ABSTRACT

Title of dissertation: DISTRIBUTIVITY AND PLURAL ANAPHORA

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This dissertation is an investigation of the semantics of sentences exhibiting plural referential dependencies. I will pursue two main lines of thought, each with consequences for the notion of distributivity as it is understood to apply to certain linguistic phenomena. First I consider the empirical scope of an event-based theory of distributivity, and argue that this approach can provide a simple and empirically adequate semantics for plural anaphoric relations such as reciprocity, reflexivity, and distance distributivity. The second part focuses on plural referential dependencies in attitude reports; in particular I address issues about distributivity and plurality that arise in cases of plural De Se ascription.

DISTRIBUTIVITY AND PLURAL ANAPHORA

by

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Chapter 1:   Overview

The goal of this dissertation is to provide a theory of meaning for sentences expressing certain plural referential dependencies. The issue of referential dependencies in general has been an important topic in linguistic theorizing, both in the areas of syntax and semantics. Likewise, plural expressions have provided a wealth of puzzles that have ramifications for foundational areas of natural language semantics such as clause meaning and the composition of arguments and adjuncts. My main task is to show how phenomena that lie at the intersection of these two domains can be treated with a particular version of neo-Davidsonian event semantics that I will argue is superior to competing analyses.

The anaphoric dependencies that I examine throughout share one main property: the anaphor's reference is determined by some antecedent noun phrase in the syntax. In particular, I look at four types of anaphoric elements that meet this criterion.

(1.1)   i Reflexive anaphors

   ex: They saw **themselves**

   ii. Reciprocal anaphors

   ex: They saw **each other**

iii. Distance *each*

    ex: They saw two movies **each**

iv. De Se pronouns

    ex: They want **PRO** to see a movie

I investigate examples like these which have another important property: the anaphors are anteceded by a plural noun phrase. Two of these anaphors are licensed only when their antecedents are plural: reciprocals and distance *each*. The other two type of anaphors, reflexives and De Se pronouns can have either singular or plural antecedents, though I focus primarily on the plural cases and the puzzles that arise there.

The semantic framework that I use to analyze these phenomena draws on ideas from event semantics. In particular, I build on those varieties of event semantics that make use of thematic roles, often called neo-Davidsonian event semantics. At first blush, one might wonder at the benefit of using events and thematic roles in theories of plurality, as these fundamental ideas in event semantics were originally put to use to explain the composition of verbs with arguments and adjuncts. As many authors have shown, a complete picture of the semantics of arguments and adjuncts can only be attained when the particular issues raised by plural arguments and adjuncts are addressed. Sentences with multiple plural expressions exhibit a range of interpretations that is not present with their simpler singular counterparts, and this range of interpretations is influenced by the syntactic configuration of the plural expressions and their interactions with other elements such as quantification and negation. For the past twenty to thirty years, event-based theories have been rather successful in providing robust and elegant explanations for a wealth

of plurality phenomena. It is my hope to extend the empirical coverage of this general approach to plural anaphora.

At the heart of all these phenomena that I consider is the notion of distributivity. Distributivity is an aspect of meaning that provides information about parts of the collections of individuals referred to by plural noun phrases. Distributivity may be expressed overtly, in the form of a distributivity morpheme like *each* in English. This morpheme may surface as a determiner-like element, or may appear separated from the plurality which it quantifies over. We also see an element of this form in the English reciprocal anaphor *each other*. A natural question to ask is whether these are the same lexical items with the same lexical semantics. It is one of my goals to argue that it is indeed the case that these elements can be given a univocal analysis that is made possible by the neo-Davidsonian system I advocate here. In Chapter 6, I will consider the issue of distributivity in attitude reports, particularly those involving the ascription of De Se attitudes to a plurality of individuals. Previous accounts of attitude reports put distributivity to use in a certain way, both in the semantics of attitude verbs and in the interpretation of the pronouns in De Se reports. I will argue that distributivity is still crucial to these reports, though not in the way that is usually assumed.

For the remainder of this chapter, I will provide a brief outline of the rest of the dissertation. The dissertation can be divided into three parts: the first part provides an introduction to the event-based theory of plurality I use throughout. The second and longest part consists of three chapters devoted to local plural anaphors and how a unified theory of distributivity can be put to work to explain the semantic properties associated with these anaphors. The final section of content consists of the penultimate chapter,

which focuses on the issue of plurality in De Se reports. I now give a brief description of each chapter.

In Chapter 2, I develop the core components of the formal system used throughout the dissertation. I will introduce the basic tenets of events semantics, and then turn to the idea of neo-Davidsonianism and what sets this apart from alternative approaches to verb meaning and argumenthood. The variety of neo-Davidson semantics that I pursue is one that has all of the verbs arguments separated, or severed; in other words, verbs are interpreted simply as monadic predicates of events. This sets up a neo-Davidsonian view of distributivity first discussed by Barry Taylor and Barry Schein; in what I call Taylor-Schein Distributivity. I then move on to define a distributivity morpheme based on Taylor and Schein's insights, focusing here on its role as a determiner. This lays the groundwork for the following three chapters where I use the same distributivity operator to account for local plural dependencies; in particular distance distributivity, reciprocity, and plural reflexivity.

In Chapter 3, I focus on two phenomena which together are called distance distributivity —floating *each* and binominal *each*. The goal is to show how the distributivity operator defined in Chapter 2 can be used in the semantics of sentences with distance distributivity. I introduce previously undiscussed data involving distance distributivity items in ditransitive sentences, for which the proposed account is argued to be superior to competitors. The reason for discussing distance distributivity first is that the canonical local anaphors, reciprocals and reflexives, which I spend the next two chapters discussing, are argued to be two special cases of distance distributivity involving the Taylor-Schein distributivity morpheme.

In Chapter 4, reciprocals anaphors are given a neo-Davidsonian decomposition relying on the notion of distributivity developed previously. I provide two problems that any theory of reciprocal semantics must take into account: first, the observation that reciprocal sentences can be true in a constrained variety of different types of situations, and second, the ability for reciprocals to appear in a wide range of argument positions. The first issue is one of the most discussed aspects of reciprocal meaning in the literature, while the second issue has received very little attention. I propose that there is a simple answer to the first issue, namely that there is a single semantic meaning for reciprocals given by the Taylor-Schein distributivity operator in conjunction with a morpheme like *other*. Furthermore, I show that the Taylor-Schein approach, together with some other neo-Davidsonian ideas, accounts for the composition of reciprocals in more argument positions than is accomplished in previous accounts.

In Chapter 5, I provide an analysis of plural reflexives in languages like English. As others have noticed, English plural reflexives often are associated with a certain distributive interpretation. I argue that this is again Taylor-Schein distributivity at work. This particular analysis, like in earlier chapters, is strengthened by considering the behavior of reflexives beyond simple transitive constructions. I end this chapter with some discussion of the duality of reciprocals and reflexives, and how the well-known local properties of these anaphors are related to the local properties of the canonical distance distributivity constructions discussed in Chapter 3.

In Chapter 6, I address the issue of plural De Se reports. There have been previous accounts of De Se reports, and previous accounts of plurality in attitude reports, but very little are these two things discussed in the same breath. After introducing some basic facts

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from these areas, I argue for the semantic plurality of De Se pronouns that are anteceded by plural noun phrases. I review the reasons for why the majority of the literature have thought such pronouns to be semantically singular, and then I use reciprocity and cumulativity phenomena to argue for semantic plurality. Building on these results, I show that the standard Hintikkan approach to the semantics of attitude reports is ill-suited to the case of plural De Se reports. I then modify existing context based accounts by incorporating ideas from plural events semantics to account for these cases.

Chapter 7 concludes the dissertation and reviews the main points argued for throughout.

Chapter 2:   Plurality and Events

Any attempt to give a comprehensive history of the central ideas in contemporary natural language semantics is sure to mention two papers by Donald Davidson written in 1967. First, we were given a general claim in Davidson (1967a) that a Tarskian system can be used to give a recursive definition of the truth conditions of sentences in natural language. In the second paper, Davidson (1967b) made some specific proposals about this program; in particular, he argued that the truth conditions of natural language sentences can be given in a logical language that includes variables that range over events.

This second paper marked the beginning of event-based theories of natural language semantics. Davidson's original arguments were the first of many, which all seem to point to the conclusion that event analyses provide elegant and empirically robust accounts for a large range of semantic phenomena. In what follows I review some of the main proposals from this research program, with a particular emphasis on its utility for giving the semantics of sentences that express plurality. I will start with Davidson's argument from adverbial modifiers, not only for its historical significance, but also because the argument is centered on a core empirical domain of meaning, namely entailment properties that are related to the presence of arguments and modifiers, an issue that will surface in several more places throughout this dissertation.

Davidson (1967b) argued that the logical form, or truth conditions, of action sentences like (2.1a) involves existential quantification over events. In the Tarskian (T-Schema) approach that Davidson (1967a) was pursuing, we can say that English sentence (2.1a) is true iff the existential generalization given in a logical language (2.1b) is true. I will notate predicate names with small caps and individual terms with lowercase letters for now; assume both proper names and definite descriptions pick out individual constants.

(2.1)   a. Antonin cooked hollandaise sauce in the kitchen with a double-boiler

   b. $\exists e[\text{COOK}(e, a, h) \ \& \ \text{IN}(e, k) \ \& \ \text{WITH}(e, d)]$

Transitive verbs were traditionally regimented as two place relations, but Davidson suggested that verbs are somehow associated with an event variable not corresponding to any of the overt arguments, but is instead existentially closed.

Davidson argued that the entailment relations between (2.1) and similar sentences (2.2)-(2.4) are best understood in terms of a silent event argument which adverbials modify. He notes that sentences like (2.1) entail sentences which differ from (2.1) only in that they have the adverbs removed. Thus, (2.1a) entails (2.2), (2.3), and (2.4); and likewise, both (2.2) and (2.3) entail (2.4). The nonentailments are also noteworthy: an upward-entailing sentence with less adverbs does not entail one with more adverbs (e.g., (2.2) does not entail (2.1a)).

(2.2) Antonin cooked hollandaise sauce in the kitchen

(2.3) Antonin cooked hollandaise sauce with a double-boiler

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(2.4) Antonin cooked hollandaise sauce

As a point of comparison, consider a non-event approach where the verb is treated as a four-place relation. Under this view, the logical form of (2.1) is given as (2.5).

(2.5) $\text{COOK}(a, h, k, d)$

(2.5) does not have a logical form that accounts for (2.1a)'s entailments. At best, the entailments could be contributed to lexical idiosyncrasies of the verb *cook*. But this would require positing a lexicon that has numerous versions of *cook*, each with its own fixed number of arguments and specific entailment properties. Furthermore, the stipulated entailment properties of the verb must be such that they explain both the entailments and nonentailments.

For the event analysis the entailment relations are explained as conjunction reduction, a familiar inference pattern from standard logic. A formula such as $\exists x[P(x) \,\&\, Q(x)]$ implies $\exists x[P(x)]$ in first-order logic given the syntax/semantics of the connective $\&$. Since adverbial modifiers are treated as conjoined predicates of events in logical form, we have an explanation for why sentences with adverbs entail sentences that differ minimally by not having these adverbs. Below I give the Davidsonian logical forms for (2.2)-(2.4); which differ from (2.1b) by missing one or more conjuncts.

(2.6) $\exists e[\text{COOK}(e, a, h) \,\&\, \text{IN}(e, k)]$

(2.7) $\exists e[\text{COOK}(e, a, h) \,\&\, \text{WITH}(e, d)]$

(2.8) $\exists e[\text{COOK}(e, a, h)]$

Treating adverbs as conjoined predicates of events also provides an explanation for the nonentailments, again relying on the logic of conjunction. Conjunction introduction is not a valid inference pattern; that is $\exists x[P(x)]$ does not entail $\exists x[P(x) \& Q(x)]$. The sentences in (2.2)-(2.3) do not entail (2.1b) since the logical form of the latter has more conjoined predicates of events than the former. The direction of entailment we observed in these sentences falls out naturally from the logic of conjunction once we accept that natural language expressions like verbs and adverbs can be associated with predicates of events. Davidson's approach thus provides an elegant treatment of sentences with adverbial modifiers, and the entailment relations among them, without increasing the size of the lexicon.

Davidson's adverbial argument was the first among many that converge on the idea that not only are silent event arguments a reasonable possibility, but they often provide better accounts of the syntax and semantics of natural language than analyses that are events-free. I do not review all of these arguments here for reasons of space. However, I will consider some plurality specific arguments later in this chapter.

Before moving on, some terminological remarks about events are in order. Often in past literature it has been useful to distinguish between events and states. I will not explore this distinction here; and I will use the term "events" loosely to talk about both events and states[1]. Also important to a comprehensive eventive theory is the granularity of the objects that serve as values to Davidsonian event variables. This issue seems to be more metaphysical than linguistic, and it is often suggested that the values of such variables

[1]Essentially, I use "event" to refer to what Bach (1986) called *eventualities*, an ontological class which contains both events and states.

as they are used in linguistic semantics may not correspond to the the metaphysicist's notion of event. I will remain neutral on this issue, though there will be a few points throughout where it will be useful to consider what counts as "*an* event" when discussing mereological versions of event semantics.

While it may remain unclear what specifically counts as an event value, there is still much that can be done in giving a compositional event semantics for natural language. There is no agreed upon definition for "individual" or "entity", but this has not stopped the field of model-theoretic semantics from using models with domains that consist of such things. I will make the same concession with events.

For the remainder of this chapter, I will review the main tenets of the event literature, in particular those that have been put to use in developing theories of sentences expressing plurality. I first introduce one of the most profound modifications to Davidson's original view: the introduction of thematic roles into event semantics. In this section I will discuss several views of the semantics of noun phrases, verbs, and their composition. I will settle on a neo-Davidsonian approach to argumenthood that I will use throughout the dissertation. I then turn to the details of the semantics of plurality, and how this fits into the event-based program. This will lead to the introduction of a neo-Davidsonian approach to distributivity, which will be fundamental in addressing anaphora phenomena in later chapters.

2.1 Thematic roles and argumenthood

2.1.1 Thematic decomposition

Very shortly after Davidson introduced his event analysis, Castañeda (1967) suggested incorporating the idea of thematic roles that have been suggested by Gruber (1965) and Fillmore (1968). Part of Davidson's analysis implies that verbs correspond to relational predicates in logical form, which have an extra event argument in addition to what was traditionally assumed; e.g., the verb *cook* for Davidson would determine the relation $\textsc{cook}(e, x, y)$ in logical form. Casteñeda argued that the logical correspondence of the verb be a predicated *only* of the event argument; the traditional arguments are associated with thematic relations in logical form that predicate of the same[2] event as the verbal monadic predicate.

(2.9)   a. Antonin cooked hollandaise sauce in the kitchen with a double-boiler

b. $\exists e[\textsc{agent}(e, a) \ \& \ \textsc{cook}(e) \ \& \ \textsc{theme}(e, h) \ \& \ \textsc{in}(e, k) \ \& \ \textsc{with}(e, d)]$

The traditional arguments of the verb are treated in the same fashion as Davidson treated PP modifiers; with thematic relations that hold of an event and an individual. For the modifiers, the choice of thematic relation used is determined in some manner from the preposition appearing in construction with the noun phrase[3]. While there are not any ap-

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[2]"Same event" may require qualifications. Authors like Parsons (1990) analyze transitive sentences as causatives, each with two events: a causing event performed by the agent, and the caused event affecting the theme. This analysis will not be pursued here. Furthermore, the notion of distributivity I will develop later in this chapter and throughout the dissertation will make reference to sub-events, such that some sentences express that some individual participates in several events, and another participates in sub-events of those events.

[3]This is not to commit to the proposal that the choice of preposition is the only relevant factor in determining the thematic role of such items. There is of course the issue of disentangling whether some

parent prepositions for the subject and object arguments in (2.9a), Casteñeda remarks that

the meaning (2.9a) can be paraphrased using a gerundive nominalization (2.10), where

the noun phrases corresponding to the agent and theme are marked with prepositions. In

§2.1.3, I will consider some different accounts of the composition of subject and object

arguments in a system with thematic relations.

(2.10) There was a cooking of hollandaise by Antonin in the kitchen with a

double-boiler

The issue of the precise inventory of thematic roles has been a source of constant

debate in the literature. The range of suggestions goes from two roles to dozens of roles;

see for example Dowty (1989) and Dowty (1991). As with many previous studies, the

exact inventory does not matter for the problems at hand in this dissertation. What mat-

ters is that there are thematic roles and that they play a role in the interpretation of noun

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prepositions are homophonous with others, or if there is an underlying lexical semantics in such cases. There are several of such puzzling cases. For example, instrumental versus comitative *with* in English and other languages. Schein (2002) assumes that they share a common semantic core, a plausible hypothesis given the similar type of actions associated with comitative and instrumental thematic roles. Though it must surely be relevant that the majority of the languages surveyed by WALS use phonologically distinct prepositions to represent these roles. Another problem along these lines is the case of *by* in English. On the one hand, it seems that homophony is involved since we know that there are agentive uses and loca-tive/directional uses, and these share no obvious connection as was the case with *with*. But does this mean we have two morphemes here? In the case of agentive *by*, is it the same morpheme that appears both clausally and nominally; (i)-(ii)?

  i. The Boston butt was barbecued by Bob
  ii. The barbecuing of the Boston butt by Bob was breathtaking

What about path versus proximal *by*; (iii)?

  iii. Adam kicked the ball by the goalie
       (either *He kicked the ball past the goalie* or *He kicked the ball while near the goalie*)

This is another case where there appears to be some (albeit vague) common locational concept that these roles could fall under, though as we saw above, this does not guarantee that we are dealing with a single mor-pheme. The arguments for different morphemes are strengthened by the fact that these homophonous prepo-sitions can co-occur; given the property of thematic uniqueness discussed in the main text, co-occurrence means that these prepositions express distinct thematic roles rather than a single all-encompassing role.

phrases, particularly by associating each role with a thematic relation in an event-based semantics. I will make use of familiar roles such as Agent, Theme/Patient, Goal, Instrument, Location, etc. I will also recognize that there are thematic roles expressed in noun phrases; an idea which I will argue for when giving the semantics of anaphors contained within noun phrases. While *clausal* thematic relations relate an individual and an event, *nominal* thematic relations relate one individual to another individual; such as locational roles like IN(x, y) and ABOVE(x, y). An example of a nominal thematic role which I will reference in later chapters is the Possessor role. What I mean by "possessor" is the role associated with the "apostrophe-*s*" type of possessor, which has been pointed out to be a rather vague sort of thematic role. NPs in this position can be interpreted in a wide variety of roles, and not all of them have to do with possession in the strictest sense. For example, possessors seem to express the agent and theme roles respectively in the following pair of sentences.

(2.11)   a. Rome's destruction of Carthage

           b. Rome's destruction by the Gauls

I will label the possessor role as POSS, which like the π role in the thematic analysis of possession in Barker (1991), corresponds to the thematic relation that holds of two individuals if the first stands in that vague, underspecified relation to the second.

Thematic roles have been somewhat of a mysterious technical notion in the literature. While many authors disagree as to which thematic roles there are, and even how a single role such as Agent should be defined, there has still been fruitful work in developing both syntactic and semantic theories assuming thematic roles. As authors like Carlson

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stress, it is of course possible to devise theories of syntax and semantics without thematic roles; though theories with them have shown to be quite successful. I take thematic roles not to be merely an *ad hoc* technical device, but rather a central discovery uncovered by linguists that calls for deeper investigation. In the next section, I will review some of the core properties of thematic roles in general, and for sections and chapters following that, I will argue that their place in event semantics can lead to new and interesting theories of plurality and anaphora.

2.1.2 Thematic Uniqueness

Thematic Uniqueness has been a important topic in the neo-Davidsonian literature. For a given clause, Uniqueness requires that if one argument in that clause has thematic role X, then no other argument can. Carlson (1984) remarks that some initial motivation for Uniqueness comes from hypothetical verbal meanings that do not appear to be realized in natural language. He notes that there are no verbs like *skick*, which are used in sentences like (2.12a) that express the same meaning as (2.12b).

(2.12)   a. John skicked the ball Bill

      b. John and Bill kicked the ball

The Uniqueness principle rules out (2.12a) since there are two separate noun phrases, *John* and *Bill*, which are intended to be tied to agentivity. Sentence (2.12b) does not violate this rule because there is a single argument noun phrase that bears the agent thematic role; namely, *John and Bill*. This assumes that the conjunction of two noun phrases is also a noun phrase, and also suggests that Uniqueness be defined as an *A-over-A* rule

(see Chomsky (1964) for discussion of *A-over-A* rules). For more on the intricacies of noun phrase conjunction, see Lasersohn (1995), Schwarzschild (1996), and Schein (forthcoming).

Landman (2000) offers an interesting idea implementing Thematic Uniqueness (which he calls the Unique Roll Requirement). So far we have been viewing the logical form constituent corresponding to thematic roles as a relation; e.g. $\text{AGENT}(e, x)$. Landman suggests that thematic roles can be viewed as functions from events to individuals; e.g., $\text{AGENT}(e) = x$. Since functions definitionally assign a single value to each argument, we have an reason for why each event value has a single individual value that is *the* agent of that event, for example. For (2.12a), each argument would be associated with its own function: *John* with $\text{AGENT}(e) = j$ and *Bill* with $\text{AGENT}(e) = b$. But since AGENT is a function, it cannot assign a different value to the same argument e. On the other hand, in (2.12b), the conjunction is associated with a plural value, the plurality associated with John and Bill, and this plurality is the sole value of the AGENT function when applied to e; see §2.2 for details on plural values. I will still continue to represent thematic roles as relations in logical form, though I leave open the possibility that Landmanesque functions are at work and this is where Uniqueness comes from.

We will return to the proper formulation of Thematic teUniqueness in the next chapter when distance distributivity is discussed. There I will suggest that it is possible for two (apparent) noun phrases to bear the same thematic role, but this happens in situations where the semantic value of both noun phrases are tied to the same plurality of individuals.

2.1.3 Degrees of separation and compositionality

Following Davidson (1967a), Montague (1973), and others, let us assume that a declarative sentence of natural language has truth conditions that are determined by the semantic values of particular lexical items contained in the sentence and the way the lexical items are arranged syntactically. Giving a full theory of this sort is of course still a work in progress; in this dissertation I will present fragments of a theory focusing on a subset of constructions in natural language. Let us start with a simple case, the semantics of simple unembedded sentences in English.

(2.13) Abe slept

(2.14) Bill saw Carl

(2.15) Abe introduced Bill to Carl

In the Montague tradition, building on insights from Frege (1879), the truth conditions of (2.13)-(2.15) are given by a *type-driven* interpretation. The range of permissible types are given by the usual recursive definition:

(2.16) Basic Frege-Montague type system

    a. Basic types:

        a. *e* (entities/individuals)

        b. *t* (truth values)

b. Function types

If α is a type and β is a type, then $\langle \alpha, \beta \rangle$ is a type; the type for functions from objects of type α to objects of type β.

With this type system, declarative sentences are assigned values of type t, proper names (and referential noun phrases in general) are assigned values of type e, and verbs like those in (2.13)-(2.15) are assigned function values; functions that take entities values as arguments and ultimately return truth values[4]. Other types produced in this system will be discussed later in connection to quantification and local anaphora; for now I will limit the discussion to the function types associated with what Davidson called "action verbs".

Consider the composition of a sentence with a transitive verb; e.g., (2.14). For this discussion I will assume that the proper names *Bill* and *Carl* are assigned type e semantic values: the entities b and c, respectively. Below I give a standard lexical axiom for ⟦saw⟧, which is indicative of a schema that can be used with all simple transitive verbs (TVs).

(2.17) *Frege-Montague approach to TVs*

$$⟦\text{saw}⟧ = \lambda y_e.\lambda x_e.\text{SEE}(x, y)$$

The verb *saw* is interpreted as a Curried/Schönfinkelized function from two entities to a truth value; the value True is assigned if those entities stand in the SEE relation to one another, specifically with x seeing y.

This approach to composition assumes that branching nodes are interpreted by the phrasal axiom of Function Application[5].

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[4]There are several more sophisticated approaches to type-driven interpretation that will have to go unmentioned here; such as systems with type-raising, type-theoretic approaches to quantification and quantifier scope, etc.

[5]I ignore for now any parameters on the interpretation function; assignments and contexts will be discussed in later sections.

(2.18) Function Application

If γ is a branching node with daughters α and β, and $[\![\alpha]\!]$ is a function whose domain contains $[\![\beta]\!]$, then $[\![\gamma]\!] = [\![\alpha]\!]([\![\beta]\!])$.

The tree below illustrates the type-theoretic composition of a simple transitive sentence.

(2.19)

$$t$$

$$e \qquad \langle e, t \rangle$$

$$\langle e, \langle e, t \rangle \rangle \quad e$$
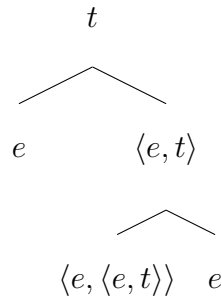
Essentially, the Frege-Montague approach, which represents the current standard in formal semantic research (cf., Heim and Kratzer (1998)), treats the truth conditions of simple transitive sentences as a dyadic predication, and these truth conditions are determined largely by interpreting the verb as a Curried function from two entities to a truth value.

2.1.3.1   Classic event analyses of verbs

The classic Davidsonian approach can be seen as making one small change to the Frege-Montague approach, the addition of an extra argument: the event argument.

(2.20) *Classic Davidsonian approach to TVs*

$$[\![\text{saw}]\!] = \lambda y_e.\lambda x_e.\lambda e_v.\text{SEE}(e, x, y)$$

Some remarks are in order about the event argument. If events can be semantic values, then there must be some semantic type they fall under. While it might be plausible to

consider an event to be some sort of entity, and thus treat it as type e, several authors have instead suggested that there is a separate ontological category for events that is distinct from the type of entities. I will adopt this sorted-domain approach here, which essentially amounts to adding a third basic type to the definition in (2.16). Unfortunately the letter e is already used for the type of entities, so I will use v as the label for the type of events; even though I will still use "e" as a variable for events in the metalanguage.

Davidson's suggestion was that the truth conditions of natural language sentences are existential generalizations of events, and event values serve as domain of quantification for such event quantifiers. To implement Davidson's event quantifier, I will assume that there is a covert existential event quantifier in the object language, to which I assign the following lexical axiom (this will be changed when intensionality is introduced in Chapter 6.)

(2.21) $[\![\exists_e]\!] = \lambda P_{\langle v,t \rangle}.\exists e[P(e)]$

The event quantifier will compose with a monadic predicate of events which is of type $\langle v, t \rangle$; e.g., the type of a transitive verb composed with its first two arguments given lexical axioms like (2.26). The result of the composition is a truth value; True if there is an event e of x seeing y, and False otherwise[6].

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[6]There have been several alternatives to Davidson's existential event quantifier approach. These alternatives still hold on to the idea that sentence meanings are intimately tied to event values of some sort, but not necessarily existential quantification over them. For example, some sentences could be seen as referring to a specific event, or plurality of events, instead of merely making an existential generalization. Some authors pursuing event analyses of plurality have suggested sentences denote a plurality of events instead of a truth value; and the plurality denoted are those events that satisfy an event predicate; essentially the predicate that serves as the first argument to the event quantifier in 2.21). I will not try to determine which approach to sentence meaning is the correct one; instead I will adopt the existential event quantifier approach for most of the dissertation since it serves as a familiar benchmark in event semantics, and from this it should be obvious for those interested in alternatives how to modify what I say here to fit such frameworks. Having said that, I will raise issues and make revisions about this approach when considering intensionality.

The introduction of thematic roles to the system opens up several new options for the lexical semantics of transitive verbs. Below I discuss the three main varieties, distinguished by the degree to which they eliminate argument places given in the Classic Davidsonian approach.

This first neo-Davidsonian alternative derives from Casteñeda's suggestion for modifying Davidson's system with thematic roles, an approach further pursued by Parsons (1990) and others. This is implemented in the type system by having transitive verbs keep the same semantic type that they have in the Classic Davidsonian approach, but the functions associated with TVs do different things with their arguments than in the classic approach; specifically, the entity values serve as argument to thematic predicates.

(2.22) *Classic neo-Davidsonian approach to TVs*

$[\![\text{saw}]\!] = \lambda y_e.\lambda x_e.\lambda e_v.\text{AGENT}(e, x) \mathbin{\&} \text{SEE}(e) \mathbin{\&} \text{THEME}(e, y)$

To reiterate what was said in previously, this approach differs from Davidson's in the way the argument values factor into the truth conditions. In both approaches, the verb determines some lexical predicate used in logical form; in this case SEE. In the Davidsonian approach, this predicate is a ternary relation, with one event argument and two entity arguments. In the neo-Davidsonian approach this predicate is a monadic predicate of events, and the entity arguments are related to this predicate indirectly by thematic predicates which share the same event variable as the monadic verbal predicate.

Since the verbal predicate in logical form is just a monadic predicate of events in the neo-Davidsonian approach, it is natural to ask if it is necessary to treat TVs as having functional types that require type e arguments at all. Put differently, the question

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is whether the thematic relations we see in logical forms like (2.26) are there because of the lexical semantics of verbs, or something else.

The classic Davidsonian and classic neo-Davidsonian approaches to TVs correspond to the claim that TVs are interpreted as three-place Curried functions in the type-driven semantics assumed here. More radical versions of neo-Davidsonianism claim that there are benefits for treating such functions as having a lower adicity.

2.1.3.2 Partial separation

Kratzer (1996) presents a theory where agent arguments are introduced by functional heads and are thus not semantic arguments of the verb. I label this approach as "partial separation", since only external arguments (i.e., subjects) do not compose as semantics arguments of the verb. For Kratzer, the internal argument, typically associated with the Theme or Patient thematic role, is not separated. Furthermore, this argument is not even represented via a thematic relation: the lexical relation determined by the verb is a dyadic relation between an event and an individual. Put differently, Kratzer does not believe there is a place for a Theme/Patient thematic role as it relates to direct objects[7].

(2.23) $[\![\text{see}]\!] = \lambda x.\lambda e.\text{SEE}(e, x)$

Kratzer's argument for such a decomposition follows an observation from Marantz (1984) about idioms. Abstracting away from particular details, the observation is that while cer-

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[7]I will not address Kratzer's reasons for not severing internal arguments. We will see shortly Schein's argument for separation of internal argument, which is considered as a viable alternative even by Kratzer herself in later work: Kratzer (2000). See also Williams (2009), who argues that Kratzer's arguments against the Theme relation are unsound.

tain Verb+D.Object combinations trigger idiomatic interpretations, it appears that there are few if not any cases of Subject+Verb idioms. Kratzer correlates this observation with argumenthood: semantic arguments of the verb can lead to Verb+NP idioms while non-argument cannot, and since there are virtually no idioms involving Subject-Verb combinations, subjects must be introduced into the derivation by some other means than Functional Application of the VP predicate to the subject's denotation; see Williams (in press) for discussion.

Following authors such as Larson (1988), Baker (1988), Hale and Keyser (1993), Kratzer assumes that there is a functional head v which introduces subject NPs and is responsible for them having an agent thematic role. She treats agents v as having the meaning in (2.24) and posits the operation Event Identification for the composition of v with the VP consisting of the verb and direct object.

(2.24) $[\![v]\!] = \lambda x.\lambda e.\text{AGENT}(e, x)$

(2.25) Event Identification

If v' is a branching node with daughters v and VP, then

$[\![v']\!] = \lambda x.\lambda e.[[\![v]\!](x)(e) \ \& \ [\![\text{VP}]\!](e)]$

As we will see shortly, Event Identification will not be needed as an operation once the more general operation of Predicate Conjunction is in place as a means of composing NP meanings that are not semantic arguments of the verb. Though I follow Kratzer in the general idea that subjects are not semantic arguments of the verb.

As for not severing the internal argument of verbs, Kratzer argues that such arguments are "more tightly linked to their verbs", and that they "lack the conceptual inde-

pendence of agents". I refer the reader to Williams (2009) who presents both conceptual and empirical counterarguments to Kratzer's claims about themes. The conclusion of this argument is that there is good reason for going one step further than Kratzer; if agents are separated, then perhaps there is a reason for going one step further: NPs never act as semantic arguments to verbs. This option is explored in the next section.

2.1.3.3   Total separation

The most radical form of neo-Davidsonianism holds that the event argument is the *only* argument of a verb, transitive or otherwise. In other words, verbs are interpreted simply as monadic predicts of events.

(2.26) *Total separation neo-Davidsonian approach to TVs*

$[\![\text{saw}]\!] = \lambda e_v.\text{SEE}(e)$

This view was first articulated in modern[8] formal semantic research by Krifka (1992) and Schein (1993), and has received support from numerous researchers since. One of the areas where total separation has been argued to be advantageous is in the domain of plurality phenomena. There is a wide variety of convincing arguments for total separation, too many to be discussed here; though see Lohndal (2012) and Williams (in press) for discussion and references. However, I will provide one argument from Schein in §2.2.6.1

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[8]The idea of localizing thematic information on noun phrases, and not verbs, can be argued to be present in Pāṇini's *Aṣṭādhyāyī*, where for him the verbal root (*dhātu*) denotes actions (*kriyā*), i.e., events, and nominal stems (*prātipadika*) denote factors (*kāraka*), things which have a certain role in the action. There are six factors that Pāṇini uses in his grammar, agent (*kartā*), patient (*karman*), source (*apādāna*), beneficiary (*saṃpradāna*), means (*karaṇa*), and locus (*adhikaraṇa*). See Gillon (2007) for an excellent overview of these issues and other aspects of the *Aṣṭādhyāyī*.

that is relevant for the discussion of distributivity in later chapters; and in those chapters I will argue that the total separation approach opens the way for new theories of certain anaphoric phenomena.

If the thematic predicates in logical form are not contributed by the verb, then where do they come from? One option is that NPs in some way determine which thematic predicate to use; see Krifka (1992) and Schein (1993). If this is the case, a further question arises: what rules of phrasal composition are used for the semantics of transitive sentence involving what are traditionally referred to as argument NPs? I will start by addressing this second question.

Aside from Function Application, some theories make use of Predicate Conjunction as another rule of phrasal composition, such as Heim and Kratzer (1998).

(2.27) Predicate Conjunction

If γ is a branching node with daughters α and β, and $[\![\alpha]\!]$ and $[\![\beta]\!]$ are both type $\langle b, t \rangle$, where b is one of the basic types e or v; then $[\![\gamma]\!] = \lambda x_b.[\![\alpha]\!](x) \ \& \ [\![\beta]\!](x)$.

The definition for Predicate Conjunction is given in such a way that it will work for the composition of both predicates of entities and predicates of events. The semantics of certain adjective/noun combinations have been treated as Predicate Conjunction of predicates of entities (Heim and Kratzer (1998) and others); and the semantics of verb (phrases) composed with VP-adverbs is treated as Predicate Conjunction of predicates of events.

(2.28) $[\![\text{savory}_{Adj} \ \text{pie}_N]\!] = \lambda x_e.[\![\text{savory}]\!](x) \ \& \ [\![\text{pie}]\!](x)$

(2.29) $[\![\text{boil}_V \ \text{quickly}_{Adv}]\!] = \lambda e_v.[\![\text{boil}]\!](e) \ \& \ [\![\text{quickly}]\!](e)$

Some approaches make use of both Function Application and Predicate Conjunction as semantic rules; such as Heim and Kratzer (1998), who use Function Application for the composition of arguments and Predicate Conjunction for the composition of adjuncts (adjectives and adverbs). Pietroski (2005) explores the hypothesis that Predicate Conjunction is the only rule of phrasal composition. Just as verbs and adverbs are interpreted as monadic predicates of events, Pietroski argues that NP/PP arguments are treated in the same way; specifically, arguments are interpreted as thematic predicates. While I will still make use of Function Application during several parts of the dissertation, I will adopt Pietroski's insight of using Predicate Conjunction for the composition of at least non-quantificational argument NPs. I will now discuss several options for implementing Pietroski's idea.

Let us assume for now that NP arguments are somehow "theta-marked" in the object language, so that an NP has some characteristic that determines which thematic predicate to present in logical form; represented schematically below.

(2.30) $[\![\text{John}_{\text{AG}}]\!] = \lambda e.\text{AGENT}(e, j)$

By treating NPs as monadic predicates of events, they can compose with other monadic predicates of events such as intransitive verb meanings by PC[9].

(2.31) $[\![\text{John}_{\text{AG}} \text{ walked}]\!] = \lambda e.\text{AGENT}(e, j) \, \& \, \text{WALK}(e)$

Below I illustrate the type-theoretic composition of a transitive sentence where verbs and their arguments are treated as monadic predicates of events.

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[9]I will ignore tense here and throughout the dissertation.

(2.32)

$$\langle v, t \rangle$$

$$\langle v, t \rangle \qquad \langle v, t \rangle$$

$$\langle v, t \rangle \quad \langle v, t \rangle$$
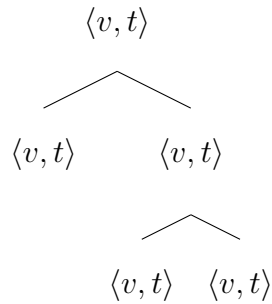
The monadic predicate of events at the root node in (2.31) will then serve as the argument to the existential event quantifier as defined in (2.21).

(2.33)

$$t$$

$$\exists_e :: \langle \langle v, t \rangle, t \rangle \qquad \langle v, t \rangle$$

$$\langle v, t \rangle \qquad \langle v, t \rangle$$

$$\langle v, t \rangle \quad \langle v, t \rangle$$
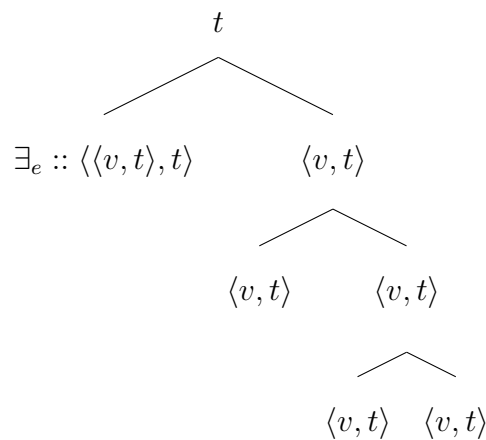
There are two questions that arise for this approach to the semantics of NP arguments: how exactly is the NP theta-marked, and how exactly does theta-marking determine a thematic predicate; i.e, what semantic rule is responsible for (2.30).

As for the theta-marking, one option is essentially a reinterpretation of Chomsky (1981) idea that thematic roles are formal syntactic features on NPs. These features can be assigned by the verb, they could be assigned to the NP and then checked by the verb (by Agreement), or they could be assigned based purely on the structural position of the NP (e.g., being a specifier versus a complement; see Baker (1988) and others). Let us collectively refer to these options as the Feature Approach since in each case the NP has

a thematic feature that plays a role in its interpretation[10]. A Feature Approach has been explored for neo-Davidsonian systems by Hornstein (2002). Under this view a new rule of interpretation is needed that interprets an NP with a theta feature as the appropriate monadic thematic predicate. I give such a rule below, where the theta feature is represented as subscript on the NP.

(2.34) Theta Rule

$$[\![NP_\Theta]\!] = \lambda e.\Theta(e, [\![NP]\!])$$

Another way of implementing the idea that NPs are interpreted as monadic predicates of events is to assume all NPs compose with an adposition which is the locus of thematic information. This assumes that even in cases where NPs do not appear with an overt adposition (e.g., subjects and direct objects), there is still a silent preposition that does the work of turning an NP meaning into a predicate of events. Below I provide a schema for appositions that compose with type e NPs.

(2.35) $[\![P_\Theta]\!] = \lambda x_e.\lambda e_v.\Theta(e, x)$

For the adposition theory, it is not the NP per se which determines the thematic relation, but a preposition that composes with the NP. This approach is motivated by modifier PPs in sentences like (2.36).

(2.36) Colonel Mustard killed Professor Plum [with a candlestick] [in the kitchen]

As discussed above, modifiers are represented in logical form by instrumental and locative thematic predicates; INST(e, c) and LOC(e, k). This rule assumes that it is not just the

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[10]Note that there is no contradiction in the claim that verbs are semantically monadic while syntactically they still assign thematic features to NP arguments in the sense of Chomsky. In other words, subject and objects NPs need not be semantic arguments of the verb in order to be syntactic arguments.

form (i.e., phonology) of a preposition that specifies its corresponding thematic relation, but instead that the preposition itself has a "theta feature" that is responsible for the choice of thematic relation. A benefit of the adposition theory is that particular thematic relations can be attributed to the lexical semantics of adpositions without introducing a new rule of composition (e.g., the Theta Rule). On the other hand, the preposition theory still relies on something like a theta feature specification in order to account for homophonous prepositions. So the issues seem to be not whether theta features are necessary, but whether they are situated on Ps and PPs, or on NPs (or Ds/DPs). For present purposes both approaches could be used, though I will stick to the adposition theory since it does not rely on an additional rule for phrasal composition.

Note that PPs may appear inside of NPs, in which case the adposition will have a lexical entry where the second argument is also of type e, and not v.

(2.37) $[\![\mathrm{P}_\Theta]\!] = \lambda x_e.\lambda y_e.\Theta(y, x)$

Let me conclude by pointing out that total separation does not necessitate Predicate Conjunction, possibly together with the Theta Rule or a definition of adpositions, as the rules for composition of a verb with its arguments (and other instances of argument composition). If a verb is interpreted as type $\langle v, t \rangle$ function, then another option not considered yet is that an NP is interpreted as a higher-order function that takes a $\langle v, t \rangle$ argument. For example, an intransitive sentence would have the subject NP interpreted as a $\langle \langle v, t \rangle, t \rangle$ function. However, we could not treat the direct object as having this type, because we do not want verb-object combinations to be type t. So different types are required for different arguments under this view. While this approach might be possible

and would only require Functional Application as a rule of composition, I will not explore it here. I assume that Predicate Conjunction is one of the possible rules, and as argued for by Pietroski, it is used for the composition of NPs and PPs, regardless if they are adjuncts or arguments

2.1.4 Ditransitives

At several points in the dissertation, I will address ditransitive constructions. I follow Larson's (1988) VP-shell hypothesis for the syntax of ditransitive sentences. Under this view, there are two VP projections in the clause; the most deeply embedded VP is where direct and indirect objects are projected, and the higher VP hosts the base position for subjects; the latter often given the category vP. At least in languages like English, there is head movement from the lower V position to the higher one, which account for the verb before objects word order.

(2.38)

$$
\begin{array}{c}
\text{S} \\
\diagdown \\
\text{NP}_1 \qquad \text{VP}_1 \\
\text{NP}_1 \qquad \text{V}'_1 \\
\text{V}_1 \qquad \text{VP}_2 \\
\text{NP}_2 \qquad \text{V}'_2 \\
\text{V}_2 \quad \text{NP}_3
\end{array}
$$
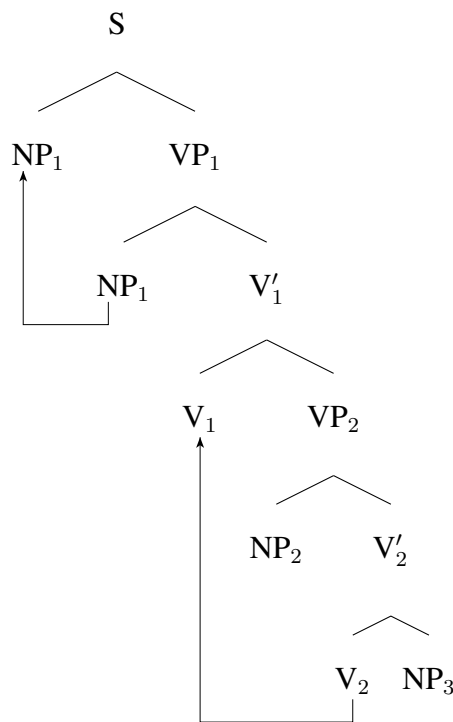
In standard treatments where FA composes a verb with its arguments, one way of representing the LF of a ditransitive sentence is as follows; the verb is interpreted in its base position, not the higher V position which its head moves to.

(2.39)

$$t$$

$$e \quad \langle e,t \rangle$$

$$e \quad \langle e, \langle e,t \rangle \rangle$$

$$\langle e, \langle e, \langle e,t \rangle \rangle \rangle \quad e$$
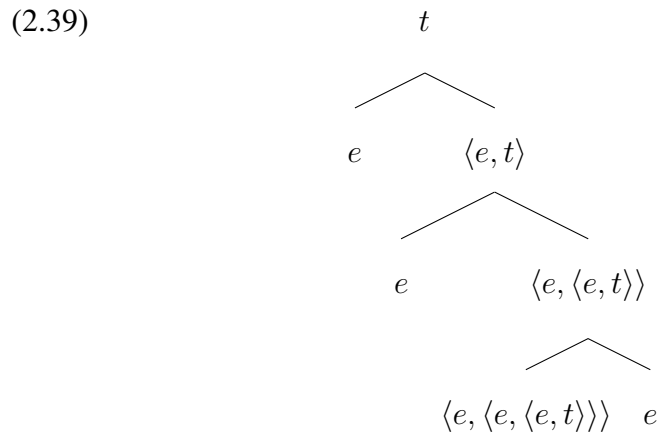
For the neo-Davidsonian view adopted here, the type-theoretic composition is as follows up until the introduction of the event quantifier. Every node is a monadic predicate of events; every branching node is composed of two predicates of events. Notice that this view of argumenthood does not require any special stipulations for the interpretation of the verb in ditransitive sentences; since the verb is a conjoinable predicate of events, not a function seeking arguments in a certain order, it is possible for the verb to be interpreted either in its base or derived V position[11].

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[11]I put aside certain event-based semantics of causativity, where the higher VP is associated with a different event value than the lower VP; see Parson (1990) and others.

(2.40)

$$\langle v,t\rangle$$

$$\langle v,t\rangle \qquad \langle v,t\rangle$$

$$\langle v,t\rangle \qquad \langle v,t\rangle$$

$$\langle v,t\rangle \quad \langle v,t\rangle$$
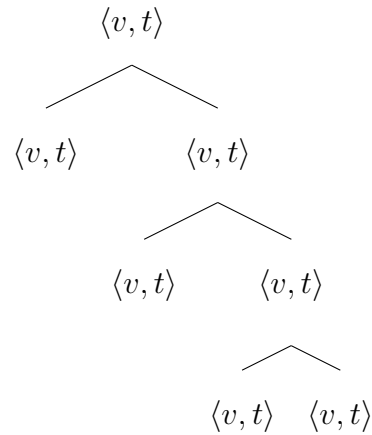
2.1.5   Section Summary

In this section I have presented the central components for the event semantics that I will pursue throughout this dissertation. At the heart of the system are the basic tenets of neo-Davidsonian semantics: the truth conditions of natural language sentences are existential generalizations of events, comprised of monadic and dyadic thematic predicates of events[12].

I will use two rules for phrasal composition throughout the dissertation: Function Application, Predicate Conjunction. I put aside the Theta Rule, and assume that adpositons are defined as functions from NP meanings to monadic thematic predicates. While Predicate Conjunction will be used for the composition of arguments, Function Application will still be used for the composition of some lexical items such as adpositions, quantifiers and also an initial exposition of attitude verbs that will appear in later chap-

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[12]Up until now, the only type of dyadic predicates in the system are thematic predicates. Pietroski (forthcoming) presents a semantics where the only non-monadic predicates are thematic predicates. This hypothesis greatly reduced the range of permissible types in the semantics. Recall from the standard recursive definitions (2.16) that the number of permissible types is in principle infinitely large; though it seems unlikely that natural language makes use of all of these types. Pietroski's proposal is that there are only two types, monadic predicates and dyadic predicates; and the dyadic predicates are constrained to only thematic predicates.

ters. For the extensional fragment presented, clauses are treated as type t as usual, and this is given by the semantics of the covert event quantifier (2.21).

As for lexical rules, all open class categories considered here will be treated as monadic predicates; either predicates of individuals (for nouns and adjectives) or predicates of events (for verbs and adverbs). In the next section, I will show how to give suitable plural entries for these categories. I will follow the total separation view of composition, so all non-embedding verbs will be interpreted as monadic predicates of events.

2.2 Events and the semantics of plurality

2.2.1 Plurality in natural language and nonfirstorderizability

It has become common in the study of natural language semantics to use first-order predicate logic in developing formal theories. Famously though, Frege's original exposition of predicate logic was higher order and as such was susceptible to Russell's Paradox. Logicians like Tarski took a step back from Frege's logic, and developed a first-order fragment that was free from this flaw. The first-order predicate calculus became the "standard" in modern logic, a fact that is undoubtedly tied to the ubiquity of first-order treatments of natural language semantics.

In the latter half of the twentieth century, both logicians and linguistics began to discover that certain natural language meanings cannot be stated in the language of first-order logic. At the heart of all these problematic cases are expressions of plurality; expressions used to talk about many individuals as such. Consider first the simple case of conjoined NPs.

(2.41) Adam and Eve are happy

The question now is, can this sentence be regimented in a first-order language. For the particular example, this turns out to be the case: a first-order logical form that represents the meaning of (2.41) can be given as the conjunction of two simpler sentences.

(2.42) HAPPY(a) & HAPPY(e)

Consider now an example that differs minimally from (2.42) by having a different predicate.

(2.43) Adam and Eve are a good couple

Following the strategy used in the previous example, the logical form assigned to (2.43) is unsatisfactory.

(2.44) GOOD-COUPLE(a) & GOOD-COUPLE(e)

The problem seems to lie in the meaning of the predicate *be a good couple*; in particular it is not a predicate that can hold of just one individual. There are many such predicates in natural language: *gathered, clustered, are roommates, sang a duet, etc.*, which are often called essentially plural predicates. This is just one of many examples of natural language sentences whose meanings cannot be represented in a first-order language; see for example Boolos (1984), Pietroski (2005). Such examples call for a revision in order to give a proper treatment of plural expressions in natural language.

There are two main approaches to modifying first-order treatments to account for plurality. Each proposes to eliminate one of the following tenets of first-order logic, while preserving the other.

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(2.45) Two first-order dogmas

    i. The domain of individuals is populated solely by concrete entities.

    ii. Each term (individual, constant or variable) is assigned exactly one value from the domain of individuals.

The plural individual approach abandons dogma (i). In addition to concrete individuals like Aristotle, a ball-point pen, and Chicago, this approach allows domains of discourse that also include collections of such individuals, which I will call *pluralities*. Returning to our problematic case above, these theories have it that the predicate *good-couple* while not holding of any *atomic* individual, can hold of a plurality. In a mereological system the plurality of Adam and Eve is represented with a sum operator; I put aside formal definitions until §2.2.2.

(2.46) GOOD-COUPLE$(a \oplus e)$

Within this approach, there are two ways of formally implementing pluralities; both coming from important sub-disciplines of mathematical logic. Historically, the first theories of plurality in natural languages drew from the field of mereology; most notably in Link's (1983) seminal work, with antecedents in Cartwright (1975). For this approach, the semantic value of plural noun phrases like conjunctions and plural definite descriptions are mereological sums of atomic individuals. Some authors (Scha (1984), Gillon (1987), Lasersohn (1995), and Schwarzschild (1996), for example) argued instead that sets should serve as the value of such plural noun phrases; for example, the semantic value of *Adam and Eve* being the set containing the individuals Adam and Eve as its only

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members. Despite some technical and conceptual differences between these approaches, they share the feature that the domain of discourse contains more than just the basic individuals assumed in first-order logic: whether the additional plural individuals be sums or sets. Correlatively, both approaches maintain dogma (ii): terms are assigned a single value, whether that value be a singular/atomic value or a plurality value.

George Boolos developed a logic that deviated from the standard first-order by abandoning dogma (ii) though maintaining (i). While this approach has been less common in natural language semantics, it has many attractive features. Perhaps most importantly is that it does not commit one to the existence of ontologically dubious entities like pluralities, whether they be sets or sums. Only the most necessary ontological objects are used; i.e., just the ones assumed a first-order ontology. With sets or sums, the logic becomes susceptible to Russell's Paradox, see especially Schein (1993) for arguments against this concerning natural language. So instead of positing pluralities, Boolos's plural logic modified the way that values are assigned to variables. Standardly, values are assigned via an assignment function, which pairs each index (or variable letter) with exactly one value from the domain of discourse. Boolos's suggestion was to essentially abandon the idea that there is an assignment *function*, and instead suggested the more general notion of an assignment *relation*[13]. Functions by definition pair each argument (in this case an index or variable letter) with exactly one value. By adopting the more general notion, each variable may be associated with more than one value; so that in some cases a single argument

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[13]One-place functions like the assignment function can be represented as a set of ordered pairs of the form ⟨index, value⟩, where the second member of each pair is a value that is unique to that specific index. In other words, the set of ordered pairs associated with some assignment function will never contain both pairs ⟨x, Adam⟩ and ⟨x, Eve⟩. For a Boolos-style assignment relation, such a set containing both pairs is possible.

position may be assigned multiple values.

I will not attempt here to distinguish among these competing theories. For the purposes of this dissertation, I believe any of these approaches would work. That is not to say that there are not larger conceptual reasons at stake; just not ones that will be addressed in this dissertation. For the purposes of implementing formal details though, I will have to settle on one. I chose to present the theories offered in a mereological system, primarily because of its familiarity.

For the remainder of this section I will spell out the details of the mereological system I will use, drawing much from the work of Landman and others for the core assumptions about plurality. I depart from Landman in some of the details mentioned in the previous section; particularly by pursuing a total separation approach to argumenthood. However, implementing these ideas into a mereological program will be relatively straightforward.

2.2.2 Ontological commitments

It has become common in event semantics to assume a sorted domain of discourse, one subdomain for individuals, $\mathcal{D}$, and one for events $\mathcal{E}$. Each subdomain contains their respective atomic entities (first-order individuals and events), plus all the mereological sums that can be formed from these atoms. I will define the sum operator $\oplus$ as a function from sets of entities to entities such that for each non-empty set X, if $X \subset \mathcal{D}$, then $\oplus X \in \mathcal{D}$; or if $E \subset \mathcal{E}$, then $\oplus E \in \mathcal{E}$. Thus, each sub-domain is closed under sum formation. I use the common short hand of representing $\oplus\{a, b\}$ as $a \oplus b$. It is also

necessary to define a part-of relation $\leq$: $X \leq Y$ iff $X \oplus Y = Y$[14].

The sum operation can put together atomic individuals to create a new plural individual (a sum) consisting of just those atoms, or it can put together two sums and create a new sum. An atom is an entity that has only itself as a part: ATOM(X) iff $\neg\exists Y : Y \leq X \,\&\, Y \neq X$. In algebraic terms, the sum operation creates domains of discourse that have the structure of an i-join semilattice.

(2.47)
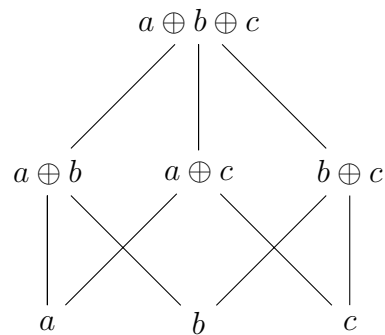
Lattice structures have many other interesting formal properties, but I put these aside as they do not have direct relevance to this dissertation.

A central feature of mereology theories is that just as the domain of individuals is closed under sum formation, so are the denotations of number-neutral predicates. That is if $P(X)$ and $P(Y)$, where P is either a simple or complex predicate of entities, then it follows that $P(X \oplus Y)$. Note that P may have $X \oplus Y$ in its denotation without having either X or Y; this would be the case with essentially plural predicates discussed above. Relational predicates are also closed under sum formation: if $R(X, Y)$ and $R(X', Y')$, then $R(X \oplus X', Y \oplus Y')$.

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[14]The part-of relation $\leq$ is a partial-ordering on each domain: it is a relation that is transitive, reflexive, and antisymmetric.

Some remarks are in order about variable names. I will adopt the convention of treating uppercase variable letters as *number neutral*: they can be assigned values that are either atomic entities or non-trivial sums. For ease of exposition, I will use lowercase variable letters solely for atomic values; that is, instead of writing $\exists X[\textrm{ATOM}(X)...]$ I will just write $\exists x[...]$. When the distinction matters, I will use letters at the end of the alphabet for variables ranging over the domain of individuals (x, y, z and X, Y, Z), and the letter E with or without primes for event variables (e, e', e'' and E, E', E'').

When intensionality phenomena are discussed in Chapter 6, I will introduce new ontological categories such as possible worlds and contexts. These require additional subdomains for each category, but they will have the same mereological properties outlined here.

2.2.3 Interpreting the open-class lexical categories

With the mereologial ontology in place, I now turn to the interpretation of the open-class lexical categories. I start with a discussion of the nominal categories of nouns and adjectives. For these categories, I offer a "pluralization" of standard textbook treatments as can be found for example in Heim and Kratzer (1998). I then discuss the interpretation of clausal categories: verbs and adverbs. For this section I will build on the results form the last section; the total separation approach to verb meaning. In sum, I follow the strong neo-Davidsonian thesis that each of these four categories can be interpreted as monadic predicates; in the nominal cases as predicates of individuals, and in the clausal cases as predicates of events.

2.2.3.1 Nominal categories: N and Adj

It is standard to treat nouns and adjectives as denoting properties of individuals. In the type-system assumed here, this corresponds to the claim that nouns and adjectives are interpreted as type $\langle e, t \rangle$ functions.

(2.48) $[\![\text{alien}_N]\!] = \lambda x.\text{ALIEN}(x)$

(2.49) $[\![\text{blue}_A]\!] = \lambda x.\text{BLUE}(x)$

There are several cases that are problematic to this simple view. For one, there are relational nouns such as kinship terms (e.g., *brother, mother, friend, etc.*). While I will not focus on such examples here, it is worth noting that such nouns can be viewed as monadic following reasoning along the lines of thematic separation of verbs discussed in the previous section. That is, while it might be conceptually necessary that a brother is always a brother of someone, it does not follow that that someone needs to be grammatically represented as an argument, syntactically or semantically. As for adjectives, Higginbotham (1985) among others notes that some adjectives require an additional parameter for interpretation. For example, the property $\text{SMALL}(x)$ seems to require some qualification, as an elephant can be small for an elephant, but it seems odd to say that it is small simpliciter. The smallest elephant is still big when compared with a mouse. Again, I put these cases aside as they are not directly relevant, and I will treat all adjectives as denoting monadic properties.

The question now is what to do about nouns and adjectives when plurality is involved. To start, let us address the issue of plural morphology. Nouns can be used to

speak of more than one individual that bears a certain property. In languages like English, this is often accompanied by plural number morphology. In Link's (1983) classic paper, nouns are treated as singular by default, and the plural morpheme closes the denotation of the singular noun under sum formation.

In the works of Schein, nouns are number-neutral by default. In the current framework, this corresponds to the claim that nouns denote a number-neutral property that can hold of either singular or sum individuals. The definition in (2.48) is modified to include a number-neutral variable.

(2.50) $[\![\text{alien}]\!] = \lambda X.\text{ALIEN}(X)$

For Schein (2005), drawing on Borer (2005), plural morphology does not pluralize, but contributes a property like $\text{COUNTABLE}(X)$ as virtually all nouns with plural morphology in languages like English resist mass interpretations[15]. The idea that nouns start as number-neutral gains support from languages that do not have nominal number morphology, such as Chinese, Japanese, Hindi, among others. In these languages, the same noun form is used to speak of both singular and plural individuals.

In this dissertation, I focus only on count nouns, though there is a large body of related literature connecting patterns of number morphology with mass and generic interpretations; see for example Carlson and Pelletier (1995) and Chierchia (1998). I leave these issues unaddressed, and I will assume number-neutral meanings like (2.50). For the next several chapters, the semantic contribution of the plural morpheme will not be relevant, though I will return to this issue when discussing plurality in De Se report in

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[15]Gillon (1987) points out a small class of counterexamples of mass-denoting nouns with plural morphology, such as *brains* and *guts*.

Chapter 6.

Adjectives will be treated on par with nouns in that I give them number-neutral meanings.

(2.51) $[\![\text{blue}]\!] = \lambda X.\text{BLUE}(X)$

Noun-adjective combinations can be interpreted by Predicate Conjunction with the result being a complex number-neutral predicate, as in the following example.

(2.52) $[\![\text{blue alien}]\!] = \lambda X.\text{BLUE}(X) \mathbin{\&} \text{ALIEN}(X)$

Before moving on, there is one further issue that will be relevant later in regards to plurality and nominal lexical categories. If a property holds of plurality, one wants to know if it also holds of the mereological parts of that plurality. This is an empirical question, and as far as noun meanings go, the answer seems to be positive. This property can be illustrated by the following valid inference.

(2.53)

$$\frac{\text{They}_i \text{ are dogs} \quad \cdot}{\text{Each one of them}_i \text{ is a dog} \quad \therefore}$$

The conclusion speaks just of atomic individuals, but a similar valid inference can be constructed, with some mereological vocabulary, if the conclusion spoke of *each sub-plurality of them$_i$*. Note that for this inference to go through, number morphology on the noun has to change from premise to conclusion. It does not follow from the premise in (2.53) that each of them is *dogs*. But this is a relatively innocent assumption especially

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given our assumptions about the number-neutral nature of noun meaning. As such, we can generalize to the following inference schema, with N as a variable for most if not all noun.

They$_i$ are N.

(2.54)

————————————

Each one of them$_i$ is a N ∴

We may thus say that the following principle, whatever its source, is part of the grammar[16].

(2.55) Property homogeneity of nouns

For every property P denoted by a noun, if a plurality X is such that $P(X)$ then for every X' such that $X' \leq X$, $P(X')$.

Nouns may be unique among open-class lexical categories in this regard[17] In the next section I will show that similar inferences do not hold in with clausal categories. It can be shown that adjectives in general do not always give valid inferences of the form [They are A] → [Each of them is A]. For example, if *they$_i$ are numerous*, it does not follow that *each of them$_i$ is numerous*, and not even that *each sub-plurality of them$_i$ is numerous*.

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[16]If the noun is a gerund, it may not be the case that property homogeneity holds. This might have to do with gerunds being more like verbs than nouns; see discussion in the next section about the principle of Variety.

[17]A possible exception to property homogeneity are collective/group nouns such as *band, committee,* or *group*. However, it has been argued by some that the parts of that make up a the denotation of a singular collective noun are not relevant linguistically, these items function as singular noun. As a singular noun, it picks out a linguistic atom that cannot be further divided by the linguistic part-of operator $\leq$. See Barker (1992), Schwarzschild (1996), and Pearson (2011) for discussion.

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I will treat proper names meanings as monadic predicates of individuals. This is a departure from the classic analysis of proper names as type e; I follow others that while NPs containing proper names may be of type e, the proper names themselves are predicative. Burge (1973) pointed out that proper names can appear in the same syntactic environment as common nouns in quantification NPs, such as in the following examples.

(2.56) Every Norbert that I know is a linguist

(2.57) There are three Johns in this year's freshman class

Proper nouns can also serve as common nouns in definite descriptions. In languages like Greek, proper names *must* appear with a definite article; providing further support for a type e over $\langle e, t \rangle$; see for example Holton et al. (2004).

(2.58) *(i)   *Maria*
     *(the) Mary
    'the Mary'

Again following Burge and others, I adopt the following definition for proper names.

(2.59) ⟦John⟧ $= \lambda X.X$ is properly called John

The above definition undoubtedly requires some modifications; for example, to be properly called by a name it is not enough to have someone just call you that name on one occasion, perhaps by mistake. Some regularity of going by that name seems to be called for. I will not pursue these issues here; the relevant point is that proper names can be given a monadic meaning, fitting with other common nouns.

I will soon introduce an ι operator as an implementation of definiteness, which will compose with proper names and other nouns to yield type e NPs. However, for expository

reasons, instead of writing $\iota X[X$ is properly called John], I will stick with the convention of using individual terms like j in the metalanguage. It would do no harm to the main points of thesis if one were to assume that proper names are of type e; though I believe that the type $\langle e, t \rangle$ analysis is preferable not just for the reasons that Burge pointed out, but also because it provides unified monadic analysis; see Pietroski (2005) for discussion.

2.2.3.2 Clausal categories: V and Adv

The clausal categories will be treated on par with the nominal ones, with the crucial difference being that while the latter are associated with monadic predicates of individuals, the former are monadic predicates of events. Treating adverbs as such has become the norm in event semantics since Davidson's seminal work. As for verbs, treating them as monadic event predicates is a consequence of adopting the total separation approach to argument structure. As with the nominal categories, the "pluralization" of these predicates involves a number-neutral plural variable. I assume that such predicates are pluralized by default, thus not requiring a Link-style *-operator to differentiate singular and plural predicates.

(2.60) $[\![\text{sleep}_V]\!] = \lambda E.\text{SLEEP}(E)$

(2.61) $[\![\text{furiously}_{Adv}]\!] = \lambda E.\text{FURIOUSLY}(E)$

As discussed in the beginning of this section, such predicates are closed under sum formation, so that if two atomic events of sleeping (whatever they might be) are in the denotation of $\text{SLEEP}(E)$, then so is the sum of those two events.

What about the other direction; if a sum E is in the denotation of an event predicate like in (2.60) and (2.61), does that mean that parts of E also are? As intimated in the previous section, this is not the case. Consider the verb *plant* in the following sentence from Kratzer (2000), Chapter 3.

(2.62) Alan, Brian, Campbell, and Dunn planted the rose bush

The actions of the agents might be divided into digging a hole, dropping the plant in, and covering the hole with soil. None of these actions alone counts a planting, though the sum of each of these smaller events will. Contrary to nouns, the behavior of verbs in this regard can be characterized as the following principle, which I take from Williams (2009). We can let V here stand for a monadic event predicate denoted by a verb.

(2.63) Variety

An event E that satisfies a description V may have an event E' that does not satisfy V as a proper part.

Similar examples can be constructed for adverbs. To anticipate an important example in §2.2.6, an event of eating a bag of potato chips may satisfy SLOWLY(E), while the eating of each chip may be done in a rapid fashion, thus not satisfying SLOWLY(E).

2.2.4 (In)definiteness

The combination of a noun with its modifiers is a type $\langle e, t \rangle$ predicate. We thus need some mechanism for turning such predicates into individual denoting expressions when dealing with referential noun phrases. I will follow Link (1983), who in turn follows

Sharvy (1980) in defining an ι operator that is suitable for plural referential NPs. The iota operator corresponds to the notion of a *supremum* in mereology theory. For any set X partially ordered by the $\leq$ relation, the supremum of X is the smallest value in X such that for any $Y \in X$, $Y \leq X$. I will represent this in the metalanguage as $\oplus P$, the sum of all the elements that fall under the property P.

(2.64) $[\![\iota]\!] = \lambda P_{\langle e,t\rangle}. \oplus P$

(2.64) can serve as the definition of the definite article when one appears overtly, otherwise I assume bare referential NPs (such as proper names in English) have a silent ι as a determiner-like element in the NP. Alternatively, one may treat (2.64) as type-shifting operation instead of a silent definite article. A benefit of using (2.64) as a formal implementation of definiteness is that the supremum is necessarily a unique element, and definite descriptions are well-known to be used felicitously only when there is such a unique element. In the case of a singular description, this will be the unique atomic individual in the domain that satisfies P; for a plural description, it will be the unique largest plurality that satisfies P[18].

In the course of this dissertation, we will also encounter indefinite noun phrases, especially bare numeric ones such as (2.65).

(2.65) three musketeers

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[18]There is a slight empirical problem with treating the denotation of a definite NP as the supremum of a poset. If plural NP picks out the largest element that satisfies the descriptions associated with the NP, then there should be no outliers; i.e., individuals that were not referred to but fall under such a description. However, when large enough pluralities are concerned, such outliers are possible. One can truthfully utter *The students threw water balloons at the principal* if 198 out the 200 students gathered in the auditorium threw water balloons, and two students abstained. Note that there is a sharp contrast with a sentence that differs minimally by including *all*: *All the students threw water balloons at the principal* would be false in this situation. In other words, the ι operator seems to better model *all the* rather than simply *the*. See Brisson (1998) for discussion.

First there is the issue of what to do with the numeral by itself. I assume that such expressions are adjectives, and thus of type $\langle e, t \rangle$.

(2.66) $[\![\text{three}]\!] = \lambda X.\text{THREE}(X)$

This has the benefit of giving a unified denotation whether or not numerals appear in bare constructions like (2.65), or in definite noun phrases like *the three musketeers*.

I assume that indefiniteness[19] is given by a sometimes silent determiner or type-shifting operation on par with (2.64). I notate this operator as $\exists_X$, not to be confused with the Davidsonian event operator $\exists_e$ defined in (2.21).

(2.67) $[\![\exists_X]\!] = \lambda P_{\langle e,t \rangle}.\lambda \Theta_{\langle e,\langle v,t \rangle\rangle}.\lambda E_v.\exists X[P(X) \ \& \ \Theta(E, X)]$

This operator takes a $\langle e, t \rangle$ restrictor argument and an adposition and returns a predicate of events that is conjoinable with further $\langle v, t \rangle$ predicates by Predicate Conjunction.

As an illustration of ι and $\exists_X$, I provide below a simplified derivation for the sentence (2.68).

(2.68) The boys ate three cookies

(2.69)　　a. $[\![\Theta_{\text{TH}} \ \exists_X \ \text{three}$

　　　　　　$\text{cookies}]\!] = \lambda E.\exists X[\text{THREE}(X) \ \& \ \text{COOKIE}(X) \ \& \ \text{THEME}(E, X)]$

　　　　b. $[\![\text{ate three cookies}]\!] =$

　　　　　　$\lambda E.\text{EAT}(E) \ \& \ \exists X[\text{THREE}(X) \ \& \ \text{COOKIE}(X) \ \& \ \text{THEME}(E, X)]$

　　　　c. $[\![\Theta_{\text{AG}} \ \text{the boys}]\!] = \lambda E.\text{AGENT}(E, \oplus\text{BOY})$

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[19]I focus here only on existential uses of indefinites, not specific ones.

d. $[\![\exists_E \text{ the boys ate three cookies}]\!] =$

$\exists E[\text{AGENT}(E, \oplus\text{BOY}) \,\&\, \text{EAT}(E) \,\&\, \exists X[\text{THREE}(X) \,\&\, \text{COOKIE}(X) \,\&\, \text{THEME}(E, X)]]$

For ease of exposition, I will simplify the logical representation of numeric indefinites: instead of $\lambda E.\exists X[\text{THREE}(X) \,\&\, \text{COOKIE}(X) \,\&\, \Theta(E, X)]]$, I will write $\lambda E.\Theta(E, 3C)$.

2.2.5 Cumulativity of thematic relations

Like monadic predicates, I will treat thematic relations as pluralized by default and thus have denotations that are closed under sum formation, see for example Krifka (1986). That is, if the pairs $\langle E, X \rangle$ and $\langle E', Y \rangle$ are in the denotation of some thematic relation Θ, then so is $\langle E \oplus E', X \oplus Y \rangle$.

As discussed in §2.1.3.3, thematic relations are determined by adpositions, either overt or covert. I repeat a schema for the definition of adpositions below with the modification of including number-neutral instead of singular variables. This is so for both clausal (2.70) and nominal (2.71) adpositions.

(2.70) $[\![\mathrm{P}_\Theta]\!] = \lambda X_e.\lambda E_v.\Theta(E, X)$

(2.71) $[\![\mathrm{P}_\Theta]\!] = \lambda X_e.\lambda Y_e.\Theta(Y, X)$

With pluralized thematic relations in place, we can now turn to the neo-Davidsonian treatment of cumulativity phenomena. As first noticed by Scha (1984), sentences with multiple plural NPs give rise to what is often called cumulative readings.

(2.72) John and Bill danced with Mary and Sue

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The sentence can be truthfully uttered as a report of several different types of situations. A cumulative interpretation of (2.72) is one where say John only danced with Sue, and Bill only danced with Mary. That is each part of the agent plurality danced with merely a proper part of the theme plurality; and conversely each part of the theme plurality danced with just a proper part of the agent plurality. Fortunately, a truth-theoretic explanation of this phenomena is already implicit in the way plural thematic relations are defined.

Given that thematic relations are closed under sum formation, we know that if $\Theta(E, X)$ holds, then for each atomic $e \leq E$, there is at least one $x \leq X$ such that $\Theta(e, x)$, and likewise for each atomic $x \leq X$, there is at least one $e \leq E$ such that $\Theta(e, x)$. Let us call this the Θ Cumulativity Principle; see Krifka (1992), Schein (1993), Landman (2000) for discussion. This of course holds for both nominal and clausal thematic relations.

(2.73) The Θ Cumulativity Principle

$$\Theta(E, X) \Leftrightarrow \forall x \leq X \exists e \leq E[\Theta(e, x)] \ \& \ \forall e \leq E \exists x \leq X[\Theta(e, x)]$$

The truth conditions of (2.72) are as follows.

(2.74) $\exists E[\text{AGENT}(E, j \oplus b) \ \& \ \text{DANCE}(E) \ \& \ \text{THEME}(E, m \oplus s)]$

These truth conditions are compatible with a number of different verifying situations; all they express is that there are some events of dancing with John and Bill as agents and Mary and Sue as themes. The event description can be satisfied if each agent danced with just one theme (with either of the two pairings available), or stronger situations such as each agent dancing with both themes. Pluralized thematic relations allow for any of these available interpretations, without the use of operators to derive certain readings. That is

not to say that such operators (e.g., distributivity or group operators) are incompatible with this approach, especially if there are further reasons for positing their existence.

Note that this is not the only approach to cumulativity. There are non-event theories which I will not review immediately, though I will bring them up in discussion with De Se reports in Chapter 6. As we will see, these are not without their flaws. One particular argument for the eventive approach to cumulativity with distributivity will be discussed in the next section.

2.2.6 Distributive and collective interpretations

One of the most well-known observations about sentences with plural expressions is their potential for distributive and collective interpretations. While some sentences seem to favor either a distributive (2.75) or collective (2.76) construal based on idiosyncrasies of the predicate involved, others present a case of ambiguity (2.77).

(2.75) They are left-handed

(2.76) They formed a circle

(2.77) They carried a piano up the stairs

In order to account for this range of interpretations, semanticists often treat one of these readings as basic, and the other derived by means of some silent operator. Both options have been pursued; for those that take collectivity as the basic interpretation, distributivity is derived by a distributivity operator; see Link (1984), Roberts (1987), and Lasersohn (1995), among others. A non-eventive distributivity operator based on the work of these authors is given below.

(2.78) $[\![\mathbf{D}]\!] = \lambda P_{\langle e,t \rangle}.\lambda X_e.\forall x \leq X[P(x)]$

In examples (2.75) and (2.77), this operator attaches to the VP and yields truth conditions stating that each atom in the subject plurality bears the property denoted by the VP.

Landman takes the other route[20]. For him distributivity is the default form of plural predication, and collective readings are derived by a group forming operator ↑ which applies to noun phrases. Landman assumes a sum-based theory of plurality where predication of a simple sum is distributive predication, and predication of a group individual corresponds to collective predication.

(2.79)   a. Al, Bob, and Chaz carried the piano

        b. Distributive: CARRY-PIANO$(a \oplus b \oplus c)$

        c. Collective: CARRY-PIANO$(\uparrow (a \oplus b \oplus c))$

There are many issues relevant for the debate concerning which reading is the basic and which is derived, and I will not attempt to review them here. Although, there is at least one straightforward argument supporting VPs being the source of ambiguity, and not NPs. Lasersohn (1995) provides an argument from conjoined VPs where one VP is interpreted distributively, and the other collectively.

(2.80) They are left handed and arranged in a circle

Sentences like this provide evidence for the VP being responsible for the ambiguity, perhaps implemented as the first VP bearing a D operator and the other not. If NPs were responsible for the ambiguity, it becomes difficult to explain (2.80) as the same NP would,

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[20]See Landman (1989a), Landman (1989b), and Landman (2000).

assuming Landman's approach, have to both lack a ↑ operator when interpreting its composition with the first VP, and posses this operator for its composition with the second.

2.2.6.1 Distributivity in event semantics

The topic of distributivity in event semantics can be traced back to the work of Taylor (1985)). Taylor addressed the logical form of sentences containing the distributive determiner *each*, and in particular how such items interacted with adverbial modifiers. He observed that in certain sentences containing *each*, adverbs construed as monadic predicates of events seem to have more than one option as for which events they modify. This is perhaps easiest to see in sentences that have two such adverbs, as in the following example taken from Taylor.

(2.81) Gracefully, Sally ate each crisp quickly

This sentence can be used to describe a situation such as the following: in one sitting, Sally ate an entire bag of chips gracefully; and as far as each individual crisp was concerned, it was eaten quickly. As the paraphrase suggests, there seems to be two sorts of events that are relevant in the meaning of (2.81): the totality of events E which correspond to those events that culminate in the eating of the entire bag, and also sub-events of E, each of which is such that a single crisp is eaten quickly. Taylor's suggestion was that the logical form of (2.81) include two event quantifiers, the Davidsonian clause-level event quantifier, and another which has narrow scope with respect to *each*. Taylor's quantifier quantifies over sub-events of the larger events associated with the clause-level quantifier. Given the assumptions presented above, this can be regimented as follows.

(2.82) $\exists E[\text{GRACEFULLY}(E)\text{AGENT}(E, s) \ \& \ \text{EAT}(E) \ \& \ \forall x : \text{CRISP}(x)[\exists E' \leq$

$E[\text{THEME}(E', x) \ \& \ \text{QUICKLY}(E')]]$

The crucial component is that the sub-event quantifier $E' \leq E$ scopes immediately below the universal quantifier associated with *each*; essentially apportioning sub-events of the appropriate type to each atomic individual that is universally quantified over, in this case the crisps. This has the effect of generating truth conditions stating that each crisp is a theme in some sub-events of E and those sub-events are quick.

Schein (1993) builds on Taylor's suggestion about the logical form of sentences with distributive morphemes when giving his seminal argument for thematic separation (i.e., total separation). According to Schein, such a view of distributivity together with the total separation approach to argumenthood is necessary for capturing certain interpretations of sentences that mix distributivity with cumulativity such as (2.83).

(2.83) Josh and Ben made each customer three sandwiches

The relevant reading of this sentence is one where Josh and Ben did all the work, and as a result each customer received three sandwiches. This does not say how much work Josh and Ben did for each customer; for example, some customer might have had his three sandwiches all made by Josh, another customer having two made by Josh and one by Ben, another customer having 1.25 sandwiches made by Josh and 1.75 made by Ben; etc. For this reading to be available, *Josh and Ben* and *three sandwiches* must be scopeless with respect to each other. Schein shows that this is not possible with theories that have verbs interpreted as polyadic predicates[21]. He claims that the only way to give adequate truth

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[21]This includes alternatives with branching quantifiers, Sher (1990).

conditions that capture this reading is with total separation and the view of distributivity given by Taylor, as expressed in the logical form in (2.84).

(2.84) $\exists E[\text{AGENT}(E, j \oplus b) \ \& \ \text{MAKE}(E) \ \& \ \forall x : \text{CUSTOMER}(x)[\exists E' \leq E$

$[\text{GOAL}(E', x) \ \& \ \exists Y[\text{THREE}(Y) \ \& \ \text{SANDWICH}(Y) \ \& \ \text{THEME}(E', Y)]]]]$

Eventive theories without thematic separation, nor even partial separation, are unable to account for such readings since they specify in the lexical entries for verbs that the conjunct associated with the verb as well as the thematic conjunct associated with the verb's arguments have the same event parameter.

I now turn to a specific implementation of Taylor's and Schein's approach to distributivity in the compositional system given here. I accomplish this by positing a lexical axiom for the distributive element *each*, which relies on several other aspects of composition discussed above; in particular the Conjunctivist approach to argument composition couched in a total separation version of neo-Davidsonianism. I will treat *each* as one instantiation of the D operator, thus the following definition will serve not just for the cases discussed by Taylor and Schein, but for other examples where one might posit a D operator. I turn to these other cases shortly.

(2.85) $[\![D]\!] = \lambda X_e.\lambda \Theta_{\langle e, \langle v, t \rangle \rangle}.\lambda P._{\langle e, t \rangle}.\lambda E_v.\forall x \leq X[\exists E' \leq E[\Theta(E', x) \ \& \ P(E')]]$

Like the quantificational approach to indefiniteness in §2.2.4, D will compose with a canonical restrictor argument as well as the adpositional thematic element. Note that I depart from the traditional approach of Generalized Quantifier Theory by assuming a type e plural restrictor argument instead of the usual predicative type $\langle e, t \rangle$. This is a relatively innocent modification, as both types have the effect of picking out a plurality

of individuals for which to quantify over. The motivation for the type e approach will become clear in later chapters when discussing anaphoric constructions; since the first argument is of type e, it can be bound and receive values via the assignment function. The third argument of D is its canonical scope argument, which will correspond to the subevent portion of logical form. The final argument of D is an event argument. Though D will never compose with an event value, the last argument position has the effect of turning D when composed with its first three arguments into a monadic predicate of events, thus allowing it to compose with other such predicates by Predicate Conjunction. The composition of D with its arguments is diagrammed in the following tree.

(2.86)

$$\langle v, t \rangle$$

$$\Theta \qquad P_{scope}$$

$$\text{each} \quad X_{restrictor}$$
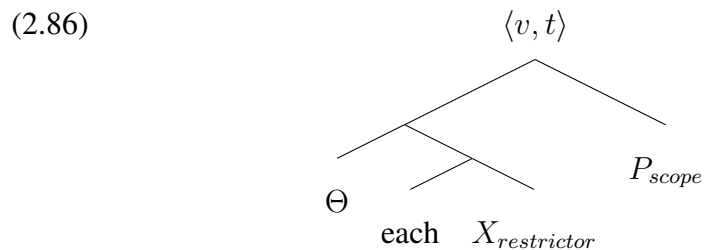
I will end this section by discussing how the version of the D operator presented here can be used in place of the non-eventive D-operator in order to account for distributive/collective contrast. This will also be the first argument motivating the particular implementation details of the restrictor argument in (2.85); in particular why I chose a type e instead of type $\langle e, t \rangle$ restrictor. The crucial claim here is that when the D operator does not appear in canonical argument positions as an *each*-DP, then the restrictor argument is a plural variable whose value is shared by another plural DP; I put off details about how this value is determined until the next section. This claim will be very important for analyzing the cases of plural anaphora in the next chapters, in which cases the other DP is the one traditionally assumed to be the anaphor's antecedent. Put differ-

ently, for cases where the D element is not in an argument position, the restrictor value will be represented twice in logical form; once in its argument position, and again as the restrictor. For a simple intransitive sentence with a distributive construal, I assume there is a silent D with restrictor adjoined to the VP (2.87a), and the restrictor shares its value with the plural subject. The truth conditions given present assumptions are presented in (2.87b)

(2.87)   a. The girls$_X$ $[_{VP}[D + X][_{VP}$ smiled$]]$

    b. $\exists E[\text{AGENT}(E, \oplus\text{GIRL})$ &

        $\forall x \leq \oplus\text{GIRL}[\exists E' \leq E[\text{AGENT}(E', x)$ & $\text{SMILE}(E')]]]$

Champollion (2010) criticizes an event-based version of distributivity that is very similar to my own, which he attributes to Lasersohn (1998). In (2.88) I provide Lasersohn's version of the meaning of (2.87a) as reported in Champollion (p. 168, example (17a)), up to the introduction of existential closure. I use the notational conventions presented here.

(2.88) $\lambda E.\forall y \leq \oplus\text{GIRL}[\exists E' \leq E[\text{SMILE}(E')$ & $\text{AGENT}(E', y)]]$

Champollion gives a convincing argument showing that Lasersohn's rendition suffers from the problem of *leakage*; it can apply to events in which more goes on than simply girls smiling. I agree that this is an unsatisfactory state of affairs. The present account avoids this problem as follows. My logical form specifies what the agents of the larger events E are, and not merely the agents of the sub-events E' as with Lasersohn's version. This fact, together with the independently required principle of Thematic Uniqueness from §2.1.2 tell us that the only types of events which can serve as values of E are those

that have the girls *and only the girls* as agents. Lasersohn's conditions are weaker, stating that only each of the relevant sub-events E' have girls as agents. Thus, we avoid the problem of leakage. Note that this is not to say that Champollion's account of distributivity (not reviewed here) is wrong[22]; it just shows that the present account at the moment does not suffer from leakage problem discussed above. I will return to the issue of leakage in the following chapter.

2.3   Chapter summary

In this chapter I have outlined the formal system that will be put to use throughout the dissertation. There will be reasons for modifications and additions, but the core system of a neo-Davidsonian semantics for plurality will remain unchanged. I first introduced a view of argumenthood that pushes Davidson's original suggestion about events to the extreme: not only are event values semantic arguments of action verbs, they are the *only* arguments of action verbs. Noun phrases are bearers of thematic roles, either by Θ-features or through composition with adpositions, and they are interpreted as thematic predicates. Following some ideas of Pietroski, Predicate Conjunction is taken to be central for the composition of both arguments and adjuncts. The event approach has also proven useful for addressing plurality phenomena in natural language. The most important aspect of this program that I will put to use in the following three chapters is the approach to distributivity first developed by Taylor and Schein. I plan on showing that the event-

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[22]Champollion develops of theory of distributivity that is also meant to account for certain properties of aspect and measurement which are irrelevant for our purposes here. I believe though that the discussion of anaphora here can be implemented in Champollion's system with all its extra theoretical machinery for a more comprehensive theory that links anaphora and these other semantic subdomains.

version of the distributivity operator in (2.85) can be used to give a unified analysis of

various local plural dependencies discussed in the literature.

Chapter 3: Distance Distributivity

Over the course of the next three chapters, I will extend the Taylor-Schein analysis of distributivity to cases where the distributive element appears separated from its restrictor argument. I will argue that the same lexical entry given for determiner uses of *each* can also be used for these cases of distance distributivity; relying on some of the general features of Conjunctivist composition together with some proposals about how the thematic roles and restrictor values are determined for "each" in such cases. In this chapter, I focus on constructions that have previously been called distance distributivity, in particular floating and binominal *each*. This will serve as an introduction for how the analysis can be further extended to reciprocals and plural reflexives in the following two chapters.

3.1   An overview of distance distributivity

In this section I will provide a brief empirical overview of the two sorts of constructions that have been labelled as cases of distance distributivity: floating and binominal *each*. I focus on English distance distributivity items and their core distributional and semantic properties, though I draw on other languages for comparison. My hope is that the proposals offered in this chapter can be extended beyond English, though I leave this

for future work. I will not attempt a detailed theoretical review of past syntactic or semantic analyses of these constructions, nor will I give a survey of the similarities and differences of these constructions across languages; for these issues I refer the reader to the comprehensive study of Zimmermann (2002) and Bobaljik (2002). What I provide below are the ingredients that are important for giving a Taylor-Schein treatment of distance distributivity.

3.1.1   Floating *each*

The study of floating *each* began with Kayne (1969), a seminal work on floating quantifiers in general. Focusing on French, Kayne observed that certain determiner-like elements can appear in positions other than the canonical prenominal determiner position.

(3.1) ***Tous*** *les enfants ont vu ce film*
   all   the children have seen this movie
   'All the children have seen this movie'

(3.2) *Les enfants ont* ***tous*** *vu ce film*
   the children have all   seen this movie
   'All the children have seen this movie'

The same sort of constructions can be observed with the distributive item *each* in English, which can appear either in a typical determiner position or floated in the middle field.

(3.3) Each of the children have seen this movie

(3.4) The children have **each** seen this movie

Floating *each* has a limited range of the kinds of antecedents that it can take. Focusing on bare or article-marked nominals[1], the antecedents to floating *each* must be plural; they cannot be singular or mass denoting.

(3.5) (The/some) children can **each** go down the slide

(3.6) *A child can **each** go down the slide

(3.7) The *(bottles of) wine has/have **each** satisfied the judges

There are several positions in the clause where a floating quantifier may appear. For English and related languages, floating instances of *each* can appear in a range of positions from immediately following the subject to immediately preceding the verb phrase. In (3.8), the possible occurrences of floating *each* with a subject antecedent/associate are given.

(3.8) The students (**each**) could (**each**) have (**each**) been (**each**) doing that

One of the central debates in the syntactic literature on floating quantifiers is that status of the positions in which these element can appear. Sportiche (1988) argued that the positions where floating quantifiers appear are A-positions; the floating element and its antecedent begin their derivational life together in a VP-internal subject position, and while this constituent moves cyclically through various A-positions to its final case position, the quantifier element becomes stranded while its complement, the antecedent, continues to the case position[2].

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[1]I consider only antecedents that are not headed by proportional determiners, which involve additional problems that are beyond the scope of this dissertation.

[2]Benmamoun (1999) follows Sportiche for most of the positions of floating quantifiers, though he argues that floating quantifiers that immediately follow the subject are still a constituent with the subject.

Alternatively, some authors have argued that floating quantifiers appear in adverbial positions. Previous proponents of this approach take it that the quantifier never forms a constituent with its antecedent; see for example Dowty and Brodie (1984). Support for this idea comes from canonical adverbs which can appear in the same positions as floated quantifiers in (3.8).

(3.9) The students (often) could (often) have (often) been (often) doing that

Further support for an adverbial analysis comes from examples in Slavic languages where the quantifier may appear in certain adverb positions that could not possibly be A-positions, barring *ad hoc* remnant movement of other elements in the clause. For example, in Serbo-Croatian, a quantifier may appear to the right of a right-adjoined VP-adverb.

(3.10) *Studenti$_i$ su   položili ispit uspešno   svi$_i$.*
      students.NOM AUX passed   exam successfully all.NOM
      'All the students passed the exam successfully.'

An additional challenge for stranding analyses is what Kayne (1969) called *L-tous* in French, which is apparent leftward movement of the floating quantifier. In (3.11), the quantifier appears to the left of its direct object antecedent, in a position which is typically not taken to be part of an A-chain associated with direct objects.

(3.11) *Elle   a   tous$_i$ voulu   les$_i$ lire*
      she   has   all   wanted   them   to-read
      'She wanted to read them all'

Some authors (Kayne (1969), Sportiche (1988), Déprez (1989)) have argued that the cases of floating considered above and *L-tous* involve distinct operations. Part of the motivation

for this comes from the fact the *L-tous* is only possible with a pronominal/clitic direct object.

(3.12) **Elle   a   tous$_i$ voulu   lire   ces   livres$_i$*
     she   has all   wanted to-read these books
     Intended meaning: 'She wanted to read them all these books'

This restriction is not observed in other languages though. For example, Serbo-Croatian allows leftward dislocation of the distributive *svaki/svi* from a non-pronominal direct object.

(3.13) *Student je   svaku$_i$/sve$_j$ brzo   pročitao knjigu$_i$/knjige$_j$.*
     student AUX each/all.ACC quickly read   book/books.ACC
     'The student read each book / all the books quickly.'

While the above data points pose problems for stranding analyses, languages with morphologically rich determiners support a connection between the antecedent and the floating quantifier, contrary to the views of most adverbial analyses which maintain that there is no such connection. For example, French floating quantifiers must agree in gender with their antecedents, and as seen in the above Serbo-Croatian sentences (3.10) and (3.13), the antecedent and floating quantifier show case agreement.

(3.14) *Elles   sont   toutes/*tous   allées à   la   plage*
     they.FEM all.FEM/*all.MASC gone.FEM.PL to   the beach
     'They all went to the beach'

Above I reviewed some key points of both stranding and adverbial theories of quantifiers float since the analysis I will develop in the remaining sections of this chapter will be hybrid of the two. I agree with the aspect of stranding analyses like Sportiche's that

the distance distributivity element and its antecedent value form a constituent in the form of a head-sister construction, the syntactic relation standardly assumed to hold between a quantification determiner and its restrictor argument. I leave open two possibilities for the syntax of the silent element that acts as the restrictor sister for the floated quantifier in surface syntax: either this element is a trace stranded by movement of the antecedent nominal, as in Sportiche's analysis, or the silent element is a covert pronoun that is referentially dependent on the antecedent nominal (i.e., there is no movement chain connecting the two positions); see §3.2.2 for further discussion. While I borrow this crucial aspect of local composition (at some point in the syntactic derivation) common in stranding type analyses, I reject that the stranding happens only in A-positions. I believe that it is beneficial to characterize the possible positions of distance items as adverbial. On the one hand, this accounts for the similarities with adverbs like *often* and also the possibility for *L-tous* and right-VP-adjoined floating elements in other languages. On the other hand, it allows for a uniform analysis of floating and binominal *each*, where the latter instances of *each* are clearly not A-positions in the movement chain of *each*'s antecedent.

One may argue that the data observed in other languages tells us nothing about English, where we do not see agreeing determiners nor the range of possible positions and antecedents seen in other languages. However, given their similarities in meaning, it might be suggested that the same core syntactic and semantic mechanisms are at work, and that a uniform analysis should be pursued. I believe that at least the semantics of floating quantifiers is the same across languages, though there may be additional factors in a given language that restrict or widen the range of possible positions and antecedents for the quantifier.

I will discuss one last empirical point about floating quantifiers that are relevant for us here, their relative scope properties. Dowty and Brodie (1984) observed that sentences with floating quantifiers exhibit so-called surface scope; see also Déprez (1994). I use the phrase "surface scope" to refer to the relative scope interpretation where the wide scope quantifier c-commands (and often linearly precedes) the narrow scope quantifier in surface syntax; i.e., before the covert transformations that derive an LF representation. For comparison, determiner uses of *each* in sentences with negation give rise to an ambiguity; they have both surface scope and inverse scope interpretations. Sentences like (3.15) are typically taken to be true if some but not all of the men kissed Mary, supporting the conclusion that the negative operator can take inverse scope with respect to the distributive operator.

(3.15) Each man didn't kiss Mary

Consider now the floating examples (3.16) and (3.17). Given Dowty and Brodie's hypothesis about surface scope, (3.16) should only allow the $\forall > \neg$ interpretation and (3.17) should only allow the $\neg > \forall$ interpretation.

(3.16) The men each didn't kiss Mary

(3.17) The men didn't each kiss Mary

(3.16) is unambiguous; it can only be true of situations where each man is such that he didn't kiss Mary. In other words, (3.16) only has the surface scope interpretation where *each* scopes over negation. The (un)ambiguity of (3.17) is harder to diagnose. This is because, unlike (3.16), the inverse interpretation entails the surface interpretation:

$\forall x \neg P(x)$ entails that $\neg \forall x P(x)$. Thus, it may be that the there is only the surface interpretation, but we cannot tell for sure since the situations that verify the inverse interpretation will also verify the surface one. For the purposes of parsimony and giving a unified analysis of floating and binominal *each*, I maintain that surface interpretations are the only ones available for distance *each*. This will be shown in the following section where we see a wider range of scopal elements for distance *each* to interact with.

3.1.2 Binominal *each*

Safir and Stowell (1988) brought an apparently different sort of distance distributivity construction to the attention of theoreticians. They labeled this variety "binominal[3]" *each*, as the meaning seems to be derived from the quantifier forming a relation between two nominal expressions, its distance antecedent and the host noun phrase that it appears immediately adjacent to[4].

(3.18) The men saw two women each

Safir and Stowell noticed that there are some restrictions to the type of noun phrases binominal *each* can appear adjacent to. They claim that this must be a numeric noun phrase, or a noun phrase modified with certain adjectives that express vague quantities such as *several*[5]. Following Safir and Stowell, I use "%" below to indicate that there are

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[3]The type of distance distributivity is sometimes referred to as *adnominal* instead of *binominal*.

[4]Safir and Stowell (1988) use the terms Range-NP and Distributing-NP for what I call the antecedent and host NPs, respectively. In Zimmermann (2002), my "antecedent" corresponds to his "Dist-Key", and my "host" to his "Dist-Share". Later in the chapter, the host-NP will be cast as a specific example of the distributor's *scope*.

[5]My own judgements are such that noun phrases containing *many* and *few* are mildly deviant hosts for a binominal *each*.

   i . ?The men saw many/few women each

some speakers of English who find acceptable non-cardinal indefinites with the indefinite article, and some who do not. Although Safir and Stowell do not mention this point, there also seems to be some speaker variation in the acceptability of *some jewels each*, especially when *some* is deaccented; thanks to Paul Pietroski (p.c.) for bringing this to my attention. Examples below are from Safir and Stowell (1988)), p. 428.

(3.19) The men saw five jewels each

(3.20) The men saw several jewels each

(3.21) The men saw one jewel each

(3.22) %The men saw a jewel each

(3.23) *The men saw the/those jewels each

(3.24) *The men saw some/certain jewels each

(3.25) *The men saw both/most/all jewels each

Binominal *each* shares some properties with its floating counterpart. For example, both require an antecedent that is a non-singular count noun phrase: singular count (3.26) and mass (3.27) noun phrases cannot serve as antecedents.

(3.26) *A man saw two women each

(3.27) *Water covered two women each

Like floating *each*, binominal *each* appears to be restricted to surface scope relative to other operators such as negation and existential indefinites. For example, (3.28) can be

true if one man saw two women, but the other men saw only one[6]; and (3.29) requires a

single man doing all the introducing (it would not be true if a different man introduced

each professor).

(3.28) The men didn't see (exactly) two women each

(3.29) A/Some man introduced the professors to two students each

A notable difference between floating and binominal *each* is that the former, at

least in English, is restricted to having just subjects as antecedents. As evidenced from

(3.29), the antecedent to binominal *each* can be a direct object. It appears that the proper

generalization for what can act as an antecedent to binominal *each* is decided by height,

and not by particular argument positions. For example, in a double object construction,

it is often assumed that the indirect object asymmetrically c-commands the direct object,

and so in this construction the indirect object can antecede the binominal *each* that appears

following the direct object.

(3.30) I gave three professors two papers each

I will return to the details behind the syntax and interpretation of binominal *each* in di-

transitive constructions in §3.3.

While both floating and binominal *each* allow for a variety of antecedents, in par-

ticular ones containing quantificational elements, I will limit my discussion to cases of

(non-kind denoting) definite and indefinite noun phrases.

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[6]Note that this does not technically rule out a lack of ambiguity, since the surface scope interpretation is entailed by the inverse scope interpretation. At the least though, we can rule out the inverse interpretation as being the only interpretation. The existential example (3.29) provides stronger support against the possibility for a wide-scoping binominal *each*, since unlike the negation example, the surface interpretation *is not* entailed by the hypothetical inverse interpretation.

3.2 Extending the Taylor-Schein approach

Distance distributivity provides a challenge to compositional semantics. These elements behave like determiner *each* in that they quantify over a restricted domain of individuals determined by their restrictor. However, for distance distributivity, the restrictor is separated in the syntax from the quantifier. The first challenge in giving a compositional account for distance distributivity items is to reconcile the composition of the quantifier with a suitable restrictor value. The next challenge is to account for the two types of distance distributivity: floating *each*, at least in English, appears in the middle field between the subject and the VP; while binominal *each* appears immediately adjacent to a host noun phrase. Given the similarities in meaning between the varieties of distributivity, we should ask if these elements have the same lexical and compositional properties. Granted, some languages use different morphemes for determiner *each* and distance distributivity items, and some languages show a difference between a distributor in a canonical floated position versus a binominal distributor; see Zimmermann (2002) for discussion. For English though, the same morpheme appears to be involved in each of these constructions, so one should consider if there is a unified analysis for these items: a single lexical entry suitable for the various occurrences of *each*. [7] I will argue that there is a single lexical

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[7]One case of DD that is particularly interesting to the present study is the prefix *po-* that appears in some Slavic languages. In Czech, *po-* can appear prenominally, in which case it is interpreted is a binominal distributor; see Zimmermann (2002), p.41 example (54i), data attributed to Hana Filip.

   i. *Chlapci koupili po dvou párcích/párkách*
     boys bought each two sausages.LOC
     'The boys bought two sausages each'

Filip and Carlson (2001) observe that *po-* can also be used as a verbal prefix, and when this happens, there is an obligatory distributive interpretation. When *po-* is absent, either a distributive or collective interpretation is possible. Data from Filip and Carlson (2001), p.8 examples (6a) and (6b) respectively.

   iia. *Děti se schovaly*

entry for *each* that is compatible with its various positions discussed above. This is the Taylor-Schein distributivity operator introduced in the previous chapter.

3.2.1 The distance composition of the Taylor-Schein distributor

In Chapter 2, I introduced the proposals of Taylor and Schein concerning a particular neo-Davidsonian approach to the truth conditions of sentences involving determiner *each*. I then implemented their ideas in a Conjunctivist approach to composition, where virtually all binary branching nodes are interpreted as a type $\langle v, t \rangle$ number-neutral monadic predicate of events. I showed how this definition of the distributivity operator can be used to model the behavior of the determiner *each* and also as a variant of the VP-level distributivity operator proposed by authors such as Link (1987) and Schwarzschild (1996). Below I will show how the same distributivity operator can be used for a compositional analysis of distance distributivity.

For convenience, I repeat the proposed definition of the distributivity operator below as (3.31) and the schematic tree representing the composition of D with its arguments (3.32). Of particular importance for present concerns is the non-standard claim that the external/scope argument of *each* is a monadic predicate of events, even when *each* is not raised.

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children REFL hide.PAST.3PL
'The children hid' (collective or distributive)

iib. *Děti se **po**-schovaly*
children REFL **po-** hide.PAST.3PL
'The children hid' (only distributive)

In the present system, *po-* can be treated as a Taylor-Schein distributivity operator like other DD elements; it just happens that in Czech the range of projections which D can attach to include the verb in addition to numeric nominals.

(3.31) $\llbracket D \rrbracket = \lambda X_e.\lambda \Theta_{\langle e,\langle v,t\rangle\rangle} \lambda P_{\langle v,t\rangle}.\lambda E_v.\forall x \leq X[\exists E' \leq E[\Theta(E',x) \ \& \ P(E')]]$

(3.32)

$$\langle v, t\rangle$$

$$\Theta$$

$$D \quad X_{restrictor}$$

$$\langle v, t\rangle$$
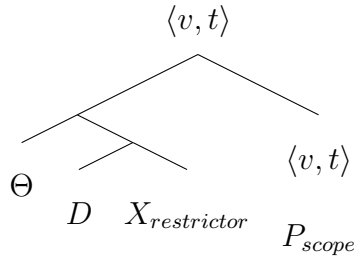
$$P_{scope}$$

Extending this approach to distance distributivity items requires the following: (i) proposals about how the restrictor value is determined by the antecedent, (ii) proposals about composition with scope argument in distance distributivity constructions, and (iii) showing that the resulting truth conditions are appropriate.

As for the restrictor argument, I propose that D composes with a Θ-marked silent plural pronoun whose semantic value and thematic role are determined by the antecedent to the distance distributor. Recall from Chapter 2 that the Taylor-Schein approach in effect attributes sub-events of a particular type to each atomic individual contained within the restrictor value, and states that that individual has a particular thematic role in those sub-events. The proposal about distance distributivity is that this thematic role is determined by the canonical role assigned to the argument position where the antecedent nominal resides, and the type e value of the antecedent also serves as restrictor argument to D. I take up the technical details behind how the Θ and type e values are determined in §3.2.2, though this informal proposal will serve for the time being.

The scope argument to D will be of type $\langle v, t\rangle$. In a Conjunctivist semantics, nodes with this type are ubiquitous. In Chapter 2, I showed how D composed with its restrictor and Θ value further composes as a subject nominal: since the sister of the subject is a $\langle v, t\rangle$ node, it serves as a suitable scope argument. The main syntactic proposal here is

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that D with its first two arguments can attach in adjoined positions as well. In the case of floating *each*, the adjunction site is the VP, so the VP will be the scope of D; for binominal *each*, the scope is smaller, it is just the nominal host which is the scope of D. In each case, the scope corresponds to the sub-event domain in logical form. Given the surface scope properties of distance distributivity items discussed in 3.1, we do not have to worry about ambiguity: the scope argument to floating and binominal *each* will always be the sister node it appears in construction with in surface syntax.

Consider first cases of binominal *each* like the following:

(3.33) The men saw two jewels each

The Θ-marked host nominal is interpreted as a $\langle v, t \rangle$ predicate: $\lambda E.\text{THEME}(E, 2J)$. This is exactly the sort of meaning that can serve as the scope argument for D. I represent the composition of binominal *each* in (3.34) below.

(3.34)

$$t$$

$\exists_e \qquad \langle v,t\rangle$

$\langle v,t\rangle \qquad\qquad \langle v,t\rangle$

$\Theta_{\text{AG}} \quad \text{The men}_i \qquad \langle v,t\rangle \qquad\qquad \langle v,t\rangle$

$\text{saw} \qquad\qquad \langle v,t\rangle \qquad\quad \langle\langle v,t\rangle,\langle v,t\rangle\rangle$

$\Theta_{\text{TH}} \quad \text{two jewels} \qquad \Theta_{\text{AG}} \quad D \quad X_i$
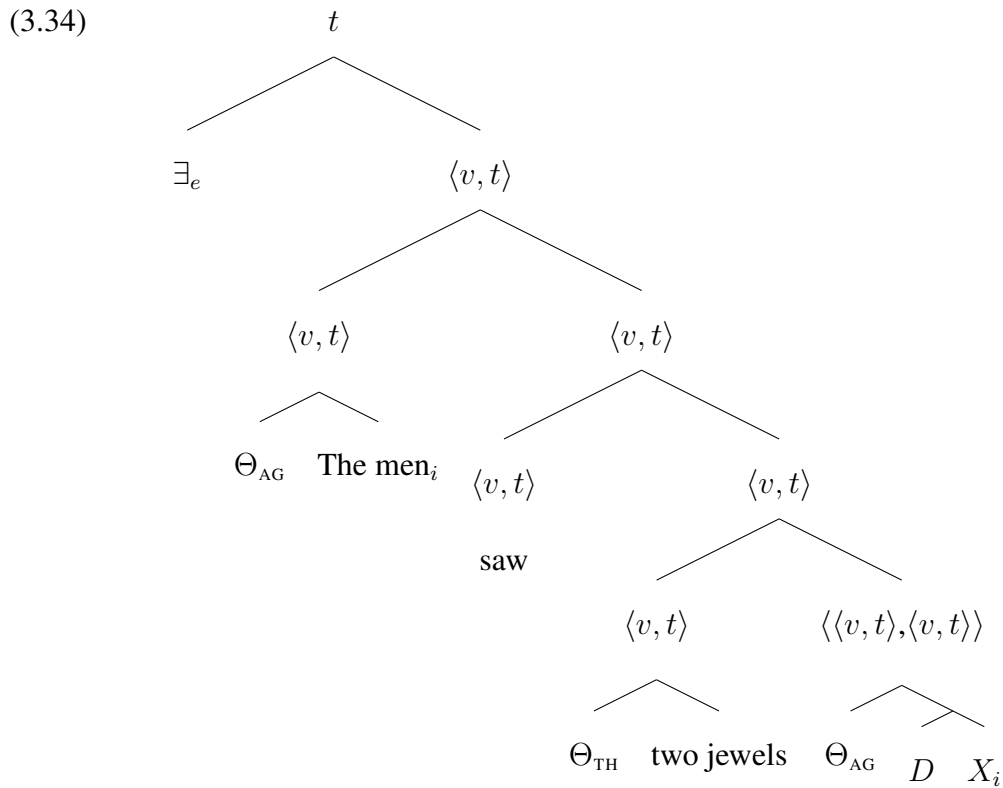
With the above assumptions about distance D composing with its antecedent's referential value X_i and thematic role Θ_{AG}, the truth conditions generated by our rules applied to (3.34) are as follows.

(3.35) $\exists E[\text{AGENT}(E, \oplus\text{MEN})\ \&\ \text{SEE}(E)\ \&$

$\qquad \forall x \leq \oplus\text{MEN}[\exists E' \leq E[\text{AGENT}(E', x)\ \&\ \text{THEME}(E', 2J)]]]$

The second line of the truth conditions represent the contribution of *each* composed with its silent antecedent value and its scope; each of the men is attributed the property of being an agent in sub-events of E, and the themes of each man's sub-events are two jewels. Because *two jewels* falls within the scope of D, we have the covariant interpretation each man saw two jewels that are possibly distinct from the jewels seen by the other men.

Turning now to the floating case (3.36), *each* is in an adjoined VP position, as

represented in the tree (3.37). This again will be a type $\langle v, t \rangle$ predicate of events.

(3.36) The men each saw two jewels

(3.37)
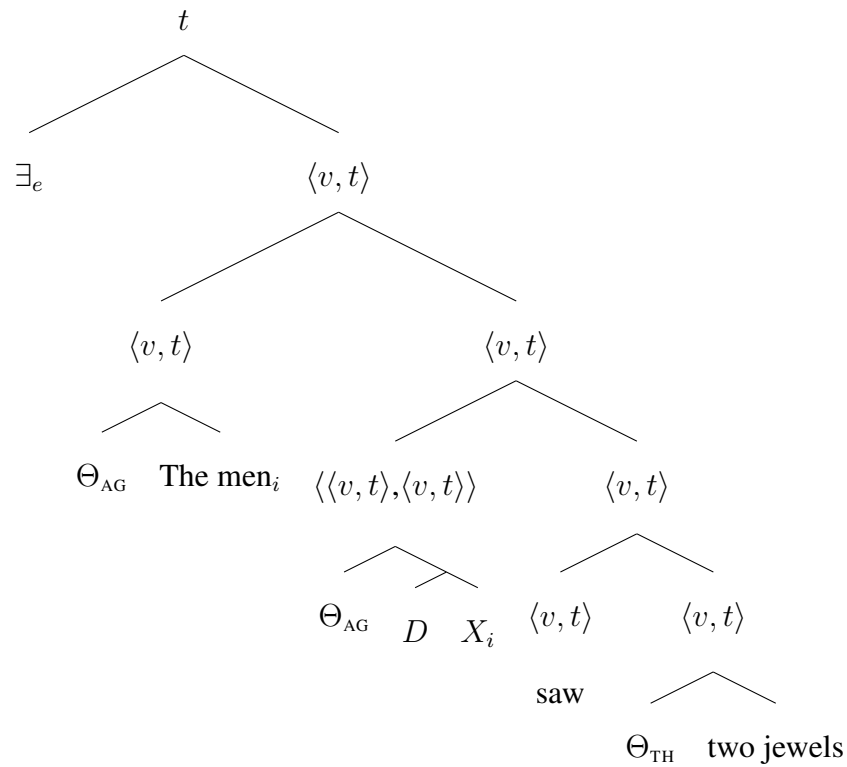
(3.36) differs from its binominal counterpart in that D has a slightly wider scope; it contains the entire VP. The sub-event portion of logical form will thus include more than in the binominal case.

(3.38) $\exists E[\text{AGENT}(E, \oplus\text{MEN}) \ \&$

$\forall x \leq \oplus\text{MEN}[\exists E' \leq E[\text{AGENT}(E', x) \ \& \ \text{SEE}(E') \ \& \ \text{THEME}(E', 2J)]]]$

While the resulting truth conditions (3.38) appear to be synonymous with those of (3.35) there are some slight meaning differences depending on the attachment sight of the distributor. In §3.3, I address ditransitive sentences where there is a clear difference in meaning relating to whether the whole VP is within the scope of *each*, as it is in

the floating cases, or whether just a host nominal acts as the scope, which we see with binominal *each*. I will first discuss some issue of how the semantics of the antecedent factors into the composition of distance D[8].

3.2.2 The distance restrictor

Above I proposed that the first two arguments of distance D, the restrictor and Θ arguments, are determined by the antecedent of D; in particular, the restrictor shares a referential value with the antecedent, and the thematic role of the antecedent is the same role that acts as the Θ argument to D. Below I propose some specific details about the compositional system to implement these ideas.

3.2.2.1 The semantic value of the restrictor

In the floating quantifier literature, it has been noticed that the restrictor of a determiner *each* is morphologically singular, though the antecedent to floated *each* is morphologically plural. This raises several questions; for one, if the determiner and distance examples differ only in that for the former the antecedent does not strand the quantifier, but in the latter it does, then why do we see different number morphology? Furthermore, there is the semantic type of the restrictor to consider. When it appears with a non-floated

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[8]The analysis of distance distributivity developed relies on the assumption that the subject and theme nominals in the same clause are interpreted as thematic predicates of the *same* event. On the one hand, this can be viewed as an attractive feature of the present account; if all argument in a clause are tied together by the same event variable (as in Davidson (1967b) and Castañeda (1967), for example), and if distance distributivity requires arguments that are tied to the same variable, then it follows that distance distributivity should be a local phenomenon, which it is standardly claimed to be. On the other hand, there have been some analyses, especially of causativity(Parsons (1990), among others), that argue for multiple event variables per clause. The values of these variables are not related to one another by the part-of relation as they are in the proposed treatment of distributivity. As such, the present account is incompatible with multiple-event-variable analyses of clauses. See especially Williams (in press) for discussion of the two analysis of causatives, and arguments in favor of single-variable analyses for these constructions.

determiner, the restrictor is standardly taken to be type $\langle e, t \rangle$. However, the antecedent of a distance D, which is in an argument position, should be a type e plural nominal.

To account for these issues, I propose that the non-floated counterpart of distance distributivity constructions is not *each N_{sg}*, but rather *each of the N_{pl}*. I treat the preposition *of* as vacuous; following Vergnaud (1974), Chomsky (1986), and Sportiche (1988), the preposition *of* is treated as the morphological spell out of genitive case in the non-floated construction. When this plural partitive restrictor is separated from the quantifier, case is assigned by a clausal argument position such as nominative case when it appears as a subject. Assuming this underlying partitive form, we thus have an explanation for the plural morphology of the antecedent in distance distributivity constructions. Note that this does not speak against the thesis for a univocal *each*; there is still one *each* that, when it appears as a determiner, can have either a singular bare restrictor or a plural partitive restrictor. The proposal here is that distance distributivity corresponds to the latter determiner use[9].

There is a semantic argument for going with the plural partitive over the bare singular as the restrictor for a distance distributivity element. Schein (2005) noticed that for the two determiner uses, there is a slight meaning difference between the two: for a determiner *each* with a plural partitive restrictor such as (3.39), there is an ambiguity: there can either be table-sized custards, each of which alone can cover a table; or smaller custards which together do the work of covering a single table. For the singular restrictor

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[9]The similarity between *each N_{sg}* and *each of the N_{pl}* is further supported by the idea that in both cases the restrictors range over a plurality of individuals. The standard claim about the denotation of an $\langle e, t \rangle$ is that it is a set of individuals. In a way, so is the denotation of a plural type e expression. The difference between *each N_{sg}* and *each of the N_{pl}* seems not to be in the semantics of *each*, but in the number morphology on the restrictor. See Schein (2005) for further discussion.

case (3.40), there is no ambiguity; it speaks only of table-sized custards.

(3.39) Each of *the custards* that covered a table contains two tablespoons of vanilla

(3.40) Each *custard* that covered a table contains two tablespoons of vanilla

Consider now floated and binominal variants of these sentences. As one might expect since distance distributivity requires a plural antecedent, these sentences allow the same range of meanings as the plural partitive determiner sentence (3.39); they can be true of small custards that collectively cover a table. This paradigm supports the claim that, at least in English, the restrictor value in distance distributivity constructions is like the plural partitive in the non-distance counterpart, instead of the bare singular restrictor.

(3.41) The custards that covered a table each contain two tablespoons of vanilla

(3.42) The custards that covered a table contain two tablespoons of vanilla each

Furthermore, since the partitive restrictor is presumably type e in the non-distance case as suggested by its occurrence with a definite determiner, this provides an explanation for why the separated antecedent is also type e[10]. The type e constituent can then serve as an argument to a Θ/adposition head or as the appropriate type of input for the Theta Rule. This analysis can then maintain that bare-singular restrictors are still $\langle e, t \rangle$, in accordance with standard practice.

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[10]It is well-known that partitive elements allow only a small range of determiners: *each of the/?three boys/*most/*few/*many/*all boys*; see Gagnon (2013) for an overview and discussion. However, the antecedents of distance distributivity elements appear to be licit with a larger range of determiners. Since I do not consider such quantificational antecedents in this dissertation, I leave this issue as a problem for future research.

I now turn to discussion of how the proposed silent restrictor of distance distributive elements is valued by the antecedent nominal. I believe that there are several mechanisms from the literature that can account for this covaluation, and I will briefly outline each of them below. One option is syntactic binding; the antecedent and silent restrictor bear an index, and there is a local binding principle akin to Principle A (Chomsky (1981) and others) that forces (i) the antecedent to c-command the silent restrictor pronoun and (ii) the index of the antecedent and the restrictor pronoun to be the same. Alternatively one can pursue a movement analysis. Following one idea from Sportiche, the antecedent and quantifier at one point in the derivation form a constituent, and then the antecedent nominal separates and moves to its case position. The quantifier then composes with the silent trace/copy of the antecedent with which it is covalued. There is the issue of how such movement proceeds if the distance distributor is in an adverbial position as I have suggested here[11]; this differs from the part of Sportiche's analysis which states that the distributor appears only in A-positions. However, I believe that it is preferable to maintain the adverbial status of *each* to give a unified analysis of floating and, especially, binominal occurrences. I believe that this issue can be resolved by certain aspects of movement in modern Minimalist syntax; in particular the idea of sideward movement; see Nunes (2004), among others. Under this view, constituents can be constructed in

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[11]If movement of a referential noun phrases leaves a trace in an adjunct that corefers with the nominal in an argument position, then one might wonder why it is impossible to say things like (i) to mean "John found a spider under himself".

    (i) $John_i$ found a spider under t_i

Some theorists argue that this structure is in fact possible when coreference is intended, and that there are rules of pronunciation (PF rules) which result in the trace being pronounced as *himself*. This is the movement theory of reflexives, advocated by Hornstein (2000) among others. The theory of reflexives developed in Chapter 5 is compatible with the general idea that *himself* appears in (or very near) the position where the antecedent moves from.

separate derivational work spaces, and there is the possibility for constrained copy-merge operations to hold between such work spaces. For distance distributivity, the proposal is that *each* composes with its restrictor, the restrictor is then copied, and moved to a different work space. The resulting [each <restrictor>] constituent can then be adjoined to an appropriate position, such as to the VP or a host DP, and later in the derivation the copied restrictor merges to its argument position.[12,13]

Since the antecedent like other nominals is interpreted as a predicate of events, this rules out the option of semantic binding in this framework, where the sister of the antecedent nominal is interpreted as a λ-expression evaluated with a modified assignment function; see Heim and Kratzer (1998). This approach would treat the sister of the antecedent as a type $\langle e, t \rangle$, but in this framework the antecedent is not type e, but rather $\langle v, t \rangle$. It may be possible to modify the rules associated with lambda abstraction to apply

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[12]Antecedence to distance *each* has to be determined by something more than mere c-command in this system. For one, there is leftward displacement of quantificational elements in some languages. Furthermore, the semantics proposed here is compatible with LFs where the restrictor and scope of *each* are the same, and unsatisfactory state of affairs.

   (i) John kissed [[three women]$_i$ each X$_i$]

There is nothing in the system that rules out (i) as an acceptable sentence. However, there might be syntactic reasons for ruling out such structures. For example, if movement is involved such structures could be ruled out as an anti-locality violation: the movement is to short; see Grohmann (2011) discussion and references. Furthermore, even without movement, there could be some economy-based reasons for ruling out *each* having the same plurality be both its restrictor and scope. Perhaps even a semantic-based notion of economy is at work; in which case (i) can be rule out as its truth conditions derived by the Taylor-Schein approach, shown in (ii), do not contribute any real difference from the sentence if *each* is absent. The other cases of distance distributivity we looked at would mean something different (or maybe less precise) if *each* were removed.

   (ii) $\exists E[\text{AGENT}(E, j) \ \& \ \text{KISS}(E) \ \& \ \forall x \leq 3W[\exists E' \leq E[\text{THEME}(E', x)]]]$

[13]As mentioned previously, in some languages the distance distributor agrees in ϕ or case features with its antecedent. For the movement approach outlined in the main text, I follow Chomsky (1995), Chapter 3, in that nominal elements enter the derivation with case, and check these features from an argument position with the appropriate case heads. This accounts for distance distributors sharing the same case as its antecedent even though it never was located in a case position.

to $\langle v, t \rangle$ nominals, though I do not explore this option here[14].

3.2.2.2 Locating the thematic role of *each*

In addition to *each* having a restrictor argument that shares a referential value with its antecedent, I claim that for suitable truth conditions *each* must also share a thematic role with its antecedent. Below I discuss how the two approaches to thematic role interpretation from Chapter 2, the adpositional approach and the Θ-feature approach, can be used to implement this dependency.

For the adpositional approach, all nominal expressions compose with a possibly silent adposition specified with a thematic role. The proposals about D so far have been that its second argument is such an adposition, whether D appears in an argument position or one of the adjoined positions associated with floating and binominal *each*. For these latter cases I proposed that the silent adposition is valued by whatever thematic role the antecedent of D has. However, notice that in proposed decomposition of distance D, the Θ adposition is discontinuous with the silent pronominal restrictor, even though the values of X_{ant} and $Θ_{ant}$ are both determined by the same antecedent nominal.

(3.43)

$$Θ_{ant} \quad D \quad X_{ant} \qquad P_{scope}$$
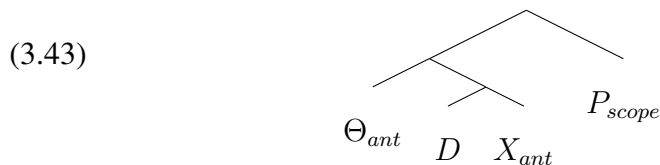
Given this decomposition, it is unclear how and why the values of X_{ant} and $Θ_{ant}$ are determined by the same expression.

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[14]I refer the reader to Champollion (2010) and his subsequent working for a type-shifting approach raises the semantic type of thematic constituents to the appropriate quantificational type. For him, this type-shifting applies to nominals composed with thematic heads similar to the adpositional approach to neo-Davidsonianism discussed in Chapter 2.

The Θ-feature approach fares better in this regard, since the thematic role is not located on an adposition, but on the nominal expression itself. Under this view, the silent restrictor contains both the relevant thematic and referential properties which it shares with the antecedent. As mentioned above with regards to Minimalist approaches to feature transfer, case and ϕ features of a nominal can get passed to the determiner that it composes with. We have seen morphologically rich languages in §3.1 which have floating quantifiers that agree in case and ϕ features with their antecedents; similar observations will be made about reciprocals in Chapter 4. I propose that Θ-features pass to the determiner in the same way as case and ϕ features; the Θ-marked restrictor passes the Θ-feature to *each*, and so *each* itself becomes Θ-marked with the appropriate role.

(3.44)

each   restrictor$_{\phi,\Theta,}$Case
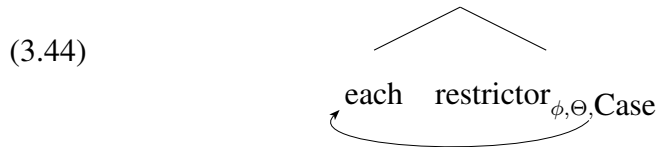
An alternative definition of D following this Θ-feature approach is given below, where D bears a Θ-feature instead of receive a thematic role value by composing with an adposition.

(3.45) $[\![D_\Theta]\!] = \lambda X_e.\lambda P_{\langle v,t \rangle}.\lambda E_v.\forall x \leq X[\exists E' \leq E[\Theta(E', x) \ \& \ P(E')]]$

Using Θ-features requires a type-shifting rule like the Theta Rule from Chapter 2.[15] While this adds an additional rule to the set of phrasal axioms, it has the benefit of allowing an analysis of distributivity where the proposed thematic and referential properties are determined solely by the restrictor of *each*. This line of reasoning follows a

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[15]I assume that the Theta Rule applies as a last resort like most other type-shifting rules. If a nominal is type e and its complement type $\langle v, t \rangle$, then the rule applies because of a type mismatch. However, the Theta Rule is not necessary for the interpretation of D_Θ composed with its restrictor, since this is already of the appropriate type to compose with a $\langle v, t \rangle$ sister.

well-established principle in modern syntactic theory that determiner-like elements, such as *each*, match the feature values of their complements.

3.3   Binominal *each* in a variety of argument positions

In the beginning of this chapter I showed that binominal *each* in ditransitive constructions has a number of potential host nominals it can attach to. Below I give a ditransitive paradigm showing the attachment possibilities for both the prepositional dative and double-object constructions.

(3.46) Josh and Ben gave five dishes to [[three judges] each]

(3.47) Josh and Ben gave [[five dishes] each] to three judges

(3.48) Josh and Ben gave [[three judges] each] five dishes

(3.49) Josh and Ben gave three judges [[five dishes] each]

In this section I will demonstrate how the analysis of binominal *each* accounts for the compositional interpretation of these sentences. In particular, I will show how proposals about the thematic role given to *each* by its antecedent and its scope argument consisting solely of the host nominal yield suitable truth conditions. I will then turn to the scopal differences between binominal and floated *each* and show that the subtly different truth conditions capture the subtly different meanings we see with certain ditransitive sentences.

3.3.1 Antecedence in ditransitives

As shown in §3.1, the generalization concerning possible antecedents of English binominal *each* is that a plural noun phrase that c-commands the host NP can be an antecedent[16]. Following standard syntactic analyses of ditransitives such as Larson (1988), we predict the following patterns of antecedent.

(3.50)   • Prepositional dative ditransitives

– A direct object host can have only a subject as an antecedent

– An indirect object host can have a subject or direct object as an antecedent.

• Double-object ditransitives

– A direct object host can have either a subject or indirect object as an antecedent

– An indirect object host can have only a subject as an antecedent

To test these predictions, I use constructions with singular noun phrases so there is no ambiguity as to what the antecedent is, since it was already shown that singular noun phrases cannot antecede binominal *each*.

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[16]Outside of English some varieties of floating quantification do not require the antecedent to c-command the floating quantifier. This is arguably the case with the French *L-tous* movement and other cases of leftward quantifier float discussed in §3.1.

(3.51) Prepositional dative paradigm:

- Direct object host

    a. The men showed two jewels each to Mary

    b. ??John showed two jewels each to them/the appraisers

- Indirect object host

    c. The men showed a jewel to three women each

    d. John showed ten jewels to three women each

(3.52) Double-object paradigm:

- Direct object host

    a. The men showed the woman ten jewels each

    b. John showed three women ten jewels each

- Indirect object host

    c. The men showed three women each the jewel

    d. ??John showed them/the appraisers each ten jewels

The predictions seem to be borne out, though there is some speaker variation with regards to two types of sentences, as indicated by the ?? in (3.51b) and (3.52d). For these cases, the antecedent noun phrase does not c-command binominal *each*. While this may limit the range of syntactic accounts of ways of determining antecedence, it does not affect the semantic proposals. For each of these cases, even the marginally acceptable ones, the antecedent will contribute a plural referential value to act as the restrictor of *each* and

the thematic role associated with the antecedents argument position. I will show now that the resulting truth conditions derived by the proposals here appropriately capture the meanings of this range of sentences.

What sets the ditransitive examples apart from the previous ones is that the subject need not be the antecedent to *each*, and so there can be a plural value from another argument position that determines the restrictor of *each*, and also *each* can be marked with a thematic role different from those typically associated with subjects. For example, consider a prepositional dative sentence where an indirect object acts as the host nominal to *each* and its antecedent is the direct object: (3.51d). This sentence describes events where there are ten jewels and each jewel is such that it was shown to three women. Since the direct object is the antecedent to *each*, the *ten jewels* plurality acts as the restrictor argument to *each* and *each* is associated with the theme thematic role. The resulting truth conditions are as follows, where the sub-event conjunct is represented in the second line.

(3.53) $\exists E[\text{AGENT}(E, j) \ \& \ \text{SHOW}(E) \ \& \ \text{THEME}(E, 10J) \ \&$

$\forall x \leq 10J[\exists E' \leq E[\text{THEME}(E', x) \ \& \ \text{GOAL}(E', 3W)]]]$

For double-object constructions like (3.52b), the indirect object will be the antecedent of *each*, so its restrictor will be the "three women" plurality and it receives the *goal* thematic role. This sentence reports that each woman is such that she was shown 10 jewels, which is captured by the following truth conditions.

(3.54) $\exists E[\text{AGENT}(E, j) \ \& \ \text{SHOW}(E) \ \& \ \text{GOAL}(E, 3W) \ \&$

$\forall x \leq 3W[\exists E' \leq E[\text{GOAL}(E', x) \ \& \ \text{THEME}(E', 10J)]]]$

Notice that there is no conjunct in the truth conditions that says that John is the agent of the relevant sub-events, but this is given by the Θ Cumulativity Principle from Chapter 2. With this principle, AGENT(E, j) entails that each atomic event $e \leq E$ has John as an agent and the totality of events E has John as its sole agent (given Thematic Uniqueness), and so any event $E' \leq E$ has John as its agent.

As a further consequence of Thematic Uniqueness, the truth of (3.51d) requires that there are no more than ten jewels involved in the verifying events; and it clearly lacks a reading where the ten jewels covary with each woman. Similar remarks hold of (3.52b). This intuition is further sharpened if the modifier *exactly* is added to the antecedent. The proposed semantics accounts for this fact since the antecedent nominal is not within the scope of *each*, and so its corresponding event variable is bound by the clause-level existential quantifier, and not the sub-event quantifier. I will elaborate on this detail in the next section, but bring it up here to aid discussion with the observed ambiguity in antecedence with ditransitives, which I turn to immediately.

From the paradigm in (3.51) and (3.52), we predict that when there are two potential antecedents that are both plural, then ambiguity should arise. We can see this in the following example.

(3.55) [John and Bill]$_i$ showed [exactly 10 jewels]$_k$ to exactly three women *each*$_{i,k}$

The ambiguity can be seen by considering what sort of events verify not just (3.55), but the unambiguous examples where the non-antecedent argument is singular. Consider first the case where the subject is singular, which means that the direct object will antecede *each* as in (3.51d) above. Since women can covary with the jewels, a verifying situation

for this sentence can involve at most thirty women; the presence of *exactly* rules out any higher number of women. Now consider a sentence where the subject is plural, but the direct object singular.

(3.56) John and Bill showed the Hope Diamond to exactly three women *each*

Here, the women can covary with John and Bill, and since there are only two agents, the maximum number of women in the verifying events is six; again *exactly* rules out any higher numbers. As for (3.55), its ambiguity lies in the fact that it can have either the six-women or the thirty-women reading; for the former, this is because the subject is the antecedent to *each* (like (3.56)), and for the latter, the direct object antecedes *each* (like (3.51d)).

3.3.2 Scope differences between floating and binominal *each*

If the proposals about distance distributivity are correct, floating *each* in English has a wider scope domain than its binominal counterpart; for the former, the scope domain is the entire VP (and possibly negation and auxiliary verbs), while for the latter the scope domain is just the host nominal. For simple transitive sentences, this difference does not appear relevant, though it does no harm in assuming such a scope difference. Essentially, it captures the synonymy of pairs like (3.57).

(3.57)   a. The men each stole two diamonds

           b. The men stole two diamonds each

As mentioned briefly in the last section, ditransitive sentences present a situation where the scope differences are more clearly observed. In this section, I focus on a particular

property of interpretation that results from being in the scope of a distributivity opera-
tor; the covariance of indefinite noun phrases. Below I present a well-known observation
about covariance, which will soon be cashed out in the neo-Davidsonian framework as-
sumed here.

(3.58) **Principle of covarying indefinites**

A covariance interpretation of singular indefinite and bare numeral noun phrases is
possible only when the noun phrase is within the scope of a distributivity operator.

We can see this principle at work with determiner *each* below, where the girls associated
with singular and numeric indefinite objects in (3.59) and (3.60), respectively, can covary
with each boy.

(3.59) Each boy loves a/some girl

(3.60) Each boy loves three girls

Covariance is also observed when the direct object is distributive and the subject is indef-
inite, as in the following sentences. This is due to the ability of distributive objects to take
inverse scope, accounted for by Quantifier Raising or some sort of type adjustment.

(3.61) A/Some girl loves each boy

(3.62) Three girls love each boy

It is well-known that the scope potential of a distributivity operator is clause-bounded,
and so a distributivity operator in a finite embedded clause cannot take inverse scope over
an indefinite noun phrase in the main clause. As such, the following examples do not
exhibit the covariance interpretations we see above.

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(3.63) A/Some boy thinks that each girl loves flowers

(3.64) Three boys think that each girl loves flowers

Returning to distance distributivity, we now have some predictions about ditransitives given the assumptions about the scope properties of floating versus binominal *each*. First, the scope of floated *each* scopes over the whole VP, so a covariance interpretation is expected of indefinites within the VP. Second, the scope of binominal *each* is only its host nominal, so if there is an indefinite in the VP distinct from the host nominal, its value(s) should not covary with the antecedent of binominal *each*. Keep in mind that inverse scope interpretations are not possible for distance *each*, as discussed above in §3.1.1. The pair of sentences in (3.65) show that these predictions are borne out.

(3.65)   a. Josh and Ben each gave two desserts to (exactly) three judges

          b. Josh and Ben gave two desserts each to (exactly) three judges

It is possible to interpret (3.65a) as describing a situation with six judges total: Josh gave two desserts to judges 1,2, and 3; and Ben gave two desserts to judges 4,5, and 6. Note that it is possible that (3.65a) can be used to describe a situation where they gave desserts to the same three judges, but the important observation here is that a six-judge reading is possible. For (3.65b), the six-judge reading is absent; this sentence is true only if there are three judges total. Below I give the LFs and truth conditions of these two sentences given the above proposals about the composition of floating and binominal *each*.

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(3.66)   a. [Josh and Ben]$_i$ [each X$_i$ [gave two desserts to three judges]]

b. $\exists E[\text{AGENT}(E, j \oplus b) \ \& \ \forall x \leq j \oplus b[\exists E' \leq E$

$[\text{AGENT}(E', x) \ \& \ \text{GIVE}(E') \ \& \ \text{THEME}(E', 2D) \ \& \ \text{GOAL}(E', 3J)]]]$

c.
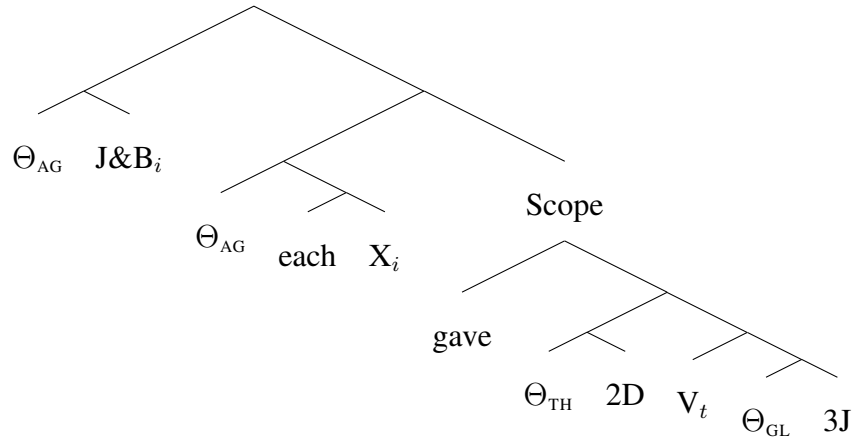
(3.67)   a. [Josh and Ben]$_i$ gave [[two desserts] each X$_i$] to three judges

b. $\exists E[\text{AGENT}(E, j \oplus b) \ \& \ \text{GIVE}(E) \ \& \ \forall x \leq 4W[\exists E' \leq E$

$[\text{AGENT}(E', x) \ \& \ \text{THEME}(E', 2D)]] \ \& \ \text{GOAL}(E, 3J)]$

c.
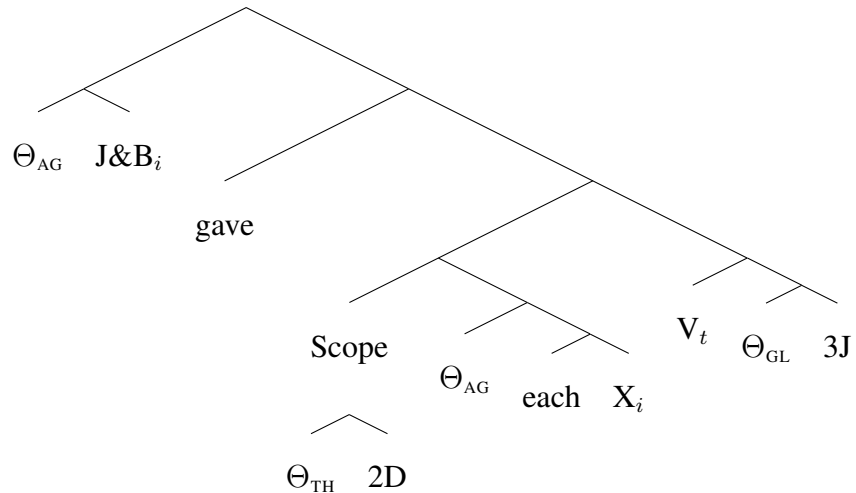
The crucial difference between the above truth conditions is the event variable in the GOAL conjunct. For the floating example, it is the sub-event variable bound by the quantifier introduced by D since the indirect object is within the scope of floating *each*. For the binominal example, the event variable in the GOAL conjunct is bound by the clause-level event quantifier and not the sub-event quantifier, because it is not within the scope of binominal *each*. For the latter case, the proposals about scope together with Thematic Uniqueness guarantee that this sentence is true only when there are exactly three judges in the relevant events, as desired. For the floating case, since the goal nominal is associated with sub-events of each agent, covariance is possible and so a six-judge reading is licensed.

The same pattern is observed with singular indefinites. A singular indefinite within that VP can covary in a sentence with floated *each* (3.68), though a covariance interpretation is missing when it is within the VP and the other object argument is a host to binominal *each* (3.69).

(3.68)   a. Josh and Ben each gave two desserts to a/some judge

   b. $\exists E[\text{AGENT}(E, j \oplus b)\ \&\ \forall x \leq j \oplus b[\exists E' \leq E$

   $[\text{AGENT}(E', x)\ \&\ \text{GIVE}(E')\ \&\ \text{THEME}(E', 2D)\ \&\ \text{GOAL}(E', \text{a/some judge})]]]$

(3.69)   a. Josh and Ben gave two desserts each to a/some judge

   b. $\exists E[\text{AGENT}(E, j \oplus b)\ \&\ \text{GIVE}(E)\ \&\ \forall x \leq j \oplus b[\exists E' \leq E$

   $[\text{AGENT}(E', x)\ \&\ \text{THEME}(E', 2D)]]\ \&\ \text{GOAL}(E, \text{a/some judge})]$

In the double object versions of (3.68) and (3.69), the same pattern of covariance obtains; (3.70) allows for covariance, but (3.71) only allows the interpretation where there is only

a single judge involved.

(3.70)   a. Josh and Ben each gave a/some judge two desserts

   b. $\exists E[\text{AGENT}(E, j \oplus b) \ \& \ \forall x \leq j \oplus b[\exists E' \leq E$

   $[\text{AGENT}(E', x) \ \& \ \text{GIVE}(E') \ \& \ \text{GOAL}(E', \text{a/some judge}) \ \& \ \text{THEME}(E', 2D)]]]$

(3.71)   a. Josh and Ben gave a/some judge two desserts each

   b. $\exists E[\text{AGENT}(E, j \oplus b) \ \& \ \text{GIVE}(E) \ \& \ \text{GOAL}(E, \text{a/some judge})$

   $\& \ \forall x \leq 4W[\exists E' \leq E[\text{AGENT}(E', x) \ \& \ \text{THEME}(E', 2D)]]]$

For the sake of completeness, I show two sentences where the antecedent to binominal *each* is a non-subject, and the subject is an indefinite. I use a singular indefinite to rule out ambiguity, and I only show this with the distransitives constructions where the antecedent c-commands the host, since non-commanding antecedents are prone to gradient acceptability among speakers, as discussed above[17]. The predictions appear to be borne out; for both the prepositional dative and double object construction, the subject indefinite cannot covary with the antecedent to *each*.

(3.72)   a. A/some philosopher introduced Chomsky and Davidson to five students each

   b. A/some bastard gave Josh and Ben five slaves *each*

In this section I have shown that two predictions made by the proposals about scope in distance distributivity are borne out. For floating *each*, covariance with an-

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[17]Floating examples are not added to this paradigm since in English only subjects can be antecedents to floating *each*, and here the interest is in non-subject antecedents.

tecedent/restrictor values is possible for indefinites within the VP. On the other hand, binominal *each* only allows covariance with the nominal host since other indefinites within the VP are outside of its scope domain. For distance distributivity constructions, the scope of *each* is determined by its surface syntactic configuration, so only indefinites within the c-command domain of floated and binominal *each* in surface syntax can covary. Covariance was implemented by again appealing to the sub-event treatment of distributivity proposed by Taylor and Schein, where the indefinites within the scope of *each* are interpreted as thematic predicates bound by the sub-event quantifier.

3.3.2.1   Comparison with Champollion 2012

In a recent paper, Champollion (2012) develops a theory of distance distributivity that is similar to the one proposed here. He uses a neo-Davidsonian semantics to attempt a uniform analysis of distributivity items, including the element *jeweils* in German; though here, I will limit the discussion to his claim about English distance distributivity[18]. Champollion achieves morpheme univocality for *each* up to type-shifting to account for the composition of determiner versus floated versus binominal *each*. However, he focuses just on transitive constructions, and the particular details of his system do not account for the scopal differences discussed in the previous section.

I will first present the technical details of Champollion's account. Champollion posits a basic eventive distributivity operator which he calls a "reformulation of Link's D

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[18]Extending the analysis I presented here to *jeweils*, at least its property of distribution to non-atoms, can be done in the same manner suggested by Champollion. He uses Schwarzschild's cover-based approach to distributivity from Schwarzschild (1996), and assigns a meaning to *jeweils* such that it distributes over contextually determined covers of a plurality, where atomic distributivity represents just one way of covering the plurality.

operator"; I will label this operator C (3.73). He then shows how C can be used as a silent

VP-level operator to account for basic distributive interpretations of subjects in sentences

like (3.74), which has truth conditions (3.75). He assumes that C is theta-marked with an

antecedent, similar to the account of D_Θ in (3.45), and he uses a functional notation for

thematic predicates.

(3.73) $[\![C_\Theta]\!] = \lambda V_{\langle v,t \rangle} \lambda E.[E \in *\lambda E'[V(E') \ \& \ \text{ATOM}(\Theta(E'))]]$

(3.74) The children C_{AG} saw two monkeys

(3.75) $\exists E[\text{AGENT}(E) = \oplus\text{CHILD} \ \& \ E \in *\lambda E'[\text{SEE}(E') \ \& \ \text{THEME}(E') =$

$\qquad 2M \ \& \ \text{ATOM}(\text{AGENT}(E'))]]$

Champollion offers the following prose paraphrase of (3.75): "This formula is true

just in case there is an event E whose agent is the children, and which consists of seeing-

two-monkeys events whose agents are atomic" (Champollion (2012), p.7). With this

operator defined, he gives the following axioms to floating and binominal *each*.

(3.76) $[\![\text{each}_{float}]\!] = [\![C_\Theta]\!]$

(3.77) $[\![\text{each}_{binom}]\!] = \lambda P_{\langle e,t \rangle}.\lambda\Theta_{\langle v,e \rangle}.\lambda V_{\langle v,t \rangle}.\lambda E_v.[[\![C_\Theta]\!](\lambda E'.[V(E') \ \& \ P(\Theta(E'))])(E)]$

The present account has the advantage of not assigning different meanings to floated and

binominal *each*. Although Champollion uses the C operator in both definitions, they do

have different types and the functions do have different bodies. Since the present account

relies on Conjunctivism, it is not required to assign different semantics types to floating

and binominal *each* since the scope argument of both varieties of distance distributivity

will always be $\langle v, t \rangle$.

Champollion's account also suffers from an empirical problem. Though it is able to account for transitive cases where floating and binominal *each* pairs seem to be synonymous, it is unable to account for ditransitive sentences where there are meaning differences between a sentence with floating *each* and its binominal counterpart, as discussed above. This particular problem lies in the V argument in Champollion's definition of binominal *each* in (3.77): this argument represents the predicate that is taken to hold of the relevant sub-events. For the cases Champollion examined, this is the monadic predicate of events contributed by a transitive verb. However, for ditransitive cases like the following, the wrong predicate of events is chosen.

(3.78) Josh and Ben gave four meals each to exactly three judges

Given a standard approach to ditransitives, the sister node of the direct object will contain the indirect object. For Champollion, this means that the indirect object's interpretation is part of the V argument, and thus is part of the predicate of events that is taken to hold of the sub-events associated with each agent. As such, his account predicts that this sentence can have "three judges" covarying with the agents. However, as mentioned above, this sentence lacks the "six-judge" reading. For the account proposed here, this lack of covariance is accounted for by having the scope of binominal *each* include just its host nominal.

3.4   Leakage revisited

In §2.2.6.1 of Chapter 2, I introduced leakage as a problem that some accounts of distributivity might suffer from. I showed there that the Taylor-Schein approach does not

suffer from leakage as far as the antecedent of D is concerned. However, given the way Taylor-Schein distributivity is currently defined, it is susceptible to leakage when it comes to non-antecedent nominals in the scope of the distributivity operator. I will first outline the problem, and then suggest a way to modify some current assumptions in order to fix the problem.

Consider a modified version of Kratzer's rose bush sentence, which we encountered in §2.2.3.2 when discussing Variety; see Schein (1993), Schwarzschild (1996) and others for discussion of similar facts.

(3.79) Alan, Brian, Campbell, and Dunn planted two rose bushes each

Recall that Kratzer's original example, repeated below, was meant to illustrate that a sentence can still be true if the actions of each individual agent do not fall under the property denoted by the verb; e.g., each agent need not be involved in a planting even though what the agents collectively do counts as a planting.

(3.80) Alan, Brian, Campbell, and Dunn planted a rose bush

(3.79) differs from the original examples in that each agent *must* be an agent of a planting; more specifically, he must be the agent of an event of planting two rose bushes (which may be different from the rose bushes that the others plant). Let us see if the truth conditions of (3.79) given by the Taylor-Schein approach to binominal *each* sufficiently captures this aspect of meaning.

(3.81) $\exists E[\text{AGENT}(E, \oplus\{a, b, c, d\}) \ \& \ \text{PLANT}(E) \ \&$

$\forall x \leq \oplus\{a, b, c, d\}[\exists E' \leq E[\text{AGENT}(E', x) \ \& \ \text{THEME}(E', 2RB)]]]$

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The truth conditions correctly capture that each agent has sub-events where two rose bushes are themes, and these rose bushes may differ from agent to agent. However, there is nothing in the truth conditions that say what types of sub-events these are other than who their agents and themes are. Put differently, there is nothing preventing these sub-events from being non-plantings; each agent's sub-events may be a trimming, a dropping-into-a-hole, a covering-with-dirt, and so on. This is unsatisfactory for the binominal example (3.79), which clearly expresses that each agent was an agent of a planting.

The goal now is to modify the Taylor-Schein approach so that the events apportioned to each individual quantified over are specified to be of certain type: they are events that satisfy the monadic predicate contributed by the verb. One option is to abandon the principle of Variety so that if some events satisfy some predicate $V(E)$, then so do all $E' \leq E$, but this move would run into immediate problems with sentences like the original rose bush example. However, I want to pursue the possibility that Variety is abandoned when it comes to the sub-events associated with the distributivity operator in particular.

For the sake of comparison, consider what counts as a "sub-individual" with respect to distributivity. In a sense, distributivity has to know where to stop, it has to know what counts as an atom. As far as distributivity goes, what matters are *linguistically relevant* atoms, which typically are not atomic by any physical or metaphysical definition. Thus, when one utters (3.82), we know that if a single dog has more than two fleas, the sentence is false; even though each dog might be further divided into parts such that each part has two fleas.

(3.82) Each of the dogs has (exactly) two fleas

What makes the distributivity operator know where to stop? It seems obvious that this is in someway related to the fact that the restrictor contains the item *dogs*. Since the noun is dog, *each* distributes over atomic dogs, regardless of one's knowledge that dogs are made up of parts.

This is by no means a new observation, but it is an important one: distributivity knows where to stop. For the Taylor-Schein approach, both sub-individuals and sub-events are quantified over in the logical form of the distributivity operator. My suggestion is that distributivity knows where to stop for sub-events just as it does for sub-individuals. That is, just as it knows to consider only sub-individuals that are dogs, it also knows to consider just sub-events that are plantings in the case of (3.79), and thus we avoid the leakage problem.

There is a tension that needs to be addressed: on the one hand, Kratzer's original rose bush example demands that the sub-events associated with each agent are not plantings, while the binomimal *each* rose bush example demands that these sub-events are plantings. But the crucial difference is that the binominal examples has a distributivity operator, and my suggestion is that part of what it means to be a distributivity operator is to know where to stop for both sub-individuals and sub-events. When sub-events are referenced elsewhere, such as in the formulation of the Cumulativity Principle from Chapter 2, they are governed by Variety. I claim that at least distributivity is special in that it quantifies over just homogenous parts of both individuals and events[19].

---

[19]Distributivity has been claimed to be "special" in other regards as well; see the volume Szabolcsi (1997) for papers about the unique syntax and scope taking properties of distributive quantifiers.

Formally, my claim is about the portion of *each*'s logical form that introduced the sub-events: ... $\exists E' \leq E[...]$. The claim is that an event E' can be a sub-event of E which satisfies $V(E)$ iff $V(E')$. This is not meant as a general rule whenever the logical constituent $E' \leq E$ is used in the metalanguage, but a specific rule about how sub-event referenced by the distributivity operator are restricted. As mentioned previously, this claim dovetails with the standard assumption that the distribution over individuals associated with *each* is also homogeneous. There are some further issues that need to be addressed which I leave for future work, such as if it is only the verbal predicate that restricts sub-events, or if modifier predicates do also.[20]

3.5 Chapter summary

In this chapter I have extended the Taylor-Schein approach to distributivity to give a a uniform interpretation for *each*, whether it appears as a determiner or a distance distributivity item. Unlike determiner uses of *each*, distance distributivity constructions have their restrictor argument separated from them in the syntax. I have proposed, following some classic ideas from the floating quantifier literature, that distance *each* composes with a silent restrictor that is covalued with a plural antecedent nominal. I have argued that the antecedent determines not just the plurality of individuals that is distributively quantified over, but also that the argument position in which the antecedent resides determines the thematic role assigned to *each*.

I have shown how this analysis can be applied to both varieties of distance distribu-

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[20]I think it is obvious that *thematic* predicates that hold of the main event need not hold of the sub-events, as evidenced by Schein's (1993) sentences used to argue for thematic separation (see discussion in Chapter 2 above) as well as the ditransitive sentences discussed in this chapter.

tivity. This was made possible by Conjunctivist ideas about composition, as the scope

argument to *each* is a type $\langle v, t \rangle$ monadic predicate of events. Under the total separa-

tionist approach to argumenthood, both VPs and NPs are type $\langle v, t \rangle$ predicates, making

both types of nodes suitable scope arguments for distance *each*. This still leaves room for

syntactic differences among these different varieties of distance distributivity; i.e., why

in some languages floated *each* can appear in a wider range of positions, and binominal

each can attach locally to more than just numeric noun phrases. The proposals here are

about semantic uniformity, and given the apparent similarities in meaning (and often mor-

phological form, as in English) between these distributive elements, I believe that a single

lexical axiom that applies to all cases is a welcome result.

This analysis was shown to work for a variety of constructions, especially for oc-

currences of binominal *each* in distransitive sentences; an issue that has received little

attention in previous studies. The main observation there was that the apparent synonymy

of minimal pairs with floating and binominal *each* can be teased apart when more nom-

inals are involved aside from the antecedent and host. In particular, I built on the well-

known property of indefinites to receive covariance interpretations within the scope of a

distributive operator to show that floating *each* has a wider scope domain than binominal

each, a difference that is captured within the current framework. I also argued that the

present account is superior to a close neo-Davidsonian alternative given by Champollion

in that it uses the same type for the composition of both floating and binominal *each*, and

it accounts for the scope differences observed in ditransitive sentences.

The ditransitive cases involving binominal *each* provide a further argument for total

separation. Like Schein's (1993) original ditransitive cases, these are scopeless sentences

that mix distributivity and cumulativity. I have argued that a proper analysis of binominal *each* requires that some thematic conjuncts (even THEME conjuncts) have a different event variable than others, as in the decomposition that Schein argues for.

This was the first step in extending the Taylor-Schein analysis beyond just determiner uses of *each*. In the next two chapters, I will address reciprocity and plural reflexivity phenomena. As I will show, distributivity is involved in these constructions as well, and I will argue that they are merely different varieties of distance distributivity to which the Taylor-Schein analysis can be applied.

Chapter 4: Reciprocity

4.1 Introduction

In this chapter I present a semantic analysis of reciprocal anaphors such as *each other* in English. I build on the results from the previous chapter and suggest that these anaphors are another sort of distance distributivity construction. For the large majority of its occurrences, I propose that *each other* has the same fundamental syntax and semantics as binominal *each* in the sense that the distributivity operator D attaches to a host nominal; in canonical instances of binominal *each* the host is a numeric noun phrase, but in the case of reciprocals, the host contains a morpheme expressing distinctness: *other*.

It is important to stress from the start that the proposals offered here are for *each other* type reciprocals, or perhaps slightly more generally for what I call *bipartite argument reciprocals* (henceforth, BARs), so named because they appear to consist of two morphemes, and they occur in typical argument positions. The analysis is not meant to apply to other types of reciprocal constructions, such as clitic/affixal reciprocals or reciprocals that appear in adverbial positions.

Given the roles that I will attribute to each part of a BAR construction, I will label the first element the *Distributor* and the second the *Differentiator*. Part of the conceptual motivation for the analysis offered here is that BARs can be decomposed into essentially

the same meanings that the Distributor and Differentiator have outside of reciprocal constructions. In particular, the analysis I give to the Distributor is exactly the same Taylor-Schein analysis that was offered for distance distributivity constructions in the previous chapter. One of the conceptual arguments for this analysis is that it supports the univocal analysis of the distributivity operator D that is argued for throughout this dissertation.

I will show that apart from supporting the parsimonious theory of a univocal *each*, the analysis has benefits in explaining two other important properties of reciprocal anaphora. The first is a major topic in the reciprocal literature: how reciprocal sentences have the ability to describe situations with varying amounts of reciprocated action; often called the *strength* of reciprocity. The second topic has received relatively little attention in the literature, and that is accounting for the composition of reciprocals in a wide range of argument positions. While previous accounts have focused primarily on BARs in direct object position, I will show that the Taylor-Schein approach to distributivity allows for a unified account of BARs in a much more diverse range of argument positions.

4.2   Issues in the semantics of bipartite argument reciprocals

In this section I will briefly review three closely related issues that I believe are paramount to our understanding of reciprocal semantics. Any adequate account of the semantics of BARs should address these issues to some extent. First, I will discuss the range of meanings available to reciprocal sentences. I then turn to the compositional status of reciprocal expressions: how they are internally composed (if they are at all) and how they interact compositionally with the rest of the sentence. The third issue is the

syntactic distribution of reciprocal expressions, that is, all the syntactic positions in which they are licit. The first two have received much attention in the literature[1], while the third has remained relatively unexplored.

4.2.1   The polysemy problem

Perhaps the most discussed aspect of reciprocity in natural language is the fact that reciprocal sentences can be used to describe situations with varying amounts of reciprocated actions. The problem can be demonstrated by considering all the situations that can make the (4.1) true.

(4.1) The dots are pointing at one another

The issue is often characterized in terms of strength, where stronger types of reciprocity involve more reciprocated action. The diagram in (4.2) demonstrates the strongest type of reciprocity, where each dot is both pointing and being pointed at by every other dot.

(4.2)
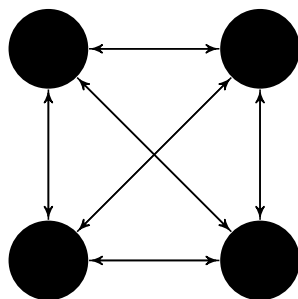
However, as remarked upon by practically every paper on the semantics of reciprocity, weaker situations can make (4.1) true. The table in (4.3) is a recent collection of all the

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[1]I will not review all of the literature that has contributed insight on these issues, but I refer the reader to Dotlačil (2010) for an excellent overview and source of references.

hypothesized truth conditions available for reciprocal sentences, taken from Beck (2001).

In order to remain theory-neutral in what follows, I will not refer to such formulas as

"truth-conditions", as this implies that there is a compositional semantics responsible for

deriving each one of these formulas. Nor will I refer to them as "readings" of a sentence,

since this invites comparison with ambiguous sentences that clearly have multiple read-

ings. Instead, I will use the theory-neutral term *formal descriptions of verifying situations*,

FDVSs for short.

(4.3)

FDVSs FOR RECIPROCAL SENTENCES	
1. Strong Reciprocity (SR)	$\forall x \in A[\forall y \in A[x \neq y \rightarrow xRy]]$
2. Partitioned Strong Reciprocity (PSR)	There is a partition PART of A such that $\forall X \in \text{PART}[\forall x \in X[\forall y \in X[x \neq y \rightarrow xRy]]]$
3. Intermediate Reciprocity (IR)	$\forall x \in A[\forall y \in A[\exists z_i...z_n \in A[x = z_i$ & $y = z_j$ & $z_i R z_n$ & $...z_{n-1} R z_n]]]$
4. Weak Reciprocity (WR)	$\forall x \in A[\exists y \in A[x \neq y \rightarrow xRy]$ & $\forall y \in A[\exists x \in A[x \neq y \rightarrow xRy]$
5. One-way Weak Reciprocity (OWR)	$\forall x \in A[\exists y \in A[x \neq y$ & $xRy]]$
6. Inclusive Alternative Ordering (IAO)	$\forall x \in A[\exists y \in A[x \neq y$ & $(xRy \lor yRx)]]$

Notice that the two weakest FDVSs (5 and 6) in (4.3) are compatible with situations

where no "reciprocating" is involved. Consider the diagram in (4.4), which is arguably

among the weakest type of reciprocal situations that can make (4.1) true; for each dot

pointing, the pointee does not point back at the pointer. Also notice the rightmost dot, the

one that does no pointing at all. Capturing this type of outlier is the hallmark of IAO, the

weakest type of reciprocity, an issue we'll return to in §4.5.

(4.4)

IAO
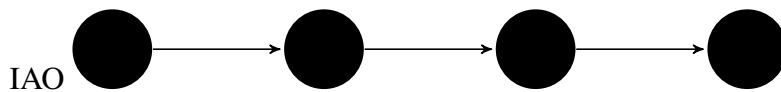
An interesting property of the FDVSs available to reciprocal sentences is that the

logical forms often used to describe them exhibit a certain entailment relation. This was

first noticed by Langendoen (1978), though he was only working with a subset of the FDVSs shown in (4.3). Below is a diagram showing the entailment relations for the more recent list of FDVSs in (4.3).

(4.5)

$$
\begin{array}{ccccccc}
 & & IR & & & & \\
 & \nearrow & & \searrow & & & \\
SR & & & & WR & \longrightarrow & OWR & \longrightarrow & IAO \\
 & \searrow & & \nearrow & & & \\
 & & PSR & & & &
\end{array}
$$
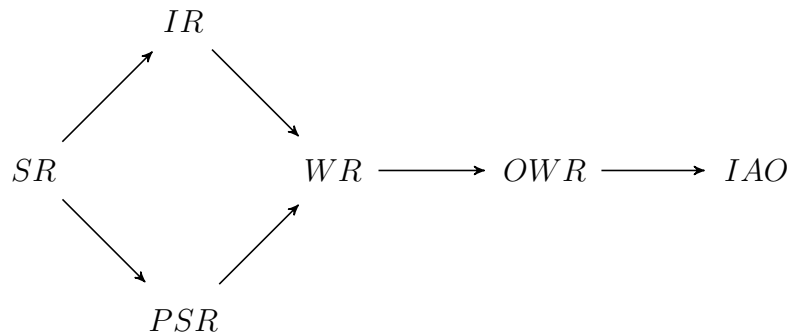
Langendoen put forth a semantic theory for reciprocal sentences that was built around these entailment facts. He suggested that we could uniformly associate reciprocal sentences with a certain weak type of reciprocity, since any situation that validates the conditions imposed by a stronger type of reciprocity can also validate the conditions imposed by any type that is weaker than it[2] (abstracting away from things like the existence of partitions and sequences used in (4.3)). For example, we can see that the diagram in (4.2), even though it exemplifies SR, validates the weaker conditions of WR, OWR, and IAO.

Underspecification approaches like Langendoen's were called into question in the influential work of Dalrymple et al. (1998). They point out that such approaches predict a sentence like (4.6) to be true in situations where there is less than full mutual acquaintance; as in a possible situation where Groucho and Harpo know each other, and Chico and Zeppo know each other, but that's all the knowing involved, as if each pair were always separated from the other. However, (4.6) sounds infelicitous when used to describe

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[2]The account developed in Sternefeld (1998) employs a similar methodology.

such a situation. As pointed out by Fiengo and Lasnik (1973), reciprocal sentences with stative verbs seem to allow only a strong interpretation, but underspecification approaches to reciprocity leave us without an explanation for why this might be so.

(4.6) The Marx Brothers know each other

It was concerns like this that lead Dalrymple et al. to propose their Strongest Meaning Hypothesis, an influential method for deriving meanings for reciprocal sentences[3].

However, I believe that such objections to underspecification analyses of reciprocity are misguided since the strength imposed by stative verbs can be shown to exist outside of reciprocal constructions. This is shown in (4.7), a sentence that seemingly lacks a cumulative reading (one where John and Mark know each other, and Mary and Sue know each other, and no other knowing relations exist).

(4.7) John and Mary know Mark and Sue

Like the reciprocal sentence (4.6), this sentence requires a situation of full mutual acquaintance in order be true[4].

Notice also that both types of constructions equally allow for outlier effects when large pluralities are involved, showing that the stative strength restriction is just a preference, and not a hard-and-fast semantic rule. Both sentences ((4.8) and (4.9)) can be used to talk about how members from the Jets know members from the Sharks and vice versa,

---

[3]The Strongest Meaning Hypothesis is a mechanism for deriving meaning that factors in non-linguistic information supplied by the context, as well as encyclopedic knowledge of the denoted verbal relation, and then provides for the sentence the logically strongest reciprocal interpretation that respects these non-linguistic facts and particular lexical idiosyncrasies involved. The mere fact that the Strongest Meaning Hypothesis is dependent on non-linguistic information shows that it computes "extra-semantic" meaning. If we are interested in just the compositional semantics of reciprocal sentences, that is, the interpretation of phrase markers by general semantic principles, the Strongest Meaning Hypothesis gives us too much. See §4.5 for more on the difference between "reciprocal meaning" and "reciprocal semantics".

[4]I thank Alexander Williams (p.c.) for bringing to my attention the fact that replacing *know* in (4.7) with *resemble*, which is another stative verb, seems to facilitate weaker interpretations.

   (i) John and Mary resemble Mark and Sue (respectively)

This is not a problem for my account, but again shows that the strength previously observed with stative verbs is not a firm rule.

and both sound felicitous even if there are a few Jets that don't know every single Shark and vice versa.

(4.8) The Jets know the Sharks

(4.9) The members of the two gangs know each other

Facts like this show that the strength imposed by stative verbs does not hold of reciprocal sentences in particular, but of sentences involving plural arguments in general. Furthermore, the strength requirement is not absolute: sentences reporting on large pluralities allow for some outlier individuals. Thus, a semantic theory of reciprocal expressions should not need to make special concessions to account for these strength phenomena. And if this is so, then perhaps Langendoen's methodology of a general weak interpretation strategy for reciprocal expressions can be revived.

The analysis developed in this paper will utilize such an underspecification approach, and we will see in 4.4 that the proposed interpretation is analogous to the fifth FDVS in (4.3), One-way Weak Reciprocity. I say analogous because the logical forms offered later in the paper are given in a language that differs from what we see in (4.3), in that they make use of higher-order quantification over both individuals and events, and verbs are treated as monadic predicates of events rather than relations, related to their "arguments" indirectly through thematic predicates. The choice of a meaning comparable to OWR is not arbitrary, but as I will show it follows from applying the Taylor-Schein analysis of distributivity to a reasonable syntactic decomposition of BARs. I will also address in §4.5 why a Langendoen-type underspecification analysis should not go too weak to have IAO as the underlying meaning of reciprocals.

4.2.2 The composition problem

I now turn to previous treatments about the composition of BARs. I will limit the discussion here to the following competing hypotheses. This first hypothesis is that BARs

are non-decomposable primitives, and the second is that BARs are complex structures

whose parts compose in a way that yields a reciprocal meaning. I will address these

hypothesis in turn, and for each I will discuss some of the issues that are at stake and also

give a brief overview of what has been said in the literature about them.

4.2.2.1   Primitive polyadic quantification

I will start with what is probably the less intuitive of the two approaches, the one that

says that BARs are primitive elements. I say less intuitive because on superficial inspec-

tion of these expressions, it appears that there are two morphemes involved. But what

these approaches lack with regard to accounting for the apparent morphemes involved,

they usually make up for in their power to handle the polysemy problem. This power

comes from treating the BAR as a polyadic quantifier, as done in Dalrymple et al. (1998),

Peters and Westerståhl (2005), Sabato and Winter (2005), and Dotlačil (2010) among oth-

ers.

A polyadic quantifier is a type of relation quantifier. To illustrate, let us first con-

sider some familiar relation quantifiers, quantificational determiners. It is standard to

treat determiners as higher-order relations that relate the sets denoted by the restrictor and

nuclear scope, as shown in (4.10).

(4.10)

$$
\begin{array}{c}
\\
\text{SCOPE} \\
\langle e, t \rangle \qquad \text{QUANTIFICATIONAL} \qquad \text{RESTRICTOR} \\
\text{DETERMINER} \qquad\quad \langle e, t \rangle \\
\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle
\end{array}
$$
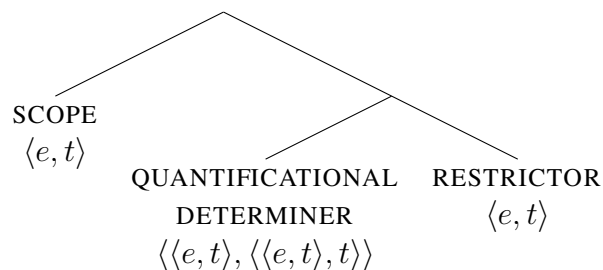
We may classify such relations, as is done in modern Generalized Quantifier Theory (see

Peters and Westerståhl (2005)), as "monadic quantifiers", since the arguments for the

higher-order relation are one-place predicates. A polyadic quantifier then is a higher-

order relation that has at least one argument that is a polyadic predicate. In the case of

reciprocals, we can analyze them as polyadic quantifiers whose polyadic argument is the relation denoted by the verb[5]. These accounts take the other argument of the polyadic quantifier to be the plurality denoted by the reciprocal's antecedent; since nothing in the present discussion hinges on how the antecedent is treated, I will simply assume here that a reciprocal's antecedent denotes a plural individual, which I notate as e_{PL}.

(4.11)

$$
\begin{array}{ccc}
\text{ANTECEDENT} & & \\
e_{PL} & \text{VERB} & \text{RECIPROCAL} \\
& \langle e, \langle e, t \rangle \rangle & \langle \langle e, \langle e, t \rangle \rangle, e_{PL} \rangle
\end{array}
$$
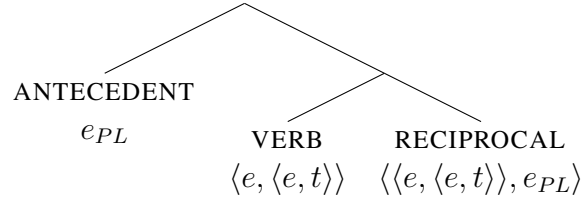
Viewing reciprocals as functions that take relations and plural entities as arguments allows us to make reference to these arguments in the body of the function. Thus, tracking the range of polysemy becomes a relatively straightforward task: we can simply copy the conditions stated in (4.3) into the body of function associated with the reciprocal. One way of doing this is to do essentially what Dalrymple et al. (1998) do: treat reciprocals as ambiguous between certain functions, each of which has as its body something similar to one of the conditions in (4.3). Another option explored by authors like Dotlačil (2010) is to posit a single interpretation of BARs, though still making reference to these arguments in the body of the function associated with the BAR.

While polyadic quantifier analyses allow us to easily track polysemy, this comes at a price. Below, I will discuss two conceptual problems that these types of approaches face, and one empirical problem. The first of the conceptual problems was already mentioned: treating BARs as primitive leaves us without an explanation for why BARs appear to consist of two morphemes. This is even more troubling when we consider the morphemes involved. As we will see soon, BARs cross-linguistically are generally made up of the same morphemes, and the apparent morphemes involved look suspiciously like

[5]Szabolcsi (1989), working in a CCG framework, was the first to use a version of polyadic quantification to explain the semantics of anaphors, in particular the semantics of reflexives. Under this view, we can think of reflexives under her view as binary functions that map a relation and an individual to a truth value as follows: $[\![\text{REFLEXIVE}]\!] = \lambda R \lambda x . Rxx$.

morphemes that might play a role in deriving a reciprocal meaning. It is striking that we never find BARs like *two another*, *few other*, or *coffee cup*, but under a polyadic quantifier approach, it is unclear why these could not be possible reciprocal expressions.

The second conceptual problem concerns the semantic type of BARs under a polyadic quantifier approach. Although the standard recursively defined typology allows for endlessly many possible types (see (2.16) in Chapter 2), it is undeniable that natural language only uses a small handful of these. We should be wary about including expressions that have types that are not well established, especially when these types are posited to account for just a very small number of phenomena (i.e., just reflexives and reciprocals). If the semantic type of polyadic quantifiers that was mentioned previously is a possible semantic type in natural language, we should wonder why the only flavors of polyadic quantification are reflexivity and reciprocity. I believe that making the decision to include these in our typology should only be done if there are no satisfactory parsimonious explanations of the phenomena.

The big empirical problem for polyadic approaches to BARs is easy to see, yet not so easy for these approaches to recover from. The approach only works if there is a polyadic predicate around for the BAR to compose with. However, BARs can appear in places where it is far from obvious how they could possibly be in the correct configuration with the verb in order to meet the compositional demands of (4.11).

(4.12) The newlyweds met each other's parents

(4.13) The professors read papers about each other

To the best of my knowledge, there are no attempts in the literature to make a polyadic quantifier analysis work with DP-internal BARs. This is not to say that polyadic quantifiers cannot be defined for these occurrences of BARs, but it does so at the cost of positing massive ambiguity and/or type-shifting principles; and these principles have to be constrained in such a way as not to overgenerate (i.e., predicting reciprocal-antecedent

relations in illicit configurations). In sum, not only is the polyadic quantifier type questionable to begin with, it cannot even handle the full range of facts. See Büring (2005) for discussion of this problem; and for a more comprehensive taxonomy of the argument positions in which BARs can appear, see §4.2.3.

These issues should make semanticists skeptical of such analyses. We will see in §4.3 more reasons that the primitive approach is empirically unjustified. Even though this analysis can handle the range of the FDVSs (though only when reciprocals appear in certain positions), I believe it is ultimately a flawed approach and cannot be the correct analysis of BARs. In the next section we will address some issues in the literature that have been brought up by those wanting to uphold the idea that BARs are complex and that these expressions, somehow, consist of the morphemes that are apparently involved. Although, we will see that these accounts have their shortcomings too.

4.2.2.2 Compositional complexity

The advocates of complexity[6] developed theories that make use of the apparent morphemes involved in BARs. Instead of reviewing all of the different takes on complexity offered throughout the years, I will discuss two classic accounts that are related to each other, and the present approach, in interesting ways.

Perhaps the earliest investigation into the composition of BARs is the work of Dougherty (1970). Dougherty believed that the reciprocal *each other* was related to floating quantifier constructions that keep everything else (virtually) the same but differ with respect to the position of *each*. For him, the reciprocal sentence with *each other* (4.18) fills in the paradigm consisting of some seemingly closely related sentences.

(4.14) Each of the men will speak to the others

(4.15) The men each will speak to the others

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[6] Among them are: Dougherty (1970), Heim et al. (1991b), Roberts (1991), and Sauerland (1998).

(4.16) The men will each speak to the others

(4.17) The men will speak, each to the others

(4.18) The men will speak to each other

For Dougherty, (4.14) represents the deep structure from which all the sentences in (4.15) through (4.18) are derived[7]. This account, as far as I can tell, is the closest analog to the syntactic proposals that will be developed in this chapter. Though his approach and mine differ in several respects, we both share the idea that the Distributor is best treated as a type of distance distributivity item.

Fiengo and Lasnik (1973) raised some objections to Dougherty's analysis. Although they offer several arguments (p. 465-467) against the floating quantifier analysis, the most convincing in my opinion is that the canonical floating quantifier sentences disallow the floating quantifier's associate to be a quantificational noun phrase, as shown in (4.19) and (4.20). On the other hand, the sentences involving BARs ((4.21) and (4.22)) allow for quantificational antecedents[8].

(4.19) *Most boys each will speak to the others

(4.20) *Most boys will each speak to the others

(4.21) ?Most boys will speak each to the others

(4.22) Most boys will speak to each other

An approach like Dougherty's that treats the floated quantifier as a determiner that has somehow been dislocated from its associate noun phrase faces serious problems if another

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[7]Dougherty actually derives the sentences in (4.15) through (4.18) with two transformations: first, Quantifier Postposition derives (4.15) from (4.14), and then all the others are derived from the result of this by the transformation Quantifier Movement. See Dougherty (1970), Fiengo and Lasnik (1973), and Dougherty (1974) for the details of these transformations.

[8]Several native speakers of English have informed me that sentences such as *Most of the men each bought a book* are acceptable. If this is so, then perhaps the problem is not as severe as previously assumed, thus deepening the syntactic similarities of reciprocal and floating quantifier constructions.

determiner is present, assuming that such determiners occupy the same position (e.g., D^0). See Chapter 3 for alternative views on the syntax of floating quantifiers that could reconcile these facts.

Heim et al. (1991b) develop an account that is a sort of inverse of Dougherty's. Dougherty takes the Distributor to be a floated quantifier, starting its derivational life in close syntactic proximity to its antecedent, whence it undergoes a lowering transformation. Heim et al. claim that the Distributor starts in the same noun phrase as the Differentiator, and then covertly raises. For them, the LFs for reciprocal sentences are as in (4.23) (taken from Heim et al. (1991b), p.66 example (7)).

(4.23) The men saw each other $\Rightarrow$ $[_S [_{NP}[_{NP} the\ men]_1\ each_2][_{VP} saw\ [_{NP} e_2\ other]_3]]$

The view that *each* starts in a different noun phrase as the reciprocal's antecedent can account for the fact that BARs allow for quantificational antecedents, thus avoiding the problem that Dougherty faced.

Both Dougherty and Heim et al.'s accounts attempt to derive reciprocal meanings from the composition of the apparent morphemes involved in BARs; however, they suffer from various difficulties that have been noted in the literature[9]. One germane problem that both of the complexity analyses face is that they do poorly in accounting for the polysemy problem. For instance, the semantics given in Heim et al., which involves a high-scoping *each*, works only for situations of Strong Reciprocity; see discussion of this issue in Beck (2001), p. 70-72. I present further problematic issues with Heim et al.'s scopal account in Chapter 6.

It seems that each of the two approaches discussed in this section succeeds in one respect, but fails in the other. The primitive polyadic approaches can account for the range of polysemy discussed above with the power of polyadic quantification, but they do so without incorporating the morphemes that apparently constitute BARs. On the

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[9]As mentioned before, problems for Dougherty can be found in Fiengo and Lasnik (1973). Williams (1991) gives a reply to Heim et al. (1991b), and in Heim et al. (1991a), they acknowledge that the issues raised by Williams present major problems for their original analysis.

other hand, the complexity approaches try to uphold morpheme univocality (i.e., *each* and *other* always mean the same thing, even when composed as a reciprocal anaphor), though doing so has often limited their potential to account for the polysemy problem. I believe that these limitations are a result of assuming a semantics that lacks the tools of the neo-Davidsonian. In the sections to come, we will see that with these tools in place, a complexity analysis is possible; one that treats the elements involved in a straightforward way, which is in several respects empirically superior to previous analyses from both camps that were discussed in this section.

4.2.3 The syntactic distribution of BARs

The last issue that I think a proper account of reciprocal semantics should address is the range of syntactic distribution of BARs. Many previous studies have focused only on sentences where the reciprocal is the direct object in transitive constructions, what Langendoen (1978) called *elementary reciprocal sentences*. A notable exception is Dotlačil (2010), where an analysis is presented that can handle ditransitive reciprocal constructions, but only double-object constructions where the reciprocal is the indirect object; that is, where it is string adjacent to the verb. The account developed in this thesis will work with a larger range of constructions, which I present below.

BARs can appear in virtually any argument position, so long as they are close enough to an antecedent to satisfy the locality and c-command demands of a binding condition like Condition A (Chomsky (1981)). For example, they can appear as indirect objects, in both double object and prepositional dative constructions. Notice the ambiguity in (4.24); this will be addressed and accounted for later in the chapter.

(4.24) The gnomes put hats on one another

(4.25) The gnomes gave each other hats

As mentioned earlier, BARs can also appear inside of noun phrases. They can

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appear in possessor position (4.26), where the antecedent is outside of the noun phrase.

(4.26) They reviewed each other's papers

They can also appear as complements to nouns. In some cases, their antecedent is noun phrase internal (4.27); where in other cases, their antecedent is outside of the noun phrase (4.28).

(4.27) I read the employees's reports about each other

(4.28) The artists painted pictures of one another

We have seen that polyadic quantifier approaches are limited in only being able to account for a small range of the syntactic distribution of BARs. I believe that Dotlačil's (2010) analysis is the most descriptively adequate so far, though it can only work when the reciprocal is string adjacent to the verb (i.e., reciprocals as direct objects or as indirect objects in double-object constructions). The reason for this is that Dotlačil relies on a polyadic analysis of *each other*, albeit an event alternative to the more familiar polyadic analyses, thus requiring the anaphor to be close enough to its verbal argument to compose with it via Function Application.

The analysis developed here will capture a broader range of the syntactic distribution, as well as account for several nuances in meaning that appear in more constructions that are more complicated than elementary reciprocal sentences. For instance, the ambiguity mentioned above with prepositional dative constructions where the reciprocal is the indirect object. Another issue that will be addressed with regards to ditransitive constructions is an interesting contrast mentioned by Williams (1991). He noticed that the reciprocal sentence (4.29a) is compatible with real-world situations, but the minimally dissimilar non-reciprocal sentence (4.29b) is not (the # indicates that the sentence can only be used to describe a bizarre real-world situation, abstracting away from cases where patients have had multiple nose jobs.)

(4.29)   a. The doctors gave each other new noses

          b. #The doctors gave each patient new noses

I will show that this paradigm represents essentially the same contrast observed between floating and binominal *each* in the previous chapter.

We will see that the approach developed here fares quite well at handling the polysemy problem, and does so without positing any ambiguity, while also being compatible with BARs occurring in any of their licit syntactic positions. This will be accomplished by treating the BAR as compositionally complex, and consisting of essentially the same *each* and *other* that we see outside of reciprocal constructions, and the *each* here is given the same interpretation as in distance distributivity constructions. Before pursuing this line of thought, we will first consider some data from various languages that pose serious problems to any approach that claims that the reciprocal is a primitive element, thus providing further support for internal compositional complexity in BARs.

4.3   Decomposing bipartite reciprocals

In this section I will give an overview of some explananda that call for a complex treatment of BARs. We will first look at three phenomena that bear on this issue: article distribution, preposition placement, and case distribution. While each phenomenon by itself might not be enough to convince one of complexity, I think that taken together they are more than suggestive. After arguing for complexity, we will examine some of the consequences of treating BARs as being composed of morphemes that can exist outside of reciprocal constructions. To this end, we will look at the behavior of *each, one* and *other* as cross-sentential anaphors. The issues raised throughout this section point to a certain type of syntactic treatment of the elements involved. In the following section, we will evaluate this suggested treatment with the proposals about Taylor-Schein distributivity given in previous chapters.

4.3.1 Article distribution

Certain languages allow article morphemes to surface within the BAR. These include Spanish (4.30), French (4.31), Romanian (4.32), and Bulgarian (4.33)[10].

(4.30) *Los estudiantes se seguian los unos tras los otros*
the students CL follow the ones behind the others
'The students are following one another'

(4.31) *Les étudiants se sont frappé les uns les autres*
the students CL AUX hit the ones the others
'The students hit one another'

(4.32) *Băie?ii s au urmărit unul pe celălalt*
Boys.DEF CL have followed one.DEF ACC other.DEF
'The boys followed one another'

(4.33) *Gostite tancuvaha edin-ija s drug-ija*
guests.DEF danced one.DEF with other.DEF
'The guests danced with one another'

Notice that when articles do surface, it is possible to have two articles within the BAR. While some languages allow two article morphemes per DP, such as the Scandinavian double definiteness languages like Norwegian (4.34), Swedish (4.35), and Faroese (4.36) (data from Julien (2005)), the languages mentioned above do not allow this. Thus, we can take the occurrence of two articles in BARs as evidence that the BAR consists of two separate nominal expressions.

(4.34) *dei to gul-e skjort-e-ne*
DEF.PL two yellow-W skirt-PL-**DEF**
'the two yellow shirts'

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[10]It should be noted that several Romance and Slavic language have an anaphoric clitic, *se*, which allows for a reciprocal reading even without a BAR present. However, this clitic is not limited to reciprocal readings; it can also be used to express reflexivity and in impersonal/middle constructions, though when the BAR is present, only the reciprocal interpretation is available.

(4.35) *det* *gul-a* *hus-et*
   DEF.N.SG yellow-W house-**DEF**.N.SG
   'the yellow house'

(4.36) *tann*   *svart-i*   *kettlingur-in*
   DEF.M.SG.NOM black-W.M.SG.NOM kitten-**DEF**.M.SG.NOM
   'the black kitten'

The crux of this argument is that two articles can appear within BARs. However, it remains unclear what meaning difference, if any, is associated with definite or indefinite marked reciprocals. I leave this as an issue for future research.

4.3.2 Preposition placement

Next we will consider the placement of prepositions that interact with BARs. Although Germanic BARs are usually the ones addressed in the literature, we can see that the placement of prepositions in these languages seems to be an exception to the general pattern we find across Indo-European languages. In Germanic languages, prepositions generally precede the BAR complex, with both *one another-* and *each other-*type reciprocals, as shown below in English (4.37) and German (4.38).

(4.37) The students danced with one another

(4.38) *Sie* *erzählten* *voneinander*
   they talk   about-one-another
   'They talk about one another'

However, in most[11] of the non-Germanic Indo-European languages where BARs are productive, the preposition always intervenes between the Distributor and Differentiator. I show this below for French (4.39), Spanish (4.40), Romanian (4.41), Bulgarian (4.42), Serbo-Croatian (4.43), and Ukrainian (4.44).

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[11]Hindi has postpositions that *follow* the entire BAR complex.

(4.39) *Les étudiants se sont donné des livres les uns aux autres*
the students CL AUX gave some books the ones to-the others
'The students gave books to one another'

(4.40) *Los estudiantes presentaron los profesores el uno al otro*
the students introduced the professors the one to-the other
'The students introduced the professors to one another'

(4.41) *Oaspe?ii au dansat unul cu cel?lalt*
guests.the have danced one.the.NOM with other.the.ACC
'The guests danced with one another'

(4.42) *Te stojat edin do drug*
they stand one beside other
'They are standing beside one another'

(4.43) *Gosti su plesali jedni s drugima*
guests AUX danced one with other
'The guests danced with one another'

(4.44) *Divčata hovoryly odna pro odnu*
girls talk one.NOM about one.ACC
'The girls are talking about one another'

If the BAR were a primitive expression, as polyadic quantifier analyses suggest, it should come as a surprise that it is possible to break it up with prepositions, though we find this to be pervasive in the Indo-European languages that have BARs. Although the data mentioned in this regard above have only shown the position of prepositions in *one-another*-type reciprocals, we have seen in Dougherty's paradigm (4.2.2.2) that English allows the *each* of *each-other*-type reciprocals to precede a preposition. Admittedly, this type of construction varies in its acceptability among speakers, but given that it is possible in just some cases is enough to make the point.[12]

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[12]Paul Pietroski (p.c.) has brought to my attention that (4.45) has a stronger interpretation than its counterpart with *each other*:

   i. The men will talk to each other

(4.45) ?The men will talk each to the others

I will treat all these cases, whether the preposition is within or outside the BAR complex, as having the same semantics. This again will lead back to the discussion of the two approaches to thematic role interpretation from Chapter 2: the preposition approach and the Theta Rule approach. I take up this issue in the next section. What is important now is that analyses that take BARs to be primitive elements have no way of accounting for the appearance of prepositions within the BAR.

4.3.3   Case distribution

The last empirical problem for primitive accounts of BARs that I will discuss concerns case morphology within BARs. Languages with BARs vary with regard to the amount of case morphology expressed on each element of the BAR. Some languages, like English, show no case morphology at all. Some languages, like Russian (4.46) and Hindi (4.47), have only the Differentiator inflecting for case, while the Distributor remains in a fixed form.

(4.46) *Oni   udarali drug druga*
      they hit   other other.ACC
      'They hit one another'

(4.47) *Unho-NE ek   dusre-ko   dekhaa*
      they.ERG one second.OBL-P saw
      'They saw one another'

There are also languages that have both the Distributor and Differentiator inflecting for case. Languages of this last type present a source of deep insight into the inner workings of BARs.

I suspect that this difference in strength has to do with the combination of the definite article and the plural morphology on *others* in (4.45) that is absent from (i). In the former, it is required that each talk to the totality of the plurality denoted by *the others*; while for the latter it seems to suffice that each man talked to at least one other of the men. Furthermore, (4.45) does not have to be necessarily interpreted as a reciprocal sentence; *the others* could refer to some previously mentioned plurality in the discourse that need not be men. This contrasts with (i), which can only have the reciprocal interpretation.

We see the double-case property in some Slavic languages, like Ukrainian and Serbo-Croatian. Interestingly, in these languages, the case of the Distributor and that of the Differentiator are generally different[13]. This can be seen in Serbo-Croatian (4.48) and Ukrainian (4.49) below.

(4.48) *Studenti   su   udarali jedan   drugog*
      students.NOM AUX   hit   one.NOM   other.ACC
      'The students hit one another'

(4.49) *Studenty   vdaryly odyn   odnoho*
      students.NOM   hit   one.NOM   one.ACC
      'The students hit one another'

Considering just these elementary reciprocal sentences, it seems that the case of the Distributor must be nominative and the case of the Differentiator must be accusative. However, when we look beyond these simple cases, we see that a deeper generalization emerges. Below are ditransitive constructions in Serbo-Croatian ((4.50a), (4.51a)) and Ukrainian ((4.50b), (4.51b)) where the BAR is an indirect object. In (4.50), the interpretation is one where the students introduced the professors to others students (among *the* students), where in (4.51) the interpretation is one where the students introduced the professors to other professors (among *the* professors).

(4.50)   a. *Serbo-Croatian*

        Studenti   su   predstavili profesore   jedni   drugima
        students.NOM AUX   introduced professors.ACC one.NOM   other.DAT
        'The students introduced the professors to one another'

    b. *Ukrainian*

        Studenty   predstavyly profesoriv   odni   odnym
        students.NOM   introduced professors.ACC one.NOM   one.DAT
        'The students introduced the professors to one another'

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[13]I am aware of one exception where the case on each element is the same, and this is when the reciprocal antecedent is nominative, thus making the Distributor nominative (which will be explained shortly), and a certain preposition is used that also happens to assign nominative. So the case of the Distributor and Differentiator are generally the same, except where there is a preposition involved that happens to assign the same case to its complement as the case of the reciprocal antecedent.

(4.51)   a. *Serbo-Croatian*

Studenti   su   predstavili profesore   jedne   drugima
students.NOM AUX introduced professor.ACC one.ACC other.DAT
'The students introduced the professors to one another'

b. *Ukrainian*

Studenty   predstavyly profesoriv   odnyx   odnym
students.NOM introduced   professors.ACC one.ACC one.DAT
'The students introduced the professors to one another'

The English sentences that comprise the translations for (4.50) and (4.51) are ambiguous. Serbo-Croatian and Ukrainian have no such ambiguity because of the case morphology within the BAR. Based on the meaning differences between the two pairs of sentences, in (4.50), it is the subject that appears to act as the antecedent for the BAR, while in (4.51) it appears that the direct object is the antecedent. This semantic fact is reflected by the case morphology of the BAR. In (4.50), where the subject acts as the reciprocal's antecedent, the case of the Distributor is nominative, the case typical of subjects. In (4.51), where the direct object is the antecedent, the case of the Distributor is accusative, the case typically associated with direct objects. In both (4.50) and (4.51), the case of the Differentiator does not vary. Thus, the proper descriptive generalization of these case facts in these languages seems to be that (i) the case of the Distributor will always match the case of the BAR's antecedent, and (ii) the case of the Differentiator will always be the case the we would expect based on the position of the BAR. In (4.48) and (4.49), since the BAR is in direct object position, so the case of the Differentiator is accusative. In both (4.50) and (4.51), the BAR appears in indirect object position, thus the case of the Differentiator is dative, the case typical of indirect objects. These facts again show that BARs consist of what looks like two DPs. A primitive analysis cannot account for productive case morphology on the parts of the BARs since for these approaches, BARs do not have parts. We will return to these cases of multiple potential antecedents and the different meanings involved, as well as the importance of the Slavic case facts, in later sections.

The facts that we have seen so far in this section show, at the very minimum, that there are some languages that have BARs that simply cannot be analyzed as primitive expressions. Of course, one could argue that the BARs in languages like English can still be analyzed as polyadic quantifiers since they lack (for the most part) intervening prepositions, BAR-internal articles, and case inflection within BARs. But to do so would require saying that *one another* in English and its equivalent in Serbo-Croatian are totally different syntactic/semantic entities, that just happen to look alike and have the same meaning. If a suitable theory for complex BARs can be developed that can account for the polysemy problem just as well as the primitive approaches, then I'm inclined to generalize the results of this section to all BARs in the Indo-European languages and say that they are all complex expressions with the same interpretation, rather than adopt the mixed approach.

4.3.4 Cross-sentential anaphora

In the introduction, I said that we should not only view BARs as being complex, but also that we should view them as being composed from essentially the same *each, one, other,* etc. that we find outside of BAR constructions. In this section I will discuss the relevant properties of these elements as they appear in cases of cross-sentential anaphora. I will not address here when elements like *one* take on a distributive character, as I am claiming that they always do in BAR constructions (an issue we will return to in §4.4). Instead, we will focus here on the relevant anaphoric properties of the morphemes that comprise BARs when they appear outside of BAR constructions.

Consider first the use of *other* as a cross-sentential anaphor. We can see from sentences like (4.52) that it is impossible for *(an)other* to refer to the individuals denoted by its antecedent. Rather, it must refer to something other than what its antecedent refers to, *and* other than the parts that comprise what its antecedent refers to.

(4.52) Three boys wore hats. Another wore a sweater.

Unlike *other*, elements like *one* and *each*(*one*) do have the ability to refer to an individual that is part of the plurality picked out by the antecedent. As we can see below, the sentences in (4.53) can have the same meaning as their counterparts in (4.54) that have an explicit partitive pronoun that is coreferential with the antecedent.

(4.53)   a. Three boys wore hats. One (also) wore a sweater.

         b. Three boys wore hats. Each (also) wore a sweater.

(4.54)   a. [Three boys]$_i$ wore hats. One of them$_i$ (also) wore a sweater.

         b. [Three boys]$_i$ wore hats. Each of them$_i$ (also) wore a sweater.

Unlike *each*, the partitive construal of *one* as a cross-sentential anaphor seems to be optional, as we see that the *one* in (4.55) is able to refer to some boy that is different from the three mentioned in the previous sentence.

(4.55) Three boys walked in. One walked out.

What is important for us is that these elements can, on some occasions, be used as a sort of partitive anaphor, referring to a part of what its antecedent refers to, in sharp contrast with cross-sentential *other*.

When *one* is used partitively, it can act as an antecedent for *other* so that otherness can be determined with regards to something *within* a plurality, a referential option that is not available in (4.52). We can see this at work in (4.56), where *other* is linked indirectly to *three boys* by having *one* as its antecedent, and then *one* acts as a partitive anaphor directly anteceded by *three boys*.

(4.56) Three boys wore hats. One wore a sweater. Another wore a scarf.

I believe that the anaphoric chain that we see in (4.56) is also at work in BARs; the Differentiator in BARs inherits the Distributor's partitivity, and as a result otherness is determined by what the Distributor picks out. (4.57) shows a schematic representation of the structure of BARs under this approach.

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(4.57) $[_S...\text{Antecedent}_i ... [_{DP} ...\textit{each one of them}_i ...]_k ... [_{DP} ...\textit{other than that}_k ...$

   $]...]$

This representation encodes that *other* is dependent on the partitive anaphor for determining its reference. If *other* were directly anteceded by the canonical reciprocal antecedent, represented as Antecedent$_i$ in (4.57), then distinctness should be determined in a manner parallel to what we see in (4.52). This is clearly not the case with BARs. As such, if we chose to view BARs as complex entities that are composed from the same *each, one, other,* etc. that are found outside of reciprocal constructions, and the Distributor and the Differentiator are separate expressions, then the linking in (4.57) is the only possible linking available given what sentences with BARs mean. This specific view of referential dependency will be an important part of the analysis, and we will return to it again at several points in the remaining sections.

   In this section we examined several phenomena that suggest a complex decomposition of BARs. We have also begun to see what a proper syntactic treatment of the Distributor and Differentiator should look like. For one, the case facts seem to suggest that two nominal expressions are involved, since each of these elements generally have different cases. The distribution of articles provides further evidence that two nominals are present. This idea is also reenforced by the anaphora data: since we know that BAR constructions involve distinctness that is determined with regard to parts of what its antecedent refers to, then the Differentiator should be linked somehow to some proper part of the antecedent and not directly to the whole plurality denoted by the canonical reciprocal antecedent. The Distributor can serve this purpose. In the next section, I will elucidate the syntactic and semantic details of this type of approach to the complexity problem.

4.4 Reciprocals as distance distributivity phenomena

In this section I will extend the Taylor-Schein approach to BARs. The basic idea, apart from some minor qualifications, is that the *each* of *each other* is just like binominal *each* with the exception that it does not attach to a numeric host, but a Differentiator host: an *other*-NP. This means that the restrictor argument of *each* is the canonical reciprocal antecedent, and the scope argument of *each* is the Differentiator.

(4.58)
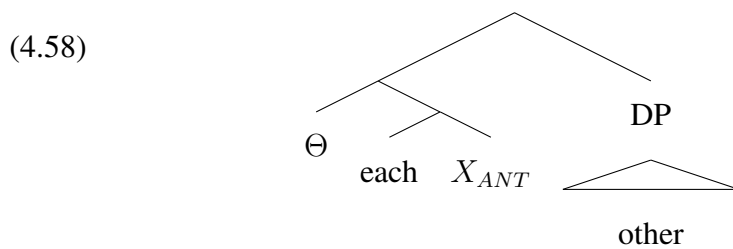
Below I will discuss what is needed for this account to be applied to elementary reciprocal sentences. I first discuss the semantics of the Differentiator host; in particular, how the distinctness inherent to *other* is determined by the Distributor, and how the Differentiator requires a partitive argument to restrict its values to members of the antecedent plurality. I then turn to how the analysis can be extended to BARs apart from the *each other* variety, with discussion about how the cross-linguistic range of preposition placement from §4.3.2 fits with the different ways of implementing thematic separation, and also how the proposed analysis gains support from the case facts from §4.3.3.

4.4.1 The semantics of the Differentiator host

As discussed in §4.3.4, the semantics of *other* requires an antecedent nominal that distinctness can be determined with regards to. Based on considerations from cross-sentential anaphora, this nominal cannot be the canonical antecedent to the reciprocal, since then the value of *other* must be distinct from all the parts which comprise the antecedent's semantic value. This cannot be the case with reciprocal sentences, since they

report that individuals within the antecedent plurality performed actions on other members of the same plurality. It was suggested from considering the anaphoric properties of (4.56) that the antecedent to *other* covaries with the Distributor.

The Taylor-Schein analysis offers a straightforward way to implement this idea. As outlined in (4.57), the antecedent of the Differentiator is the Distributor. Following the proposal that the Distributor is interpreted in the Taylor-Schein fashion, the logical form a reciprocal sentence will involve apportionment of sub-events to each individual thematic participant x of the antecedent plurality. Distinctness is then determined for each x within its appropriate sub-events. This is achieved by the following proposals since the Differentiator is within the scope of *each*. I give a first-pass of the truth conditions for (4.59) below as (4.60).

(4.59) The students saw each other

(4.60) $\exists E[\text{AGENT}(E, \oplus\text{STUDENT}) \,\&\, \text{SEE}(E) \,\&\, \forall x \leq \oplus\text{STUDENT}[\exists E' \leq$
$E[\text{AGENT}(E', x) \,\&\, \exists Y[\text{OTHER}(Y, x) \,\&\, \text{THEME}(E', Y)]]]]$

I treat the Differentiator as an indefinite noun phrase with existential force, comparable to *an other/some others*; though see §4.5 for possible reasons for treating it as definite instead. I remain uncommitted as to whether *other* is an adjective or a noun in BARs; but I treat it as a special open class lexical category by associating it with the dyadic predicate $\text{OTHER}(X, Y)$. This is to make explicit which value(s) the value of the Differentiator is distinct from. I give the following definition for the predicate $\text{OTHER}(X, Y)$.

(4.61) $\text{OTHER}(X, Y) =_{df} \neg\exists Y'[Y' \leq Y \,\&\, Y' \leq X]$

This definition says that for $\text{OTHER}(X, Y)$ to be true then neither Y nor any part of Y can be an improper part (i.e., part of or equal to) of X.

In the case of reciprocals, the proposal is that the semantic value of the Differentiator covaries with the Distributor; for the case of (4.59), each student x is associated with

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its own sub-events E', such that when x is the agent of E', the theme is some Y distinct from x.

The truth conditions given in (4.60) require a further modification. Notice that the values of Y associated with the Differentiator can be anything so long as they are distinct from the agent x; for example, Y can be assigned values that are teachers and not students. This would predict that (4.59) can be true in situations where students did not see other students, but teachers instead. This is an unwelcome result; the truth of (4.59) requires students to see other students; and not just any students, but students which are also part of the value determined by the reciprocal's antecedent. In order to account for this restriction, I propose that the semantic values of the Differentiator are restricted by a silent partitive phrase *of them*, where *them* is coreferential with the reciprocal's antecedent. This will ensure that values Y above are not just distinct from x, but also come from the same plurality of which x is a part.

This is not the first time that partitivity has been argued to be crucial to the interpretation of reciprocals. Beck (2001) suggests a similar decomposition; for her the interpretation of the BAR can be paraphrased as "the others among them", where *them* corefers with the reciprocal's antecedent. This approach is different from the present approach since I am arguing for the partitivity to be represented twice; once on the Distributor (as all distance D operators have a partitive restriction), and then once again on the Differentiator. Having partitivity represented twice will have payoffs that we will see below.

This analysis of the Differentiator has similarities with so-called *double-index* approaches to reciprocity.[14] These approaches argue that two values (i.e., indices) are required for the interpretation of reciprocal expressions: the first is a *contrast* value for which distinctness is determined with regards to, the other a *range* value which represents the plurality of individuals that reciprocated action holds among. The present approach

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[14]For double-index approaches, see Fiengo and Lasnik (1973), Heim et al. (1991b), Heim et al. (1991a), Schwarzschild (1996), Sauerland (1998), Sternefeld (1998), and Beck (2001).

maintains that contrast and range values are required, but in specific way. The range value corresponds to the partitive argument on both the Distributor and Differentiator, and this is always covalued with the reciprocal's antecedent. The contrast value will covary with the values of x given by the Taylor-Schein distributivity operator, as discussed above. The range value on the Distributor has already been discussed with regards to distance distributivity in the following chapter, and since I am viewing the Distributor essentially as binominal *each*, the same remarks apply to its composition in BARs. As for the Differentiator, I will represent it as having two indices; the first is the contrast, the second is the range. I thus give the following $\langle e, t \rangle$ definition of the Differentiator.

(4.62) $[\![\text{Differentiator}_{i,k}]\!]^g = [\![\text{other}_i \text{ of them}_k]\!]^g = \lambda X.X \leq g(k) \ \& \ \text{OTHER}(X, g(i))$

The value i will also be part of the antecedent plurality k; this is given by the Distributor. For the time being, I will assume that this type $\langle e, t \rangle$ meaning in (4.62) feeds existential closure (see Chapter 2); and so the Differentiator is interpreted as indefinite. It is also possible for *iota* closure to apply, the result being a type e definite Differentiator. I will make some comments about this in the next section, following some suggestions from Schein (2003). Furthermore, allowing both definiteness and indefiniteness within the BAR might be useful for explaining languages which mark BARs thusly; see §4.3.1. Whether definite or indefinite, the resulting expression will be marked with the thematic role typically associated with the argument position of the BAR; in the case of (4.59), this will be the THEME role.

With these proposals about the Differentiator in place, I now give the following truth conditions for (4.59) in (4.63). The crucial difference is the partitive restriction on the Differentiator; as shorthand, I represent this immediately following the existential quantifier $\exists Y$ instead of as a separate conjunct.

(4.63) $\exists E[\text{AGENT}(E, \oplus\text{STUDENT}) \ \& \ \text{SEE}(E) \ \& \ \forall x \leq \oplus\text{STUDENT}[\exists E' \leq$
$E[\text{AGENT}(E', x) \ \& \ \exists Y \leq \oplus\text{STUDENT}[\text{OTHER}(Y, x) \ \& \ \text{THEME}(E', Y)]]]]$

Notice that the truth condition above is rather weak; it requires that each student sees at least one other different student, and nothing more. I return to discussion of this with respect to the polysemy problem in §4.5.

Officially, my position is about the semantics of *each other* BARs, since these clearly have a distributive element (*each*) and a differentiating morpheme (*other*). However, the analysis can be extended to other types of BARs if one is willing to assume covert distributivity. This has not necessarily been an issue in past accounts of distributivity: as mentioned in Chapter 2, Link and Schwarzschild have proposed silent distributivity operators to account for distributive interpretations of VPs, and Beck (2001) has proposed silent distributivity operators to account for Strong Reciprocity.

Concerning *one another* type reciprocals found in English and other Indo-European languages, these can be accommodated into the present account by assuming that they are decomposed as [[each *one*] [another]]. In other words, the *one* is taken to be part of the Distributor; see LaTerza (2010). This analysis of *one another* reciprocals is motivated by the case facts observed in §4.3.3. Recall that for languages like Serbo-Croatian and Ukrainian, the case of *one* matches the case of the reciprocal's antecedent, while the case of *other* is that which is typically associated with the argument position which that BAR occurs in. This is similar to the distance distributivity facts from Chapter 3, where in languages with rich case systems, the case of the distributivity morpheme matches that of its antecedent. Furthermore, these case facts parallel the proposed thematic role assignment: just as the case of the Distributor matches the case of its antecedent, the thematic role required for the proper implementation of Taylor-Schein distributivity requires that this too is shared with the antecedent. The Distributor in these languages is assigned the case associated with the reciprocal's argument position, and likewise I proposed that the Distributor be assigned a thematic role determined by the reciprocal's argument position. This links the Distributor with the appropriate thematic relation in logical form, within

the sub-event domain, on par with the nominal host in binominal *each* constructions[15].

4.4.2 Prepositions and Thematic Roles within BARs

In this section I will discuss the cross-linguistic range of preposition placement within BARs and how this might help determine the choice between the adpositional approach and the Theta Rule approach to neo-Davidsonian composition. In §4.3.2 , it was observed that BARs across languages, and to a limited extent within English, can have prepositions that are placed either outside of the entire BAR complex or intervening between the Distributor and the Differentiator.

(4.64)

P

Distributor   Differentiator

(4.65)

Distributor
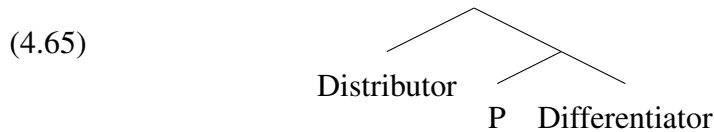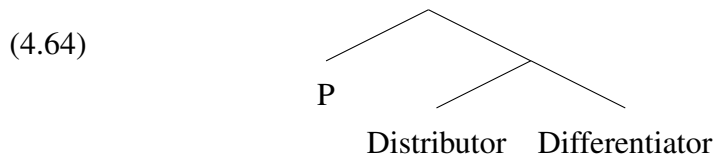
P   Differentiator

Regardless of where the preposition is placed, the common feature is that it is associated with a thematic role that I have argued to be assigned to the Differentiator. This pattern of thematic role assignment is strengthened by the case facts from §4.3.4: the Differentiator is case marked by the case typically associated with that preposition.

Recall from Chapter 2 the two proposed theories of thematic interpretation in the total separation approach to argumenthood. For the preposition approach, the thematic

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[15]BARs in other languages can be assigned the same semantic values as the Distributor and Differentiator here, although the motivation for doing so becomes weaker when considering the morphemes involved. For example, the Russian BAR is *drug drugi* (lit., "other other") and the Hindi (lit., "one second"). While it not clear how these morphemes can take on the meanings as *each* and *other* in the appropriate way, it is also not clear how the morphemes involved can work together to compose a reciprocal meaning. For example, Russian seems to involve two sorts of distinctness, and not distributivity, while Hindi suggests that ordering is somehow involved. I thus believe that the analysis presented in the main text applies to just *each other* and *one another* type BARs, though I leave open the possibility that BARs in other languages can receive the same treatment if one were to assign the meanings I gave the Differentiator and Distributor to morphemes that appear to have different meanings.

content is located in the preposition itself, which composes with a nominal meaning to yield a monadic predicate of events with the appropriate thematic relation.

(4.66) $[\![P_\Theta]\!] = \lambda X_e.\lambda E_v.\Theta(E, X)$

For the Theta Rule approach, the preposition is essentially semantically vacuous: the nominal bears the thematic role which is type-shifted by the Theta Rule.

(4.67) Theta Rule

$\quad [\![NP_\Theta]\!] = \lambda E.\Theta(E, [\![NP]\!])$

Under the latter view, the role of the preposition is not to assign a thematic role, though it could possibly participate in a syntactic feature checking relation with an NP/DP which bears the appropriate role.

For cases where the preposition intervenes between the Distributor and the Differentiator, the choice between the two theories does not matter. However, when the preposition appears outside of the BAR complex, as it often does in English and other Germanic languages, it appears the Theta Rule is preferred. Following the assumption that the Distributor is syntactic adjunct to the Differentiator nominal, and the c-command domain of the Distributor corresponds to the sub-event domain in logical form, then the preposition cannot compose with the Differentiator in the appropriate way.

(4.68)

```
            PP
           /  \
          /    \
         P      DP
               /  \
              /    \
        Distributor  DP

           Differentiator
```
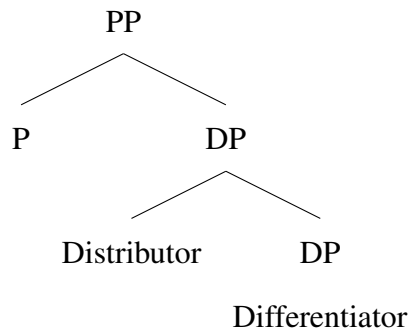
Within the present framework, not only will Differentiator not be assigned a thematic role, but it will not be of the appropriate type ($\langle v, t \rangle$) to compose with the Distributor.

The problem is avoided under the Theta Rule approach, since the DP by itself bears a thematic role, so the Differentiator will be type-raised to the appropriate thematic predicate without needing to compose with the preposition. As such, this is another theory-internal reason for preferring the Theta Rule over the adpositional approach for a neo-Davidsonian interpretation of nominals[16].

4.5   Accounting for polysemy

Using Taylor-Schein Distributivity produces logical forms for BARs that are roughly equivalent to the ones associated with *One-way Weak Reciprocity* (OWR) as it is shown in the table (4.3) from §4.2, repeated below.

(4.69) *One-way Weak Reciprocity*

$$\forall x \in A[\exists y \in A[x \neq y \ \& \ xRy]]$$

The main differences are the use of events, total thematic separation, and higher-order variables, all of which have benefits when accounting for the range of syntactic distribution of BARs, as will be discussed in the next section. Furthermore, the choice of this weak semantic meaning was not arbitrary; it came about from the proposed lexical entry of D composed with a partitive *other* morpheme.

Considering just elementary reciprocal sentences, the present approach shares important similarities with OWR in that they both involve a sort of distributive apportionment by having a universal quantifier scope above an existential, and they both do not express "genuine" reciprocity in the sense that if x did something to y, then y necessarily did something to x. Given this similarity and the entailment facts from §4.2, this means that the neo-Davidsonian logical forms used here can be judged true by any situation that meets the conditions for OWR or any stronger type of reciprocity. This leaves out

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[16]The preposition account can potentially be saved by treating the surface position of the preposition as derived from by movement: in other words, the base structure of (4.68) is like (4.65), where the preposition can locally compose with the Differentiator. The problem with this alternative is the unmotivated head-movement around an adjoined Distributor to yield (4.68).

the sixth alleged reading, an issue we will return to shortly. But first let us examine the logical form of the sentence that we first used to illustrate the polysemy problem.

(4.70) The dots are pointing at one another

(4.71) $\exists E[\text{AGENT}(E, \oplus \text{DOT})\ \&\ \text{POINT}(E)\ \&$

$\forall x \leq \oplus \text{DOT}[\exists E' \leq E[\text{AGENT}(E', x)\ \&\ \exists Y \leq$

$\oplus \text{DOT}[\text{OTHER}(Y, x)\ \&\ \text{AT}(E', Y)]]]]$

We can paraphrase (4.71) as follows: there are some events of pointing with the dots as their agents, and each of those dots have their own sub-events in which that dot pointed at one or more other dots. This underspecified approach is compatible with very weak situations, say where the dots are arranged in a circle, and each dot only points at the dot immediately to its left; but it is also compatible with the strongest types of reciprocal situations (see (4.2)), since there it is still true that each dot points at at least one other dot.

Admittedly, there are some situations where a reciprocal sentence used to describe it would be predicted to be true under the current approach, but speakers' judgments say otherwise. However, I believe that these apparent counterexamples reflect extra-semantic contributions to meaning, such as the role of context and typicality[17]. In Sternefeld's (1998) words, "...it appears that the problem of salient readings, which cannot be dealt with in a purely semantic theory, is independent of the particular issue connected with reciprocity" (p. 318, fn 9). I take it that what is meant by a "purely semantic theory" is one that focuses just on the compositional aspects of meaning. This is not to say that these compositional aspects are all there are; of course things like context and lexical idiosyncrasies factor into restricting the possible meanings of utterances, and thus affect speakers judgements about truth or falsity. But the concern of Sternefeld's, which I share, is that if we are purporting to give a semantics for reciprocals, we should focus on those

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[17]See Kerem et al. (2009) for discussion of the role of typicality in reciprocal expressions.

aspects of meaning that are context independent, indefeasible, and follow from general principles regarding compositional interpretation.

The proposal offered here addresses the compositional semantics of BARs, and to do so requires disentangling some aspects of meaning that I think have been mistakenly grouped into this category. Below, I will discuss two cases that I think illustrate this "problem of salient readings", with the understanding that the general line of reasoning, particularly of how these facts should not be accounted for in a purely semantic theory for BARs, can be extended to similar circumstances. I then turn to purported weakest type of reciprocity, Inclusive Alternative Ordering.

4.5.1 Typicality preferences are extra-semantic

The first case of typicality I will discuss involves the well-known examples of things like telephone poles being equally spaced from one another (see Dalrymple (1998)).

(4.72) The telephone poles are spaced 500 meters from one another.

(4.72) would normally be used to describe situations in which there is a line of telephone poles, and each telephone pole is connected to two others, and is separated from each of them by 500 meters. Were one of the poles to be separated by only 200 meters, (4.72) would be a very awkward way of describing that situation; some might even say that (4.72) is false in that situation. The present approach offers no reason why this might be so, but I do not think that it has to. I believe that there is nothing about the way that the lexical items are composed in (4.72) that is accountable for this awkwardness, but rather this can be attributed to how we typically think of situations involving telephone poles, and situations that expressions like *is spaced x meters from* are typically used to report on. All that one needs to show that this is the case is a situation where the telephone poles are not related by the transitive closure of the *is spaced 500 meters from* relation (see Schein (2003)), but yet speakers will judge (4.72) true in that situation. Here is one

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such situation.

Imagine that Dr. Frankenstein requires pairs of telephone poles for his new experiment. Each pole in the pair is connected by wires to the other pole, and also must be spaced 500 meters from the other. Crucially, it does not matter how far each pair is from any other pair. Some pair might only be 10 meters from another pair, which entails that one of the poles in that pair is 10 meters from one of the poles in the other pair; but these do not matter to Dr. Frankenstein, since only the poles that are connected pairwise by wires have to be spaced 500 meters. Suppose then that the doctor's assistant Igor sets up the poles according to the doctor's wishes, following the rule that each member of the pair be spaced 500 meters from the other member, but to save space, he packs the pairs tightly together such that if a pole is next to another pole that it does not form a connected pair with, then they are only spaced by 10 meters. In such a situation, Igor can speak truthfully if he uttered (4.72), even though all of the poles are not related by the transitive closure of the *is spaced 500 meters from* relation. And since (4.72) can be true in situations other than the ones *typically* assumed for such sentences, then it cannot be a rule of compositional semantics that (4.72) has to be interpreted in such a way that makes only the typical situation true and not weaker ones.

Another example, also brought up by Dalrymple et al. (1998), can be demonstrated with a situation of a six on one fight. If the situation were such that a gang of six were attacking a single victim, and each member of the gang punched that victim, but the victim only got to hit one of the gang members, then the sentence in (4.73) sounds strange when uttered by an observer of the fight.

(4.73) They are punching one another

I believe that this too is something that the compositional semantics should not have to account for. This oddity might be pragmatic in nature, as (4.73) is not the most informative way to characterize the situation. But notice that it cannot be this configuration

of combatants that makes (4.73) strange, since if we took the same ratio of gang members and victims but multiplied it, so that there were three 6-vs-1 fights of the sort just described, then the acceptability of (4.73) improves drastically. We see again the defeasibility of these apparent restrictions on the meaning of sentences with reciprocals, which implies that these restrictions should be kept separate from the general interpretive rules of compositional semantics.

4.5.2   Inclusive Alternative Ordering

I will turn now to a problem that cannot be attributed to extra-semantic factors: the problematic situations that caused researchers to posit *Inclusive Alternative Ordering* (IAO), the weakest FDVS for reciprocal sentences. We saw an example of this in §4.2, where there was a line of dots doing some pointing, but the rightmost dot was not pointing at anything. Similar situations can be described by sentences like (4.74).

(4.74) The plates are stacked on each other

The issue here is how to account for the plate at the bottom of the stack. My proposed treatment, as well as OWR, require that for every plate, there is another plate on which it is stacked; put differently, with these logical forms, this sentence could be true iff we are talking about infinitely many plates. However, speakers judge (4.74) to be true in real-world situations where there are a finite number of plates stacked, and the bottommost plate is not on top of any other plate. The way that IAO fixes this problem is to have a disjunctive participation statement.

(4.75) *Inclusive Alternative Ordering*

$$\forall x \in A[\exists y \in A[x \neq y \ \& \ (xRy \ \lor \ yRx)]]$$

This would make (4.74) true iff for each plate x, either x is stacked on top of another plate, or another plate is stacked on top of x.

Before I address how the present approach can be modified to handle this problem, let us reflect on the methodology that I have been urging. I have tried to revive Langendoen's underspecification approach for the reasons discussed above. Why is it then that I proposed something analogous to the penultimately weakest reading, and not the weakest one? Something like IAO is able to capture these problematic cases, so why not go that weak?

The first reason is a compositional one. The logical forms proposed here were argued to arise from the syntactic configuration of the Distributor and the Differentiator. I showed that with this syntax, and certain rules for interpretation in a neo-Davidsonian framework, we arrive at a logical syntax that works well for reciprocals, but these are the same rules of interpretation that can be used independently of reciprocal constructions. I have argued in previous chapters that the same lexical axiom I use for the Distributor in BARs can also be used for the semantics of distributive determiners and distance distributivity items. It just so happens that when we take these interpretive rules and apply them to reciprocals, then the result is something analogous to OWR. However, to incorporate a disjunctive participation statement into logical form is *ad hoc*, and does not follow from any independently motivated rules of interpretation.

There are also two empirical reasons which argue against theories with IAO. First, let us consider reciprocal sentences with negation. If, following Langendoen, reciprocals have a weak interpretation in the sense discussed above, then we would predict that the negation of a reciprocal sentence should yield relatively strong truth conditions[18]. This prediction appears to be borne out, as the sentence (4.76) can only be true if little to no hitting happened.

(4.76) The boys didn't hit each other

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[18]I will not be giving an explicit compositional treatment of negation in the neo-Davidsonian system used in here. For present purposes it will serve to assume that negative sentences involve the same logical forms as their positive counterparts, plus the addition of a logical negation operator scoping above the clause level existential event quantifier.

Interestingly, sentences like (4.76) can be true if just a little bit of hitting happened. For example, one can truthfully say *Ali and Liston didn't hit each other* if Ali had a first-round knockout and Liston didn't get a chance to do any hitting. In general, it appears that a negative reciprocal sentence can be uttered truthfully when some of the relevant action takes place, but would become false if that action were reciprocated. Theories with IAO make incorrect predictions here. Consider the negation of the IAO schema:

(4.77) $\neg[\forall x \in A[\exists y \in A[x \neq y \& (xRy \lor yRx)]]]$

To paraphrase, this says that not every atom in the antecedent plurality was involved in the relation. For (4.76), this would give truth conditions that are paraphrased as "not every boy was involved in a hitting (either as a hitter or hittee)"; this conditions are clearly not satisfied by the first-round-knockout situation just described. Importantly, (4.76) can be true of this situation. Truth conditions based on (4.77) would come out false in the Ali-Liston situation, contrary to speakers' intuitions. We do not run into this problem with the slightly stronger OWR, nor the present approach which it is based on; these can be paraphrased as "not every boy was an agent in a hitting", which is true of the Ali-Liston situation as desired.

While a theory that includes IAO can account for the problematic edge cases mentioned above, it makes wrong predictions with many sentences involving comparison[19].

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[19]As is well-known, these constructions are felicitous when they embedded under certain operators. Heim et al. (1991), among others, observe that sentence like (i) have perfectly reasonable interpretations; the crucial factor seems to be that the comparative reciprocal clause is embedded under an attitude verb.

    i. They think they are taller than one another

I will return to such constructions in De Se chapter. I will leave unaddressed how other comparative sentences, such as (ii) can receive non-contradictory interpretations.

    ii. They sang better than each other

This sentence can be used to describe instances where say A sings better than B on day 1, but B sings better than A on day 2. While I believe an explanation for sentences like (ii) is already implicit in the framework involved here, which relies on *plural* existential quantification over events, I will not explore this matter further. What is important for the argument in the main text is that there are some comparative sentences that are clearly infelicitous/contradictory, and accounts with IAO do not provide an explanation for why this is so.

(4.78) #The students are taller than one another

(4.79) #The students exceed one another (in height)

A theory with IAO would predict these sentences to be true just as long as one individual is taller than the rest . The approach developed here predicts a contradiction, a prediction that is borne out. Below is the logical form of (4.79) in the system presented here[20].

(4.80) $\exists E[\text{AGENT}(E, \oplus\text{STUDENT}) \ \& \ \text{EXCEED}(E) \ \& \ \forall x \leq \oplus\text{STUDENT}[\exists E' \leq$
$E[\text{AGENT}(E', x) \ \& \ \exists Y \leq \oplus\text{STUDENT}[\text{THEME}(E', Y) \ \& \ \text{OTHER}(Y, x)]]]]$

Paraphrasing, *each* student is associated with another student such that the former is taller than the latter. This is something that cannot be true of each student, hence the infelicity.

It appears that we are left with a choice between two flawed theories; the current one, where we have to make exceptions for edge effects, or a theory with IAO, which runs into problems with negation and comparatives. It is worth stressing here that this is not a problem specific to my particular proposal, but a challenge for any theory of reciprocal semantics. I will now briefly outline two possibilities for fixing the problem in the present approach. The first is to keep the semantic framework given above the same, but add a pragmatic condition like Sauerland's (1998) Benevolence, which allows for a certain amount of exceptions when judging such sentences to be true.

(4.81) Benevolence (from Sauerland (1998), p. 200)

Assume that an assertion is true in at least one situation compatible with common world knowledge.

Sauerland argues that certain verbal predicates like *follow X into the room* are associated with typically non-reflexive following relations in the real world, and given our knowledge about such situations, we know (according to Sauerland) that there is "...no possible

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[20]I choose to give the logical form of (4.79) and not (4.78), since giving the logical form of the latter would require a neo-Davidsonian treatment of comparative constructions, which cannot be done here. I refer the reader to Fults (2006) and Wellwood (2014) for discussion.

situation compatible with our world knowledge about *following someone into the room* where it is true for a group of children that each child followed every other child". For Sauerland, this provides a case for which Benevolence can be used. For the present account, we can modify the alleged world knowledge along the lines that there is no possible situation where every child follows at least one other into the classroom since there will always be the child at the head of the line who does not follow anyone.

The other option for accounting for these outlier cases is to modify the logical forms in the way that Schein (2003) did to account for such examples. He argues that the logical forms of reciprocal sentences should include information about temporal orientation, and his amendment to logical form can be paraphrased as such: each plate is stacked on *the* other plates that have been stacked. For him, the definite description associated with Differentiator does not have necessary existential import, so we could interpret it as "the others that were already stacked, *if there are any*". With this modification, (4.74) would come out as true since the plate on the bottom is in fact stacked on the zero or more other plates that have already been stacked. I hope that future research will help decide which of these two options are better, but I think that both are plausible. As for theories that use IAO, I see no way that they could recover from the inconsistency involving negation and comparatives, nor do I see how to implement the disjunctive participation statement associated with IAO in a non-stipulative way that makes due with just the morphemes involved in BARs.

In this section we saw how the independently motivated rules from the last section derive neo-Davidsonian logical forms that have been shown to be able to handle five out of the six FDVSs listed in the table in (4.3). I have argued that the concerns about adopting an underspecification approach are unwarranted when our task is to give a compositional semantics for reciprocals. In this section, we focused on several extra-semantic factors that should be kept as extra-semantic in analyses like the one offered here. Correlatively, as we saw in §4.2, there are certain properties of meaning concerning sentences

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that involve plurals in general, specifically the strength imposed by stative verbs and the possibility of outlier participants, which should be accounted for by a larger theory of plurality of which reciprocity is a part. In other words, we should not attribute special properties to reciprocal expressions to handle these problems, but a theory of plural expressions should be developed so that it accounts for these issues in both reciprocal and non-reciprocal sentences. As for the sixth FDVS, Inclusive Alternative Ordering, we saw that allowing this as a possible reading for reciprocal sentences causes problems when considering reciprocals in negative and comparative sentences. If we eliminate Inclusive Alternative Ordering as a possible reading, then the only problems to be overcome are the edge cases. So, if we find a way to account for edge cases, and I provided two possible ways above, the account offered here is underspecified *enough* to account for the full range of polysemy, barring extra-semantic restrictions on speaker meaning.

4.6   Beyond elementary reciprocal sentences

I now turn to how the interpretation strategy for BARs presented here can be applied to a wide range of their syntactic distribution. The literature on reciprocals has offered little discussion of cases that are not elementary reciprocal sentences, and almost no discussion of reciprocals that appear within noun phrases. I will show that the present approach can be modified in a simple way that can account for nominal reciprocals with the same mechanism that accounts for clausal reciprocals. If this approach is right, the modification will offer new insights into the nature of Taylor-Schein Distributivity.

We have already seen how BARs are interpreted when they are in elementary reciprocal sentences, where the presence or absence of a preposition makes little difference. In what follows, we will first examine more complex cases of clausal reciprocals, in particular ditransitive constructions, and then turn to cases of reciprocals that appear inside of noun phrases[21].

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[21]It is worth pointing out that while this approach shares some similarities with Schein's (2003) take on

4.6.1 BARs as indirect objects

Consider the sentence in (4.82), which is ambiguous between a reading where the gnomes put hats on each other's heads, and a reading where the gnomes stacked hats on top of other hats. These are the cases that languages like Serbo-Croatian and Ukrainian, with rich case morphology on BARs, disambiguate by varying the case of the Distributor.

(4.82) The gnomes put the hats on one another

The ambiguity is relatively straightforward to capture under the present approach. We can attribute each reading to the reciprocal having a different antecedent, as evidenced by the Case facts from §4.3. For us, this means two things: having different potential binders for the pronoun in the partitive restrictor that the Distributor and Differentiator share, and also having different potential sources for the Distributor to get a thematic role from. In the case where the subject is the antecedent, the Distributor will have the AGENT role, and the BAR will provide information about how parts of what *the gnomes* picks out interact with one another. This reading is shown by the logical form below.

(4.83) $\exists E[\text{AGENT}(E', \oplus\text{GNOME}) \& \text{PUT}(E) \& \text{THEME}(E, \oplus\text{HAT}) \& \forall x \leq$
$\oplus\text{GNOME}[\exists E' \leq E[\text{AGENT}(E', x) \& \exists Y \leq$
$\oplus\text{GNOME}[\text{OTHER}(Y, x) \& \text{ON}(E', Y)]]]]$

When the direct object is the antecedent, the Distributor will have the THEME role, and the partitive restrictors will be valued by *the hats*. The logical form for this reading is shown in (4.84).

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reciprocals, it differs in important ways. The logical forms used here and in his work on reciprocals have some differences, but I think the crucial difference lies in how we treat the syntax of BARs. For him, the BAR represents a sort of reduced adverbial clause. For example, the sentence *they hit each other* for him would involve the matrix clause *they hit*, onto which is adjoined the reduced adverbial clause *each...other*. While he is not explicit about the exact syntax of such adverbial clauses, I believe that what he has in mind is a sort of gapping construction. This works well for elementary reciprocal sentences, but it is not clear how to extend this analysis beyond these simple cases. Cases like *they met each other's parents* and *they read books about each other* present clear problems for such an approach.

(4.84) $\exists E[\text{AGENT}(E', \oplus\text{GNOME}) \,\&\, \text{PUT}(E) \,\&\, \text{THEME}(E, \oplus\text{HAT}) \,\&$

$\forall x \leq \oplus\text{HAT}[\exists E' \leq E[\text{THEME}(E', x) \,\&\, \exists Y \leq \oplus\text{HAT}[\text{OTHER}(Y, x) \,\&\text{ON}(E', Y)]]]]]$

For these cases, it is just a matter of determining the reciprocal's antecedent. Once that is done, the rest falls out as in the simpler cases we saw earlier[22]. Notice that the analysis of this ambiguity is parallel to the analysis of ambiguous binominal *each* ditransitives, such as (3.55) from Chapter 3.

4.6.1.1 The Williams paradigm

The present approach also allows us to explain the following contrast noticed by Williams (1991), mentioned in §4.2.3.

(4.85)   a. The doctors gave each other new noses

      b. #The doctors gave each patient new noses

To explain this contrast requires us to assume the standard approach to the structure of double-object constructions discussed in Chapter 2, where the indirect object DP c-commands the direct object DP. We have formulated Taylor-Schein Distributivity in a way that the c-command domain of the distributivity operator corresponds to the sub-event portion of logical form. Non-reciprocal double object sentences like (4.85b) have the distributive DP as the indirect object, and so given the standard syntax just mentioned, this means that this DP will c-command the direct object, and the interpretation of such direct objects will include sub-event variables in their thematic conjuncts[23]. Below is the logical form for the non-reciprocal sentence (4.85b), derived with our rules from the last section.

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[22]As far as I can tell, this is the first time this ambiguity has been addressed.

[23]The sentences used in Schein's argument for thematic separation (see Chapter 2) have a numeral DP as the direct object, and the argument requires the narrow-scope reading where such DPs are interpreted within the scope of the distributive indirect object. In (4.85b), the direct object is a bare plural, which have been known since Carlson (1977) to only have narrow-scope readings, so unlike the corresponding sentences with numeral direct object DPs, we do not have to control for wide-scope readings.

(4.86) $\exists E[\text{AGENT}(E, \oplus\text{DOCTOR}) \ \& \ \text{GIVE}(E) \ \& \ \forall x \leq \oplus\text{PATIENT}[\exists E' \leq$

   $E[\text{GOAL}(E', x) \ \& \ \text{THEME}(E', \text{new noses})]]]$

The sub-event portion of this logical form says that for each patient, that patient had sub-events E' where he/she is the goal, and where he/she received new noses. Although we have left out discussion about the semantic contribution of the plural morpheme, in this case it appears to cause the values of the *new noses* above to be two or more in number[24]. As such, the themes of the sub-events above will be more than two in number, and the infelicity arises because we do not normally think of each rhinoplasty patient as receiving any more than one new nose.

On the other hand, the Distributor in the BAR sentence (4.85a) will only c-command the Differentiator DP, given the syntactic decomposition proposed for BARs. As such, the sub-event section of logical form will include the interpretation of the Differentiator, but *not* the direct object DP. So the logical form of (4.85a) will be as follows, where the thematic conjunct associated with *new noses* will include the main-event variable E, and not the sub-event variable E', in contrast to the logical form of (4.85b).

(4.87) $\exists E[\text{AGENT}(E, \oplus\text{DOCTOR}) \ \& \ \text{GIVE}(E) \ \& \ \forall x \leq \oplus\text{DOCTOR}[\exists E' \leq$

   $E[\text{AGENT}(E', x) \ \& \ \exists Y \leq$

   $\oplus\text{DOCTOR}[\text{OTHER}(Y, x) \ \& \ \text{GOAL}(E', Y)]]] \ \& \ \text{THEME}(E, \text{new noses})]$

This logical form is weaker than the previous one in the sense that we know that new noses are involved, but nothing is said about how they are related to each individual patient (in the case of (4.85a), the doctors are also patients). This is similar to dependent plural constructions such as *unicycles have wheels*, where we know that unicycles and wheels are involved, but nothing tells us how to apportion wheels to unicycles, and the sentence

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[24]The multiplicity aspect of bare plural meaning has been argued by Zweig (2008) to be an implicature, and as such, it should be cancelable. I agree with this treatment for most cases, as sentences with bare plurals in downward-entailing contexts seem to have the "one-or-more" interpretation: one can answer yes to *Do you have children* if one only has a single child. However, making a question out of (4.85b) still seems to require each patient receiving two or more new noses: *Did each patient get new noses*.

still sounds felicitous even though we know that each unicycle only has one wheel; see Zweig (2008) for a neo-Davidsonian treatment of dependent plurals.

This paradigm is similar to the contrast observed between floating and binominal *each* ditransitives in §3.3.2 in the previous chapter. Like the floating examples, (4.85b) has a wider scope domain for *each* that contains more arguments than their counterparts, thus more thematic conjuncts in logical form. The reciprocal example is on par with the binominal *each* sentences: the scope domain of *each* is just the host nominal to which it is attached, so other nominals will not be interpreted as being bound by the sub-event quantifier, but rather the clause level event quantifier.

Williams' contrast is accounted for by this theory by positing a syntactic difference between the pair of sentences, already motivated from distance distributivity phenomena in Chapter 3. Both sentences involve distributive elements, but only in the non-reciprocal sentence is the direct object in the scope of the distributivity operator, thus, only in this sentence is a plurality of noses apportioned to each patient given our approach to distributive sub-event apportionment. In the reciprocal sentence, we are only told that new noses are themes in events of giving, events that have doctors being both agents and goals, but we are not told how many noses each doctor received, just as we are not told how many wheels each unicycle has in the dependent plural sentence above.

Examples similar to Williams's paradigm can also be accounted for by this approach. Consider cases where instead of a bare plural direct object, there is a singular indefinite.

(4.88)   a. The doctors gave each other a new car

          b. The doctors gave each patient a new car

Recall the Principle of Covarying Indefinites from Chapter 3; the observation that a covariance interpretation of singular indefinites is only permitted when they are within the scope of a distributivity operator. It follows then, given our assumptions about the syntax

and semantics of ditransitives, that (4.88a) allows only the interpretation where there is a single new car that is being passed back and forth among the doctors, while (4.88b) allows a covariance interpretation.

4.6.1.2 Nominal BARs with nominal antecedents

We will now turn to nominal reciprocals, such as (4.89).

(4.89) John read the professors' reviews about each other

In (4.89), *the professors* acts as the reciprocal antecedent, and as such we would expect this DP to bind the partitive restrictor, and pass its thematic role to the Distributor. I will assume that the relevant thematic role is the possessor role POSS, which corresponds to the POSS(X, Y) relation in logical form; see Chapter 2. The account requires some revisions though, as we run into a problem when we use Taylor-Schein Distributivity to interpret the Distributor in cases like (4.89). So far, this rule adds sub-events to logical form, and the individuals picked out by Distributor were taken to be participants in these sub-events. But in those cases, the Distributor was associated with eventive thematic roles of the form $\Theta(E, X)$. In (4.89), the Distributor is associated with a non-eventive thematic role, which means that while we are able to talk about sub-events with Taylor-Schein Distributivity, we do not have a way of saying how the professors participated in those events.

To fix this problem, I propose a modification of Taylor-Schein Distributivity whereby it introduces a *sub-entity* existential quantifier, which I intend to be a generalization of sub-event quantification. Depending on the syntactic configuration that the distributive DP finds itself, it will either introduce an existential quantifier that ranges over the domain of events $\mathcal{E}$, or an existential quantifier that ranges over the domain of entities $\mathcal{D}$. In the cases of clausal reciprocals, which include elementary reciprocal sentences and the ditransitive sentences we were considering, then the quantifier will range over $\mathcal{E}$, which is just the version of Taylor-Schein Distributivity we have been assuming so far. However, in cases of nominal reciprocals, where reciprocals appear inside of noun phrases, the

sub-entity quantifier will range over the domain of individuals, $\mathcal{D}$, and not the domain of events $\mathcal{E}$.

This generalization can be implemented as follows. Recall that the final argument of the Taylor-Schein proposed definition of D, repeated below, is an event argument.

(4.90) $[\![D]\!] = \lambda X_e.\lambda \Theta_{\langle e, \langle v, t \rangle \rangle}.\lambda P_{\langle v, t \rangle}.\lambda E_v.\forall x \le X[\exists E' \le E[\Theta(E', x)\ \&\ P(E')]]$

This has the effect of turning D with all its other arguments (whether or not Θ is an adpositional argument or given as a Θ-feature on D) into a monadic predicate of events that can be conjoined with other $\langle v, t \rangle$ nodes. Crucially, an event value is never given to these $\langle v, t \rangle$ constituents, but instead the corresponding event variable is closed by an existential quantifier. A parallel state of affairs holds in the nominal domain, where $\langle e, t \rangle$ predicates are conjoined, and eventually closed by either $\exists_X$ or ι; see §2.2.4.

My proposal is that the final argument to D is underspecified, or polymorphic, in the sense that it can compose with either predicates of events or predicates of individuals. In other words, D is able to be conjoined with a $\langle v, t \rangle$ when it appears clausally or $\langle e, t \rangle$ when it appears internal to nominals. When the former is chosen, the logical form corresponding to D will mention sub-*events*, and when the latter is chosen the local form will mention sub-*entities* – subparts of a plurality of individuals.

There is of course the issue of deciding which type of monadic predicate D composes with in particular cases. When the closure operator is introduced either at the root of the clause or the nominal, this polymorphic variable can be resolved to appropriately range over events or entities. Alternatively, this value can be decided by whether the scope argument of D is of $\langle v, t \rangle$ or $\langle e, t \rangle$; whatever type the scope is will be the type of the composition of D with its scope. I thus give the final version of the D operator, where its final argument is marked as type α, which is the polymorphic variable ranging over events or entities. I also use α and α' as the polymorphic variables in the sub-event/entity domain of logical form:

(4.91) *Taylor-Schein Distributivity, polymorphic version*

$$\llbracket D \rrbracket = \lambda X_e.\lambda\Theta_{\langle e,\langle\alpha,t\rangle\rangle}.\lambda P_{\langle\alpha,t\rangle}.\lambda\alpha.\forall x \leq X[\exists\alpha' \leq \alpha[\Theta(\alpha',x) \, \& \, P(\alpha')]]$$

Let us apply this new to the problem at hand, and we will see how it derives a satisfactory representation for (4.89).

(4.92) $\exists E[\text{AGENT}(E,j) \, \& \, \text{READ}(E) \, \& \, \exists Y[\text{POSS}(Y,\oplus\text{PROF}) \, \& \, \text{REVIEW}(Y) \, \& \, \forall x \leq$

$\oplus\text{PROF}[\exists Y' \leq Y[\text{POSS}(Y',x) \, \& \, \exists Z \leq \oplus\text{PROF}[\text{OTHER}(Z,x) \, \& \, \text{ABOUT}(Y',Z)]]]]]$

The BAR's contribution to logical form can be paraphrased as such: for each professor, x, there are some "sub"-reviews Y' that x is $Poss$-related to, such that those reviews Y' are about some professor(s) Z other than x. Notice that instead of sub-events E', there are sub-entities Y' which are one or more reviews associated with each professor. These truth conditions capture the fact that (4.89) can be used regardless of whether each professor possessed one or several reviews (number-neutrality of Y') and whether those reviews are about one or several other professors (number-neutrality of Z).

The polymorphic rendition of Taylor-Schein D allows for the semantics to remain the same internal to D, but the types of its arguments are determined by whether the reciprocal appears clausally or nominally. This type adjustment is not like other type-shifting rules, which add or shuffle the arguments values of some expression. Instead, the proposal is a sort of bleaching of types; a single rule that can be used for eventive arguments or entity arguments.

As an alternative theory, instead of an underspecified/polymorphic D one may posit two items for this issue D_E and D_X depending again on whether it appears clausally or nominally. (4.90) represents D_E, the D operator used outside of nominals which has been discussed since Chapter 2. (4.93) below defines D_X, the D operator used within nominals. The sole difference is that wherever a v is used in D_E, e is used in D_X.

(4.93) $\llbracket D_X \rrbracket = \lambda X_e.\lambda\Theta_{\langle e,\langle e,t\rangle\rangle}.\lambda P_{\langle e,t\rangle}.\lambda Y_e.\forall x \leq X[\exists Y' \leq Y[\Theta(Y',x) \, \& \, P(Y')]]$

In sum, the proposal is that there are two varieties of distributivity, clausal distributivity and nominal distributivity. Clausal distributivity involves apportionment of sub-events to the individuals quantified over, while nominal distributivity involves apportionment of sub-individuals to the individuals quantified over. In each case, the D operator still performs the same core operations with its arguments as it had since Chapter 2, but now it allows some flexibility with regards to the basic types, events and individuals. In the case of events, we have clausal distributivity, and thus the thematic role associated with D relates individuals to events, the scope of D is a predicate of events, and D with all its arguments (save the last one which is always existentially closed) is itself a monadic predicate of events. In the case of individuals, we have nominal distributivity, and so the thematic role associated with D relates individuals to individuals, the scope of D here is a predicate of individuals, and D with all its arguments is a monadic predicate of individuals.

4.6.1.3   Possessor BARs

I now turn to BARs that appear in possessor position. It might come as a surprise that I will not be treating these as as a case of nominal reciprocals, but we will see why soon enough. To interpret these in a way that captures their meaning correctly, we have to assume that the syntax of a possessor DP like the one in (4.94) is as in (4.95)[25].

(4.94) The newlyweds met each other's parents

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[25]Note that we already saw reasons to believe that the Distributor and Differentiator need not form a constituent to the exclusion of all other items; recall the presence of articles and prepositions from §4.3.

(4.95)

DP$_i$
DP$_j$ ... DP$_i$
...each...
DP$_k$ D'$_i$
...other... D$_i$ CompD
's
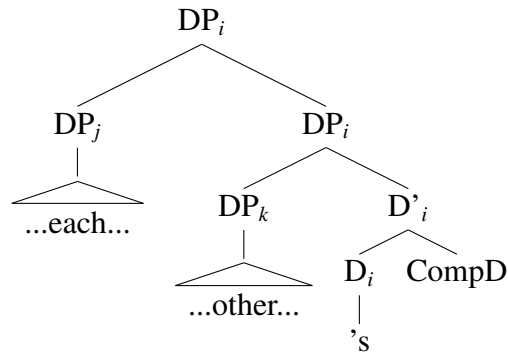
This syntax might strike some as strange, as one might expect both the Distributor and Differentiator to be in SpecDP. The syntax that places both in SpecDP is compatible with the present approach, and it would look like the other cases of BARs that we have been considering thus far, where the Distributor is adjoined to the Differentiator DP. This possible tree is shown in (4.96).

(4.96)

DP$_i$
DP$_k$ D'$_i$
DP$_j$ DP$_k$ D$_i$ CompD
...each... ...other... 's
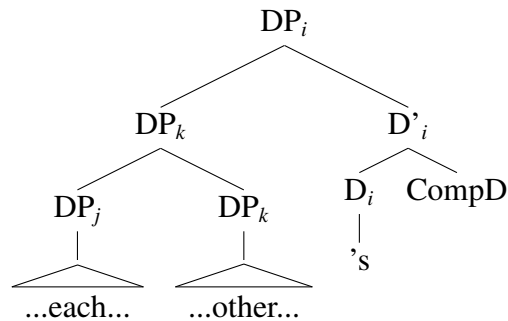
The reason why (4.96) is not the structure that I will assume is that it will derive a logical form that does not suffice to represent the meaning of possessor reciprocal sentences. The problem is similar to the one that lead us to the revised version of Taylor-Schein Distributivity: it creates a logical form where the sub-entity quantifier is quantifying over the wrong types of things. In both cases, since the BAR is anteceded by the clausal subject, the Distributor will have the AGENT role. In (4.96), for the Distributor within the nominal we should be using the nominal variety of D, not the event version. Thus when we use the revised Taylor-Schein Distributivity rule, the sub-α quantifier will range over entities, not events, which is the wrong type for a Distributor with the AGENT role. However, in (4.95), the Distributor is adjoined outside of the nominal, meaning that the event version of D will be used. This is because the Distributor attaches to the entire

DP/PP containing *other*, and this DP/PP is a type $\langle v, t \rangle$ expression.[26] So, assuming this structure, the logical form of (4.94) would be (4.97), which correctly captures the meaning of the sentence.

(4.97) $\exists E[\text{AGENT}(E, \oplus\text{NEWLYWED}) \ \& \ \text{MEET}(E) \ \& \ \forall x \leq \oplus\text{NEWLYWED}[\exists E' \leq$
$E[\text{AGENT}(E', x) \ \& \ \exists Y[\text{PARENT}(Y) \ \& \ \text{THEME}(E', Y) \& \ \exists Z \leq$
$\oplus\text{NEWLYWED}[\text{OTHER}(Z, x) \ \& \ \text{POSS}(Y, Z)]]]]]$

Note that the syntax that I am claiming is necessary for possessor reciprocals is compatible with the distance distributivity analysis of reciprocals. While in many cases the Distributor attaches directly to Differentiator DP, it is entirely possible for it to be adjoined to something that *properly contains* the Differentiator DP, as I have already suggested is the case for BARs with intervening prepositions in some languages.

4.6.1.4   BARs in *picture*-NPs

The last type of construction we will be looking at involves nominal reciprocals that have clausal antecedents; i.e., antecedents that appear outside of the nominal as in (4.98).

(4.98) The artists drew pictures of each other

These cases pose a minor problem for the present approach, though there are two plausible ways to fix this. But first, let us consider what the problem is. As one might have expected, it lies in the value-types of the relevant constituents, in this case, the Distributor. The Distributor in (4.98) appears within a nominal, so our generalized Taylor-Schein Distributivity rule would produce sub-entity quantification over individuals, not events, in logical form. However, the reciprocal antecedent has the clausal AGENT role, and given our assumptions that the Distributor gets its thematic role from the reciprocal antecedent,

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[26]The choice among DP or PP depends on which approach to total separation discussed in Chapter 2 is being used: the Theta Feature approach would have the Distributor adjoining to a DP, while the adpositional approach would have the Distributor adjoining to a PP.

then the Distributor also has the AGENT role. This means that we are placing conflicting demands on the logical form conjunct associated with the Distributor's thematic role; on the one hand, this conjunct should have an event variable in it because the Distributor has an eventive thematic role, on the other hand, the revised Taylor-Schein Distributivity tells us that this conjunct should have an individual variable, and not an event variable, since the Distributor appears inside a noun phrase.

There are two ways around this impasse. The first is to take the Chomsky (1986) analysis of picture-NPs, which says that there is a covert pronoun in the SpecDP position. For the present approach, this pronoun would have to be bound by the reciprocal antecedent. The benefit of this approach is that it treats (4.98) on par with how we treated sentences like (4.89), where the reciprocal antecedent is a possessor DP. Under this view, the antecedent for the BAR in (4.98) would be the covert pronoun in SpecDP, which would have the nominal role POSS instead of the clausal role AGENT. Thus, the value-type of the Distributor will match the value-type of the sub-entity quantifier. The syntax of the relevant DP in (4.98) under this approach is given in (4.99), and the corresponding logical form for this sentence is given in (4.100).

(4.99)
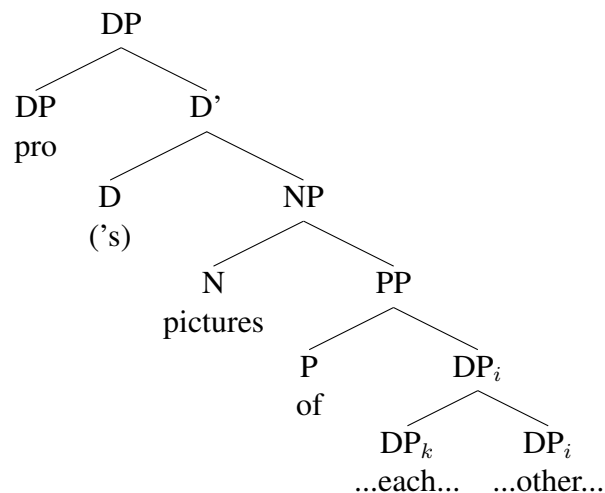
(4.100)

$$\exists E[\text{AGENT}(E, \oplus\text{ARTIST}) \,\&\, \text{READ}(E) \,\&\, \exists Y[\text{POSS}(Y, \oplus\text{ARTIST}) \,\&\, \text{PICTURE}(Y) \,\&\, \forall x \leq$$

$$\oplus\text{ARTIST}[\exists Y' \leq Y[\text{POSS}(Y', x) \,\&\, \exists Z \leq \oplus\text{ARTIST}[\text{OTHER}(Z, x) \,\&\, \text{OF}(Y', Z)]]]]]$$

Another way around the issue, brought to my attention by Paul Pietroski (p.c.), is to posit a short quantifier movement of the Distributor so that it adjoins to the picture-DP, as shown in (4.101).

(4.101)
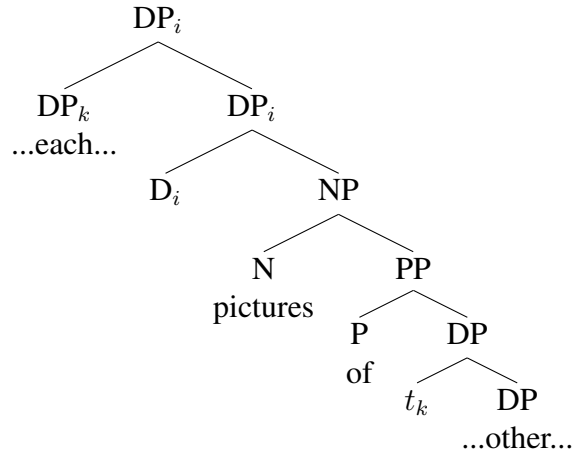
Under this approach, we can view the Distributor as taking the overt subject DP as its antecedent, which would give it the AGENT role, which is fine now since it appears outside of the nominal. This means that the sub-α quantification will be over events, which matches the role of the Distributor. While the other option made both Distributor role and sub-$alpha$ quantification associated with individuals, this option makes both associated with events. The logical form for (4.98) under this quantifier movement approach is given in (4.102).

(4.102) $\exists E[\text{AGENT}(E, \oplus\text{ARTIST}) \ \& \ \text{DRAW}(E) \ \& \ \forall x \leq \oplus\text{ARTIST}[\exists E' \leq$
$E[\text{AGENT}(E', x) \ \& \ \exists Y[\text{PICTURE}(Y) \ \& \ \text{THEME}(E', Y) \& \ \exists Z \leq$
$\oplus\text{ARTIST}[\text{OTHER}(Z, x) \ \& \ \text{OF}(Y, Z)]]]]]]$

To recapitulate, in this subsection we have proposed a generalized version of the Taylor-Schein approach to distributive quantifiers. The result is a single rule of interpretation that can be used for the Distributor of BARs, regardless if its appears clausally or nominally. This allows us to give an elegant semantics for all occurrences of BARs, and as far as I know, this is the first analysis that tries to accomplish such a task.

Notice that the approach offered here is only possible once we assume total thematic separation. We need to be able to manipulate variables in thematic conjuncts without affecting the variable in monadic verbal conjuncts. Moreover, approaches that advocate polyadic quantifiers require a verb as one of the reciprocal's arguments. While this might work for some cases of clausal reciprocals, it fails when considering noun phrase internal reciprocals. These considerations provide further support to the neo-Davidsonian who wishes to eliminate the idea of verbs being interpreted as relational predicates.

4.7   Chapter summary

In this chapter I presented another application of the Taylor-Schein approach to distributivity. I have argued that BARs are a sort of distance distributivity construction, where the Distributor component of the reciprocal is treated in exactly the same way as the distance D operator in the previous chapter. Like binominal *each*, the Distributor of BARs has a very limited scope domain, in most cases just scoping over the Differentiator. Also like binominal *each* and distance *each* in general, the antecedent nominal provides the appropriate plural value and thematic role needed to compute suitable truth conditions.

I have argued that BARs should be decomposed into two components, preferably the same *each* and *other* used outside of reciprocal constructions. This should be the null-hypothesis for the semantics of BARs. Previous approaches have advocated a primitive analysis in terms of polyadic quantification, but I have argued that such accounts are both conceptually and empirically untenable.

The truth conditions derived for reciprocal sentences in this approach are relatively weak. This approach is in essence a revival of Langendoen's proposal that reciprocal sentences uniformly have weak semantic meanings. Making this claim required some discussion and ancillary claims about how extra-semantic aspects of meaning factor into judgment of truth for reciprocal sentences, but I believe these are empirically well grounded.

Finally, the approach developed here can account for a much larger range of the

syntactic distribution of BARs than what has been addressed in previous analyses. This was made possible by the total seperationist neo-Davidsonian assumptions I have adopted together with the Taylor-Schein D operator.

Chapter 5:   Plural Reflexives

5.1   Introduction

In this chapter I extend the general neo-Davidsonian framework offered previously to give a semantics for plural reflexive anaphors. The discussion will focus on what I will call *essentially distributive plural reflexives*; a common type of reflexive found among the worlds languages that exhibits a certain type of distributive interpretation. I will introduce the core properties of such reflexives in the next section; §5.2. I will show that some languages have two types of reflexives: one that is essentially distributive, and one that is not; this latter type I will refer to as *cumulative reflexives*. We will see that essentially distributive reflexives are typically morphologically complex when compared to the cumulative ones, and each type is associated with certain semantic properties.

For the essentially distributive reflexives, I offer an analysis that fits within the neo-Davidsonian framework pursued here. I will treat reflexives as another sort of distance distributivity construction, on par with the phenomena discussed in the previous two chapters. Although these anaphors do not wear their distributivity on their sleeves like reciprocals do, I believe positing a covert distributivity operator in the right position explains the core facts of essentially distributive plural reflexives. What sets this analysis apart from others, such as Cable (2014), is the proposal that the distributivity operator composes directly with a nominal host, like binominal *each* and the Distributor in BARs.

5.2 Essentially distributive plural reflexives

Previous work on English reflexives has shown that the range of interpretations available to them are restricted in a certain way. I call this property the essential distributivity of plural reflexives, and it can be demonstrated by the following entailment relation.

(5.1) The essential distributivity of plural reflexives

They$_i$ V themselves $\Rightarrow$ Each of them$_i$ V itself

Consider for example the sentence (5.2) with a plural reflexive. This sentence seems to report that Brutus and Caesar engaged in self-kicking.

(5.2) Brutus and Caesar kicked themselves

It may also be true that Brutus and Caesar engaged in reciprocal kicking in addition to self-kicking, but it for (5.2) to be true, self-kicking would have to take place, regardless if any other kicking happens.

In a recent typological study, Heine and Miyashita (2008)) report that 61% of the languages they surveyed have plural reflexives that are essentially distributive. Other varieties of plural reflexives exist that do not exhibit this property; these are what I will call cumulative reflexives, which I will describe in detail shortly.

The existence of two types of plural reflexives with different meaning properties raises the question of whether these items should be grouped into a natural class. Although I will not explore all the relevant issues here, it seems that the expression "reflexive" may be a misnomer; in part because some reflexives do not need to express reflexivity at all in a particular sentence for that sentence to be true (such as the *se* clitic in Romance and Slavic). Furthermore, what a linguist might label as a reflexive anaphor in one language may differ in its licensing domain (see Büring (2005) on this) and other subtle

differences in meaning (i.e., the logophoric behavior of so-called long-distance reflex-
ives in languages like Icelandic (Thráinson (2007)) and Chinese (Anand (2006)), among
others).

Regardless of how a comprehensive taxonomy of reflexives works out, we can still
focus on language specific forms that share certain properties. For example, English
essentially distributive reflexives must be locally bound and appear in the position of
other nominal expressions (though see below for qualifications). There are several other
Indo-European languages that have reflexives that behave this way.

I am putting aside cases of sentences that have what looks like reflexives but are
used in a non-reflexive way. For example, English has certain adverbial uses of forms like
himself that are used to indicate a sort of exclusivity.

(5.3) My kid went to the bathroom himself

(5.4) I built this boat myself

One may felicitously utter (5.3) if his child were potty-training and finally acquired the
necessary skills where he can use the toilet alone. Likewise, (5.4) can be used if I wanted
to express that I built the boat with no help from others. Other adverbial uses of apparent
anaphors can be used as intensifiers, often appearing string adjacent to the noun phrase
that they are intensifying.

(5.5) Chomsky himself doesn't believe in Deep Structure anymore

These uses share the property that they appear in what seems to be adverbial positions.
While these may share some common properties with canonical reflexives, I do not ex-
plore this here. I will keep the focus in this chapter on reflexives that appear in argument
positions.

I also put aside long-distance uses of reflexives. Although this phenomenon does
not exist in English, some languages have a use of reflexives that can be used as a sort

of logophoric expression. These forms often correspond to the cumulative variety of reflexives in language.

Below I will provide two diagnostics tests for recognizing essentially distributive reflexives. They are essentially Truth Value Judgment tests, where one judges a reflexive sentence assuming some information which is provided previously. These background situations are such that the conclusion in (5.1) does not hold for these situations. As will be shown, test sentences with English reflexives and other essentially distributive reflexives from other languages are judged false in these situations. On the other hand, when cumulative reflexives are used instead, speakers often judge the sentence true in these situations. Before moving on to these tests, I will give a very brief overview on the morphology of essentially distributive and cumulative reflexives in some Indo-European languages.

5.2.1   The long and short of plural reflexives

Several European languages have two types of morphemes to express reflexivity; in this section, I will examine Dutch, French, German, and Serbo-Croatian. I will label these "short form" and "long form" reflexives. Very often, the long form reflexives seem to be composed of the short form plus some additional morpheme.

(5.6) Long and short form reflexives

	SHORT FORM	LONG FORM
FRENCH	se	se...eux-mêmes
GERMAN	sich	sich selbst
SERBO-CROATIAN	se	sebe

With the exception of French, the forms in these languages do not inflect for ϕ-features (importantly, not number morphology). French long form reflexives always have the clitic *se* together with an inflecting anaphor that appears in argument positions; I thus refer to this long-form construction as *se...eux-mêmes*.

These languages fall into two classes regarding the syntactic distribution of their reflexives. For Dutch and German, both the short and long form reflexives appear in argument positions. For French and Serbo-Croatian, only the long form reflexives appear in argument positions, while the short forms appear in the appropriate clitic position in that language.

I now turn to the meaning differences between these two forms. It is well-known that short-form reflexives are in some ways less restrictive than long forms, see Cable (2014) and references within. When anteceded by a plural nominal, short-form reflexives fall under what I have been calling cumulative reflexives, while long forms typically bear the marks of essentially distributivity. In what follows, even though many languages do not show number morphology on the reflexive anaphor, I will use the expression "plural reflexive" to refer to reflexives that have a plural antecedent.

5.2.2   Purely reciprocal situations

A purely reciprocal situation would be one where each atomic individual did not perform the relevant action on him/herself, but only on another. For example, suppose Brutus kicked Caesar, and Caesar kicked Brutus, and neither kicked himself. The following English sentence is reported to be false in such a situation.

(5.7) Brutus and Caesar kicked themselves

Furthermore, long-form reflexives in other languages are also judged false in this purely reciprocal situation.

(5.8) French:

Brutus et César se sont donnés des coups de pied a eux-mêmes

(5.9) German:

Brutus und Caesar haben sich selbst getreten.
Brutus and Caesar have SICH self kick
'Brutus and Caesar have kicked themselves'

(5.10) Serbo-Croatian:

Brut i Cezar su šutali sebe.
Brutus and Caesar AUX kicked self
'Brutus and Caesar kicked themselves.'

One the other hand, the short-forms in these three language can be used to describe the purely reciprocal situation.

(5.11) French:

Brutus et César se sont donnés des coups de pied

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(5.12) German:

> *Brutus und Caesar haben sich getreten*
> Brutus and Caesar have SICH kick
> 'Brutus and Caesar have kicked themselves/each other'

(5.13) Serbo-Croatian:

> *Brut i Cezar su se šutali.*
> Brutus and Caesar AUX SE kicked
> 'Brutus and Caesar kicked themselves/each other'

The insistence on "purely" reciprocal situations is enforced since there can be a situation where each of Brutus and Caesar kicked the other *and* himself. As expected, long-form reflexives can be used truthfully to describe this situation since the inference in (5.1) holds, it is just that each is not exclusively kicking himself.

On a similar point, Murray (2008) and Cable (2014) bring up example situations with mixed amount of reflexive and reciprocal action. For example, imagine half the senators performed only self-kicking, and the other half performed only other-kicking. For such situations, the short-form reflexive sentence (5.14a) can be used truthfully, yet still the long-form sentence (5.14b) is false. I provide an example from Serbo-Croatian to illustrate this point.

(5.14) a. *Senatori su se šutali.*
   senators AUX SE kicked
   'The senators kicked themselves.'

   b. *Senatori su šutali sebe.*
   senators AUX kicked self
   'The senators kicked themselves.'

This shows the motivation behind the universal force in (5.1): it does not suffice for just some individuals in the plurality to be self-kickers, *each* individual must be a self-kicker.

5.2.3 Purely collective situations

A purely collective situation here is one where, for some antecedent value A and verbal relation R, each atom in A stands in the R relation to A *as a plurality*, even though that that atom may not stand in the R relation to itself. Consider the case of a rock band. Each rockstar in the band hates himself. But out of this depression and self-loathing, good music is born. The band as whole makes great music, and each rockstar loves the band that he plays in. Assuming the Heim and Kratzer (1998) analysis of indexed expressions with some plural modifications (possibly even with Landman-style groups, see Chapter 2), one might expect a sentence like (5.15) to be true in this situation; see the next section, §5.3, for details on Heim and Kratzer's analysis of reflexives.

(5.15) The rockstars love themselves

(5.15) is clearly false in the situation described. Compare with a sentence that differs minimally from (5.15) in that the plural reflexive is replaced with the singular description *the band*. As expected, the latter sentence is able to express that the rockstars collectively love the band, even though each rockstar may hate himself.

(5.16) The rockstars love the band

Interestingly, the judgements about short and long form reflexives cross-linguistically are a bit murky with these examples. While no speaker finds a long-form example to be true in this situation, some also find the short-forms to be unacceptable. This is clearly a case where more data collection is called for, but the conclusion drawn here is still a useful one, especially for long form reflexives. Nonetheless, the example here can be used to show that essential distributivity is required for long-form reflexives. This fact becomes useful for cases where it seems that a group interpretation is intended, such as in the following.

(5.17) The collaborators praised themselves

One could imagine (5.17) being used to describe a situation where the praising was about the collaboration, and not at any point about any singular collaborator. In other words, each collaborator praised the collection of collaborators. One may then go on to use examples like (5.17) to argue that this is a use of reflexives that goes against the general inference pattern in (5.1). A counterargument could then take the form that even cases like (5.17) are an instance of essential distributivity: by praising a collection that contains yourself, you are still considered to be praising yourself. The counterargument becomes more convincing with the rockstar example: there, there is no question about whether the rockstar stands in the love relation to himself, it is given as a premise that each rockstar hates himself. In this way, the situation accompanying (5.15) counts as a "purely" collective situation in a way the situation accompanying (5.17) does not. One claiming that plural reflexives have a collective interpretation based on (5.17) must then provide an explanation for why that interpretation is missing in (5.15). I offer the alternative account that English-type plural reflexives are essentially distributive, even (5.17) counts as a case of this, and the rockstar example is then predicted to be false.

5.3   Heim and Kratzer (1998) on reflexives

Before giving my analysis of plural reflexive semantics, I present a well-known textbook treatment. I will show that this analysis, together with standard mereological assumptions, provides a good account of cumulative reflexives, but falls short in explaining the behavior of essentially distributive reflexives.

Heim and Kratzer (1998) treat reflexives like other indexed expressions in their system; e.g., pronouns and traces. The indexed expression receives its semantic value from an assignment function g. As a way of extending this system for plurality, assume that both atomic and sum values in the domain are indexed; for example, index $g(3)$ could have the value $b \oplus c$, the plurality consisting of Brutus and Caesar. If this is the case, the semantic value of *Brutus and Caesar loved themselves* could be given as (5.18) in Heim

and Kratzer's system. Recall that Heim and Kratzer use a non-Davidsonian approach to argumenthood, hence the lack of event variable and thematic roles below.

(5.18) $[\![[\text{Brutus and Caesar}]_3 \text{ love themselves}_3]\!]^g = \text{LOVE}(b \oplus c, b \oplus c)$

Applying another standard assumption, let us take it that the relation LOVE in (5.18) is cumulative. As such, there are several types of models that could satisfy the truth conditions in (5.18): (i) a model M_1 where $\text{LOVE}(b, b)$ and $\text{LOVE}(c, c)$, (ii) a model M_2 where $\text{LOVE}(b, c)$ and $\text{LOVE}(c, b)$, and (iii) a model M_3 where $\text{LOVE}(c, b \oplus b)$ and $\text{LOVE}(c, b \oplus c)$. Of course there can be models where the more than one of these states of affairs can hold at once, but the important point here is that the denotation of LOVE in the basic three models mentioned above will make (5.18) true under the assumption that LOVE is closed under sum formation.

In prose, M_1 corresponds to the situation where Brutus loves Brutus, Caesar loves Caesar, and no other loving is taking place; call this a reflexive situation. M_2 corresponds to the situation where Brutus loves Caesar, Caesar loves Brutus, and no other loving is taking place; call this a reciprocal situation. Finally, M_3 corresponds to the situation where Brutus loves the plurality containing him and Caesar, and Caesar loves the plurality containing him and Brutus; call this a collective situation[1].

Coupling a standard approach to the semantics of reflexives together with a standard assumption about nominal denotation in mereological approaches to plurality, we predict that the English sentence in (5.18) should be true in any of the three situations mentioned above. As I have shown in the previous two sub-sections, these predictions are not borne out for English type reflexives, and arguably the long-form reflexives in languages that make the long/short distinction. Sentences with these forms can only be true relative to reflexive models like M_1, and not (purely) reciprocal or collective models. On the other

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[1]Depending on the details in whatever system of plurality one is using, further qualifications on the model might be needed for characterizing the collective situation. For example, in Landman's system with Groups (Landman (1989a)), Landman (1989b), Landman (2000)) the relevant collective interpretation would be given with the $\uparrow$ operator: $\text{LOVE}(b, \uparrow (b \oplus c))$ and $\text{LOVE}(c, \uparrow (b \oplus c))$

hand, short-form variants of the sentence in (5.18) have been argued to allow truth in all three situations. Indeed, one way of analyzing this is that short form reflexives are the sort of indexed elements that Heim and Kratzer are addressing. Their ability to be used to describe the range of situations mentioned above is attributed to the closure of the verbal predicate under sum-formation. In other words, the sentence in (5.18) should have the same range of meanings as other transitive sentences with two plural argument nominals; see Chapter 2. It is for this reason that I call such reflexives "cumulative": they are consistent with the same range of models that would make non-reflexive cumulative sentences true.

The question now is, why are long-form reflexives different? There has to be something beyond the standard structures assumed by Heim and Kratzer that accounts for their essentially distributive nature. I will now turn to an analysis of long-form reflexives that accounts for their essential distributivity, applying the Taylor-Schein approach yet again.

5.4   A Taylor-Schein analysis of long-form reflexives

One way of accounting for the semantic properties of plural reflexives is to treat them as another sort of distance distributivity construction. My proposal for this is to posit a silent distributivity operator that attaches to the argument nominal in the position where the plural reflexive resides. While reciprocals were proposed to involve an element like binominal *each* attaching to a Differentiator host, the proposal here is parallel, where instead of the host *each* composing with an *other* morpheme, it composes with a *self* morpheme.

(5.19) Proposed syntactic decomposition of plural reflexives
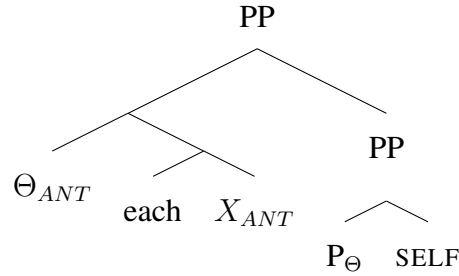
In Chapter 4, an almost identical decomposition is given for reciprocals in (4.58). Again, the only difference between the two LFs is the host nominal of distributivity operator: for reciprocals, the host is [...*other*...], and for reflexives the host is [...*self*...]. There is also the difference that for reflexives, at least in English type languages, the distributivity operator is always covert, while this is not the case with reciprocals. I will return to this issue shortly.

The LF of the sentence (5.7) given the proposed decomposition of reflexives is represented as follows.

(5.20)   a. Brutus and Caesar kicked themselves

          b. [Brutus and Caesar]$_i$ kicked [each X$_i$ [SELF]]

I will treat the semantic contribution of the abstract SELF morpheme as a variable bound by *each*. As such, the truth conditions for (5.7) given the proposed syntactic decomposition of reflexives together with the proposals from previous chapters are as follows[2].

(5.21) $\exists E[\text{AGENT}(E, b \oplus c) \ \& \ \text{KICK}(E) \ \& \ \forall x \leq b \oplus c[\exists E' \leq$
$E[\text{AGENT}(E', x) \ \& \ \text{THEME}(E', x)]]]$

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[2]Note that this treatment is sufficient for singular reflexive constructions as well. The distributivity operator quantifies over all x that are *part-of* the antecedent value. Because the part-of relation is reflexive (for all $a, a \leq a$), the antecedent value can be singular and the truth conditions will be appropriate for singular cases.

In prose, this says that there are events of kicking E with Brutus and Caesar as agents, and for each of Brutus and Caesar, there are sub-events of E where he is both the agent and the theme of those sub-events.

Cable (2014) offers a similar proposal for essentially distributive reflexives, where he argues for a VP adjoined D operator. For him, this operator is only licensed under certain conditions involving focus. I will not address the focus issues here; indeed, it may be the case that the D operator I propose here, though it differs in syntactic position from Cable's D operator in reflexive construction, might be licensed by the same sort of focus considerations. This would account for the alleged ability of English-type reflexives to sometime not have their typical distributive character. My point of contention with Cable is not whether the D operator is always involved with English-type reflexives and whether focus is responsible for its appearance; rather, I wish to argue against his proposed location of the D operator.

There are some attractive features of Cable's account that can be carried over to the present one. Perhaps most interesting are Cable's claims about the optionality of the D operator in reflexive constructions. He observed that in some limited circumstances (which I will not explore here), English plural reflexives can be interpreted as cumulative reflexives. This means that the observed essential distributivity is not a hard-and-fast property of reflexive interpretation, even though it may represent a preferred interpretation. Again, my point of disagreement with Cable is in the position of the silent D operator in reflexive constructions; I leave open the possibility that Cable's focus-based semantics can be used to determine which contexts allow the D operator to appear or not in reflexive sentences.[3]

Cable essentially treats the D operator in reflexive constructions as the silent element that authors like Link (1987) and Schwarzschild (1996) used when accounting for

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[3]A point of similarity between the two accounts is that neither Cable nor I provide an explanation for why the plural reflexive, at least in English, has plural morphology. I take this to be some type of morphosyntactic agreement process that does not have an effect on the semantics. See the previous footnote for how singular reflexives are handled in the present account.

the distributive construals of some sentences (see Chapter 2). This claim is on par with what I have observed about floating quantifiers: because D is attached to the VP, it takes scope over the entire VP. Regardless of any particular implementation of the D operator, this has the result of attributing a property associated with the entire VP's meaning to each individual in the subjects denotation. I offer two counterarguments to this general idea. First, there are cases where the VP contains elements that do not describe the action of each member in the antecedent plurality, but those members as a collection. Second, there are cases where the antecedent to the reflexive is contained within the VP, in which case a VP adjoined D operator is in a sense "too high" to provide appropriate truth conditions for the sentence.

5.4.1   A scope argument for a local D operator

Consider first ditransitive sentences that contain a singular indefinite together with a plural reflexive within the VP.

(5.22) The students introduced themselves to a professor

According the Principle of Covarying Indefinites from Chapter 3, an indefinite within the scope of a distributivity operator should be able to covary with the individuals distributively quantified over. However, there is no such reading of (5.22); this sentence can only be true if there was a single professor that they introduced themselves to. The point is made more precise when the indefinite is modified by *different*.

(5.23) The students introduced themselves to a different professor

This sentence cannot mean that the professor that one student introduced himself to is different from that of another student. Indeed, difference in (5.23) can only be with regards to another professor mentioned within the discourse; for example: *The parents introduced themselves to one professor, and the students introduced themselves to a **different***

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professor. Compare this to a case where *different* is clearly within the scope of a distributivity operator (e.g., a distributive subject), and as such difference can be determined with regards to the individuals distributively quantified over.

(5.24) Each of the students introduced himself to a different professor

The lack of covariance is unexplained under Cable's proposal of a VP-adjoined D operator; which could scope over the indefinite contained within the VP. Under the account proposed here, the lack of covariance is explained by having the D operator have a very limited scope: it scopes only over the *self* morpheme in the direct object position, and the indefinite is then not within the scope of the D operator.

5.4.2   An antecedence argument for a local D operator

Another argument against a VP adjoined D operator for plural reflexive sentences comes from cases where the subject is not the antecedent of the reflexive. Cable (2014) only considers transitive sentences, where the only possible antecedent is the subject, and so there is no harm in positing the VP-adjoined D operator. However, that analysis cannot explain cases like (5.25).

(5.25) God showed us to ourselves

The VP adjoined operator here does nothing to explain the distributive interpretation of reflexives occurring *within* the VP.

The problem cannot be escaped by assuming QR of the antecedent plurality, and then attaching the D operator to its derived sister. Consider first a variant of (5.25) with a bare plural subject.

(5.26)   a. Gods showed us to ourselves

   b. QR LF: [Us$_i$ [D [gods showed t_i to ourselves]]]

Like other dependent plural sentences, (5.26a) can be true if for each x of us, a *single* god showed x to itself. However, the LF (5.26b) suggests that a plurality of gods were shown to each individual, since bare plurals take obligatory low scope with respect to operators such as D; see Carlson (1977), for example.

Similarly, if *Gods* in (5.26a) were replaced with *A god* as in (5.27a), then there should be a covariance interpretation since the subject would be in the scope of the D operator according to an LF like (5.26b) , but no such interpretation exists.

(5.27)   a. A god showed us to ourselves

        b. QR LF: [Us$_i$ [D [a god showed t_i to ourselves]]]

We have a further argument for a local D operator, one that can scope over only certain parts of the VP and not others. In this case, the present account would have the D operator attaching to the indirect object as its host, and its antecedent would be the direct object. This gives us appropriate truth conditions without appealing to QR.

(5.28) $\exists E[\text{AGENT}(E, g) \,\&\, \text{SHOW}(E) \,\&\, \text{THEME}(E,\text{us}) \,\&\,$

$\forall x \leq \text{us}[\exists E' \leq E[\text{THEME}(E', x) \,\&\, \text{GOAL}(E', x)]]]]$

5.4.3   Advantages over polyadic quantification approaches to reflexives

As with reciprocals, there have been accounts of reflexives that treat them as higher-order functions, or polyadic quantifiers; see discussion in previous chapter. One of the earliest polyadic analysis of reflexives is Szabolcsi (1989); working within the CCG framework, she models the semantics of the reflexive anaphor off of the W-combinator from combinatory logic. The claim is that the reflexive takes a relational argument and then in effect duplicates the value of the reflexive's antecedent.

(5.29) $[\![\text{REFL}]\!] = \lambda R.\lambda X.R(X, X)$

One of the benefits of this analysis is that it incorporates the content of Principle A into the semantics of the reflexive: the second argument to the reflexive will be its antecedent, and it follows from this that this argument will always be a higher coargument in the same clause as the reflexive.

The problem with this approach is the same as with treating reciprocals as polyadic functions: the definition in (5.29) only works for reflexives that are in direct object position, though reflexives can appear in more argument positions than this. Büring (2005) p. 43-45, offers many cases that are problematic for this approach to reflexives. Below I provide "pluralized" versions of Büring's examples. For one, there are cases where the antecedent to the reflexive is not the next highest coargument of the relation.

(5.30) They introduced God to themselves

Furthermore, there are cases where the reflexive and its antecedent are not coarguments at all. Compare with nominal-internal reciprocals from the previous chapter.

(5.31) The CEOs despised those recent articles about themselves

A very difficult case that Büring points out concerns reflexives coordinated with another nominal, such as the following example from his p. 44, fn 10.

(5.32) Polsen painted pictures of himself and Mary

As he observes, the problem is even more severe on the non-distributive reading of (5.32), where a single picture contains images of both Polsen and Mary.

An advocate of the polyadic approach may respond by saying that it is possible to assign polyadic types to reflexives in these argument positions, and that reflexives are ambiguous in as many ways as there are argument positions in which they can licitly appear. However, as Büring states and as was pointed out in the last chapter, advocates of such a view must provide a way to constrain such an ambiguity. A further challenge is to explain the conjunction data (5.32). Virtually all views on the semantics of conjunction

(and especially the CCG theory that Szabolcsi assumed) have it that both conjuncts have the same type. This means that whatever complicated higher-order type is given to the reflexive in (5.32), the simple proper name *Mary* must also be given the same type; and it follows further that simple proper names must then be as many ways ambiguous as reflexives when they appear conjoined with them. Given the massive amounts of ambiguity or type-shifting involved in this approach, which to the best of my knowledge has not been shown to be constrained in any way, an alternative should be sought. The Taylor-Schein approach which I provide does not require different semantic types for reflexives; just referential and thematic role values that are determined by its antecedent.

On a different note, polyadic treatments of reflexives also need to take into account essentially distributive reflexives. While (5.29) will work for cumulative reflexives[4], it requires non-trivial modifications to account for essentially distributive reflexives. While it might seem that simply applying a D operator after the reflexive composes with its relation argument, see the previous two sections for reasons why this strategy cannot extend to more complicated sentences beyond simple transitives.

5.4.4 A unified analysis of local plural anaphora

This has been a relatively short chapter, but not without reason. I have argued that the case of essentially distributive plural reflexives is but another instance where Taylor-Schein distributivity provides a simple explanation. Again, we see that that Taylor-Schein approach works just as easily when we move beyond simple transitive constructions, and again provides a superior account to competing analyses when the empirical explananda is extended thusly.

As such, the chapter summary here will take on a different form from previous chapters. Now that we have seen sum of local plural anaphoric phenomena I will discuss

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[4]Büring notes that there are some languages where a polyadic analysis of reflexives might work. In these languages, the reflexive marker appears as a verbal affix, not as an anaphor that may occupy various argument positions. A similar story might also be applicable to clitic reflexives in Romance and Slavic, and further might be used to explain their cumulative behavior in plural sentences.

in this dissertation, we can now reflect on what the similarities and differences among these constructions mean for theories of grammar and meaning.

The main proposal from these last three chapters is about the distributivity operator D, often realized overtly as *each* and its equivalents in other languages. I have pursed the route of morpheme univocality, arguing that the semantic value of D is the same regardless of where it appears. It always has the same type, and always performs the same operation with its arguments. This includes *in-situ* determiner uses of *each* and also cases of distance distributivity.

What I have done in the last two chapters is argue that local anaphors, reciprocals and reflexives, are but another type of distance distributivity construction. I have argued that both anaphors share an important property with binominal *each*, namely that they are all constructions where the Taylor-Schein D operator attaches directly to a nominal expression. This is made possible by the separationist assumption that nominals are interpreted as thematic predicates. A question that I have left unexplored is why there are only certain types of nominals that D can attach directly to. Under the present account, this includes the numeric nominals that binominal *each* attaches to, the Differentiator in bipartite argument reciprocals, and the abstract *self* morpheme in essentially distributive reflexives. While this treatment raises the question of which nominals can act as appropriate hosts for D, one of the benefits is that provides a way of stating the duality of reflexives and reciprocals. Under the present approach, both have the same underlying structure, and differ only by whether the host nominal is, abstractly, OTHER and SELF.

(5.33) Reciprocal LF:

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(5.34) Reflexive LF:

$$PP$$

$$\Theta_{ANT} \quad \text{each} \quad X_{ANT} \quad PP$$
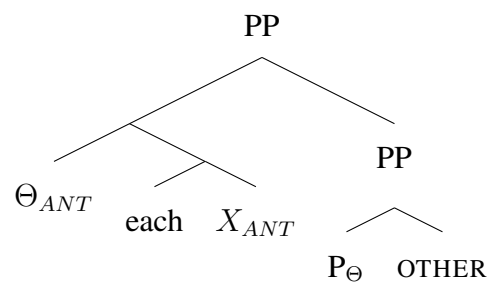
$$P_\Theta \quad \text{SELF}$$
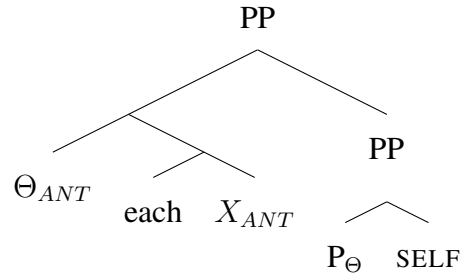
As a final remark, all of the constructions I have looked at so far are local anaphoric phenomena in the sense that their semantic values are dependent on an antecedent expression contained in the same local domain. Now, consider my proposal that all of these phenomena involve the same element, a distance D operator. This opens the way for the novel syntactic hypothesis that the locality of canonical distance distributivity constructions and canonical cases of local anaphora can be reduced to one another. In a sense, all of these constructions are distance distributivity. The hypothesis then, which I leave to future syntactic research, is that whatever syntactic operation is responsible for "floating" of the D operator explains the locality of these constructions: Principle A can then be explained away by whatever principles govern such quantifier movement.

Chapter 6: Plurality and De Se reports

6.1 Introduction

The previous chapters focused on anaphors that exhibit an obligatory referential dependency with a local plural antecedent. In this chapter, I will turn attention to a type of plural anaphor that does not have to be locally licensed, but still is obligatorily dependent on a grammatical antecedent. This is the case of the plural De Se pronoun. I will focus on the semantics of sentences like (6.1) where PRO, a De Se pronoun, is anteceded by a plural attitude holder nominal.

(6.1) Obama and Romney want PRO to win

Intentionality phenomena such as propositional attitude reports have provided a wealth of problems for a proper treatment of meaning in natural language. Within this domain, the issue of De Se attitudes ascription, or essential indexicality, deepens the challenge. Linguists and philosophers have developed several approaches to the semantics of De Se attitude reports, and indexicality in general; however, there is very little discussion of cases of plural attitude ascription. Below I present a case study on obligatory De Se ascription to a plurality of individuals. I start with an overview of the relevant data, reviewing previous insights on plurality in attitude reports and also introducing De Se phenomena in different languages. I will draw attention to the distinction between obligatory and optional De Se reports, and why my focus here is primarily about the former. I then turn to arguments about the essential plurality of De Se pronouns, where I will address problematic issues from majority of previous approaches that treat bound plural

pronouns in attitude reports as semantically singular. Lastly, I will develop a semantics of plural De Se pronouns by modifying existing accounts of the semantics of attitude reports and indexicality. I will show that the general notion of distributivity is in a sense fundamental to the semantics of plural De Se reports, but not in the way that previous accounts have suggested.

6.2 Empirical overview

Higginbotham (1981) observed that sentences like (6.2a) can be used to ascribe two different types of attitudes to the plurality of attitude holders, Obama and Romney. Since then many have taken this to indicate that such sentences are ambiguous between a *group reading* (6.2b) and a *dependent reading* (6.2c).

(6.2) a. Obama and Romney think that they will win the election

   b. Group: Each of Obama and Romney think: "Obama and Romney will win"

   c. Dependent: Each of Obama and Romney think: "I am going to win"

While authors have argued about the source of such an ambiguity, one idea seems to be prevalent: for at least the dependent reading, the semantic value of the embedded pronoun is treated as semantically singular. This provides an explanation for why the dependent readings report attitudes about a singular individual[1].

Heim et al. (1991b) observed that the availability of dependent readings is determined by the presence of a pronoun in the embedded clause that is referentially dependent on the attitude holder nominal[2]. Beck and Sauerland (2000) give the following example

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[1]See Stechow (2003), Maier (2006), Schlenker (2012), among others. A notable exception is Rullmann (2004), Rullmann (2008) who argues for uniform semantically plural pronouns for finite reports that optionally report a De Se attitude.

[2]That dependent readings require a *referentially dependent* pronoun in the embedded context is evidenced by replacing *Bill* in (6.3) with the pronoun *he*, resulting in a report that still lacks a dependent reading:

   (i.) Max and Peter said that he$_b$ will marry Ann and Amy (*respectively)

that shows that without a pronoun it is impossible to bring about the dependent reading even with the help of *respectively*.

(6.3) Max and Peter said that Bill married Ann and Amy (*respectively)

The relevant unavailable interpretation of (6.3) is one where Max said that Bill will marry Ann, and Peter said that Bill will marry Amy. (6.3) only has the interpretation where each of Max and Peter said the same thing: that Bill will marry two women, Ann and Amy.

The paraphrase in (6.2c) indicates another important property of dependent readings, namely that each attitude holder holds an attitude about himself. As others have noticed, there does not seem to be a "crossed" reading of (6.2a), where Obama thinks only Romney will win, and Romney thinks only Obama will win[3]. These facts suggest that the dependent reading of plural reports cannot be characterized simply as cumulation between attitude holders and the contents of embedded clauses (see Dimitriadis (2000) on this point). Rather, the proper generalization for dependent readings seems to be that they report about a plurality of self-directed attitudes.

De Se reports are another, perhaps related, phenomena concerning self-directed attitudes. One has a De Se attitude about oneself in a way that it is impossible to be mistaken as to who the self is; see for example Lewis (1979) and Perry (1979) . In the terminology of the philosophy literature, I will label this crucial feature of De Se attitudes as the property of immunity to error through misidentification[4].

Furthermore, this may be tied to the further condition that the pronoun be read De Se. Since I focus on obligatory De Se reports, and these issues are specifically about optional De Se reports, I leave them to future research.

[3]The observation that crossed readings do not exist has been made by Higginbotham (1981) and Heim et al. (1991b). Dotlačil (2010) suggests that such readings might be available for sentences that express reciprocity in the embedded clause, though the previously mentioned authors say that such readings are impossible even then. Based on my own intuitions about the meanings of such sentences, I am inclined to agree with Higginbotham and Heim et al. that crossed readings are always disallowed.

[4]Recanati (2012) distinguishes between different types of De Se attitudes, what he calls implicit and explicit De Se. According to him, it is implicit De Se attitudes that are immune to error through misidentification. I assume that obligatory De Se reports report on implicit De Se attitudes based on the truth of sentences in contexts like (6.4) in the main text.

Some types of attitude reports in natural language obligatorily report De Se attitudes, such as subject control constructions in English and Italian (Morgan (1970), Chierchia (1989)). The truth of a De Se report depends not only on whether an individual has a self-directed attitude, but also whether that attitude has the property of immunity to error through misidentification. In a situation where just the former condition is met (6.4a), the obligatory De Se report (6.4b) is false. For comparison, I provide an attitude report with a finite embedded clause (6.4c), which has been known to optionally report De Se attitudes. Accordingly, in situation (6.4a), (6.4c) can be true even though (6.4b) cannot.

(6.4) From Schlenker (2012), p. 1573:

    a. John is so drunk that he has forgotten that he is a candidate in the election. He watches someone on TV and finds that person is a terrific candidate, who should definitely be elected. Unbeknownst to John, the candidate he is watching on TV is John himself.

    b. False: John hopes PRO to be elected

    c. True: John hopes that he will be elected

Another type of obligatory De Se report are those that involve shifted indexicals (Schlenker (1999), Anand (2006)). In languages like Amharic, a first-person indexical pronoun in certain attitude reports can have its reference determined by the attitude holder noun phrase instead of the speaker of the report, as in (6.5) from Schlenker (2003). When this happens, the indexical must be read De Se.[5]

(6.5) *ǰon ǰəgna nə-ññ   yɨl-all*
     John hero be.PF-1SO 3M.say-AUX.3M
     "John says that he himself is a hero"

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[5]The English translation in (6.5) includes the phrase *he himself* to indicate that this is an obligatory De Se report. See Higginbotham (2003) and references within for the De Se properties of *he himself* in English.

Some authors have suggested that what sets obligatory De Se reports apart from other attitude reports is the presence of a special pronominal element in the embedded clause; see Schlenker (2012) for discussion and references. We have already seen that PRO and shifted indexicals are associated with obligatory De Se reports; others have suggested that logophors also fit into this category (for example, Clements (1975), Hyman and Comrie (1981), Schlenker (2012)). Below is a speech report in Ewe (data from Clements (1975)) with the logophoric pronoun *yè*. As Clements and Schlenker note, *yè* must refer to the attitude holder and it must be read De Se.

(6.6) *kofi   be   yè-dzo*
      Kofi   say   LOG-leave
      "Kofi said that he (= Kofi) left'

The existence of special pronominal forms such as PRO, shifted indexicals, and logophors opens up the possibility for a strong hypothesis that all of these "De Se pronouns" have the same or very similar lexical semantics[6]. I will adopt this hypothesis throughout this chapter, because as we will see, at least English PRO and Amharic shifted indexicals behave the same with respect to plurality.

I now turn to the main empirical focus of this chapter, one that has received little attention in the literature: the behavior of obligatory De Se reports with plural attitude holder noun phrases such as (6.1). These reports too have dependent readings. In fact some authors such as Higginbotham (1981) and Heim et al. (1991b) take it that for control constructions like (6.7), the dependent reading is the only one available. Their evidence for this comes from sentences that involve a reciprocal in the embedded clause.

(6.7) They want to visit each other

It may be that (6.7) may strongly favor a dependent construal where each attitude holder simply wants to visit others, with no desires about people visiting him. However, I do not

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[6]Though see especially Anand (2006) who argues for different ways of deriving De Se interpretations for these different constructions.

think that it should be false if a group reading was intended; e.g., a reading where each attitude holder wants to visit and be visited by other attitude holders. It may be the case that a report is true under the dependent construal if there are self-directed attitudes, but not *if and only if* there are self-directed attitudes. This suggests another way to look at the group/dependent contrast: there is no ambiguity, but truth conditions that are general enough to allow for both group and dependent readings. I will return to the hypothesis in §5. Although, regardless of how group readings factor into the theory, the existence of dependence readings by itself poses interesting questions for semantic theorizing, a fact that will drive much of the discussion in this chapter.

It can be shown, with suitable conversational situations, that the dependent construals of plural De Se reports require that each singular attitude holder holds a De Se attitude about himself. This means that at the very least, each attitude holder has a thought about himself that is immune to error through misidentification. To see this, consider (6.1) spoken in a situation where there is an identification error (6.8a). Here the report (6.1), repeated below as (6.8b), is judged false.

(6.8)   a. Situation: Each candidate is regretting his decision to enter the election. Each feels that another individual would do better in his place, and so each desires that he himself will lose and that another will win instead. While wallowing in despair at the prospect of winning something they don't want, each candidate is in his respective hotel room drinking heavily. At the same time, they are watching past debates looking for another candidate to replace them, and each candidate finds such a person and exclaims "I want *him* to win". Little do they know, each candidate is talking about himself.

   b. False: Obama and Romney want to win

In Amharic, plural reports with plural shifted indexicals can have a dependent reading, on par with the English (6.1). The sentence (6.9) can be true if each candidate said "I

will win" even though the embedded clause has the form "We will win"; see LaTerza et al. (2013).

(6.9) *atʃʼu-wotʃtʃ-u*   *inni-ʃänf-all-än*   *al-u*
     candidate-PL-DEF   1PL-win.IPFV-AUX-1PL   say.PFV-3PL
     'The candidates said we will win'

This parallel between the two languages is expected if shifted indexicals and PRO are part of a natural class of De Se pronouns with the same or similar lexical semantics.

As discussed above in connection to group readings, each individual in a plurality of attitude holders may hold attitudes about other individuals as well. However, for obligatory De Se reports the attitude holder's thoughts about other individuals are susceptible to identity errors. For example, suppose each of Obama and Romney mistake the other for their respective vice presidential running mates. In such a situation, (6.1), repeated below as (6.10) can be true under the group construal where Obama wants himself and Romney to win, and Romney wants himself and Obama to win; however, neither candidate knows that the other person he wants to win is actually his opponent. This might be expected, since the immunity property of De Se attitudes concerns an individual attitude holder's thoughts about himself; thoughts that are about other individuals are not immune to identity errors.

(6.10) Obama and Romney want to win

Concerning optional De Se reports like English (6.2a), repeated below as (6.11) it could be the case that the dependent construal implies that each individual has a De Se attitude about himself.

(6.11) Obama and Romney think that they will win the election

Many English speakers find that the report (6.11) cannot be true in the mistaken identity situation described above in (6.8a). This invites the novel hypothesis that all dependent

readings are De Se. I will not however pursue this here, since optional De Se reports present some complications that do not exist for obligatory reports[7]. Furthermore, it is not clear that the De Se properties of optional and obligatory reports are derived in the same way; see Anand (2006). Therefore, in this paper I will limit the focus to obligatory De Se reports, though I hope the discussion here will be insightful for future work on optional De Se reports.

The existence of dependent readings and the obligatory De Se nature of reports like (6.1) provide good reasons for treating the embedded De Se pronoun as semantically singular. Nonetheless, I will argue in the next section for treating such pronouns as semantically plural.

6.3   Arguments for plural De Se pronouns

To argue for the plurality of De Se pronouns like subject controlled PRO in sentences like our parade case (6.1), repeated below as (6.12) I will present a "singularist" strategy for interpreting plural De Se reports with which the plural alternative presented in later sections can be compared. Under this singularist view, PRO is treated as a singular variable bound by a (possibly covert) universal operator that scopes above the attitude

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[7]For example, we have seen that dependent readings surface at least in cases where there is an embedded pronoun that is referentially dependent with the attitude holder nominal. Dimitriadis (2000) has suggested that dependent readings can also arise when the pronoun's reference is determined by a noun phrase other than the attitude holder nominal as in (i).

   i. The lawyers who represent John and Mary think they will sue each other
     (Dimitriadis (2000), p. 58)

However, similar constructions to (i), such as (ii), seem to resist a dependent reading where the embedded pronoun is referentially dependent on some noun phrase that is not the attitude holder nominal.

   ii. The people that listen to Debussey and Saint-Saens think that they are brilliant (#although Debussey fans think Saint-Saens is not brilliant, and vice versa for Saint-Saens fans)

This issue does not arise for obligatory De Se reports, where the value of the De Se pronoun is always determined by the attitude holder nominal This observation has been made by syntacticians for subject control constructions; see Chomsky (1981) and references within. Since the focus here is on obligatory De Se reports, we will only be dealing with cases where the value of the embedded pronoun is determined by the attitude holder nominal.

verb (6.13). Although there has been no previous accounts (at least that I am aware of) that explicitly address *obligatory* plural De Se reports in this manner, the approach has been suggested by Maier (2006) and others to account for the dependent readings of optional De Se reports like (6.2a).

(6.12) Obama and Romney want to win

(6.13) Singularist truth conditions for (6.12):

$\forall x : x \in \{Obama, Romney\}[x \text{ wants } x \text{ to win}]$

I am putting aside the De Se and other intentionality properties of the report for the time being, and so (6.13) is simplified to not express anything about De Se content. The reason for this is that the arguments in this section focus on the singular nature of the variable associated with PRO, not about its intentionality properties. In later sections I will return to the De Se properties of these reports and show how they can be integrated into the semantics given the results from this section.

Having said that, I think that it is important to at least recognize that the De Se properties of sentences like (6.12) provide some initial motivation for a singularist account. De Se attitudes are about an attitude holder's self, and I take this to be a fundamentally singular notion. If we take PRO and other De Se pronouns to be the locus of De Se information, then it is plausible that these pronouns should be treated as semantically singular. Furthermore, these reports allow dependent readings, which are characterized as reporting the attitudes about a singular individual. This provides further support for singularist truth conditions like (6.13).

Despite these reasons, I will argue that the semantic value of PRO is alway plural when anteceded by a plural noun phrase[8]. The argument for a plural PRO comes from

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[8]The semantic value of PRO may be plural in other cases as well. For example, in partial control constructions like (i); see Landau (2001) for further data and discussion. It has been suggested that PRO in such examples refers to its controller plus some contextually salient others.

   i. John wants PRO to meet at 6

plural De Se reports where the embedded clause expresses cumulativity or reciprocity. These phenomena have been argued to require the presence of a local plural noun phrase. In the cases that interest us, only PRO can fit this role; and therefore since these constructions are well-formed, then PRO must be plural. For each of these phenomena I will also consider salient alternative analyses that account for their respective phenomena without a semantically plural PRO (and if not PRO, then an overt plural pronoun when English optional De Se cases are considered). I will then present counterarguments for each of these alternatives from the literature arguing that they are empirically inadequate, supporting the conclusion that reciprocity and cumulativity are licensed in a clause when that clause also contains another noun phrase that is plural and sufficiently local.

Before turning to the arguments proper, which are semantic in nature, I will discuss some reasons for thinking that PRO is morphologically plural in plural De Se reports. Since PRO is silent, its morphological plurality has to be diagnosed from other elements in the sentence[9]. The clearest evidence of this type comes from languages with inflective infinitives such as Brazilian Portuguese, where the verb with PRO as its subject shows plural agreement (data from Carolina Petersen, p.c.).

(6.14) *Obama e   Romney temem PRO terem   perdido a   eleição*
     Obama and Romney fear   PRO have.PL lose   the election
     "Obama and Romney are afraid that they will lose the election"

However, these such reports have been known to resist reciprocity and cumulativity in the embedded clause; (ii) is unacceptable, and (iii) lacks a reading where John wants to kiss only Mary and for some relevant other to kiss Sue; it can only have the distributive meaning where John wants to kiss both Mary and Sue.

    ii. *John wants PRO to meet each other

    iii. John wants PRO to kiss Mary and Sue

These data call into question whether the PRO in partial control constructions is semantically plural in the same way as the PRO in the cases that interest us here where the attitude holder noun phrase (i.e., the controller) is semantically plural. Since my focus here is only on the latter construction, I will leave issue of the semantic plurality of partially controlled PRO for future research.

[9]The morphological plurality of other De Se pronouns like Amharic plural shifted indexicals is obvious; the suffixed pronominal elements are plural, and the verb to which they affix shows plural agreement.

While there may be reasons to treat PRO as morphologically plural, this does not entail that it has to be semantically plural. Semanticists have posited rules like (6.15) that essentially remove the morphological ϕ-features, including number, from a bound pronoun; see Stechow (2003), Maier (2006), and Heim (2008)[10].

(6.15) FEATURE DELETION

Delete the features of all variables that are bound

(Stechow (2003), via Anand (2006))

This rule has been used as a way to explain dependent readings despite the presence of a plural pronoun by treating the morphologically plural pronoun as semantically singular. The arguments that I turn to now are of a different sort. I will use essentially plural phenomena as diagnostics for *semantic* plurality. In particular, I draw on leading ideas from the semantics of cumulativity and reciprocity that strongly suggest that PRO must be semantically plural. One of the consequences of PRO being plural is that we can abandon rules like (6.15), at least as far as number ϕ-features go, and treat morphologically plural pronouns as semantically plural. The thesis pursued here can be viewed as a null-hypothesis, where morphological and semantic plurality go hand in hand.

6.3.1 Cumulativity

Cumulative interpretations of plural sentences were first observed in the semantics literature by Scha (1984), and are characterized by having parts of one plurality related to parts of another but not exhaustively. Consider the following sentence which has a clear cumulative interpretation[11].

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[10]It is assumed in Feature Deletion accounts that the removal of ϕ-features corresponds to a singular semantic value. It is not clear that this is a necessity of the system: several authors working on plurality and mass semantics have suggested that the bare variable, without any number features, is number neutral. See Schein (1993) and others. Thus, it may be that there are conceptual problems with the formulation of Feature Deletion, aside from the empirical problems I raise in the main text.

[11]Beck and Sauerland (2000), p.350, use the phrase "cumulative interpretation" to refer to "...all cases where a sentence containing two plurals has truth conditions weaker than those of a doubly distributive para-

(6.16) Obama and Romney danced with Michelle and Ann

This sentence can be true if each candidate danced with his own wife and no one else; Obama only danced with Michelle, and Romney only danced with Ann. This is the cumulative interpretation of (6.16). Crucial for our purposes is that the meaning of (6.16) does not require that each of Obama and Romney have the property of dancing with both Michelle and Ann; see Chapter 2 for further discussion and references.

When (6.16) is embedded in a plural De Se report like (6.17), the result allows a dependent reading where Obama wants to dance only with Michelle, and Romney only with Ann. For the sake of making the dependent reading clear, assume that neither candidate has any desires about the other candidate dancing.

(6.17) Obama and Romney want to dance with Michelle and Ann

Assuming the singularist truth condition strategy (6.13), (6.17) would be assigned truth conditions like (6.18).

(6.18) $\forall x : x \in \{Obama, Romney\}[x$ wants x to dance with Michelle and Ann]

This says that each of Obama and Romney want to dance with both Michelle and Ann, which predicts that (6.17) should be false when each candidate only wants to dance with a single woman. This prediction is not borne out, as (6.17) can be true in a cumulative desire situation; e.g., a situation where each candidate only wants to dance with his own wife.

Similar facts can be observed in Amharic in sentences with plural shifted indexicals. Speakers judge (6.19) to be true in situations where each candidate said that he will only dance with one woman; this data comes from LaTerza et al. 2013.

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phrase". This definition will suffice for most of the sentences discussed here, though see Schein (1993) and Sternefeld (1998) for generalized notions of cumulative interpretation suitable for cases with an arbitrary number of plural noun phrases.

(6.19) *atʃʼu-wotʃtʃ-u*   *kä-Michelle-na*   *Ann gar*   *ɨnnɨ-däns-all-än*
     candidate-PL.DEF   with-Michelle-and Ann with 1PL-dance.IPFV-AUX-1PL
     al-u
     say.PFV-3PL
     'The candidates said we will dance with Michelle and Ann'

The problem with (6.18) is the singular value associated with the De Se pronoun, resulting in the condition that some singular candidate wants himself to dance with a plurality of wives. If the De Se pronoun were plural in this case, these problems would not arise since local plural values license cumulative interpretations. See Chapter 2 for the details of how cumulative interpretations are represented in the neo-Davidsonian system.

6.3.1.1 Against non-lexical approach to cumulativity

We have seen that the basic singularist treatment of sentences like (6.17) is inadequate because it forces a distributive interpretation, though we have seen that cumulative interpretations are possible. There has been one previous account of such cases that I am aware of that is still singularist in the sense that it treats PRO as receiving a singular value, but it is unlike (6.13) in that it does not force distributivity. This is the account given by Beck and Sauerland (2000), which utilizes a double-star theory of cumulativity (Krifka (1986)). Beck and Sauerland define the **-operator as follows.

(6.20) $**R(X, Y) = 1$ iff $\forall x \in X \exists y \in Y[R(X, Y)]$ & $\forall y \in Y \exists x \in X[R(X, Y)]$

A crucial point for Beck and Sauerland's account of cumulativity in plural De Se reports is that the **-operator can apply not only to lexical relations (e.g., transitive verb meanings), but also relations that are derived in the syntax. They assume that definite plural noun phrases can Quantifier Raise and leave behind a variable that is λ-bound, and the resulting λ-expression can host the **-operator. For (6.17), Beck and Sauerland would assign the following LF (compare with their example (40), p. 363).

(6.21) (Obama and Romney)(Michelle and Ann) $**\lambda y \lambda x[x$ wants x to dance with $y]$

While the **-approach can account for the cumulative cases that interest us here while assuming a singular PRO, it has been criticized as being empirically inadequate for other reasons. For previous counterexamples, I refer the reader to Kratzer (2005) objections against using *-operators to derive non-lexical cumulative relations based on examples involving durative adverbs, and Schein (1993) for arguments against pluralizing relations in general, based on sentences that mix cumulativity and distributivity, as discussed in Chapter 2. Below, I offer some new counterarguments based on plural De Se reports. Consider the following example, and its LF given Beck and Sauerland's theory

(6.22) a. Those twenty mechanics want to fix these 100 cars in one week

     b. (Those twenty mechanics)(these 100 cars) $**\lambda y.\lambda x.[x$ wants x to build y in one week]

According to the **-approach, the truth of (6.22a) depends on each single mechanic wanting to fix at least one car this week *and* each car being fixed by at least one mechanic. But one could imagine situations where this condition would not be met, yet (6.22a) would still be judged true. For example, it might be the case that each mechanic is assigned a specific task; e.g., rebuilding an engine, working on the electronic systems, attaching the wheels to the axles, etc. In such a case, no single mechanic is fixing a single car, nor is any car being fixed by a single mechanic. According to the definition of the **-operator from (6.20), (6.22a) is incorrectly predicted to be false in this situation.

The adverbial modifier *in one week* presents additional problems for the **-approach. (6.22a) can be true if what each individual mechanic wants is to do his job in less than a week, but as a group, the twenty mechanics work to fix 100 cars in one week. Such a situation would not verify (6.22a) since, according to the LF in (6.22b) and the definition of the **-operator, each mechanic's desire is to do his job in one week.

I conclude from the discussion above, as well as the counterarguments from previous literature, that the **-approach is inadequate for the so-called non-lexical cases of

cumulativity. However, there still seems to be a place for lexical cumulativity where the
**-operator can be of use, as suggested by Kratzer (2005). Under this view, cumulativity
arises only between plural coarguments (and possibly adpositional modifiers) of a verb
to which the **-operator has been applied. Thus, the cumulativity we see in the plural
De Se report (6.17) strongly suggests that PRO is plural since it is the only other plural
coargument of the embedded verb.

6.3.2 Reciprocity

It is standardly assumed that reciprocal anaphors must be bound by local seman-
tically[12] plural antecedents (Chomsky (1981) among others). Based on ECM examples
like (6.23) and (6.24), we can see that the relevant local domain for English reciprocals
is the subject domain of the reciprocal, and not its tense domain (see Büring (2005) for
discussion).

(6.23) [The professors]$_i$ want [the students]$_j$ to praise [each other]$_{*i,j}$

(6.24) [The girls]$_i$ believed [the boys]$_j$ to have kissed [each other]$_{*i,j}$

Since *each other* in (6.23) and (6.24) can only take the ECM subject as its antecedent, its
binding domain must be its subject domain; if the binding domain were the reciprocal's
tense domain, we would expect the matrix subject to also be a potential antecedent[13].

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[12]Fiengo and Lasnik (1973) offer arguments based on *pluralia tantum* nouns that it is not enough for the
reciprocal's antecedent to be merely morphologically plural. This is evidenced by the unacceptability of (i)
when talking about a single pair of scissors.

    i. *The scissors are connected to each other

[13]It should be noted that reciprocals do not require the most local potential antecedents to be their an-
tecedents. Recall from Chapter 4 that a sentence where there are multiple c-commanding NPs within the
reciprocal's subject domain, either can be the antecedent, as shown by the ambiguity in (i):

    i. [The gnomes]$_i$ put hats$_j$ on [one another]$_{i,j}$

If the subject acts as the antecedent, we have the reading where gnomes put hats on other gnomes. If the
object is the antecedent, we have the reading where the gnomes stacked up hats.

In §2 we saw that reciprocals can be used in the embedded clause of English subject control constructions, and that on the dependent construal of such sentences the content of the reported attitude for each attitude holder does not have to involve reciprocated action. For example, the sentence (6.25) does not have to mean that each candidate wants mutual destruction, but it could express that Obama wants to destroy Romney, and Romney wants to destroy Obama.

(6.25) Obama and Romney want PRO to destroy each other

Given that the reciprocal in (6.25) must be bound by a local plural antecedent in its subject domain, and since (6.25) is grammatical, it follows that PRO is the local plural antecedent of the reciprocal.

The singularist treatment from (6.13) would assign a singular value to PRO, and for sentence (6.25) would yield the truth conditions shown in (6.26).

(6.26) $\forall x : x \in \{Obama, Romney\}[x$ wants x to destroy each other$]$

Since reciprocals require semantically plural antecedents, the above truth conditions predict the same sort of infelicity for (6.25) as we see in (6.27). These predictions are not borne out for the plural De Se report, which suggests that the singularist treatment is inadequate for these constructions.

(6.27) *He destroyed each other

Amharic again provides support that such behavior is not limited to PRO, but surfaces for other De Se pronouns like shifted indexicals. In the following example, the embedded clause with a plural shifted indexical expresses reciprocity by means of an anaphoric infix. Similar to (6.25), (6.28) can be true if each animal said that he would kill another and remain alive himself.

(6.28) *insäsa-wotʃtʃ-u   inni-ggäddil-all-än   al-u*
       animal-PL-DEF   1PL-kill.RECIP.IPFV-AUX-1PL   say.PFV-3PL
       The animals said that we will kill each other

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6.3.2.1   Against scopal theories of reciprocals

There have been accounts of embedded reciprocals that get by with only a singular value for the embedded pronoun. The paradigm example of this approach is Heim et al. (1991b). The central idea of their analysis is that the *each* of *each other* undergoes quantifier raising and binds a singular variable associated with the embedded pronoun. Their resulting truth conditions can be paraphrased as (6.29), which they use to account for the dependent reading of the sentence.

(6.29) Obama and Romney *each* wants that *he* destroys *the other*

As the paraphrased truth conditions show, we do not need a semantically plural local antecedent under this view to derive an appropriate meaning for this sentence. For Heim et al. (1991b), the reciprocal is not a simplex anaphor requiring a semantically plural antecedent, but a complex constituent containing a quantifier that can raise and bind a singular variable associated with the canonical local antecedent.

Several objections have been raised against this analysis of reciprocals. First, there is the direct reply to Heim et al. (1991b) given by Williams (1991). One of his counterarguments came from the fact that the dependent reading that Heim et al. (1991b) were trying to capture with this account of reciprocals is found in constructions even when there is no reciprocal present; we have seen several examples of this already, such as (6.1). Correlatively, Dalrymple et al. (1994) show that there are some languages where reciprocal expressions are monomorphic verbal affixes, and as such, they have no distributive component that can participate in quantifier raising as Heim et al. (1991b) suggest.

Even if one were to assume a covert distributivity operator that is available even when an overt one is not supplied by the reciprocal, Williams shows that the resulting truth conditions suffer from being too restrictive. Consider the following De Se report based on Williams's counterexample sentences which were discussed in Chapter 4.

(6.30) The plastic surgeons want to give each other new noses

After quantifier raising, the truth conditions for (6.30) in the system of Heim et al. (1991b) can be paraphrased as follows.

(6.31) The plastic surgeons each wants that he gives another new noses

The crux of the argument is that (6.30) can be true if what each surgeon wants is to give just one other surgeon exactly one new nose. According to the truth conditions in (6.31) though, the sentence is true if and only if what each wants is to give a plurality of noses to another doctor.[14]

    Asudeh (1998) offers further arguments that the scopal theory of reciprocals is incorrect. If *each* QRs, then we expect it to be susceptible to familiar quantifier scope ambiguities. He shows with a variety of scope-sensitive operators that there is almost always no wide-scope universal construals with sentences containing these operators and reciprocals. Consider (6.32) for example.

(6.32) At the stroke of midnight, John and Mary showed a diamond ring to each other

Universal indirect objects usually can scope over indefinite direct objects (Larson (1988)) as in cases like (6.33).

(6.33) At the stroke of midnight, John and Mary showed a diamond ring to each jeweler

The sentence with the reciprocal indirect object does not have the same covariance ambiguity as (6.33); it can only mean that there is a single diamond ring that John and Mary showed each other. If the reciprocal contained a universal quantifier, we expect a wide scope universal reading where there could be several diamond rings, as in (6.33), but this reading is missing from (6.32). Asudeh shows similar scope tests involving negation, modals, wh-words, and ellipsis constructions that show that reciprocals do not have the scope-taking potential one would expect if they contained universal quantifiers.

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[14]This argument does not rely on particular assumptions about bare plurals. In fact, bare plurals are not even necessary to make the argument; if the bare plural is replaced with a singular definite (e.g., *a new car*), we still see the relevant contrast. These facts parallel those discussed in connection to scope and covariance in Chapters 3, 4, and 5.

I conclude from this discussion that reciprocals do in fact require semantically plural local antecedents, as has been suggested by most of the reciprocity literature. This provides further support that PRO must be semantically plural in plural De Se reports, despite the apparent singularity associated with De Se attitudes and dependent readings.

6.3.3   Section summary

In this section I presented arguments for plural De Se pronouns using cumulativity and reciprocity. For reasons independent of plural De Se reports, these phenomena have been argued to require the presence of a local semantically plural noun phrase. In the examples we looked at, the relevant local domain is the complement clause of the attitude verb. In these clauses, the only suitable local noun phrase that could license these essentially plural constructions is the De Se pronoun, and since the relevant interpretations are licensed, we can conclude that these De Se pronouns are semantically plural.

I considered alternative analyses of these phenomena that treat the pronouns as semantically singular, and presented several counterarguments to these analyses. The argument is strengthened by the fact that each alternative approach only deals with one type of essentially plural phenomena; Beck and Sauerland (2000) say nothing about reciprocals, nor does Heim et al. (1991b) say anything about cumulativity or dependent plurality. The facts when taken together suggest that the plurality of De Se pronouns in these constructions forms the basis of a unified analysis for these different plural phenomena, and also supports the conclusion drawn by previous research about the relevance of locality to these issues.

For the remainder of the chapter I develop two separate neo-Davidsonian approaches to the semantics of De Se reports. The first approach builds on context-based approaches to De Se interpretation; as in Schlenker (1999) and Anand (2006), for example. One of the central properties of this approach is that attitude verbs do not have their arguments severed; they take both an embedded clause and subject argument. In the second approach,

I sketch a separationist approach to attitude verb meaning where subject and embedded clause meanings are related to the verb's meaning only indirectly through thematic relations, comparable to the analysis of single clause constructions seen in previous chapters. I first outline some of the relevant theoretical background required for the context-based analysis.

6.4 Theoretical background on neo-Kaplanian De Se semantics

In this section I will outline a context-based approach to the semantics of De Se reports, drawing primarily from the work of Schlenker (1999, 2003, 2012). I will put this to work in the next section while developing a context-based approach to plural De Se reports. The issues that the semantics is meant to address are undoubtedly compatible with a number of different approaches to the semantics of De Se reports; I chose to cast the analysis in Schlenker's neo-Kaplanian framework because of its familiarity and because of certain formal details that facilitate the modifications needed to account for plural reports. Below I sketch the aspects of this framework that are required for the analysis to be presented in later sections; I refer the reader to Schlenker's (2012) survey article and cited references for further details.

Formally, contexts are tuples that model attitudinal situations of speech and thought. At the minimum, a context specifies the author (the individual who is speaking or thinking; i.e., the attitude holder) of such a situation and the possible world in which the situation occurs. The members of a context are often called the *coordinates* of that context. It is common to include other coordinates in contexts such as the addressee, time, and location of an attitudinal situation. However, I omit these other coordinates for expository reasons; for the purposes of this chapter it is necessary to focus only on the author and world coordinates.

The exact details of how contexts figure into the compositional details of De Se reports with different types of De Se pronouns is currently being debated. My concern

is not to distinguish among competing theories, but rather to address two core assumptions that virtually all of these theories share: (i) the lexical axioms for attitude verb involve universal quantification over contexts, and (ii) embedded clauses are interpreted as functions from contexts to truth values. These assumptions are a mild deviation from traditional approaches to the semantics of attitude reports where clauses are treated as functions from possible worlds to truth values, and attitude verbs quantify over possible worlds; Hintikka (1969), von Fintel and Heim (2012). Using contexts instead of possible worlds allows for more fine-grained distinctions in meaning that cannot be captured by appeal to standard propositions; in particular certain indexical aspects of meaning such as obligatory De Se interpretations. Schlenker constructs this argument for natural language following essentially what philosophers such as Lewis (1979), Perry (1979), and Kaplan (1989) have done for the proper representations of indexical thoughts; I refer the reader to these papers for the relevant arguments.

A standard claim about the truth conditions of attitude reports is that they are universal generalizations stating that the predicate denoted by the embedded clause holds of each context (or world) that is accessible to the attitude holder. Different attitude verbs determine different accessibility relations that in turn determine which set of accessible contexts is universally quantified over. For instance, the verb *think* is associated with a doxastic accessibility relation; a relation that determines a set of contexts that are consistent with the beliefs of a given attitude holder in a certain context of evaluation. Below I give examples of accessibility relations; I use the function WORLD(c) to give to world coordinate of context c.

(6.34)   a. $R_{think}(x, c) = \{c' : c'$ is compatible with x's thoughts in WORLD$(c)\}$

   b. $R_{want}(x, c) = \{c' : c'$ is compatible with x's desires in WORLD$(c)\}$

   c. $R_{say}(x, c) = \{c' : c'$ is compatible with what x said in WORLD$(c)\}$

A crucial component of using contexts over worlds is that the set of accessible contexts

determined by the relation $R(x, c)$ will always have x, the attitude holder, as the author coordinate for each accessible context. Put differently, for a context to be accessible to an individual, that individual must be the author of that context. This property of accessibility will play a role in developing an account of plural reports in the next section.

With this notion of accessibility in place, the semantics for attitude verbs given by Schlenker and others in the De Se literature can be given as follows. Below the lexical axioms I provide a schematic LF for all attitude reports (6.36), which will remain unmodified in later sections.

(6.35) a. $[\![\text{think}]\!] = \lambda c. \lambda p. \lambda x. \forall c' \in R_{think}(x, c)[p(c') = 1]$

  b. $[\![\text{want}]\!] = \lambda c. \lambda p. \lambda x. \forall c' \in R_{want}(x, c)[p(c') = 1]$

  c. $[\![\text{say}]\!] = \lambda c. \lambda p. \lambda x. \forall c' \in R_{say}(x, c)[p(c') = 1]$

(6.36)
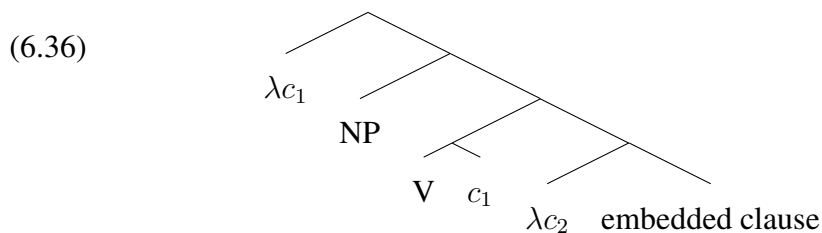
The first argument to the attitude verb is a silent context argument bound by the nearest λc operator; this value is used to determine the relevant set of accessible contexts for the attitude holder x[15]. Again, these definitions are meant to showcase the two relevant assumptions I mentioned previously; I omit for present purposes other aspects concerning the fine details of attitude verb meanings.

Given assumption (ii) above, clauses are associated with predicates of contexts. This corresponds to the claim that there are λc operators at the root of each clause; represented schematically in (6.37).

(6.37) λc_1 John said λc_2 Mary is smart

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[15]In other approaches, this context value is not given as a silent argument, but is represented as a parameter on the interpretation function; see Anand (2006) for discussion.

I remain neutral as to whether the λc operator is present in the object language, possibly in the form of a diagonalization operator (see Anand (2006), Schlenker (2012) for discussion); or if it is introduced by a semantic rule like Intensional Function Application (see Heim and Kratzer (1998)), von Fintel and Heim (2012)). The presence of λc operators, whatever their source, are important for the present account in the following ways: they create a type $\langle c, t \rangle$ function (a function from contexts to truth values) to serve as the second argument to attitude verbs, and being lambda operators, they can bind c variables in their scope. I will now turn to this latter property.

In Schlenker's (2003) account, the meanings of De Se pronouns are determined by the author coordinates of contexts. He follows Cooper (1983) in treating the ϕ-features of pronouns as presuppositions: pronouns receive their semantic value by the assignment function s[16], and any ϕ-features on the pronoun determine presuppositions that the semantic value of the pronoun must satisfy or else induce presupposition failure. For first-personal pronouns, Schlenker posits $\textsc{auth}(x, c)$ as the presupposition given by first-person features: the value of the pronoun, x, satisfies this presupposition if it is the author of the relevant context c.

Following insights from Kaplan, Schlenker attributes the immunity property of De Se attitudes to the author presupposition. He suggests that all De Se pronouns be treated as having such a presupposition whether they are indexical in form (shifting indexicals in Amharic) or not (e.g., PRO and logophors), and the differences among these pronouns be treated as a lexical specification on the pronoun restricting which contexts c the referential values x can be authors of. In other words, different pronouns will have slightly different presuppositions of the general form $\textsc{auth}(x, c)$. For instance, in Amharic the c variable of the author presupposition is a free variable, and thus can be bound by either the matrix

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[16] I follow Schlenker (2003) in using s instead of g for assignment functions; the former is representative of a modification of the classical Tarskian approach to assignment. Schlenker suggests, following others, that "...the theory must specify that the assignment function in question correctly captures the referential intentions of the speaker. This may be done by simply requiring that the original assignment function be properly determined by the context. Thus if the speaker meant to refer to John by 'he$_2$', $s(2)$ should be John." (Schlenker (2003), p. 51).

or embedded λc operator (6.38). Depending on which operator binds the free c variable, either a non-shifted (6.39a) or shifted (6.39b) interpretation will arise. In the following definitions, I will use the δ notation of Anand (2006) to notate presuppositions.

(6.38) $[\![\text{I}_{Amharic}]\!]^s = s(n)\ \&\ \delta\text{AUTH}(s(n), c)$

(6.39) a. John said I_n am a hero

  b. Amharic non-shifted LF:

   λc_1 John said $\lambda c_2\ [s(n)$ is a hero $\&\ \delta\text{AUTH}(s(n), c_1)]$

  c. Amharic shifted LF:

   λc_1 John said $\lambda c_2\ [s(n)$ is a hero $\&\ \delta\text{AUTH}(s(n), c_2)]$

On the other hand, English first person indexicals are associated with the presupposition that the value of the pronoun is always the author of the actual speech context c^*, and thus English indexicals will never shift under attitude verbs.

(6.40) $[\![\text{I}_{English}]\!]^s = s(n)\ \&\ \delta\text{AUTH}(s(n), c^*)$

Following Chierchia (1989) and Schlenker (2012); PRO is always bound by the closest λc operator, and so the value of the pronoun must be the author of an embedded context. The definition of PRO looks much like the Amharic indexical in having a free context variable, but the values of this variable are restricted by the condition (6.41) and so PRO will always be unambiguous[17].

(6.41) Syntactic condition on PRO (adapted from Schlenker (2012))

 When embedded under an attitude verb, PRO must be bound by the closest c-

 commanding λc-operator.

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[17]Presumably this definition will work for PRO in other languages such as Italian, since they both give rise to obligatory De Se interpretations and the reference of PRO is determined by the closest attitude holder NP. However, I leave it an open ended question as to the semantic value of PRO in so-called "backwards control" constructions, another type of obligatory De Se report found in languages like Tsez, see for example Polinski and Potsdam (2002). PRO appears in the subject position of the attitude verb, and the referential NP in the embedded position where PRO would appear in languages like English and Italian. In such languages, it seems the referential noun phrase acts as De Se pronoun, suggesting that there might be more than just the shape of the noun phrase that gives rise to the obligatory De Se interpretation.

(6.42) $\llbracket \text{PRO} \rrbracket^s = s(n) \wedge \text{AUTH}(s(n), c)$

There are many aspects of De Se semantics that will go unmentioned here. What I provided above is a simple presentation of the pertinent ideas from previous work in this area; specifically how to interpret attitude verbs, their complement clauses, and De Se pronouns in Schlenker's neo-Kaplanian system. These ideas will serve as a benchmark; in the next section I will build off of them to develop an account for plural De Se reports.

6.5   A context-based semantics for plural De Se reports

For the remainder of the chapter, I will focus on developing a semantics for plural De Se reports. In this section I will build a context-based theory, while in the next section I will build a theory where attitude verbs have their arguments severed. Let us first take stock of the properties of plural obligatory De Se reports that a proper semantics should take into consideration. Below I provide a list of the core properties we saw in previous sections.

(6.43) Properties of plural obligatory De Se reports

    i. They report that each attitude holder has a De Se attitude about himself.

    ii. They can have both dependent and group readings.

    iii. They do not have a crossed reading.

    iv. They contain De Se pronouns that are semantically plural.

    v. They have embedded clauses that describe the attitudes of a plurality taken together.

To begin with, consider the following consequence that property (iv) above has for standard accounts of propositional attitude reports. If De Se pronouns can be semantically plural (i.e., they can denote non-trivial sums), then the propositions ($\langle c, t \rangle$ functions) denoted by embedded clauses in plural De Se reports have the form $\lambda c.[...they...]$, where

they represents the value of the De Se pronoun. This poses a problem for traditional Hintikkan approaches to attitude reports where a proposition is taken to hold universally of each accessible context; see (6.35) above. Consider again (6.1), repeated below.

(6.44) Obama and Romney want PRO to win

Simplifying the semantic representation somewhat, the embedded clause denotes the proposition $\lambda c.[\text{they}_{o \oplus r} \text{ win in } c]$. For the dependent reading, there is no context accessible to either Obama or Romney where a plurality associated with them wins, and so the Hintikkan approach would incorrectly predict falsity. It seems that the truth of the dependent reading does not require a plurality to win in each accessible context; we observed earlier that (6.1) can be true if Obama desires Obama to win in Obama contexts and Romney desires Romney to win in Romney contexts. The issue now is how to construct a compositional account that captures this while still treating the De Se pronoun as semantically plural, in accordance with the arguments from §3.

Here I pursue one possible answer: the proposition denoted by an embedded clause can, sometimes, hold of a plurality of contexts taken together. Compared to familiar approaches to the truth of attitude reports (6.45) involving universal quantification, I offer an alternative involving plural predication that can be schematized as in (6.46).

(6.45) *A believes/hopes/wants p* = True

 iff each c of A's belief/hope/want alternatives C is such that $p(c)$

(6.46) *A believes/hopes/wants p* = True

 iff the plurality C corresponding to A's belief/hope/want alternatives C is such that $p(C)$

Below I offer two proposals for how to implement these ideas. First there is a modification of attitude verb semantics so that the proposition $\lambda C.[\text{they win in } C]$ does not need to hold of *each* accessible context, but in some cases it can hold of *the* accessible contexts

collectively. As for the semantic value of De Se pronouns, I will develop a hybrid of Schlenker's account with a thematic role approach to De Se suggested by Higginbotham (2003).

This section is organized as follows. I first address the issue of the interpretation of the clausal complements of attitude verbs, assimilating the Davidsonsian event quantifier with a context-based theory of clause meanings. I then turn to the interpretation of attitude verbs. I make claims about how to modify Schlenker's claims about attitude verb meaning to be suitable for plural reports, starting with modifications on how accessibility relations are defined, and then moving on to one of the central claims of this chapter: the possibility for attitude verbs to express collective predication of contexts. Following this, I present the second central claim: a thematic role based interpretation of De Se pronouns.

With these ingredients in place, I turn to the truth-conditional derivation of plural De Se reports. I will show how the proposals put forth here can account for the both group and dependent readings uniformly, without appealing to ambiguity. I will also show how the hypothetical crossed reading is ruled out, and how non-De Se reports lack dependent readings. I then use reciprocity in De Se reports to provide an argument for the thematic approach to De Se pronouns argued for here, as well as showing an extension of this approach to embedded predicates of personal taste. The final issue brought up in this section is an outline of a problem for future research, centered around the issue of thematic separation in attitude reports.

6.5.1 Embedded clause interpretation

In Chapter 2 I presented a standard view of sentence meaning in (neo-)Davidsonian semantics, namely that they are type t existential generalizations of events. As reviewed in the previous section, standard accounts of attitude reports make the intension of the embedded clause for its composition with the attitude verb, where the intension of a clause meaning in the neo-Kaplanian framework is a type $\langle c, t \rangle$ function from contexts to truth

values.

There are several ways to get from the basic type t to its intensional type $\langle c, t \rangle$. As mentioned previously, several options explored in the literature include positing a silent operator in the object language, or by making use of the rule of Intensional Function Application. I explore a different possibility: the silent existential event operator used in previous chapters can be defined in a way that its composition with its $\langle v, t \rangle$ complement yields the intension of a clause.

(6.47) First pass definition

$$[\![\exists_E]\!] = \lambda P_{\langle v,t \rangle}.\lambda C_c.\exists E[P(E)]$$

So far this intensional version of the $\exists_E$ creates the correct type for composition with an attitude verb after composing with its first argument. Notice that the context variable C is number-neutral. This will become important in the following sections where I will argue that there are certain cases where a non-trivial plurality of contexts is required.

There is still an issue that needs to be remedied. In the framework for intensionality assumed here, the embedded clause described events that take place in possible worlds (which are coordinates of the contexts) that are accessible to the attitude holder. So far, nothing about (6.47) requires that the events that are existentially quantified over exist in any particular world. This can be fixed by use of a metalanguage predicate $\text{IN}(E, W)$, which is satisfied if the event(s) E take place in world(s) W. In the revised definition, I use C_w to refer to the world coordinate of context C.

(6.48) Final definition

$$[\![\exists_E]\!] = \lambda P_{\langle v,t \rangle}.\lambda C_c.\exists E : \text{IN}(E, C_w)[P(E)]$$

This will be the version of $\exists_E$ that I will put to use in what follows. We still have all the benefits of Davidsonian event analyses for explaining clause-internal aspects of meaning, but the type of the clause is now an intensional type of the appropriate sort to compose with attitude verbs.

6.5.2 Attitude verb interpretation

I now turn to a "pluralization" of attitude verb meaning. I first modify the general form of accessibility relation definitions, and then use this to give attitude verb definitions that incorporate the idea of collective predication of contexts introduced above.

6.5.2.1 Pluralized accessibility relations

The standard definitions of accessibility relations ((6.34) above) are defined only for singular attitude holders; given an attitude holder x and context of evaluation c, an accessibility relation determines a set of contexts accessible to x in c. When faced with the issue of how to modify accessibility relations for cases involving a plurality of attitude holders, there are two plausible options for how to determine the appropriate set of accessible contexts: it is either the union or the intersection of the each singular attitude holder's respective sets of accessible contexts. Given that there are dependent readings, it seems that union is the correct choice.

To see what goes wrong with the intersection approach, consider again the dependent construal of (6.1). Assume that each candidate's respective accessible contexts are determined by the standard singular accessibility relations; (6.34) from §4. If the plural attitude report used the intersection of Obama and Romney's accessible contexts, then in the relevant model associated with the dependent construal this would be the empty set. This is so because Obama's contexts are all and only those where Obama wins and Romney loses, and Romney's contexts are those where Romney wins and Obama loses; there are no contexts accessible to both Obama and Romney where each gets what he wants, and so the intersection of their respective desire contexts is empty. The truth conditions of the report would involve universal quantification over the empty set, which is an unsatisfactory state of affairs. Initially it might not seem so bad if a universal generalization can be true if the domain of quantification is empty, a standard assumption in modern logic.

This would correctly capture the truth of our report, but it does so at the cost of allowing any proposition to hold when the set of accessible contexts is empty. In other words, in cases where Obama and Romney do not want the same thing, a desire report about them will always be true regardless of the embedded clause used.

Dependent readings thus suggest that the truth of the report is determined in part by contexts that only some individuals of the plurality of attitude holders are accessible to. It therefore seems appropriate to include these contexts in the relevant set that determines the truth of a plural attitude report; and so this set should be given by the union/sum of each singular attitude holder's respective accessible contexts. The general form of an accessibility relation R is given below. Keep in mind that lowercase variables are for atomic values, and uppercase variables are number neutral.

(6.49) *Plural accessibility relation - set version*

$R(X, C) = \{c : \exists x \leq X[c' \text{ is } R\text{-accessible to } x \text{ in } \text{WORLD}(C) \text{ and } \text{AUTH}(x, c')]\}$

In prose, a context c is accessible to a plurality of attitude holders X if c is accessible to at least one singular attitude holder x in X.[18]

To keep things consistent with a mereological approach, accessibility relations should determine a sum of contexts, not a set. Appropriate sums of accessible contexts are given by simply applying $\oplus$ to the sets of accessible contexts given by (6.49).

(6.50) *Plural accessibility relation - mereology version*

$R(X, C) = \oplus\{c : \exists x \leq X[c' \text{ is } R\text{-accessible to } x \text{ in } \text{WORLD}(C) \text{ and }$

$\text{AUTH}(x, c')]\}$

This assumes that contexts and their coordinates are part of a sorted domain of discourse, and each subdomain is closed under sum formation. There is precedent for sorted domains

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[18]In order to avoid the problems with an empty set of accessible worlds/contexts, I assume that every attitude holder has at least one accessible world/context for each attitude. Note that this is not an issue particular to my account; the standard Hintikkan definitions of accessibility relations and attitude verbs require the same stipulation or else truth is predicted whenever an attitude holder has an empty set of accessible worlds/contexts (i.e., in cases where an attitude holder does not want/think/etc. something).

in the event literature on plurality, where there is a subdomain for individuals, and another for events, and each have the usual algebraic structure; see Chapter 2. I propose that other ontological categories such as worlds also have a mereologial subdomain closed under sum-formation. Furthermore, contexts themselves can be summed by summing their coordinates; given $\langle auth_1, world_1, ... \rangle$ and $\langle auth_2, world_2, ... \rangle$, their sum would be $\langle auth_1 \oplus auth_2, world_1 \oplus world_2, ... \rangle$. This latter assumption will be important for the semantics of De Se pronouns and the attitude reports that contain them.

6.5.2.2 Generalizing the Hintikkan approach

The traditional Hintikkan approach can be likened to a certain type of plural predication: distributive predication of a plurality of contexts. I propose that there is a place for the other variety of plural predication in attitude reports; specifically, that (at least) De Se reports involve collective predication of the same sort of plurality. I will leave the technical details behind the satisfaction conditions of such predicates for later sections. For now it is enough to just work with an informal characterization of the proposal, as in (6.46), for the purpose of giving the lexical semantics of attitude verbs.

Let us first consider how to cast the traditional Hintikkan approach as distributive plural predication. The first step is to replace set notions with mereological ones in the lexical axioms of attitude verbs. For an attitude verb AV and its corresponding accessibility relation R, this can be done as follows.

(6.51) $[\![\text{AV}]\!] = \lambda C.\lambda P.\lambda X.\forall c' \leq R(X, C)[P(c')]$

Once given its arguments, the attitude verb yields truth conditions stating that every atomic context in the sum of accessible contexts determined by R satisfies the predicate P. There is another way to implement this in a mereological system; instead of universal quantification, a distributivity operator can be used. The same plurality that was quantified over now becomes an argument to the predicate $^D P$.

(6.52) $[\![AV]\!] = \lambda C.\lambda P.\lambda X.^D P(R(X,C))$

So far, this is just a notational variant of a standard idea. But treating attitude reports as involving plural predication, instead of universal quantification, leaves open the possibility that other types of plural predication might be involved in some attitude reports.

I propose that De Se reports represent a case where the distributivity operator is not present, and as such there is collective predication of a sum of accessible contexts. In other words, the embedded clause for De Se reports describes the attitudes of a plurality collectively, even if it does not describe the attitude of any singular attitude holder. In the past, authors have posited a De Se/non-De Se ambiguity for attitude verbs; I too posit such an ambiguity, but what sets De Se and non-De Se versions of attitude verbs apart is whether or not a distributivity operator is present[19]. Below I give the general form of a De Se attitude verb denotation.

(6.53) $[\![AV_{DeSe}]\!] = \lambda C.\lambda P.\lambda X.P(R(X,C))$

This is the first step in capturing the idea of collective satisfaction behind (6.46). For (6.1), the complement clause will have the form $\lambda C.[\text{they win in } C]$. A De Se attitude verb will take this proposition as an argument an apply it to the sum of Obama and Romney's accessible desire contexts. After λ-conversion, this sum will be the value of the variable C in the proposition associated with the embedded clause. Thus, the truth of the report, according to the De Se attitude verb denotation, will be decided by whether this sum of contexts collectively has the property that Obama and Romney win in those contexts. Because collective predication is at work, the truth conditions make no reference to

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[19]I do not deny that there may be more to the De Se/non-De Se ambiguity than just the former being collective and the latter distributive. For example, in Chierchia's (1989) well-known analysis of De Se reports, he develops a system where De Se attitude verbs take property-denoting clausal arguments while non-De Se attitude verbs take proposition denoting ones; building on insights from Lewis (1979). However, both types of attitude verbs for Chierchia involve universal quantification, and are thus susceptible to the plurality problems discussed above. So even if one were to assume the property/proposition dichotomy, I argue that this is not enough: De Se attitude verbs must also be collective in some sense in order to account for cases where the embedded clause property (which might contain a reciprocal component or express cumulativity) does not hold of each attitude holder.

atomic contexts, and so we have an explanation for why (6.1) can be true even though the proposition $\lambda C.$[they win in C] does not hold of any single accessible context.

There is still the task of providing criteria for when a proposition holds collectively. I suggest that this has to do largely with how plural De Se pronouns are defined, which I turn to immediately.

6.5.3 Plural De Se pronouns

In this section I will modify the Schlenkerian approach to De Se pronouns to account for plural cases. The crucial parts of Schlenker's analysis that I wish to make use of are: (i) the meaning of De Se pronouns contain a free context variable, which eventually gets bound by a λC operator; and (ii) the meaning of a De Se pronouns is bipartite, containing a referential component that is valued on par with other pronouns, and a presuppositional component that is responsible for the obligatory De Se interpretation.

The core modification that I will explore here is a revised presuppositional component. The presupposition will still make use of the notion of authorhood, but will do so in a way that involves the thematic role associated with the De Se pronoun. I will show in later sections that this particular presupposition provides a way to properly account for the both group and dependent readings without appealing to ambiguity, while also ruling out crossed readings. I will also show that this approach has the additional benefit of explaining a subtle nuance in meaning regarding reciprocity in De Se reports.

6.5.3.1 Thematic roles strike again

Higginbotham (2003) suggests that the meaning of PRO makes crucial use of the thematic role associated with the argument position where PRO resides. This addition is compatible with several of Schlenker's main claims about De Se reports; e.g., the use notions such as context and author, and the idea that different De Se pronouns have slight variations in meaning that differentiate PRO, shifted indexicals, and logophors. Appeal-

ing to thematic roles opens the way for a neo-Davidsonian account of De Se pronouns, one that I will argue works particularly well in accounting for the properties of plural De Se reports.

Higginbotham's motivation for using thematic roles comes from what he calls the *internal* property of PRO. This is a property of PRO that exists in addition to the property of immunity to error through misidentification. Higginbotham focuses on the use of PRO in certain gerundive complements of intensional transitive verbs such as *remember*.

(6.54)   a. Only Churchill remembers his giving the speech

b. Only Churchill remembers PRO giving the speech

This rather famous pair, discussed in Fodor (1975), illustrates an important point. When Churchill gave the "Blood, Sweat, and Tears" speech, there were other people there listening; and with this premise in mind, (6.54a) is clearly judged false. On the other hand, assuming further that no one but Churchill gave this speech, (6.54b) is judged true.

We may characterize this dichotomy as follows. (6.54a) is used to report the remembering of a proposition, in particular the proposition that Churchill gave the speech. People other than Churchill can remember this proposition too; such as people who were in attendance during the speech. Since other people also remember this proposition, when the exclusivity morpheme *only* is used in sentences like (6.54a), the sentence is thus judged false. On the other hand, (6.54b) is judged true as a report of the same situation. This suggests that what Churchill is reported to remember here is not a proposition. If it where a proposition, we would expect the same judgements as (6.54a), since the same proposition would be involved. However, this is not the case, as (6.54b) seems to communicate that what Churchill remembers is something more private and perspectival than what is reported to be remembered in (6.54a).

So what is Churchill reported to remember then in the case of (6.54b)? He remembers participating in an *action*. He remembers standing at the podium, looking over the

audience, and speaking the words of the speech. In other words, he remembers being a thematic participant of some sort in the events described by the complement of *remember*.[20] Since no one else was a participant in such events, they cannot remember being such a participant (assuming that memory modification or some other device of science fiction is not at work here), thus (6.54b) is true.

This is what is meant by the *internal* nature of PRO. The complement of the attitude verb does not describe a proposition that concerns the attitude holder, but instead describes an action that the attitude holder stands in some relation to. The attitude holder's role in the action is determined by the thematic role assigned to PRO; since PRO receives an agent role in (6.54b), we know that what Churchill remembers is being an agent in the action of given the speech. Furthermore, he remembers this in a way that is immune to error through misidentification; that is, he remembers in a De Se way. This is a special property of PRO, and arguably other De Se pronouns, which is lacking in the more basic pronouns as exhibited by (6.54a).

For present purposes, Higginbotham's proposal can be viewed as a way of extending Schlenker's account, which already provides a way of addressing immunity to error through misidentification by appealing to the author of an embedded context. Abstracting away from certain details, Schlenker's proposal of (6.55) can be represented as (6.56), and Higginbotham's can be given as (6.57) which crucially specifies which thematic relation holds of the author.

(6.55) John wants PRO to ...

(6.56) John wants $\lambda c.\text{AUTH}(c)$ ...

(6.57) John wants $\lambda c.\exists E[\text{AGENT}(E, \text{AUTH}(c)) ...]$

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[20]This should not be confused with the similar claim that what is remembered is an action: the claim is that what is remembered is the *performing* of an action. Onlookers can remember an action of Churchilll, but they cannot remember participating as Churchill in that action.

There are many details of Higginbotham's account that are not presented here, as they are not critical to the issue at hand. What is important for present purposes is the use of thematic relations to account for De Se properties of certain pronominal elements. In the following section, I will use Higginbotham's insight as a key ingredient in the proposal for a modified presuppositional component of De Se pronouns.

6.5.3.2   A new semantics for De Se pronouns

The goal now is to "pluralize" both the referential and presuppositional components of De Se pronouns. The referential component is relatively straightforward: the semantic value is determined by the antecedent, and when the antecedent is plural, so is the referential component of the De Se pronoun. In this way, the De Se pronoun is like other referential nominals. As a nominal element, it will be a bearer of a thematic role, and thus be interpreted as a monadic predicate of events. For this discussion, I will use the Theta Feature approach discussed in previous chapters (see especially Chapter 2). Thus, the beginnings of a general rule for De Se pronouns would look as follows.

(6.58) $[\![\mathrm{DSP}_{n,\Theta}]\!]^s = \lambda E.[\Theta(E, s(n)) \,\&\, [\text{De Se presupposition}]]$

The index n on the pronoun will act as an argument of the assignment function s. In textbook treatments of the interpretation of indexed structures (Heim and Kratzer (1998)), each pronoun bears an index, and the assignment function takes that index as an input and assigns an atomic value as an output. This view can be modified by allowing non-trivial sums to be assigned to a given index. I illustrate this below with a sample assignment function s that assigns atomic values to some indices and plural values to others.

$$(6.59) \quad s = \begin{bmatrix} 1 = a \\ 2 = b \\ 3 = a \oplus b \\ 4 = c \\ 5 = a \oplus b \oplus c \\ ... \end{bmatrix}$$

Alternatively, one can follow the suggestions of Lasnik (1986) where plural pronouns have not just a single index, but an index set. Under this view, each atom referred to by the pronoun has an index, and the index set of the plural pronoun has as members the various indices associated with these atomic values. This approach may have advantages over the single index approach to plural pronouns; see Büring (2005)) for references and discussion. For the following discussion I will stick to the single index approach, though I consider the index set approach to be a viable alternative that does not require substantial changes to the main ideas presented here.

I now turn to the presuppositional properties of plural De Se pronouns, which will be an important ingredient in giving proper truth conditions of De Se reports in the next section. I will draw on Higginbotham's insight, and incorporate a thematic relation into the presupposition. The particular thematic relation is again determined by the Theta Feature on the De Se pronoun. The question now is how exactly to formulate this thematic presupposition in a way that correctly captures the meaning of both singular and plural De Se pronouns.

I propose that the De Se presupposition is a universal generalization over the contexts that are accessible to the attitude holder(s). This is where the context variable, contained in Schlenker's original presuppositions, is put to use. The difference here is that the context variable is number-neutral, and receives the value of the plurality of contexts that are accessible to the attitude holders. The presupposition thus states properties that hold universally of each atomic context within these accessible contexts. Drawing on

Higginbotham's insight, I propose further that this property describes sub-events in which atomic authors participate in on their respective atomic worlds.

(6.60) Proposed De Se presupposition:

$$\forall c \leq C[\exists E' \leq E[\text{IN}(E', c_w) \;\&\; \Theta(E', c_a)]]$$

In prose, the presupposition states that for every atomic context c in C, there are sub-events E' of the events described by the complement clause E such that E' takes place in c_w and the Θ of E' is c_a. I now present the final schema for De Se pronoun interpretation, incorporating both referential and presuppositional components.

(6.61) $\llbracket \text{DSP}_{n,\Theta} \rrbracket^s = \lambda E.\Theta(E, s(n)) \;\&\; \delta[\forall c \leq C[\exists E' \leq E[\text{IN}(E', c_w) \;\&\; \Theta(E', c_a)]]]$

The variable C in the presupposition is bound by the λC operator introduced by the $\exists_E$ defined in (6.48). The variable E is bound by the λE operator introduced by the Theta Rule, the same operator that binds the event variable in the referential component of the De Se pronoun, see (6.58).

The work of the De Se presupposition can be appreciated by comparing it to previous accounts of De Se ascription, in particular the property self-ascription view (Lewis (1979), Chierchia (1989)). Chierchia treats the embedded clauses of obligatory De Se reports as properties, where the position of PRO has been abstracted over. He follows Lewis in treating De Se attitudes not as involving propositions, but as the self-ascription of a property by the attitude holder. For Chierchia, the embedded clause of the reciprocal sentence, repeated below as (6.62), would be interpreted as in (6.63) (number-neutral variables are my addition).

(6.62) Obama and Romney want to destroy each other

(6.63) $\llbracket$PRO to destroy each other$\rrbracket = \lambda X.X$ destroy each other

If one assumes that attitude verbs universally distributive the property denoted by embedded clauses (as in (6.63)) to each individual agent, then (6.62) should be false or

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infelicitous since a reciprocal property cannot hold of a singular individual, as discussed previously. Now let us try the suggestion that universal quantification is not at work as I suggested above, and the truth conditions involve collective satisfaction of the predicate in (6.63). This avoids the problem of giving the reciprocal a singular antecedent value. However, it does so at the cost of removing precision about De Se content; it raises questions about why there are a lack of crossed readings, or why there should be dependent readings, and why each attitude holder has a De Se thought himself. The De Se presupposition I defined above is meant to avoid these issues. Under the present account, property self-ascription is still at work in capturing De Se content, but it is a different sort of property than the ones given by λ-abstraction on the position of the De Se pronoun. In particular, the proposal here is that each individual attitude holder self-ascribes a thematic property: the property of being the Θ of some events E'. For (6.62), it is reported that Obama self-ascribes the property of being the agent of some events E', and Romney self-ascribes the property of being the agent in some events E''. The proposed truth conditions of (6.62) do not say much about E' and E'', except that together $E' \oplus E''$ count as events where Obama and Romney destroy each other. To summarize, property self-ascription is still at work in De Se reports, but they are properties of being a thematic participant in some type of sub-event.

6.5.4 The truth conditions of plural De Se reports

We are now in a position to put the proposals about the semantics of embedded clauses, attitude verbs, and De Se pronouns to work. I will first present a derivation of our parade case, repeated below as (6.64).

(6.64) Obama and Romney want PRO to win

I then turn to discussion of how the derived truth conditions can account for both group and dependent readings. The approach developed here is such that these are not two sep-

arate "readings" in the sense that (6.64) is ambiguous; rather, the truth conditions are underspecified in a way that they are compatible with both group and dependent construals of (6.64). I will also discuss how the hypothetical crossed reading is ruled out in this system, and how non-De Se reports lack a dependent interpretation. I then present an argument from reciprocity in De Se reports that supports the thematic approach developed here.

Before deriving the truth conditions of (6.64), some preliminary remarks about the LF of De Se reports are in order. Below I provide LF phrase marker of (6.64) that will act as input to semantic interpretation.

(6.65)

$$\text{[Obama and Romney]}_n \qquad \text{want} \quad c^* \quad \exists_E \quad \text{PRO}_{n,ag} \quad \text{to win}$$
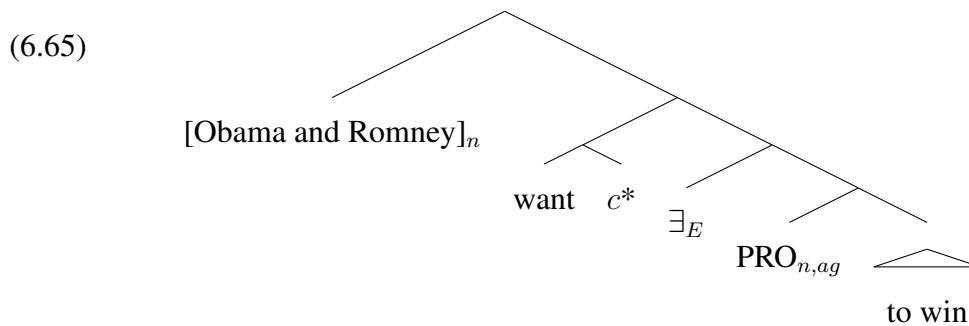
The attitude holder nominal and the De Se pronoun, PRO, are coindexed with n; this results in the referential component of PRO's meaning having the same semantic value as the subject of the attitude holder: $o \oplus r$. As mentioned previously, the De Se pronoun is treated on par with other nominals in the neo-Davidsonian system pursued here in that it is interpreted as a monadic predicate of events by being Theta-marked with the feature ag; however, the subject of the attitude holder is interpreted simply as a type e value. In §6.5.6, I suggest that this argument too should also be treated as a monadic predicate of events.

The attitude verb composes with a context argument, in this case c^*, that is used to generate the appropriate plurality of alternative contexts: BOUL$(o \oplus r, c^*)$. I will simplify the embedded clause somewhat by treating the infinitival marker *to* as semantically vacuous; in other words, I assume $[\![\text{to win}]\!] = [\![\text{win}]\!]$. With all this in mind, I provide the derivation of the truth conditions of (6.64) below in (6.66).

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(6.66)   i. $[\![\text{win}]\!]^s = \lambda E.\text{WIN}(E)$

ii. $[\![\text{PRO}_{n,ag}]\!]^s = \lambda E.\text{AGENT}(E, s(n)) \;\&\; \delta[\forall c \leq C[\exists E' \leq$
$E[\text{IN}(E', c_w) \;\&\; \text{AGENT}(E', c_a)]]]]$

iii. $[\![\text{PRO}_{n,ag}\ \text{win}]\!]^s = \lambda E.\text{AGENT}(E, s(n)) \;\&\; \text{WIN}(E) \;\&\; \delta[\forall c \leq C[\exists E' \leq$
$E[\text{IN}(E', c_w) \;\&\; \text{AGENT}(E', c_a)]]]]$

iv. $[\![\exists_E\ \text{PRO}_{n,ag}$
$\text{win}]\!]^s = \lambda C.\exists E : \text{IN}(E, C_w).\text{AGENT}(E, s(n)) \;\&\; \text{WIN}(E) \;\&\; \delta[\forall c \leq$
$C[\exists E' \leq E[\text{IN}(E', c_w) \;\&\; \text{AGENT}(E', c_a)]]]]$

v. $[\![\text{want}]\!]^s = \lambda C.\lambda P.\lambda X.P(\text{BOUL}(X, C))$

vi. $[\![\text{want c*}]\!]^s = \lambda P.\lambda X.P(\text{BOUL}(X, c*))$

vii. $[\![\text{want c*}\ \exists_E\ \text{PRO}_{n,ag}\ \text{win}]\!]^s$
$= \lambda X.[\lambda C.\exists E : \text{IN}(E, C_w).\text{AGENT}(E, s(n)) \;\&\; \text{WIN}(E) \;\&\; \delta[\forall c \leq C[\exists E' \leq$
$E[\text{IN}(E', c_w) \;\&\; \text{AGENT}(E', c_a)]]]](\text{BOUL}(X, c*))$

viii. $[\![\text{Obama and Romney want c*}\ \exists_E\ \text{PRO}_{n,ag}\ \text{win}]\!]^s$
$= \exists E : \text{IN}(E, C_w).\text{AGENT}(E, s(n)) \;\&\; \text{WIN}(E) \;\&\; \delta[\forall c \leq C[\exists E' \leq$
$E[\text{IN}(E', c_w) \;\&\; \text{AGENT}(E', c_a)]]](\text{BOUL}(o \oplus r, c*))$
$= \exists E : \text{IN}(E, \text{BOUL}(o \oplus r, c*)_w).\text{AGENT}(E, o \oplus r) \;\&\; \text{WIN}(E) \;\&\; \delta[\forall c \leq$
$\text{BOUL}(o \oplus r, c*)[\exists E' \leq E[\text{IN}(E', c_w) \;\&\; \text{AGENT}(E', c_a)]]]$

The last step [viii] gives the truth conditions of (6.64). In prose, it states that there are events E that take place in the collection of Obama and Romney's desire worlds; these are events of winning with Obama and Romney as their agents; lastly, there is the presupposition that each atomic context c in Obama and Romney's desire alternative contexts are such that the author of c is the agent of some sub-event $E' \leq E$, and E' takes place on the world of c.

I will now turn to discussion of how these truth conditions are satisfied by models associated with the group and dependent construal of (6.64), and how a model associated

with the crossed reading does not satisfy these truth conditions.

6.5.4.1   The range of interpretations of plural De Se reports

Let us consider what a model for the dependent reading of (6.64) looks like. Recall that this represents a situation where Obama wants just Obama to win, and Romney wants just Romney to win. This corresponds to a model where Obama's desire contexts are such that the author of each of those contexts wins and Romney loses; likewise, Romney's desire contexts are such that the author of each of those contexts wins and Obama loses. The sum of Obama and Romney's desire contexts in c^*, $\text{BOUL}(o \oplus r, c^*)$, is then such that there are events E which contain sub-events where Obama wins and different sub-events where Romney wins. Thus, the totality of E may be characterized as having both Obama and Romney as agents of winnings. Of course, each of these winnings takes place in different possible worlds; Obama wins in Obama worlds and Romney wins in Romney worlds. Both those worlds (and the contexts they are coordinates of) taken together are such where Obama and Romney win in them. It follows then that the portion of the truth conditions before the De Se presupposition are satisfied: $\exists E \; : \; \text{IN}(E, \text{BOUL}(o \oplus r, c*)_w).\text{AGENT}(E, o \oplus r) \; \& \; \text{WIN}(E)$.

Let us now consider what each atomic desire context looks like in this model. For each of Obama's contexts c, Obama as an author c_a wins in each atomic world c_w. In other words, each of Obama contexts are such that the author of that context is an agent of winning events. Vice versa for Romney; for his contexts, the author of each of those contexts is an agent of a winning events in a Romney world. The presupposition is thus satisfied in this model. Furthermore, by making a statement about the author of each individual context, we have an explanation for the obligatory De Se content of the report, in the same way that De Se content is accounted for in Schlenker's system.

Consider now the group construal of (6.64), where Obama and Romney each wants the plural consisting of the two of them to win. This is probably not the case with the

election, but perhaps they bowl on the same team and they want to win the bowling competition. In a model associated with this case, each of Obama's contexts will be such where both the author of the context *and* Romney[21] are agents of winning in the world of that context. Likewise, in each of Romney's contexts, the author of that context and Obama win in the world of that context. This situation ends up satisfying the truth conditions of (6.64) since the De Se presupposition does not require of each context c that c_a is the *only* agent of the winning on c_w. The truth conditions are thus underspecified enough to be satisfied by models associated with dependent and group construals, without appeal to ambiguity[22]. Of course, the task now is to make sure that the truth conditions are not too underspecified. I will take up this issue shortly. But first, some remarks about the principle of Variety are in order.

Recall from Chapter 2 predicates of sums of events are such that there is no guarantee that the predicate will hold of any of the parts of the sum. This was represented by the principle of Variety. This is relevant for the present case, since the truth conditions in (6.64) state that the sum of events E are such that $\text{WIN}(E)$. In the presuppositional portion of the truth conditions, we see a statement about each author being the agent of some sub-events $E' \leq E$. Does this mean that they are agents of winning? By the principle of Variety alone, this is not guaranteed. However, consider the fact the main events E are a sum of winning events that take place in different possible worlds. From Variety alone, we cannot conclude that the part of E are also winnings; but would the state

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[21]Or perhaps some counterfactual version of Romney.

[22]If there is no ambiguity involved, we would expect truth of cases where the embedded clause contains conjoined VPs, where one VP receives the dependent construal and the other VP receives the group construal (thanks to Neil Myler, p.c., for bringing this predication to my attention). As is shown below, this is indeed possible.

    i. Obama and Biden want to win and (then) kill each other

Notice however that such examples alone do not rule out an ambiguity approach in general; they just show that the ambiguity does not lie in the subject, PRO, or some operator above it. For example, one could analyze the group/dependent dichotomy a property of VPs, in which case the VPs in (i) could be viewed as ambiguous (perhaps one of the construals is given by some VP-level operator). This line of reasoning is on par with the discussion of ambiguity regarding collective/distributive ambiguities discussed in Chapter 2.

of affairs hold if E counts as winnings but its sub-events do not? In theory, this could be a case where Obama did something in his worlds, and Romney did something in his worlds; their actions alone did not count as a winning, but the sum of their actions would. Unless we assume a metaphysics built around modal realism and travel among worlds is possible, where the actions in one world can influence and be influenced by actions in another world, it is very hard to see how the events E can be winnings while its parts E' that may take place in an Obama world for example are not a winning. I believe then that it is safe to assume that if E counts as winnings, and these describe events that take place in multiple worlds, then it is fair to assume that sub-events E'[23] of E that take place in a single world also count as a winning.

The hypothetical crossed reading of (6.64) is one where Obama wants himself to lose and Romney to win, and Romney wants himself to lose and Obama to win. If it were not for the De Se presupposition in the truth conditions of (6.64), there would be nothing to rule this out. Without the presupposition, the truth conditions would simply be that Obama and Romney are agents of winning in events that take place in the collection of Obama and Romney's accessible desire context. Nothing is said about individual contexts, specifically who is winning on the worlds of those contexts. While these presupposition-less truth conditions can be satisfied by models associated with group and dependent construals, they can also be satisfied by a model where Obama's worlds are such that Obama loses and Romney wins, and vice versa for Romney.

The presupposition rules out this case by its appeal to authorhood. In particular, the statement that the author of each context is the agent of a winning in the world of that context. For each of Obama or Romney's contexts, the author loses; so while it may be true that the totality of Obama and Romney's desire alternatives can be characterized as having Obama and Romney win, it does not hold that the author of each context wins in

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[23]This is not to say that the events $E' \leq E$ that take place in a single world also have all their parts count as winning; for example, part of Obama's winning might have been due to his campaigning, but his campaigning alone does not count as winning. This suggests that variety might be viewed as a condition that only holds of events that take place in a single world.

the world of that context. In essence, the crossed-reading is ruled out by the component of meaning that is responsible for the obligatory De Se interpretation.

For the sake of completeness let us consider a non-De Se report like Beck and Sauerland's (6.3), repeated below as (6.67), which lacks a dependent construal.

(6.67) Max and Peter said that Bill married Ann and Amy

A dependent situation would be one where Max said that Bill married Ann, and Fred said that Bill married Amy. In other words, each of Max's alternative contexts are such that Bill married Ann, and each of Peter's alternative contexts are such that Bill married Amy. In §6.5.2.2 we drew a distinction in the semantics of De Se versus non-De Se reports to account for this. In particular, non-De Se attitude verbs are interpreted in the classical Hintikkan fashion, implemented in here with a distributivity operator that forces the predicate associated with the embedded clause to hold of *each* accessible context; while on the other hand, De Se attitude verbs are interpreted without the distributivity operator, and we thus have the effect of collective predication which I have argued gives rise to dependent construals. Since (6.67) is not a De Se report, then the proposition $\lambda c.$[Bill married Ann and Amy] is taken to hold of each of Max's contexts and each of Peter's. But none of these contexts satisfies the proposition that Bill married Ann and Amy, since each attitude holder in this case only said that Bill will marry just one woman, and therefore (6.67) should be judged false, as desired.

6.5.4.2   Reciprocity as an argument for the thematic approach

One may wonder whether using thematic relations in the De Se presupposition is necessary. A possible alternative that still treats these De Se pronouns as plural would be that the pronoun simply refers to the plurality of authors. Our parade case (6.64) would then have truth conditions paraphrasable as "the authors of C win in the worlds of C". This would still derive both group and dependent readings with the same truth conditions,

and crossed-readings are ruled out because in that case there are no authors winning. Why then go through all the trouble with a convoluted De Se presupposition?

One argument for the thematic approach comes from embedded reciprocal expressions of the kind discussed earlier.

(6.68) Obama and Romney want PRO to destroy each other

If the antecedent to the reciprocal in such cases is the De Se pronoun PRO, then the alternative account just outlined would have the antecedent value of the reciprocal be "the authors". This could be implemented by a slight modification to Schlenker's non-thematic De Se presupposition that replaces his singular variables with number-neutral ones: $\delta\text{AUTH}(X, C)$. The resulting truth conditions would then be as follows given the account of reciprocity argued for in Chapter 4[24]. For ease of exposition, I will use C as a shorthand for $\text{BOUL}(o \oplus r, c*)$

(6.69) $\exists E : \text{IN}(E, C_w).\text{AGENT}(E, o \oplus r)$ & $\delta\text{AUTH}(o \oplus r, C)$ & $\text{DESTROY}(E)$ & $\forall x \leq$
$o \oplus r[\exists E' \leq E[\text{AGENT}(E', x)$ & $\exists Y \leq o \oplus r[\text{OTHER}(Y, x)$ & $\text{THEME}(E', Y)]]]]$

The problem here is the presupposition that Obama and Romney are authors. While this does account for the De Se properties of the report, it provides the wrong sort of information to the reciprocal. With "the authors" as the reciprocal's antecedent, the truth conditions state that the authors are both the agents and the themes of the destruction events. However, (6.68) can be used to report Obama's desire to destroy Romney and not be destroyed himself; and vice versa for Romney. This would be a dependent construal of (6.68). Reflecting a bit on a model associated with this situation, we want whatever counterfactual version of Romney that exists in Obama's worlds *not* to be a Romney-author value, since that would imply that Romney wants himself to be destroyed. Likewise for the counterfactual version of Obama on Romney's worlds. In other words, we want the

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[24]This argument does not require my particular approach to reciprocals. Any approach which relies on a single local plural antecedent to compute the reciprocal's meaning would run into the same problem.

values of the themes of destruction to not be authors in order to account for this dependent reading. The non-thematic approach does not offer a solution here; it merely states that Obama and Romney are authors, regardless of which thematic role they assume.

The thematic De Se presupposition offers exactly what we need to avoid this problem. This presupposition attributes authorhood not to individuals per se, but to participants under some thematic guise. Consider the truth conditions of (6.68) given the account developed here.

(6.70) $\exists E : \text{IN}(E, C_w).\text{AGENT}(E, o \oplus r) \ \& \ \delta[\forall c \leq C[\exists E' \leq$
$E[\text{IN}(E', c_w) \ \& \ \text{AGENT}(E', c_a)]]] \ \& \ \text{DESTROY}(E) \ \& \ \forall x \leq o \oplus r[\exists E' \leq$
$E[\text{AGENT}(E', x) \ \& \ \exists Y \leq o \oplus r[\text{OTHER}(Y, x) \ \& \ \text{THEME}(E', Y)]]]]$

The non-presuppositional contribution of the truth conditions are just as before: Obama and Romney's desire contexts are such that Obama and Romney destroyed each other. Again the reciprocal takes as its antecedent the referential value of the De Se pronoun, in this case $o \oplus r$. The De Se presupposition adds the further conditions that the agent of the destructions *for each atomic context* is the author of that context. Therefore, for each atomic context c, the theme of the destruction in c will be the other candidate, but there is nothing in the truth conditions that says that the other candidate is also an author in c, just that the agent is an author in c.

In brief, the distinction between the accounts can be summarized thusly: the non-thematic account says simply that Obama and Romney are authors, while the thematic account says that the agent of the destruction in each atomic context is an author. The former treats Obama and Romney as authors regardless of whether they are agents or themes, while the latter states just that Obama and Romney *as agents* are authors, but nothing is said about the themes. Of course, the themes could be authors too; this would correspond to a group construal where each wants mutual destruction. But this is not a necessary interpretation of the report; and the non-thematic approach does not provide an explanation for a dependent interpretation.

6.5.5 Plural ascription of predicates of personal taste

In this section I will examine an alleged non-subject occurrence of PRO, and show that the account developed here accounts for plural versions of these cases as well. Stephenson (2010), following insights from Lasersohn (2005), argues that embedded predicates of personal taste involve a silent PRO that acts as an experiencer argument that is referentially dependent on the attitude holder nominal. The crucial aspect of meaning here is that what tastes good is evaluated based on John's tastes; not, for example, the speaker's tastes.

(6.71) John wants the cake to taste good PRO_j

I will not review here the exact details and arguments for Stephenson's approach, I will build on her account and show how her proposals about the role of PRO in embedded predicates of personal taste can be easily extended to plural variants of this construction.

The first step is accounting for the experiencer PRO. This is relatively straightforward in the present approach: PRO is assigned an experiencer Theta Feature, and this yields an experience relation in the De Se presupposition. Thus, we get truth conditions of (6.71) that can be paraphrased as John desired states of the cake tasting good relative to the tastes of the author (i.e., John) who experiences that taste. This is just a case where PRO receives a thematic role different from agent: everything else remains the same.

Consider now plural versions of the constructions that interested Stephenson, such as (6.72).

(6.72) Obama and Romney want the cake to taste good $PRO_{o \oplus r}$

Interestingly, (6.72) can be used truthfully even if Obama and Romney have conflicting ideas about what tastes good. This is, again, another sort of dependent reading which can be accounted for by the present approach. Simplifying to avoid extraneous details, the truth conditions of (6.72) are given below.

(6.73) $\exists E : \text{IN}(E, C_w).\text{EXP}(E, o \oplus r)$ & CAKE-TASTES-GOOD(E) & $\delta[\forall c \leq C[\exists E' \leq$

$\qquad E[\text{IN}(E', c_w)$ & $\text{EXP}(E', c_a)]]]]$

In prose, Obama and Romney's desire contexts are such that the cake tastes good in those contexts, but as far as each individual context is concerned, what counts as good is determined by the author of that context.

6.5.6 Severing the arguments of attitude verbs

In this section I will outline an issue about the standard semantic type of attitude verbs. For much of this dissertation I have pursued a strong neo-Davidsonian thesis: the total separation approach to argumenthood. In standard theorizing, canonical attitude verbs are typically assigned definitions where they receive at least two arguments, the meanings of the embedded clause and the attitude holder nominal[25]. A question then arises if attitude verbs, like all other verbs, are monadic predicates of events/states. If so, we are lead to the further question about how to to represent the argument of attitude verbs as separated thematic conjuncts.

One hurdle in pursuing this line of thought is reconciling separation of the subject argument with the generation of the relevant set of alternative contexts. In standard approach to attitude verb meaning, the composition with the subject provides a type e value used to generate the set of alternative contexts that are accessible to that value (with respect to an evaluation context). The particular accessibility relation to be used is generally taken to be part of the attitude verb's meaning, but this relation only determines the appropriate set when it is given the type e value, provided by the subject nominal. Function Application thus seems to be perfect for the composition of the attitude verb with its subject. If one were to pursue thematic separation, an explanation would be required for how

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[25]Here, for simplicity, I have followed others in positing a third context-of-evaluation argument. This is not necessary though, as other approaches represent this value as a parameter of the interpretation function, not as an argument to the attitude verb. I focus in the main text only on those more traditional "arguments" of attitude verbs.

to generate the alternative contexts for the attitude verb which does not directly compose with a value that tells us who the contexts are accessible to.

Another issue is the composition of the attitude verb with the embedded clause. I have followed previous approaches in treating the attitude verb as a sort of higher order function, which takes a $\langle c, t \rangle$ function as an argument and applies it either to each context (on the classical Hintikkan approach) or to the plurality of accessible contexts itself (on the present approach). This type of composition is again easily accommodated by Function Application.

The choice to separate the arguments of attitude verbs is a step towards a more parsimonious theory with the same approach to argumenthood applied to all verb meanings. Not only that, but there is a further unification of clause meanings that could be sought. Most clause meanings in this dissertation are existential generalizations of events; not so with attitude reports, as the attitude verb is responsible for producing a type t meaning after composition with its arguments, without the need for existential closure.

Furthermore, there are empirical reasons for pursuing separation, at least internal to the theory developed here. I have argued for an analysis of De Se pronouns that makes crucial use of them being assigned thematic roles and being interpreted in a neo-Davidsonian fashion. As mentioned previously, this is not so with the subject of attitude verbs, which is treated here as a standard type e expression. A problem arises when we consider cases of iterated attitude reports like (6.74).

(6.74) John wants PRO to want to win

There are conflicting demands on the semantic value of PRO in this system. On the one hand, we want PRO to be treated as a type $\langle v, t \rangle$ expression (i) to fit with all other neo-Davidsonian nominals, and more importantly (ii) this type is required to compute the meaning of the De Se presupposition put forth above. On the other hand, we want PRO to be a type e expression so that it can compose with the embedded attitude verb, and thereby create the appropriate set of alternative contexts. The problem can be fixed if the external

arguments to attitude verbs were separated, and then PRO could always be interpreted as $\langle v, t \rangle$. Alternatively, another unified approach is to not separate any arguments, but this would require all arguments being of type e, and this goes against the plethora of arguments for thematic separation.

In the next section, I sketch a theory where the arguments of attitude verbs are severed, and introduce some issues in this line of reasoning for future research.

6.6   A separationist account of De Se reports

In this section, I will show how far the tools used in previous chapters can go in explaining some of the puzzles of plural De Se reports. I will not add much to the general neo-Davidsonian system here; the goal is to show that much of the problems we saw previously can be addressed by the neo-Davidsonian theory of plurality presented here if we put aside some issues about the interpretation of attitude verbs and De Se pronouns. The focus will be on ideas that should be familiar by now, such as thematic separation and how cumulativity is related to thematic roles. To close this section, I make some suggestions about how to "intensionalize" this account.

6.6.1   The task

The general goal here is to give a neo-Davidsonian decomposition of attitude reports. This means taking standard truth conditions of attitude reports, which are universal generalizations of worlds/contexts (6.75), and representing them instead as an existential generalization of eventualities (6.76).

(6.75) $\forall W \in R(X, W')[p(W)]$

(6.76) $\exists E[\Theta_1(E, X) \ \& \ \mathbf{V}(E) \ \& \ \Theta_2(E, p)]$

As discussed in §6.5.6, this is not a trivial task. However, I believe that the primary difficulty is reconciling intenstionality properties of attitude reports with the neo-Davidsonian

decomposition in (6.76). As such, I will put off discussion of intensionality until the end of this chapter, and show how far a neo-Davidsonian approach to attitude verb meaning can go in explaining the cumulative (or non-cumulative) properties of attitude reports we have observed thus far.

Below I repeat the list of relevant semantics properties exhibited by plural De Se reports that need to be addressed.

(6.77) Properties of plural obligatory De Se reports

    i. They report that each attitude holder has a De Se attitude about himself.

    ii. They can have both dependent and group readings.

    iii. They do not have a crossed reading.

    iv. They contain De Se pronouns that are semantically plural.

    v. They have embedded clauses that describe the attitudes of a plurality taken together.

6.6.2 The internal argument of attitude verbs

Let us start with the related observation that not all attitude reports in natural language have property (v). This was evidenced from Beck and Sauerland's example (6.3) repeated below as (6.78). Compare with a sentence that differs minimally from (6.78) by having a pronoun that is coreferential with the attitude holder (6.79).

(6.78) Max and Peter said that Bill will marry Ann and Amy (*respectively)

(6.79) Max and Peter said that they will marry Ann and Amy (respectively)

As remarked upon earlier, (6.78) reports that Max and Peter said the same thing: Bill married the two women. On the other hand (6.79) can report that each said a different thing; namely that he will marry just one of the women. This is where we can see property

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(v): the embedded clause of (6.79) does not describe the attitude(s) of either Max or Peter, but seems to describe their plurality of attitudes when taken together.[26]

We have seen this state of affairs previously, not in the domain of attitude reports, but with simple action sentences. Starting in Chapter 2, we saw that the object of an action verb can denote something that a plural subject is not related to exhaustively. Simple cumulative sentences exemplify this.

(6.80) Max and Peter married Ann and Amy

Although (6.79) can report that each man married two women, it can also be used to report that each man married one of the women. Likewise, (6.79) can be used to report that each said that he will marry two women (the group reading), or it can be used to report that each wants to marry one woman (the dependent reading).

The action monoclause (6.80) is accounted for by having both subject and object associated with thematic relations with plural arguments. This idea has been extended to the domain of attitude reports by Dotlačil (2010). Putting details aside, he argues that the embedded clauses of attitude reports be associated with a plurality of events. This account has much in common with accounts of perception reports like (6.81) which have also been argued to involve a verb that takes an event-denoted complement; see Higginbotham (1983).

(6.81)   a. John saw Brutus stab Caesar

  b. $\exists E[\text{AGENT}(E, j)\ \&\ \text{SEE}(E)\ \&$
    $\exists E'[\text{THEME}(E, E')\ \&\ \text{AGENT}(E', b)\ \&\ \text{STAB}(E')\ \&\ \text{THEME}(E', c)]]$

In both the classic analysis of perception reports and Dotlačil's analysis of attitude reports, the events denoted by the embedded clause must meet the event description associated

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[26]Again, I am not claiming that this is a property specific to obligatory De Se reports, as the optional report (6.79) has this property. As Beck and Sauerland observed, presence of a pronoun is a crucial factor. It may further be the case that when the dependent reading is intended with an optional report like (6.79) then it must also be De Se; but I put this issue aside as optional De Se reports are not my focus here.

with the embedded clause. For (6.81), the events that are themes of the seeing must be events of stabbing where Brutus is the agent and Caesar is the theme. Likewise, for a De Se report like (6.82), the things wanted are events where Obama wins.

(6.82) Obama wants PRO to win

If attitude verb's have separated arguments like other verbs, then the attitude verb is interpreted as a monadic predicate of events (or states), and its internal argument is associated with a thematic relation. It does not matter for present purposes what we label this thematic relation, so I will just call it INT, short for *internal*. Under this view, action sentences and attitude reports do not look very different, save that the internal argument for the former is individual denoting, while for the latter it is event denoting.[27]

(6.83)   a. Obama wants cookies

   b. $\exists E[\text{AGENT}(E, o) \ \& \ \text{WANT}(E) \ \& \ \exists X[\text{COOKIE}(X) \ \& \ \text{THEME}(E, X)]]$

(6.84)   a. Obama wants PRO to win

   b.

   $\exists E[\text{AGENT}(E, o) \ \& \ \text{WANT}(E) \ \& \ \exists E'[\text{AGENT}(E', o) \ \& \ \text{WIN}(E') \ \& \ \text{INT}(E, E')]]$

Dotlačil's general idea also provides a way to explain group and dependent readings in plural reports. The explanation proceeds along the same lines for how sentences like (6.80) above can have both distributive and cumulative readings. For the distributive reading, each agent did something to the entirety of the theme, while for the cumulative reading, each agent did something to only a part of the theme. Consider now our parade case (6.1), repeated below.

(6.85) Obama and Romney want PRO to win

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[27]An interesting question arises whether the internal thematic role is really different in both cases. See Pietroski (2005) for discussion.

Let us idealize and assume that PRO is simply a pronoun that is covalued with *Obama and Romney*. As such, the embedded clause denotes events of Obama and Romney winning. For the group reading, each individual wants both Obama and Romney to win. If E is the plurality of denoted by the embedded clause (events where both Obama and Romney win), then both Obama and Romney want E: E is the theme of both Obama's and Romney's wantings. Compare with the distributive reading of the action sentence (6.80), where both agents married the entire plurality denoted by the theme.

Conversely, for the dependent reading of (6.85), neither Obama nor Romney by himself wants all of E, since E has both candidates winnings and each candidate wants just one candidate to win: himself. That is to say, each candidate wants just a proper part of E, namely those parts where he is the winner. This is comparable to the cumulative reading of the action sentence (6.80), where each agent does not marry the entirety of the theme, but just a part of it. For (6.80), what is required is that Max and Romney *together* married Ann and Amy, even if no single agent married Ann and Amy. Likewise, for (6.85), what is required is that Obama and Romney *together* want Obama and Romney to win, even though no single agent wants the Obama-Romney plurality to win.

In sum, the tools to derive group and dependent readings are already present mechanisms needed to handle distributivity and cumulativity. As it stands, this analysis of cumulativity predicts crossed readings of plural De Se reports to be possible, but we know that this is not the case. I will turn to this issue shortly.

6.6.3   Intensionality, attitudes De Se, and separation

We have so far accounted for properties (ii), (iv), and (v); we still need to address the obligatory De Se properties and the lack of crossed readings. I believe that these two properties are very closely related; and I will discuss their interdependency in both this section and in §6.5. As a way of leading into this topic, let us consider one problematic aspect of Dotlačil's account: he does not provide a way to account for the limited range of

readings with Beck and Sauerland type examples. Dotlačil gives his analysis for attitude reports in general, but the crucial point of Beck and Sauerland's examples is that only attitude reports with embedded pronouns that refer to the attitude holders allow dependent readings. Another way of putting this is that without the pronoun, attitude reports must be understood distributively in the sense described above.

Let us assume that it is not just the presence of a pronoun that gives rise to dependent readings, but a pronoun read De Se. This would mean that only De Se reports allow the cumulative interpretation (the dependent reading), while non-De Se reports only allow the distributive interpretation (the group reading). Several authors have argued that the grammar of De Se reports differs from that of non-De Se reports; see for example Chierchia (1989), and Percus and Sauerland (2003), among others. I propose that there is a difference in the interpretation of De Se versus non-De Se reports, and that difference lies in the interpretation of their respective embedded clauses. In particular, I propose that Dotlačil's analysis is only correct for De Se reports: only De Se reports have embedded clauses that denote a plurality of events, and so only De Se reports exhibit cumulativity between the agents and these events.

The question now is what is the interpretation of non-De Se embedded clauses if they are not a plurality of events. I propose that these embedded clause pick out a proposition, as they do in classical accounts of attitude reports. What is important for the present account is that each embedded clause picks out *one* proposition, a singular thing, and this is what is crucial for explaining the absence of cumulative interpretation in non-De Se reports. Again, let us make a comparison with a monoclausal action sentence, this time with a singular theme.

(6.86)   a. Obama and Romney saw Michelle

   b. $\exists E[\text{AGENT}(E, o \oplus r) \,\&\, \text{SEE}(E) \,\&\, \text{THEME}(E, m)]$

Since the theme argument is singular, we know that Michelle is the theme of both Obama and Romney's seeing. In a case like (6.80) above where the theme is plural, cumulativity

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is possible as E may be divided into proper parts where Ann is the theme and proper parts where Amy is the theme. This is not the case with (6.86): here Mary is the sole theme, so both agents must have seen Mary in order for (6.86) to be true.

If non-De Se reports have a singular internal argument (a proposition), then the lack of a cumulative reading for Beck and Sauerland's (6.78) is explainable in the same terms as the lack of cumulativity in (6.86). With the proposed dichotomy between De Se and non-De Se embedded clause interpretation, the logic of cumulativity allows us to account for another puzzling property about these plural reports.

Appealing simply to cumulativity between agents and events incorrectly predicts that crossed readings should be possible. There is nothing so far that restricts the parts of E that are events of Obama's winning as being strictly the objects of Obama's desires, and vice versa for Romney. Put differently, the truth conditions of (6.85), given in (6.87), are satisfied if some wanting events E' that is a part of E is such that Obama is the agent of E' but the internal of E' are events of Romney winning, and if there are other parts of E, E'', where Romney is the agent of E'' and the internal of E'' are events of Obama winning.

(6.87) $\exists E[\text{AGENT}(E, o \oplus r) \ \& \ \text{WANT}(E) \ \& \ \exists E'[\text{AGENT}(E', o \oplus r) \ \& \ \text{WIN}(E') \ \& \ \text{INT}(E, E')]]$

The system must have a way to restrict the interpretation of (6.85) so that such interpretations are not possible.

So far, we have not spent much time considering what types of events act as the internal argument of attitude verbs in De Se reports. Canonical attitude reports about belief, desire, etc. are about mental states, so presumably the types of events that are objects of attitudes are internal/mental in a way that other events are not. Maybe the events of an individual winning take place in the world of that individual's imagination, or in the parlance of possible world semantics, these events take place on a world that is bouletically accessible to an individual in the case of a desire attitude. This "internalness"

is also a key feature of what makes a De Se attitude De Se. The immunity property mentioned previously concerns an attitude holder's way of thinking about himself, or internally representing himself in such a way that he cannot be mistaken about the identity of the individual represented.

When we are reporting a De Se attitude, we are reporting about the mental state of one or more attitude holders. The proposal is that the events that are objects of attitude are in some sense "mental events", and as such, exist in the mind of only the individual who is holding the attitude. If we are reporting about a plurality of attitude holders, then the plurality of events that are the internals must be linked to their respective attitude holders. Under this view, it makes no sense for an event that is conceived of in the mind of Obama to be the internal of Romney's desire. I propose that this is part of the reason why crossed interpretations are ruled out: while cumulativity alone allows (6.87) to be satisfied by in the crossed situation, idiosyncratic knowledge of what it means to be an event of wanting disallows certain assignments of sub-events to the agents and the themes.

This idea can be implemented formally on par with centered worlds. Essentially, a centered world $\langle w, x \rangle$ pairs a world and an individual such that w is experienced from the perspective of x. The notion was introduced by Lewis (1979) when addressing De Se attitudes, and has been used in several analysis of De Se attitudes since; see Pearson (2012) for a recent overview. If worlds can be centered, then why not events? If centered-events, not just events, are the internal arguments of some attitude verbs then De Se interpretations can be accounted for on par with their treatment in centered-worlds accounts: De Se pronouns pick out the centers, similar to how they pick out authors in a context-based approach. We also can clarify the restriction on crossed readings: an individual attitude holder x cannot be the agent of an attitudinal event if the events that are the INT do not have x as the center. In other words, Obama cannot be the agent of an event whose INTs have Romney as the center; the events that Obama wants must be Obama-centered events.

De Se interpretation is not the only intensionality phenomena observed in attitude

reports. As such, even centered-events do not explain why a proper name in the scope of an attitude verb cannot substituted for *salva veritate*. I will now make some brief suggestions for how this issue might be addressed in future work. First, worlds can be brought back into the picture, so that we can talk about intensions of (possibly centered) events and not just events. Under this view, event-denoted complements of attitude verbs are interpreted as *event concepts*, functions from possible worlds to events. One could also argue that the internal arguments are centered-worlds or contexts that *contain* events, similar to the suggestions about the relationship between events and contexts discussed in the previous section. Both of these suggestions draw on the possible worlds to explain intensionality phenomena. An issue to be addressed is how exactly the relevant possible worlds are determined when the attitude verb's arguments are severed. In standard accounts, the attitude verb relies on its composition with the subject argument to determine the relevant set of accessible possible worlds. Under a separationist approach, it seems that a variable over worlds is required somehow in the internal argument, and the value of this variable is determined by either binding from the subject or supplied by context. Alternatively, one may wish to abandon the possible world approach to intensionality altogether. One theory that does this is the Interpreted Logical Form (ILF) approach to attitude reports; see Larson and Ludlow (1993) and references within. Although I cannot review all the details of this approach here, the main idea is that the internal argument of attitude verbs is a phrase marker (specifically, an LF phrase marker) where each node is pair $\langle x, y \rangle$ such that x is the syntactic expression typically associated with that node, and y is x's semantic value. Opacity is accounted for under this view since substituting one name for another might preserve the semantic value, but it does not preserve the form of the syntactic element in the pair. The main modification to the Larson and Ludlow approach would be to allow the S (or TP or CP) nodes to sometimes have eventive semantic values, specifically when it comes to perception reports and De Se reports. For De Se reports, the semantic value may be a centered event, as previously suggested. As a final suggestion, regardless

of which approach to intensionality a total-separationist adopts, I believe that much of the work standardly attributed to the attitude verb can be delegated to the INT thematic role. One might even find reasons to further divide the types of thematic relations available to clausal complements, such that some of them induce intensionality (i.e., attitude verbs) and some do not (i.e., perception verbs). It might even be the case that obligatory De Se interpretation is tied to a particular thematic role.

In this section I have sketched an account of attitude reports, and De Se attitude in particular, where there is thematic separation of the argument of attitude verbs. While the principles of plurality and event semantics used so far were somewhat successful with De Se reports, the biggest issue is accounting for intensionality phenomena. The conclusion is that simple events cannot be the internal arguments of attitude verbs; but this does not mean that a slightly more refined or intensionalized notion of event cannot be used. To this end, I suggested some options that include centering events in a Lewisian fashion, using intensions of events or event concepts, or using ILFs where the semantic value of sentences are events. It is my opinion that attitude verbs are the next frontier for total separation, and if some of the issues on intensionality can be resolved, it is possible for a uniform theory in which all verbs are interpreted as monadic predicates of eventualities.

6.7   Some remarks about optional De Se reports

As I mentioned at the outset, my focus in this chapter is on obligatory De Se reports. In this final section of content, I will outline some problematic issues concerning optional De Se reports that need to be addressed in future work.

The issues are mainly empirical, and rely on the results of some rather subtle judgments about the meanings of these reports. Consider first an example that has been important in determining when dependent readings are available: Beck and Sauerland's sentence, repeated below as (6.88).

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(6.88) Max and Peter said that Bill will marry Ann and Amy (*respectively)

The relevance of this data point in the above discussion was to show that without a bound pronoun in the embedded clause, only the group reading is available. That is, the only reading available is the one where Max and Peter said the same proposition. Now, suppose that some speakers do not agree with this judgement and allow a reading where Max and Peter said different things, one about Ann and one about Amy, and as such the use of *respectively* is acceptable to these speakers. This would mean that there can be cumulation across finite clauses. In the present system, this is not necessarily problematic: it just means that the proposal about collective satisfaction for De Se verbs applies to *all* attitude verbs, whether De Se or not. In other words, we could completely abandon the Hintikkan approach and remove universal quantification from the truth conditions of attitude reports. This is one area where more serious data collection is required, as at least some speakers of English that I have asked do not find the cumulative reading completely unaccessible. My own personal judgements are in line Beck and Sauerland's claims, but this might be an area for speaker variation, and the theory of attitude verbs meaning in general will ultimately have to address speakers's intuitions about these kinds of data.

Another area of questionable data concerning optional De Se reports is the presence of a De Se interpretation with dependent readings. Consider the plural case of mistaken used above to show the De Se properties of obligatory De Se reports; except this time the test sentence is an optional De Se report.

(6.89)   a. Situation: Each candidate is very depressed the night before the election.
              Each feels that another individual would do better in his place, and so each
              thinks that he himself will lose and that another will win instead. While
              wallowing in despair at the prospect of losing, each candidate is in his
              respective hotel room drinking heavily. At the same time, they are watching
              past debates looking people who will win instead of them, and each

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candidate finds such a person and exclaims "I think *he* will win". Little do they know, each candidate is talking about himself.

b. Obama and Romney think that they will win

The question now is whether (6.89b) is true or false in this situation. The situation is set up in such a way that only a dependent interpretation could be true since each does not think the group consisting of Obama and Romney will win. If the judgement of this sentence is false, then we could attribute it to the mistaken identity, on par with the obligatory De Se cases. If true, we have a puzzling state of affairs. It would mean that there is self-directed relation that holds between the antecedent and the pronoun, but this is not the De Se same self-directed relation.

My own intuitions and those of several other English speakers are that optional De Se reports like (6.89b) are false of mistaken identity scenarios like (6.89b). This suggests that dependent readings must be De Se, even when they are found in optional De Se reports. As such, we could analyze the pronoun *they* as being ambiguous between a regular pronoun and a De Se pronoun (see Schlenker (2012) for discussion of De Se interpretations of "regular" pronouns in English). When it is interpreted De Se, a De Se attitude verb could be used an thus collective satisfaction is possible. The consequence of this view is that whenever there is a dependent reading, then the report is must be read De Se. Note that his assumes that dependent/cumulative readings are not always available, as argued for by Beck and Sauerland; see previous paragraphs for issues about these data.

However, suppose that some speakers find (6.89b) true of the mistaken identity situation. This would mean that dependent readings are not tied to De Se interpretation. This would not be such a issue if it where not for the lack of crossed readings in optional reports, as shown by Higginbotham (1981) and others. If cross-readings were allowed, then we could attribute the less-than-group readings to cross-clausal cumulativity. But this cumulativity is restrained in a way where each attitude holder has to have an attitude about himself. The De Se analysis provided an independent reason for why self-directedness

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might be involved: it is because the report is De Se and De Se attitudes by definition are about one's self. Thus, if (6.89b) does not have to be read De Se on the dependent construal, we need another mechanism for restricting the range of interpretations for these optional De Se reports. Of course, the first step is again more serious data collection to see how speakers judge cases like (6.89); but supposing that speakers consistently judge (6.89b) true, then more work needs to be done on finding a way to restrict dependent readings without appealing to De Se.

Above I discussed two data issues that are paramount in the analysis of plural *optional* De Se reports. For both of them the judgements are subtle and at least for the latter issue, a convoluted mistaken identity scenario has to be considered while making the judgement. Furthermore, even if De Se is a crucial property in explaining both optional and obligatory De Se reports, it is not clear that a De Se interpretation is derived uniformly for both optional and obligatory reports; see Anand (2006). As such, I leave this issues to future work with the hope that the discussion in this section, and in this chapter as a whole, can be insightful and informative in developing new theories.

6.8   Chapter summary

The chapter was devoted to the semantics of an understudied pronominal element: the plural De Se pronoun. These pronouns are responsible for obligatory De Se ascription to a plurality of individuals. We observed that plural De Se pronouns give rise to group and dependent interpretations, though they lack a crossed interpretation. The fact that these pronouns are De Se and can have dependent interpretations suggest that they, at least sometimes, are interpreted as semantically singular. I have argued using reciprocity and cumulativity phenomena that plural De Se pronouns are always semantically plural, even for dependent interpretations.

I pursued two ways of looking at the meaning of De Se reports. For the first approach, I abstracted away from most of the intensional properties of the report, seeing

how much can be explained by just appealing to the theory of plurality and event semantics used so far. I showed that the mechanisms for capturing distributivity and especially cumulativity in basic sentences can be extended to De Se reports once some modest assumptions are in place. I then developed an alternative analysis drawing on familiar ideas from semantic theories of attitude reports, especially from context-based approaches to De Se reports. I have argued that if De Se pronouns are semantically plural, then the classical Hintikkan approach to attitude verb meaning which crucially relies on universal quantification is unsuitable for plural De Se reports. I then developed a theory building on Schlenker's context-based neo-Kaplanian semantics for De Se reports. The core revision was defining attitude verbs as expressing plural predication. For cases where the Hintikkan approach might still be of use, I have suggested that the attitude verb expresses distributive predication of contexts. On the other hand, at least plural De Se reports, where the Hintikkan approach falls short, are suggested to express collective predication of contexts. Additionally, I proposed a thematic-based interpretation for De Se pronouns drawing on ideas from Higginbotham. The resulting system with these new definitions of attitude verbs and De Se pronouns were then shown to be able to derive both group and dependent readings, and rule out crossed readings. I then argued that the account draws further support from its treatment of reciprocity and predicates of personal taste in the embedded clause of plural De Se reports. I ended the chapter with a plan for future research, specifically whether or not thematic separation, a crucial component throughout the earlier chapters of this dissertation, can and should be applied to attitude verb meanings.

Chapter 7:   Concluding Remarks

In this dissertation I have presented a neo-Davidsonian event semantics for several plural anaphoric dependencies. Below I will summarize the main results of the dissertation.

The first part of the dissertation was a pursuit of morpheme univocality. The morpheme in question is a distributivity operator, represented overtly in English as *each*. The particular semantics I assigned to the distributivity operator is based on proposals of Barry Taylor and Barry Schein about determiner uses of the distributivity morpheme. I have argued that given a Conjunctivist view of composition, where nominal arguments are interpreted as conjoinable thematic predicates, it is possible to assign a single lexical axiom to the distributivity operator that is suitable for both determiner uses and cases of distance distributivity.

I first considered canonical distance distributivity phenomena: floating and binominal *each*. I then argued that familiar local anaphors, such as reciprocals and reflexives in English, can also be treated as a type of distance distributivity construction. In particular, I linked reciprocals and reflexives to binominal *each* in the sense that in all three cases the distributivity operator composes directly with a nominal host, which is made possible by neo-Davidsonian approach to noun phrase meaning pursued here. In all of these cases, the Taylor-Schein view of distributivity was argued to be at work. I have provided several arguments for this view throughout the dissertation, though in my mind one of the strongest conceptual arguments is that such a large range of phenomena can be accounted for with a univocal definition of *each*.

The analysis of distributivity also has a wider empirical coverage than previous studies. A common theme through Chapters 3 through 5 is the relevance of ditransitive sentences and other sentences with multiple arguments. Prior research has focused on these anaphors as direct objects in simple transitive sentences, and in many cases these analyses do no extend to sentences when the anaphors occur in other syntactic positions. Furthermore, sentences with multiple nominals often present multiple sources of antecedence for these anaphors, often leading to ambiguity. The Taylor-Schein analysis was argued to be superior to its competitors in its capacity to uniformly account for the compositional interpretation of these anaphors in a variety of argument positions.

Beyond these local anaphors, I also examined plural versions what I call "De Se pronouns" in Chapter 6. Examples of these types of pronouns are obligatory subject controlled PRO, shifted indexicals, and logophors in certain languages. These pronouns all share the property of requiring an obligatory De Se interpretation. I have shown that plural De Se reports present some puzzling characteristics that are not seen in their singular counterparts, particularly a wider yet restricted range of possible interpretations. The central empirical claim of this chapter is that whenever a De Se pronoun is anteceded by a plural attitude holder noun phrase, then the De Se pronoun must be interpreted as semantically plural. I addressed previous proposals that treat plural pronouns in attitude reports as semantically singular, and I provide several arguments against these views.

I essentially offer two analyses of these plural De Se phenomena. The first analysis abstracts away from the intensional properties of these reports while pushing the plural event semantics used previously in the dissertation to account for the core properties of plural reports. The second analysis incorporates a specific theory of intentionality in De Se reports, specifically the neo-Kaplanian context-based approach presented in the work of Philippe Schlenker.

I hope that both analyses of plural De Se can serve as benchmarks for future research. The first analysis requires more fleshing out of the intentionality aspects of De Se

reports, though I believe that remaining theory-neutral in this respect makes the core ideas of the first analysis extensible to several different approaches to intentionality. The second theory incorporates some specific claims about intentionality and De Se in particular, and thus I believe it to be more precise in capturing the semantic nuances in these reports. However, it does so at the cost of being rather convoluted. My goal with presenting two ways of viewing the semantics of plural De Se reports is to give options for subsequent research. Some may not be interested in exactly how the psychological aspects of De Se reports work out, perhaps because of skepticism about how much of this actually has to do with the language of attitude reporting, and thus may find the first analysis to be more insightful. Others may be more interested in a semantics that incorporates these psychological aspects, as is done with several previous accounts of De Se reports. Future work in this camp may find the second analysis more useful.

A common theme of the various analyses presented here is that the sentences examined were argued to have relatively weak meanings, with various ways of making them true. Consider the well-known observation about reciprocal sentences that they can be true in a variety of situations. While others have posited ambiguity in accounting for this fact, I believe that it is better to assign weak truth conditions to reciprocal sentences that are compatible with the variety of ways of making a reciprocal sentence true. Similar remarks apply to plural De Se reports, which were observed to have both group and dependent interpretations. This was another area where previous research has posited ambiguity, though I showed that it is possible to give uniform truth conditions that are compatible with either construal. Methodologically, I believe that the single-weak-meaning thesis of any phenomena is always worth considering. On the one hand, there is the attraction of parsimony: accounting for more with less. On the other hand, a single-weak-meaning theory attempts to account for a wide range of data with sparse theoretical machinery, making such theories more easily falsifiable and thus making it easier for future researchers to evaluate and criticize.

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