f.	m_5	c_4	no
g.	m_5	c_5	no

Despite the fact that some men meet more than one child (m_4 and m_5), and despite the fact that some children meet more than one man (c_4 and c_5), each

[13] This is an odd way to talk about such a small number of women and donkeys, but since we will often need to keep track of individual assignment functions, it will be convenient to keep the numbers of participants as small as possible. I will always intend for my remarks here and below to scale up to more realistic situations.

man/child encounter counts as a separate case for the purposes of evaluating the quantification. Thus the simple unselective account correctly predicts that (23c) will be false in this situation. If we ignored either the man variable (collapsing the last four instances into two cases) or the child variable (again, collapsing the last four instances into two cases), we would incorrectly predict that (23c) is true in this situation, since the quantificational score would be three cases for versus two cases against. But this does not agree with the standard judgment on the preferred reading of (23c).

Obviously, we need a mechanism for grouping assignment functions into cases. Root (1985), working in a DRT framework, suggests that embedding functions need to be grouped together into equivalence classes for the purposes of keeping score for quantification. I have implemented this idea for unselective binding by means of a mechanism reminiscent of the calculation of Schwarzschild's (1989) select-tuples. Schwarzschild groups assignment functions into equivalence classes based on the set of variables that are bound by the quantification; I generalize this technique by relativizing the equivalence classes to arbitrary subsets of the bound variables.

Let us see how this works in more detail. Assume that V contains the set of variables that are bound by a given instance of quantification, and let R be a subset of V. Then R will be interpreted as the set of variables that are relevant for distinguishing cases. This set R will induce a partition on the set of assignment functions as described in (50).

(50) Cases:

Two assignment functions will be members of the same case if and only if they agree on what they assign to variables in R.

To see how this leads to a description of the observed interpretations for the asymmetric examples above, consider again the situation against which we evaluated (46a). Assume that the woman variable is relevant, but the donkey variable is not, that is, R contains only the woman variable.

(51)

	woman	donkey	happy	
a.	w_1	d_1	yes	Case I
b.	w_2	d_2	yes	Case II
c.	w_3	d_3	no	Case III
d.	w_3	d_4	no	
e.	w_3	d_5	no	

According to the rule in (50), the assignment functions in (c), (d), and (e) will be members of the same case, since they agree in assigning the woman variable to the same entity (namely, w_3). This case structure clearly indicates that

the score for the quantification should be two to three in favor of the generalization, as desired.

Similarly, if we assume that the set of variables that are relevant for distinguishing cases in (46b) contains only the apartment variable, then we get the desired case structure for the apartment-dominant reading for (46b).

(52)

	drummer	apartment	half empty
a.	d_1	a_1	yes
b.	d_2	a_2	yes
c.	d_3	a_3	no
d.	d_4	a_3	no
e.	d_5	a_3	no

Since the assignment functions in (c), (d) and (e) all assign the apartment variable to the same entity, they are all members of the same equivalence class, regardless of what they assign to the drummer variable. Given the correct choice for the membership of R, once again we predict the correct truth conditions.

It will be convenient to officially adopt some of the terminology I have been using in the discussion above.

(53) a. A CASE is a set of assignment functions.

b. A member of a case is an INSTANCE of that case.

On the simple unselective binding scheme, an assignment function is always a case all by itself; but on the refinement proposed here, an assignment function is just a instance of a case.

Note that by generating the set of cases from a set of distinguished variables R, we explicitly guarantee that there will be a one-to-one correspondence between proportional readings and sets of bound variables. Thus where there are two bound variables, as in the examples in (46), there will potentially be four readings: one reading in which both variables are relevant for distinguishing cases (the symmetric reading), two asymmetric readings in which one variable is relevant and the other is not, and a fourth in which neither variable is relevant. On his fourth reading, R is the empty set, which leads to a degenerate case structure in which all of the assignment functions are viewed as instances of a single case. Assuming that we have some set of principles for predicting which variables will be relevant in any given situation, the availability of this degenerate partition is harmless, as near as I can tell.

This correlation between proportional readings and sets of bond variables is not guaranteed on the situation-based account advocated by, e.g., Berman (1987) and Heim (1990). This work is based on Kratzer's theory of situations (e.g., Kratzer (1989)), on which situations contain other smaller

situations as parts. On these proposals, proportional readings depend on the lattice structure of the situations in a model. Different proportional readings correspond to evaluating a quantification at a different level of granularity. At each different level, a different set of instances are lumped together into a single event. To see how this works, consider the sentence in (54).

(54) If a letter arrives for me, I'm usually at home.

Berman observes that if fifty letters arrive on the one day that he fails to be at home, that day's letters do not constitute fifty separate counterexamples to the generalization asserted by (54). In our terms, the letter variable is irrelevant for distinguishing cases.

Berman takes this example to motivate a situation-based approach to individuating cases.

> Given the fact of our world that letters typically arrive in bunches constituting a single delivery, letter-arriving is plausibly classified as such a vague [i.e., lumpy] situation, wherein the arrival of 50 letters is ordinarily on a par with that of a single letter. (Berman (1987, 16))

Assuming there is some way of figuring out which sub-events in which a single letter is delivered will get lumped together into a single letter-arriving event, then it is clear that an account on which quantifiers quantify over (possibly complex) events will be capable of describing any desired proportional reading. Here each sub-event (the arrival of a single letter) corresponds to one of our instances, and a complex event (the arrival of the day's letters) is exactly analogous to a case.

What is lost on the situation account is the connection between the variables involved and the variety of possible proportional readings. For the situation-based account, the division of the set of instances into lumps depends so strongly on the facts of the world that we should predict that there will be as many proportional readings as there are ways of lumping minimal situations together.

In any case, now that we have a system for predicting the range of possible partitions on a set of variables, we must adjust our method for calculating the truth conditions for a quantificational expression.

(55) A case satisfies a formula iff at least one instance of that case satisfies the formula.

In (51), for instance, the first case satisfies the nuclear scope because its only instance satisfies the nuclear scope. But the third case does not satisfy the nuclear scope, since none of its instances satisfies the nuclear scope.[14]

Now that we have an idea of what the possible range of proportional readings is, we can turn to the problem of predicting which reading will be preferred on any given occasion.

Predicting proportional readings

We have seen how to characterize the range of possible proportional readings based on a set of distinguished variables. In general, given a set V of bound variables, there will be as many proportional readings as there are subsets of V. A number of writers have speculated on how to predict which proportional reading will be appropriate for any given situation (including Bäuerle and Egli (1985), Kadmon (1987), Heim (1990), and Chierchia (1990)). Some of the factors that seem to be relevant include the way in which situations are individuated (lumped); focus; and the presence of donkey pronouns in the nuclear scope. However, although there has been some success at characterizing what different proportional readings are possible, no one has yet put forward a comprehensive theory predicting which proportional reading will be preferred in any given situation. I will not attempt to develop such a general theory here, but I will make some general comments, followed by a more specific principle that we will need in section 4.8.

As before, let R be some subset of V. Then we can express constraints on the availability of proportional readings as constraints on the membership of R.

(56) A variable $x \in V$ will be in R (i.e., relevant for distinguishing cases) if there is a non-accidental correlation between the value of x and the value of the nuclear scope.

[14] Note that the requirement for satisfaction given in (55) is as weak as it could be: it would suffice if only one out of many instances satisfied the nuclear scope. So far, this has not been an issue; all of our examples have involved situations in which all or none of the instances of a case have satisfied the nuclear scope. As Chierchia (1990) points out, however, the weak formulation is necessary for the most natural reading of the sentence *Usually, if a man has a dime, he puts it in the meter* (attributed to Pelletier and Shubert). If a man has three dimes in his pocket, normally he will only put one of them into the meter with respect to any quantificational case. Yet each of the three dimes will correspond to a separate instance of that case. Here only one out of three instances satisfies the nuclear scope, but the case intuitively counts as confirming the generalization.

In other words, a variable will be relevant for distinguishing cases if it is perceived to be relevant for affecting the outcome of the quantification.

We can see how this works for the examples in (46), repeated here.

(57) a. Usually, if a woman owns a donkey, she is happy.
b. Usually, if a drummer lives in an apartment complex, it is half empty.
c. Usually, if a man sees a child, they smile at each other.

We observed in the previous subsection that the preferred reading for (57a) has the woman variable as the only relevant variable; (57b) has the apartment variable as the only relevant variable; and (57c) has both the man variable and the child variable as relevant. To see how the rule in (56) predicts these readings, let us consider them one at a time. In (56a), consider the proposition denoted by *she is happy*. This depends rather strongly on who the woman in question is. This means that there is a non-accidental correlation between the value of the woman variable and the satisfaction of the nuclear scope. This is sufficient to nominate the woman variable as relevant for distinguishing cases. The donkey variable, in contrast, does not affect the value of the nuclear scope. For any given women, she is either happy or unhappy, no matter which of her donkeys she is paired with.

In (57b), there is a similar contrast between the drummer variable and the apartment variable. Whether the apartment building in question is half-empty depends only on the identity of the apartment building, and does not depend on which drummer we have in mind. Thus in (57b), we predict that the apartment variable will be relevant and the drummer variable will not be.

In (57c), however, whether or not a man and a child smile at each other depends on the disposition of both the man and the child. A particular man may smile at one child, but frown at another. By the same token, a particular child may smile at the sight of its father, but cry at the sight of a stranger. Thus it is not sufficient to know the value of the man variable or the child variable alone in order to predict whether the nuclear scope is satisfied. Because of this symmetry in the influence of the value of the two variables on the outcome of the nuclear scope, they receive equal status with respect to distinguishing cases, so that both variables will be members of R.

The rule in (56) is not formulated precisely enough to make firm predictions. I will not develop the modal logic necessary to make the notion of a "non-accidental correlation" more precise here. However, for our purposes, it will suffice to mention two rules of thumb that depend on purely structural aspects of the quantification at hand.

(58) Variables that are relevant for distinguishing cases must occur in the translation of the restriction.

This rule simply gives the equivalent of Heim's rule of existential closure for the nuclear scope, as motivated by examples like (59).

(59) Usually, if a woman owns a donkey, she beats it with a stick.

Both the woman variable and the donkey variable occur in the translation of the restriction, so they can potentially be relevant for distinguishing cases (as far as (58) is concerned). Note that both the woman variable and the donkey variable also occur in the nuclear scope (on the relevant reading) as the translations of the donkey pronouns.

However, the stick variable occurs only in the translation of the nuclear scope. To see that the stick variable can never be relevant for distinguishing cases, imagine we have a particular woman in mind, as well as one of her donkeys. She beats this donkey on several occasions, and each time she uses a different stick. There is no reading of (58) on which there are separate cases corresponding to which stick the woman used. This is predicted by the rule in (58), since there is no occurrence of the stick variable in the translation of the restriction of (59). We will henceforth ignore variables that occur only in the nuclear scope.

The second rule of thumb will prove to be crucial for our understanding of the proportional readings of quantificational possessives.

(60) The variable corresponding to the surface structure complement of a quantificational determiner is always relevant for distinguishing cases.

As is widely known, examples involving adverbial quantifiers give rise to proportional readings that are unavailable to examples involving nominal quantifiers.

(61) a. Usually, if a drummer lives in an apartment building, it is half-empty.

b. Most drummers who live in an apartment building like it.

Both of these sentences have a drummer-dominant reading. In addition, the adverbial quantification in (61a) also has a reading on which the apartment variable is relevant but the drummer variable is not. In fact, as described above, the apartment-dominant reading is the preferred reading for (61a) in a neutral context.

However, (61b) does not have an apartment-dominant reading. To see this, notice that if an apartment building houses twenty drummers, each drummer who dislikes her apartment building counts as a separate counterexample to the claim in (61b). In other words, the drummer variable is necessarily relevant for distinguishing cases in (61b), as predicted by (60). We shall see in the next section that this rule is crucial for predicting the truth conditions of

quantificational possessives, since it entails that the possessor variable will always be relevant for distinguishing cases.

8. The perspective paradox resolved

This section investigates the consequences of the theory of unselective binding and proportion sketched in the previous sections for instances of quantification involving possessives. We will discuss both non-quantificational possessives that occur in the logical scope of some other quantificational operator, as well as quantificational possessives, in which the quantification in question arises from a quantificational determiner embedded in the possessive itself.

The goal of this section (and this chapter) is to account for the intuition that possessives in general, and especially quantificational possessives, can be "about" either the class of objects described by the possessor, or the class of objects described by the possessee description.

(62) Most younger students' favorite teachers smile at them often.

Intuitively, (62) can either be construed as a generalization about younger students (they prefer friendly teachers), or about what sort of teachers can be expected to smile at their students (the ones who aren't worried about being popular).

Up to this point in the dissertation, I have argued that there is no relevant ambiguity in (62) at any level of representation, either in the syntactic surface structure (chapter 1), in the descriptive content (chapter 2), or in the logical form due to possessives (chapter 3). How, then, can we account for the intuition that (62) is ambiguous? I have argued that that the quantification in (62) binds two variables, the student variable and the teacher variable. What I will suggest here is that the different readings of (62) result from different choices for which of these two variables are assumed to be relevant for distinguishing cases.

In chapter 1, I argued that syntactic possessives have only a spec-of-DP structure, so that there is only one syntactic constituent structure available for the possessive in (62) (namely, [[*most younger students'*] *favorite teachers*]). To see that the possessive in (62) must be syntactic (rather than a possessive noun-noun compound, as in *most men's rooms*), notice that the adjective *younger* modifies only the student description, that the possessor and the possessee nouns are separated by the adjective *favorite*, and that the possessive neither receives an idiomatic interpretation, nor does it serve as the name of a kind. Furthermore, the pronoun *them* is anaphorically linked to the student

description, which further supports the hypothesis that there is no possessee-dominant analysis for (62). As argued in chapter 1, all of these facts indicate that there is no syntactic ambiguity in the possessive in (62).

In chapter 2, I argued that possessives are potentially ambiguous across a variety of interpretations, depending on the argument structure of the possessee nominal. In particular, a possessive can be ambiguous between a lexical interpretation or an extrinsic interpretation. But this ambiguity is independent of the ambiguity we are trying to explain, as shown by the example in (63).

(63) Most kindergarten teachers' children obey them.

As explained in section 4.5, the possessive in (63) can entail either that there is a kinship relation between each teacher and their children, or an extrinsic relation. On the kinship reading, (63) describes the home life of kindergarten teachers, and on the extrinsic reading, (63) describes how effective kindergarten teachers are in the classroom. On both of these readings, there is still the sense that (63) can either be a statement about the properties of kindergarten teachers, or a statement about a particular group of children. For instance, on the kinship reading, (63) can either suggest that kindergarten teachers are so used to absolute control at school that they exact the same sort of obedience from their own children, or that of all the different kinds of children, at least the ones whose parents are professional teachers are likely to be well-behaved. Thus the different perspectives on what a quantificational possessive is about cannot be explained as a consequence of any variability in its descriptive content due to the argument structure of the possessee.

In chapter 3 I argued that a quantificational possessor phrase must raise to take scope over its host possessive phrase. This might have led to an explanation for the perspective paradox, if there were evidence for the existence of two distinct logical forms such that in one, the possessor phrase had scope over the possessee phrase, and in the other, the possessee phrase had scope over the possessor. Then we could predict that the description that had scope over the other would be the description that the quantification was about. But the fact that a raised determiner phrase must command its trace in logical form entails that there will only be one logical form for each possessive. That is, in order for a quantificational possessor phrase to command its trace in logical form, the possessor must command its host possessive. Therefore the possessor phrase will always have scope over its host possessive, as argued in chapter 3. This means that there is no hope of accounting for the relevant ambiguity of (62) or (63) based upon any indeterminacy at the level of logical form.

The only remaining candidate, then, for an explanation for this phenomenon is the indeterminacy in interpretation described in the last two sections. That is, I claim that what a quantification is about correlates with which variables are relevant for distinguishing cases.

Non-quantificational possessives

To see how this would work, consider first an example involving a non-quantificational possessive. Recall from section 4.6 that the only way that a non-quantificational possessive will be bound by a quantifier is by virtue of the absorption principle. This means that in order to be bound, the translation of the possessive must contain an occurrence of a bound variable.

(64) a. Usually, if a young mother has a child that is sick, she takes it to the doctor.

b. Usually, if a young mother's child is sick, she takes it to the doctor.

On the relevant reading for (64a), both the mother variable and the child variable are bound by the quantification. Similarly, (64b) has a reading on which the mother variable is bound. On this reading, thanks to the Absorption principle, the child variable will also be bound. For both examples, there is a proportional perspective on which each instance in which a mother fails to take a sickly child to the doctor constitutes a separate counterexample. If so, then the child variable is relevant for distinguishing cases. In addition, both examples also have a reading on which the child variable is not relevant. For example, if most of the women in the neighborhood rush their children to the doctor at the first sign of a cough, but there is one woman with many children who often get sick, but who is too poor to ever take them to the doctor, this one poor woman counts as a single counterexample to the claim.

Finally we are beginning to see how the availability of a variety of proportional readings can lead to an explanation for the perspective paradox. If the child variable is not relevant, then the statements in (64) are generalizations about the behavior of women; but if the child variable is relevant, then the statements in (64) are generalizations about the properties of children who have young mothers.

However, there is an important difference in entailments between the two sentences. Recall from section 2.5 that the use of a possessive presupposes that there is a unique child for each women. This means that there will be a one-to-one correspondence between women and their children for the possessive example, so that there will necessarily be at most one instance per case on either reading.

(65)		mother	sick child	takes it to the doctor
	a.	m_1	c_1	yes
	b.	m_2	c_2	yes
	c.	m_3	c_3	no

If we decide that only the mother variable is relevant, there will be one case per mother, so that each instance will constitute a separate case. But if we decide instead that the child variable is the only relevant variable, then there will one case per child, and each instance will still constitute a separate case. Therefore the uniqueness presupposition for possessives entails that different proportional readings for (non-quantificational) possessives in the scope of a quantificational operator will always have identical truth conditions.

Any attempt to find distinct truth conditions that depends on having more than one possession per possessor will come to grief because of the uniqueness presupposition. But what happens when there is potentially more than one possessor for each possession?

(66) Usually, if a drummer's apartment building has thin walls, it is half-empty.

Since more than one drummer can live in the same apartment building, it is possible for the possessive description in (66) to describe the same apartment building for different choices of a drummer.

(67)		drummer	apartment	half-empty
	a.	d_1	a_1	yes
	b.	d_2	a_2	yes
	c.	d_3	a_3	no
	d.	d_4	a_3	no
	e.	d_5	a_3	no

Here there are three drummers living in the same apartment building. The rent in apartment building a_3 is so low (that's why the drummers are living there) that even though the walls are very thin and the drumming is loud, no one is willing to move to a more expensive place. On this scenario, we will have one case per apartment building, so that the three instances of drummers who live in building a_3 constitute a single case, and, given the facts in (67), the generalization is predicted true.

If, on the other hand, we decide that the drummer variable is relevant for distinguishing cases, then we would get another case structure. Perhaps the reason a_3 is still full is that the three drummers who live there take special

pains to practice quietly. If any one of the noisy drummers moved into apartment building a_3, it would promptly empty out. On this scenario, it is plausible that the drummer variable is relevant for distinguishing cases. In this situation, each drummer will correspond to a distinct case, so that each instance in (67) will constitute a separate case. Then more than half of the cases will be cases in which the drummer's apartment building is not half-empty, and the generalization will be predicted false. Thus different assumptions about which variable is relevant for distinguishing cases can lead to distinct truth conditions for non-quantificational possessives.

We could also suppose that both the drummer variable and the apartment variable are relevant. However, thanks again to the uniqueness presupposition, there is always a unique apartment building for each drummer. This means that the symmetric reading will always be indistinguishable from the possessor-dominant reading, at least, as far as truth conditions are concerned.

Some similar examples appear in (68).

(68) a. Usually, if a sick child's mother has any money, she takes it to the doctor immediately.

b. Usually, if a student's teacher likes him, she passes him.

c. Usually, if a paper's author is a graduate student, it is long.

In each of these sentences, there is certainly a possessor-dominant reading in which each child, student, and paper counts as a separate case. But there is also potentially a possessee-dominant reading in which it is only the qualities of the mother, the teacher, and the author that count. The fact that these give rise to distinct truth conditions establishes that the possessor variable and the possessee variable are bound independently, and that which variable is assumed to be relevant for distinguishing cases can lead to distinct truth conditions for non-quantificational possessives.

Quantificational possessives

Naturally we should expect that the same range of readings are available for quantificational possessives. I will argue that quantificational possessives do have a possessor-dominant reading and a symmetric reading, but these two readings lead to identical truth conditions because of the uniqueness presupposition. Unfortunately, the reading that lead to distinct truth conditions for the non-quantificational examples above, namely, the possessee-dominant reading, is unavailable for quantificational possessives. The reason is that we already know from the non-possessive examples in section 4.7 that the variable corresponding to the surface structure complement of a quantificational determiner is always relevant for distinguishing cases. For quantificational

possessives, this means that the possessor variable is always relevant for distinguishing cases.

(69) Most people's favorite color is blue.

It is easy to imagine that a number of people have the same favorite color, as suggested by (70).

(70)

	person	color	is blue
a.	p_1	r	no
b.	p_2	y	no
c.	p_3	b	yes
d.	p_4	b	yes
e.	p_5	b	yes

Here one person likes red, one person likes yellow, and three different people like blue. If it were possible for the color variable to be relevant at the same time that the person variable was not relevant, we would expect the case structure indicated in (70). There would be three cases, one for each color, and we would predict that (69) is false in this situation, since only one out of three favorite colors is blue.

However, (69) does not have such a reading. In general, quantificational possessives only have readings on which the possessor variable is relevant. But this is exactly what we would predict from the general theory of proportion outlined in the previous section, since we stipulated there that the variable corresponding to the surface structure complement of a quantificational determiner is always relevant for distinguishing cases.

(71) Most drummer's apartment buildings are half-empty.

In contrast to the adverbial and the non-quantificational possessive examples above, (71) does not have an apartment-dominant reading. That is, if three drummers live in the same full apartment building, they each count as a separate counterexample to the claim in (71), no matter what the circumstances.

So far all we have said is that the possessor variable must be relevant. This leaves two possible proportional readings available for a simple quantificational possessives: either the possessee variable is relevant, leading to a symmetric interpretation, or it is not relevant, leading to a possessor-dominant interpretation. These two possibilities account for the intuition that quantificational possessives have two distinct kinds of interpretations, according to whether the quantification is taken as a characterization of the set described by the possessor (possessor-dominant interpretation), or as a characterization of the set described by the possessee, i.e., the set described by the possessive as a whole (symmetric interpretation).

However, although there is a strong intuition that these interpretation schemes are somehow distinct, they do not give rise to distinct truth conditions. As for the non-quantificational possessives, the uniqueness presuppositions of possessives will entail that these two readings always lead to identical truth conditions.

(72) Most graduate students' longer papers are about English.

Here the presence of the adjectives guarantees that we do not have a noun-noun compound (see section 1.4). Now consider the truth conditions for this sentence given the situation depicted in (73).

(73)

	student	paper	about English
a.	s_1	p_1	no
b.	s_2	p_2	no
c.	s_3	p_3	yes
d.	s_3	p_4	yes
e.	s_3	p_5	yes

In order to test whether there is a difference in the truth conditions between the possessor-dominant reading and symmetric reading, we would like to have a set of instances as given in (73). For the symmetric reading, each student/paper pair would count as a separate case, but for the possessor-dominant reading, we would have the case structure as indicated in (73), giving rise to different predicted truth conditions.

However, the set of instances in (73) violates the uniqueness presupposition, since there are distinct instances that agree on what they assign to the student variable but which differ in what they assign to the paper variable (e.g., (c) and (d)). In order for the uniqueness presupposition to be satisfied, if a particular student wrote more than one paper, then the value of the paper variable must be a proper sum. As described in section 2.5, the paper variable will always be the maximal set of papers possessed by the relevant student (see also section 4.9 for a more detailed discussion of uniqueness presuppositions in quantificational contexts).

(74)

	student	paper	about English
a.	s_1	$\{p_1\}$	no
b.	s_2	$\{p_2\}$	no
c.	s_3	$\{p_3, p_4, p_5\}$	yes

This set of instances depicts the same facts, but it is consistent with the uniqueness presupposition: there is at most one value for the possessee variable for each choice of a possessor. We are still free to decide that the possessee variable is relevant or not for distinguishing cases, but either choice

necessarily results in the same case structure, namely, the partition on which each instance corresponds to a distinct case.

To summarize, the unselective binding theory of quantification motivated in the first part of this chapter predicts that the possessor description and the possessee description will both give rise to variables that can be independently bound by a quantifier. Given a general theory of proportionality as sketched in section 4.7, we predict that possessives will have a variety of proportional readings, depending on which of its variables are taken as relevant for distinguishing cases. Which variables are relevant corresponds exactly with intuitions concerning what a quantification involving a possessive is about. Confirmation of these assumptions comes from the fact that a non-quantificational possessive can give rise to distinct truth conditions for its possessee-dominant reading versus its possessor-dominant reading.

However, there are two factors which work to obscure the full pattern of expected proportional readings. One factor is the uniqueness presupposition associated with the possessive construction, which requires a unique possessee for each choice of a possessor. This has the effect of guaranteeing that the case structure for the possessor-dominant reading and the symmetric reading will be identical, leading to identical truth conditions. Therefore the possessor-dominant reading and the symmetric readings will always be indistinguishable from the point of view of truth conditions.

The second factor affects only quantificational possessives. As motivated for non-possessive examples (see section 4.7), the variable due to the surface structure complement of a quantificational determiner is always relevant for distinguishing cases. It follows that the possessor variable in a quantificational possessive will always be relevant for distinguishing cases. This means that a quantificational possessive will never have a possessee-dominant reading. It can have either a possessor-dominant reading or a symmetric reading, but since the uniqueness presupposition guarantees that these two readings have identical truth conditions, even though quantificational possessives have distinct proportional readings, they can never give rise to a detectable difference in truth conditions.

9. Fragment

This section presents the final increment to the fragment developed in chapters 1, 2, and 3. It focuses primarily the interpretation of possessives in quantificational contexts, especially when the quantificational element comes from a determiner embedded in a possessor phrase.

Recall from chapter 3 that quantifiers take two logical arguments corresponding to a restriction and a nuclear scope. For quantificational determiners, the restriction corresponds to a (raised) determiner phrase, and the

nuclear scope corresponds to a clause. The interpretation rules for quantificational determiners translate both the restriction and the nuclear scope as truth-value-denoting expressions in the logic, that is, as formulas.

(75) $[\![$*Most people's dogs bark*$]\!]$
$= \textbf{most}([\textbf{people}(x) \wedge \pi(x,y) \wedge \textbf{dogs}(y)],\ [\textbf{bark}(y)])$

As usual, we will hold the choices of a model and a possible world constant, and recursively define the value of a quantificational formula with respect to an assignment function g supplied by the context in which the quantification is embedded.

(76) $[\![\alpha(\phi,\psi)]\!]^g = Q_\alpha(K, K_s)$

Here α is the translation of the quantificational operator we are trying to interpret, Q_α is the generalized quantifier denoted by α, and K and K_s are sets calculated from ϕ, ψ, and g, as described below. Roughly, K is the set of relevant cases, and K_s is set of cases that satisfy the nuclear scope.

Standard generalized quantifiers, e.g., as in Barwise and Cooper (1981), are relations over sets of individuals. Here, generalized quantifiers will be relations over sets of cases (that is, sets of sets of assignment functions). As described in van Eijck (1985), generalized quantifiers can be defined in terms of the cardinality of their arguments. Therefore, let $r = |K|$, and let $s = |K_s|$. Then $Q_{\textbf{every}}(K, K_s)$ is true just in case $r = s$, and false otherwise; $Q_{\textbf{most}}(K, K_s)$ is true just in case s is at least half as large as r; and $Q_{\textbf{some}}(K, K_s)$ is true just in case s is greater than or equal to 1; and $Q_{\textbf{no}}(K, K_s)$ is true just in case s is 0. Note that these definitions are only intended to cover quantification involving at most a finite number of cases.

The set of cases K will be a partition on a set of assignment functions. That is, a case is simply a set of assignment functions. Any theory of quantification that is capable of making predictions concerning donkey anaphora and proportion situations will have to characterize the set of relevant cases in one way or another; however the set of cases is described, we can calculate K_s as given in (77).

(77) $K_s = \{k \in K : \exists f \in k[[\![\psi]\!]^f = T]\}$

Thus K_s is the set of cases that contain at least one instance that satisfies the nuclear scope.

It remains only to explain how to calculate the set of assignment functions that will be legitimate instances for any use of a quantificational expression, and then to calculate the set of cases K. The ingredients that are needed for determining the set of legitimate instances consist of the set of bound variables V, the translation of the restriction ϕ, and the assignment function g against which the quantificational expression is to be evaluated. The rules for

calculating the membership of V as motivated in section 4.6 are summarized in (78) here.

(78) A variable x occurring as the index of a determiner phrase A

a. may be in V if A is an indefinite occurring either in the restriction or the nuclear scope of α;

b. must be in V if there is some variable y in V such that y occurs in the translation of A;

c. must be in V if α is the head of A; and

d. may not be in V except as provided for in (a), (b), and (c).

Then V is any set of variables that is consistent with (78). For each instance of quantification, there are a number of possible choices for V, according to the optionality implicit in (78a). That is, some indefinites may freely be interpreted as bound or not. Here (78b) expresses the Absorption principle. Note that some indefinites must be bound in order to satisfy (78b). The rule in (78c) expresses the observation that the surface structure complement of a quantificational determiner must always be bound by the denotation of that determiner. Recall that these rules have two important consequences for the interpretation of possessives: if the translation of a possessive contains a bound variable, then that possessive will be bound (*Usually, if a woman hates her hair, she cuts it*); and both the possessor variable and the possessee variable in a quantificational possessive will be bound by the quantificational determiner.

The rules in (78) refer to syntactic categories and hierarchical relationships in logical form. Obviously, a more compositional formalization is needed here. However, this would require quite a bit of formal machinery that I am not prepared to develop to the appropriate level of detail. At the very least, we would have to associate with each expression in the logic a list of variables that could be bound in that expression. In other words, this is the place where the decision to pursue an unselective theory for the sake of expository clarity—rather than, say, a dynamic logic approach on which these problems are treated in detail—falls short of the desire for a fully explicit formal method for evaluating quantificational expressions.

In any case, once we have determined the set V of variables bound by α, we can calculate the set of instances that are relevant for the evaluation of the quantification. The set I of legitimate instances will be the maximal set of assignment functions f such that $[\![\phi]\!]^{f'} = T$, where $f'(x) = f(x)$ for all $x \in V$, and $f'(x) = g(x)$ otherwise. That is, every legitimate instance must provide values for the bound variables that render the restriction true.

In addition, we will require that I is consistent at least with any presuppositions associated with the restriction. In particular, the uniqueness presupposition for possessives described in section 2.5 will have the following effect. Assume that x is a variable indexing a possessor phrase for a particular possessive, and y is the variable indexing the whole possessive. Then if f and f' are legitimate instances such that $f(x) = f'(x)$, it must be true that $f(y) = f'(y)$. That is, any legitimate instances that agree on what they assign to the possessor variable must also agree on what they assign to the possessee variable. In other words, for any set of legitimate instances, there must be a unique possession for each possessor. On this view, the uniqueness presupposition associated with the possessive is satisfied or not only with respect to a set of assignment functions. See Kadmon (1987) for a more detailed exposition of this approach to uniqueness, where she expresses her general uniqueness requirement as a constraint on the set of legitimate embeddings for a discourse representation.

Once we have determined the set of legitimate instances I, all we need to do is factor I into cases. In order to do this, we must choose a set $R \subseteq V$, where R is the set of variables that are relevant for distinguishing cases. As described in section 4.7, I will adopt the simplifying assumption that there is only one constraint on the membership of R: if x is the index of a determiner phrase A headed by α, then x is in R. The most important consequence of this constraint for our purposes is that it entails that the possessor variable in a quantificational possessive will always be relevant for distinguishing cases.

Finally, K will be that partition on I such that two assignment functions f and f' are members of k, for some $k \in K$, if and only if $f(x) = f'(x)$ for all $x \in R$. Put another way, two instances will be members of different cases only if they differ in what they assign to some variable that is relevant for distinguishing cases.

Examples

I will illustrate how these rules work by comparing the interpretation of an instance of adverbial quantification with an instance of a quantificational possessive. In order to make this comparison, we must adopt a large number of more or less reasonable assumptions, all intended to provide two examples that differ only in those ways that are crucial for illustrating the special properties of quantificational possessives as opposed to quantificational adverbs.

To begin, we must assume that we have extended the syntactic analysis, the rules that govern logical form, and the translation rules so as to provide an analysis of adverbial quantification. This will involve at least allowing for the syntax of adverbial expressions, as well for logical form rules which raise quantificational adverbs to provide them with the appropriate logical scope.

(79) a. Usually, if a student writes a paper, it wanders.

b. $[\![\textit{usually}]\!]$ $([\textbf{student}(x) \wedge \textbf{writes}(x,y) \wedge \textbf{paper}(y)], [\textbf{wanders}(y)])$

This hypothetical translation is intended to be as similar as possible to the translation provided by our fragment for the following quantificational possessive.

(80) a. Most students' papers wander.

b. $[\![\textit{most}]\!]([\textbf{students}(x) \wedge \pi(x,y) \wedge \textbf{papers}(y)], [\textbf{wander}(y)])$

We must also assume that *usually* denotes the same quantifier as *most*. We can also assume that these two expressions are to be evaluated with respect to a situation in which the following facts hold.

(81)

	student	paper	wanders
a.	s_1	p_1	yes
b.	s_1	p_2	yes
c.	s_2	p_3	yes
d.	s_2	p_4	yes
e.	s_3	p_5	no
f.	s_3	p_6	no
g.	s_3	p_7	no
h.	s_3	p_8	no
i.	s_3	p_9	no

For this world, assume that the **write** relation and the π relation are coextensional, so that $\textbf{write}(x,y) = \pi(x,y)$; furthermore, we can assume that these relations contain only pairs mentioned in some line of the chart in (81). Finally, we must also assume that in both examples, both the student variable and the paper variable are bound by the quantifier. Then any difference in the truth conditions for (79) and (80) will be due only to differences in the set of instances, or to differences in the choice of the set of relevant variables.

First, consider the adverbial example. By assumption, the set of bound variables $V = \{x, y\}$. This is consistent with (78), since x and y both index an indefinite determiner phrase that occurs in the logical scope of *usually*. Thus the set of legitimate instances I will contain at least one assignment function for each line in the chart in (81). In particular, using the lowercase letters identifying the lines in (81) as indices, let f_a be an assignment function such that $f_a(x) = s_1$ and $f_a(y) = p_1$, and similarly for $f_b, \ldots, f_i$. In addition, I will contain many more assignment functions that differ from $f_a, \ldots, f_i$ only in what they assign to variables that do not affect the satisfaction of either the restriction or the nuclear scope, but we can safely ignore

these other instances, since they will all be equivalent to one of the instances $f_a, \ldots, f_i$.

Since there is no nominal quantification in this example, we are free to choose any subset of V for our set of relevant variables, leading to the following four possibilities for the set of cases K.

		R	K	READING
(82)	a.	$\{\}$	$\{I\}$	
	b.	$\{x\}$	$\{[f_a], [f_c], [f_e]\}$	student-dominant
	c.	$\{y\}$	$\{[f_a], [f_b], \ldots, [f_i]\}$	paper-dominant
	d.	$\{x, y\}$	$\{[f_a], [f_b], \ldots, [f_i]\}$	symmetric

Here I use the notation $[f]$ to indicate the equivalence class containing f. If we decide that neither of the bound variables are relevant, as in (82a), then K will contain a single case consisting all of the legitimate instances. Since it doesn't make sense to use the quantificational adverb *usually* when you intend to describe a situation involving a single case, (82a) does not correspond to any intuitively appropriate perspective on the situation, although it presence here is harmless; in any case, I will ignore this possibility from now on.

In (82b), we see that distinguishing cases only on the basis of the identity of the student (the student-dominant reading) leads to a case structure involving three distinct cases, since there are three students in this model. Similarly, in (82c), distinguishing cases on the bases of the identity of the paper leads to nine cases, since there are nine papers. In this situation, since none of the papers were co-authored, the paper-dominant reading and the symmetric reading given in (82d) give rise to the same case structure.

		K	K_s	$Q_{\textbf{usually}}(K, K_s)$
(83)	a.	$\{[f_a], [f_c], [f_e]\}$	$\{[f_a], [f_c]\}$	true
	b.	$\{[f_a], [f_b], \ldots, [f_i]\}$	$\{[f_a], [f_b], [f_c], [f_d]\}$	false

In (83a), we have the evaluation of the student-dominant reading. There are three cases, only two of which satisfy the nuclear scope. In (83b), we have the evaluation of the symmetric reading (which is equivalent in this situation to the paper-dominant reading). There are nine cases, four of which satisfy the nuclear scope. Since the truth conditions require that more than half of the cases must satisfy the nuclear scope, we predict that the quantification will be true on the student-dominant reading, but false on the symmetric reading. That is, the truth of the adverbial quantification depends on whether each of the meandering papers of student s_3 counts as a separate counterexample to the generalization expressed by the quantification.

Now consider the quantificational possessive. We must have a different set of instances for this quantification, since the presuppositions have changed. Thanks to the singular marking on the indefinite *a paper* in the adverbial example, we considered only those assignment functions that mapped the paper variable onto a single paper. But in the quantificational possessive example, the plural marking on the possessee allows us (but does not require us) to consider assignment functions that map the paper variable onto a proper sum, that is, a collection of papers. However, in addition, the uniqueness presupposition due to the possessive construction requires that there be a unique set of papers possessed by each student. In effect, each student will be associated with only the maximal collection of salient papers possessed by her. Assuming that all of the papers mentioned in (81) are salient, this gives the following set of legitimate instances I.

		f	$f(x)$	$f(y)$
(84)	a.	f_a	s_1	$\{p_1, p_2\}$
	b.	f_b	s_2	$\{p_3, p_4\}$
	c.	f_c	s_3	$\{p_5, p_6, p_7, p_8, p_9\}$

Now there are only three legitimate instances, one for each student and her unique set of papers, even though (84) represents the same set of facts depicted in (81). Since x is the index for the determiner phrase headed by *most*, x must be a member of R. This means that there are only two possibilities for R, depending on whether or not the possessee variable is taken as relevant for distinguishing cases: either $R = \{x\}$ (the possessor-dominant reading), or $R = \{x, y\}$ (the symmetric reading).

		R	K	K_s	$Q_{\textbf{most}}(K, K_s)$
(85)	a.	$\{x\}$	$\{[f_a], [f_b], [f_c]\}$	$\{[f_a], [f_b]\}$	true
	b.	$\{x, y\}$	$\{[f_a], [f_b], [f_c]\}$	$\{[f_a], [f_b]\}$	true

On the possessor-dominant reading, there is one case per student, giving three cases. On the symmetric reading, there is one case for every distinct student/paper pair; but since there is a unique paper for each student, there will also be three cases for the symmetric reading. Thus in contrast to the adverbial example, we predict that both of the proportional readings available to the quantificational possessive example will have identical truth conditions.

5

Concluding remarks

This dissertation has motivated and defended an analysis of the semantics of the possessive construction in English. The analysis gives a treatment of the syntactic structure, the descriptive content, the presuppositions, the logical form, and the quantificational properties associated with possessives. The model-theoretic fragment developed in the dissertation provides a unified formal account of lexical versus extrinsic possession, the licensing of donkey anaphora and negative polarity items, the narrowing effect, and the perspective paradox.

Perhaps the most surprising result of the investigation is the discovery that possessives do not have the truth conditions that it seems that they ought to have. That is, the first assumption of most linguists, and even most semanticists, is that possessives are ambiguous between a spec-of-DP structure ([[*most students'*] *dogs*]) and a spec-of-NP structure ([*most* [*students' dogs*]]), and that the truth conditions for quantificational possessives will reflect this ambiguity. In particular, the expectation is that one reading will involve quantification over possessors (students), and the other reading will involve quantification over possessees (dogs). But quantificational possessives simply cannot quantify over the extension of the possessee phrase (recall that the truth conditions of *most people's favorite color is blue* cannot be determined solely by counting colors). I have suggested an explanation for this discrepancy between expectation and observed behavior based on general properties of quantification. That is, whenever a quantifier binds two variables, there will be a variety of different proportional readings. In the case of quantificational possessives, factors intervene to prevent the full range of expected readings from showing up (in particular, a difference between adverbial quantification and nominal quantification in general), and even those proportional readings that are available cannot be distinguished by means of truth conditions, thanks to the effect of the uniqueness presupposition associated with possessives. Thus my account explains the intuition that possessives are ambiguous, as well as the reason that this ambiguity does not lead to any detectable different in truth conditions.

However, even if this analysis is right, there is still something left over to be explained. My impression is that the intuition that possessives can have a right-branching (spec-of-NP) structure is almost overpowering, even for

linguists who have been convinced that it simply doesn't exist. Why is this mistaken intuition so persistent, and so strong? One possible place to look for an explanation is in a theory of performance. Note that the possessive is the only construction in English which is fully left-recursive ([DP $\rightarrow$ DP D$'$]). Perhaps our brains simply can't accept the fact that at the moment we hear a determiner, we can't tell how deeply it is embedded until we find out how many possessee phrases follow it. It would be especially interesting in this regard to compare the situation in English with the corresponding facts for languages with different phrase structure properties: languages which are predominantly left-branching, such as Turkish or Japanese, or languages in which possessives are syntactically ambiguous in exactly the way that I claim English possessives are not (I understand that Finnish may be such a language).

Although the perspective paradox is intriguing, and it does bear on general issues concerning quantification, binding, and proportion, it is primarily a phenomenon that is peculiar to the possessive construction (at least, in English). However, my claim that noun phrases are systematically ambiguous between set-denoting expressions and relation-denoting expressions has much more far-reaching consequences for nominal semantics in general. There is little doubt that nouns and nominals differ in some respect according to whether they are relational or not; however, it is still not clear how this difference should be reflected in the formal characterization of the denotation of a nominal. In this dissertation, I have taken the strongest position possible, that is, I claim that an adequate characterization of the descriptive content of possessives requires that the denotation of a relational noun differs from the denotation of a non-relational noun every bit as much as the denotation of a transitive verb differs from that of an intransitive verb. Thus I construct a fully compositional account of the descriptive content of nominals in which the distinction between relational and non-relational nouns is built in to their translations at the lexical level. This means that the relational/non-relational opposition is unavoidable at any level of projection. Clearly this will have implications that will lead to unexpected predictions, either good or bad.

Another result of my investigation that potentially has wider implications is the analogy between the interpretation of possessives and donkey anaphora. In the sentence *Most women's donkeys bray*, the relationship between the quantifier embedded in the possessor and the logical argument to the *bray* predicate is mediated by the possessive construction in the same way that the relationship between the donkey pronoun and its indefinite anaphor in *Most women who own a donkey beat it* is mediated through the semantics of donkey anaphora. I happen to have chosen to defend the unselective binding conception of donkey quantification as ranging over sequences of individuals,

rather than a more modern situation-based E-type analysis or a dynamic approach, but the more important point is that any analysis of donkey anaphora should have something to say about the interpretation of quantificational possessives.

Of course, a number of problems concerning the possessive remain unsolved. One particularly vexing question concerning the semantics of possessives is their status with respect to the definite/indefinite opposition. We have seen a number of ways in which possessives resemble definites (they carry a uniqueness presupposition, they can refer to familiar discourse entities), as well as a number of ways in which possessives more closely resemble indefinites (they can refer to novel discourse entities, they can be bound by quantifiers). I have suggested that possessives and definites and indefinites all denote descriptions; although this provides a unified framework for explaining ways in which possessives can resemble either definites or indefinites, it does not explain how they differ. I have no explanation, for instance, for the behavior of possessives with respect to the so-called definiteness effect. For instance, the ability of a possessive to occur in an existential *there* construction seems to depend on whether the possessor alone can appear in the same position (*There is a/*the man's daughter in the garden*). What is the relevant definiteness property that a possessor shares with its host possessive? What exactly is the mechanism by which the projection of this property is accomplished?

In sum, I hope to have shown that the semantics of possessives can play an important part in the theory of nominal relations, of discourse anaphora, and of quantification, with special relevance for donkey anaphora and the proportion problem.

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