Event Quantification and Plurality

by

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M.A. Linguistics
Universidade Estadual de Campinas, 2000

Submitted to the Department of Linguistics and Philosophy
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

September 2005

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Abstract

This dissertation presents three studies based on the hypothesis that the domain of entities on which natural language interpretation relies includes a partially ordered sub-domain of events. In this sub-domain, we can identify singular and plural elements, the latter being characterizable as mereological sums having singular events as their minimal parts. I discuss how event variables ranging over pluralities are introduced in the logical representation of natural languages sentences and how event operators manipulate these variables. Logical representations are read off syntactic structures, and among the elements I will claim are hidden in the syntactic representation of certain sentences are plural definite descriptions of events and event quantifiers selectively binding plural variables. My goal will be to motivate the postulation of these elements by showing how reference to pluralities of events shed light on several properties of a variety of constructions, and how interpretive differences originated in singular/plural oppositions overtly manifested in the nominal domain are replicated in the aspectual/verbal domain, even in the absence of any overt morphological manifestation. The empirical domain of investigation includes adverbial quantification, donkey anaphora and imperfective aspect, with both habitual and progressive readings being analyzed in detail.

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Acknowledgments

I would like to express my deepest gratitude to my advisor Irene Heim, from whom I learned a great deal through her writings, her teaching and her advising. She allowed me to develop my work at my own pace, never being impatient or discouraging. She was always very generous with her time, having provided me with invaluable insights and unconditional support from the first appointment we had to the day of my defense.

It was also a great pleasure to work with the other members of my committee Kai von Fintel, Danny Fox, and Sabine Iatridou, who were always available for discussion and helped me a lot by sharpening my ideas with their penetrating criticism.

I am very grateful to Barry Schein, who was very kind in agreeing to read a preliminary draft of the thesis, and discussing it with me.

I feel fortunate to have had great teachers at MIT, and I would like to thank all of them for sharing their knowledge with me. Thanks to Noam Chomsky, Michel DeGraff, Suzanne Flynn, Michael Glanzberg, Michael Kenstowicz, Alec Marantz, Van McGee, Byunghan Kim, Shigeru Miyagawa, David Pesetsky, Norvin Richards, Donca Steriade, Hubert Truckenbrodt, Kenneth Wexler, and Cheryl Zoll.

I would also like to thank all my fellow students in the department, and my Ling-00 classmates in particular: Marketa Ceplova, Aniko Csirmaz, Jon Gajewski, Heejeong Ko, Andrew Nevins, Becki Norris, Joey Sabbagh, and Michael Wagner.

Many thanks to the students and visitors from Brazil whose stay at the department overlapped with mine: Andres, Amelia, Rafael and Tomas Salanova, Alexandre, Cristina and Ana Ximenes, and Roberta Pires. And not far from MIT, at UConn, Ana Claudia Bastos and Cynthia Zocca. There, I would also like to mention Klaus Abels, Cedric Boeckx, Deborah Pichler, Luisa Marti, and Fumi Niinuma. And a little bit further, in New Haven and Ann Arbor, Fernanda, Anderson, Cris, and Yran.

Before I came to MIT, I was very lucky to have Jairo Nunes as a teacher, advisor, and friend. Were it not for his constant encouragement, I would not have come to the United States to pursue my graduate studies. I am very thankful for his friendship and all his support throughout these years.

I have an immense gratitude for all love and support I received from my family in Brazil during the past five years. My special thanks to my mother Vera, my father José Olindo, my brother Daniel, and my parents-in-law, Sueli and Vilson.

There are no words to express how important my wife Elaine has been to me for the past five years. She has helped me overcome many challenges, and has given me so much love and understanding that I feel privileged for having such a wonderful person to share the rest of my life. This thesis is dedicated with love to her.

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Chapter 1

Introduction

This dissertation presents three studies based on the hypothesis that the domain of entities on which natural language interpretation relies includes a partially ordered sub-domain of events. In this sub-domain, we can identify singular and plural elements, the latter being characterizable as mereological sums having singular events as their minimal parts. I discuss how event variables ranging over pluralities are introduced in the logical representation of natural languages sentences and how event operators manipulate these variables. Logical representations are read off syntactic structures, and among the elements I will claim are hidden in the syntactic representation of certain sentences are plural definite descriptions of events and event quantifiers selectively binding plural variables. My goal will be to motivate the postulation of these elements by showing how reference to pluralities of events shed light on several properties of a variety of constructions, and how interpretive differences originated in singular/plural oppositions overtly manifested in the nominal domain are replicated in the aspectual/verbal domain, even in the absence of any overt morphological manifestation. The empirical domain of investigation includes adverbial quantification, donkey anaphora and imperfective aspect, with both habitual and progressive readings being analyzed in detail.

The purpose of this introduction is to establish a starting point for the studies that follow, and give an overview of the remainder chapters. Section 1 is a brief comment on Godehard Link's theory of pluralities (Link 1983 and other works collected in Link 1997), which assumes the existence of plural objects. It is not intended as a defense of Link's view against alternatives, but rather, as succinct remarks about its basic features and some developments.[1] Section 2 introduces the core of event semantics (Davidson (1967) and much subsequent work), and discuss how the existence of a partially ordered domain of events can be motivated. Section 3 is the above mentioned overview of the rest of the dissertation.

Before starting, let me add some general remarks about semantic interpretation:

Truth Conditions: I assume that the goal of a semantic theory is to assign truth conditions to natural language sentences, as shown in the schema below:

S* is true if, and only if, *p

S is a syntactic structure, and p is a statement describing the world. I will usually refer to p as the logical representation of S, due to the constant usage of logical formulae to encode it.

Compositionality: I also assume that interpretation is compositional, with lexical items being assigned a semantic value and rules of interpretation specifying how the semantic value of a complex expression (a syntactic constituent) is obtained from its parts. Semantic values will be referred to as denotations or extensions. They are assigned to linguistic expressions by a function represented as $[\![.]\!]$. Sentences themselves are in the domain of this function, and the schema above can be abbreviated as follows:

$[\![\text{S}]\!] = 1$ if, and only if, *p*

The semantic value of a sentence is then a truth-value: sentences that are true are assigned the truth-value 1, and those that are false are assigned the truth-value 0.

[1] For a critique of Link's and related views on pluralities, see Schein (1993).

Types: Semantic interpretation is type-driven, which means that linguistic expressions are assigned types to which the rules of interpretation are sensitive. The set of types can be defined recursively from a set of basic types, and the following rule: if a and b are types, then $\langle a, b\rangle$ is also a type. To each basic type a corresponds a set (or domain) of entities D_a. An expression of type a denotes a member of D_a. To each complex type $\langle a, b\rangle$ corresponds a set (or domain) $D_{\langle a,b\rangle}$ whose members are functions from D_a to D_b. An expression of type $\langle a, b\rangle$ denotes a function in $D_{\langle a,b\rangle}$. Among the basic types are **e**, **v**, and **t**: type-e expressions denote individuals, type-v expressions denote events and type-t expressions denote truth-values (0 or 1).

We have established that sentences denote truth-values. I will discuss the semantic values of specific lexical items and other expressions, as we discuss the sentences in which they appear. After all, decisions about whether a certain semantic value is adequate or not for a certain expression can only be made after inspecting the truth-conditions of sentences containing the expression.

1.1 Plural Objects

Link (1983) proposed a theory of pluralities based on the idea that the domain of individuals (type e entities) is formed by singular as well as plural objects. Singular objects are atomic entities and have no proper parts, while plural objects are mereological sums having proper parts.[2] According to Link's theory, there is no type-theoretic distinction between singular and plural objects, both being basic, type e entities. Conjoined NPs such as 'John and Mary' and plural definite descriptions such as 'the boys' can thus be viewed as referring to pluralities: the sum of the individuals John and Mary, and the sum of all boys, respectively. The difference between the denotations of singular and plural common nouns, as in 'book' vs. 'books', is also

[2] I will not talk about the part of Link's theory that deals with mass entities.

minimal: both are type $\langle e, t \rangle$ expressions referring to sets of objects, the difference being that the former denotes a set of singularities whereas the latter denotes a set containing pluralities.[3] This in turn allows a straightforward extension of Generalized Quantifier Theory to handle cases of (collective) plural predication as in (1):

(1) Some students gathered in the hall.

$[\![\text{some students}]\!] = \lambda \mathbf{P}.\ \exists \mathbf{X} : \mathbf{students}(\mathbf{X})\ \&\ \mathbf{Q}(\mathbf{X})$

$[\![(1)]\!] = \exists \mathbf{X} : \mathbf{students}(\mathbf{X})\ \&\ \mathbf{gathered - in - the - hall}(\mathbf{X})$

Both the noun phrase 'students' and the verb phrase 'gathered in the hall' denote sets containing pluralities, and the sentence asserts the existence of a plural individual that belong to both sets.

Also of interest is the possibility of assigning the same meaning to the definite article 'the' in 'the student' and 'the students'. For concreteness, let us assume a Fregean view on definite descriptions, according to which they are referential expressions. The definite article can then be viewed as denoting a function that takes a set and returns its maximal element:

(2) $[\![\text{the}]\!] = \lambda \mathbf{P}.\ \mathbf{max}(\mathbf{P})$

$\mathbf{a} = \mathbf{max}(\mathbf{P}) \leftrightarrow \mathbf{a} \in \mathbf{P}\ \&\ \forall \mathbf{x} : \mathbf{x} \in \mathbf{P} \rightarrow \mathbf{x} \leq \mathbf{a}$

It then becomes possible to explain the uniqueness presupposition associated with singular definite descriptions in an elegant manner, for the only way for a set of singularities to have a maximal element is if the set is a singleton. A similar reasoning can be used to explain why the use of a plural description such as 'the two boys' is only appropriate in a context where there are only two (salient) boys: assuming that

[3] Whether or not the sets denoted by plural common nouns contain singularities in addition to pluralities is not obvious. 'Some students arrived' seems to entail that more than one student arrived, but at the same time 'no students arrived' seems to entail that not a single student arrived. Without being explicit about the meaning of these determiners, there is no a priori reason to choose one view over the other. Link's own view was that plural common nouns denoted sets containing both singular and plural objects. I will return to the role of number morphemes in forming these sets in chapter 3.

'two boys' denotes the set of plural boys whose members have two minimal parts, the only way for that set to have a maximal element is if there are only two boys, in which case the set would also be a singleton.

Let us see now how verbal predicates and plural arguments can combine. Consider the following example:

(3) Three boys ate a sandwich.

This sentence can mean that a group of three boys shared a single sandwich, but it can also mean that each boy ate his own sandwich, with a total of three sandwiches having been consumed. The first meaning can be represented as in (4):[4]

(4) $\exists \mathbf{X}\ \exists \mathbf{y} : \mathbf{boys(X)}\ \&\ |\mathbf{X}| = \mathbf{3}\ \&\ \mathbf{sandwich(y)}\ \&\ \mathbf{eat(X, y)}$

All we need to assume here is that the meta-language predicate *eat* can relate singular as well as plural individuals. We interpret the formula $\mathbf{eat(X, y)}$ as follows: every part of $\mathbf{X}$ ate a portion of $\mathbf{y}$, and every portion of $\mathbf{y}$ was eaten by a part of $\mathbf{X}$. Notice then that (4) is vague about how the sandwich was shared between the boys, that is, each boy must have eaten a portion of the sandwich but we are not told how big of a portion.[5]

To express the second meaning of (3), we use a distributive operator that quantifies over parts of the sum of boys:

(5) $\exists \mathbf{X} : \mathbf{boys(X)}\ \&\ |\mathbf{X}| = \mathbf{3}\ \&\ \forall \mathbf{x} : \mathbf{x} \leq \mathbf{X}\ \&\ \mathbf{at(x)} \rightarrow \exists \mathbf{y} : \mathbf{sandwich(y)}\ \&$ $\mathbf{eat(x, y)}$

[4] I use capital letters X, Y, Z for variables ranging over plural individuals. The formula $|X| = n$, with X an individual and n a number, abbreviates the following statement: the set of X's minimal parts has cardinality n.

[5] The expression *portion of y* corresponds to what Link called 'a material part of y'. Material parts should not be confused with individual parts, which is what I have been referring to as 'parts', without any qualification. Atomic entities, by definition, do not have any proper individual part. But they can have proper material parts, as the pizza in the example above does.

I will have more to say about this distributive operator in chapter 3. For the moment, let us content ourselves with the assumption that it can be optionally inserted in the logical representation of sentences containing plural NPs. What (5) means then is that there is a group of three boys, such that each one of them ate a sandwich.

Cases with more than one plural NP can be treated similarly:

(6) Three boys ate five pizzas.

Under one reading, the so-called cumulative reading, (6) means that between them, three boys ate a total of five pizzas. Here, too, nothing can be concluded about how much of each pizza each boy ate. Under this reading, sentence (6) receives the following representation:[6]

(7) $\exists \mathbf{X}\ \exists \mathbf{Y} : \mathbf{boys(X)}\ \&\ |\mathbf{X}| = \mathbf{3}\ \&\ \mathbf{pizzas(Y)}\ \&\ |\mathbf{Y}| = \mathbf{5}\ \&\ \mathbf{eat(X, Y)}$

$\mathbf{eat(X, Y)} \leftrightarrow \forall \mathbf{x} \leq \mathbf{X} : \exists \mathbf{x}^* \leq \mathbf{X}\ \exists \mathbf{y} \leq \mathbf{Y} : \mathbf{eat(x \oplus x^*, y)}\ \&$

$\forall \mathbf{y} \leq \mathbf{Y} : \exists \mathbf{x}^* : \mathbf{eat(x^*, y)}$

According to (7), there was a group of three boys and a group of five pizzas, such that each one of the boys (alone or with the help of at least one other boy) ate at least one of the pizzas, and each pizza was eaten by one or more boys.

Distributive readings are also available for (6), and are obtained with the help of distributive operators optionally associated with the plural NPs:

(8) $\exists \mathbf{X} : \mathbf{boys(X)}\ \&\ |\mathbf{X}| = \mathbf{3}\ \&$

$\forall \mathbf{x} : \mathbf{x} \leq \mathbf{X} \rightarrow \exists \mathbf{Y} : \mathbf{pizzas(Y)}\ \&\ |\mathbf{Y}| = \mathbf{5}\ \&\ \mathbf{eat(x, Y)}$

(9) $\exists \mathbf{Y} : \mathbf{pizzas(Y)}\ \&\ |\mathbf{Y}| = \mathbf{5}\ \&$

$\forall \mathbf{y} : \mathbf{y} \leq \mathbf{Y} \rightarrow \exists \mathbf{X} : \mathbf{boys(X)}\ \&\ |\mathbf{X}| = \mathbf{3}\ \&\ \mathbf{eat(X, y)}$

[6] To shorten the formulae below, I use the following conventions: x, y are variables ranging over atomic objects, x^*, y^* range over atomic and non-atomic objects. I continue to assume that X, Y range over pluralities only.

(8) represents a reading according to which thrre boys ate (each) five pizzas, and (9) represents the reading according to which there are five pizzas, each of which was shared by three boys.[7]

1.1.1 A Note on Non-increasing Plural QPs

A potential problem for theories of pluralities that treat cardinal NPs as existential quantifiers over plural individuals comes from cases where non-increasing NPs are involved. Here, I will just point to the origin of the difficulties faced by these theories and refer the reader to some proposals designed to deal with them. Consider (10), for instance, and compare the truth conditions that a theory assuming quantification over pluralities (which I will refer to as PL) assigns to it with the ones assigned by the classical generalized quantifier theory (GQ) of Barwise and Cooper (1981):

(10) John ate exactly three apples.
✓GQ: $|\{\mathbf{x} : \mathbf{apple(x)}\} \cap \{\mathbf{x} : \mathbf{ate(j,x)}\}| = \mathbf{3}$
♯ PL: $\exists \mathbf{X} : |\mathbf{X}| = \mathbf{3}\ \&\ \mathbf{apples(X)}\ \&\ \mathbf{ate(j,X)}$ (too weak!)

The crucial problem here is that according to PL, (10) should be true even if John ate more than three apples, which is not the case. This is so because the existence of a group of three apples eaten by John is not incompatible with the existence of more apples eaten by him.

The advantage of GQ over PL disappears, however, when cumulative readings are taken into account. Then, neither GQ nor PL can deliver appropriate truth-conditions for sentences with non-increasing cardinal NPs:

(11) Exactly three boys ate exactly two apples.

[7] Also possible is the insertion of two distributive operators, one associated with the subject and the other with the object. I let it to the reader to figure out what the corresponding readings convey.

$$\sharp\text{GQ: } |\{\mathbf{x} : \mathbf{boy(x)}\} \cap \{\mathbf{x} : \mathbf{x\ ate\ exactly\ 2\ apples}\}| = \mathbf{3} \quad \text{OR:}$$

$$|\{\mathbf{x} : \mathbf{apple(x)}\} \cap \{\mathbf{x} : \mathbf{exactly\ 3\ boys\ ate\ x}\}| = \mathbf{2}$$

$$\sharp\text{ PL: } \exists\mathbf{X}\exists\mathbf{Y} : |\mathbf{X}| = \mathbf{3}\ \&\ |\mathbf{Y}| = \mathbf{2}\ \&\ \mathbf{boys(X)}\ \&\ \mathbf{apples(Y)}\ \&\ \mathbf{ate(X, Y)}$$

GQ fails because it gives truth-conditions that entails the existence of boys who ate at least two apples (each) or apples eaten by at least three boys, depending on the scopal relations associated with the two generalized quantifiers. PL fails for the same reasons it failed above with respect to (10). The existence of three boys who (between them) ate two apples is not incompatible with the existence of more than three boys who ate more than two apples.

Given what we just saw, one might think that what is missing from the truth-conditions assigned by PL is a maximality component that once introduced would strengthen the meanings derived by this theory, avoiding the problems detected above. Let us reconsider (10), which was problematic for PL. We need a way of saying that the group of apples that is being quantified over is the maximal group of apples eaten by John.

(12) John ate exactly three apples.

$$\mathbf{max}\{\mathbf{n} : \exists\mathbf{X} : |\mathbf{X}| = \mathbf{n}\ \&\ \mathbf{apples(X)}\ \&\ \mathbf{ate(j, X)}\} = \mathbf{3}$$

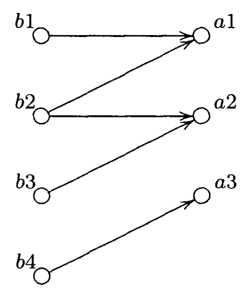
The truth conditions above require that three be the maximal number n such that John ate n apples. Thus the sentence would be true if John ate exactly three apples, but false if he ate more. This is indeed what we want. Let us assume then that the meaning of the DP 'exactly three apples' has maximality built-in, as shown below (cf. Bonomi and Casalegno 1993 and Hackl 2000 for variants of this idea):

(13) $[\![\text{exactly three apples}]\!] = \lambda\mathbf{P}.\ \mathbf{max}\{\mathbf{n} : \exists\mathbf{X} : |\mathbf{X}| = \mathbf{n}\ \&\ \mathbf{apples(X)}\ \&\ \mathbf{P(X)}\} = \mathbf{3}$

However, this idea cannot be extended to cases of cumulativity. To see why, let us reconsider (11). Depending whether the subject or the object takes wide scope, we get two different truth-conditions. Consider first the case in which the subject scopes above the object:

(14) $\mathbf{max\{n : \exists X : |X| = n \ \& \ boys(X) \ \& \ max\{n' : \exists Y : |Y| = n' \ \& \ apples(Y) \ \& \ ate(X, Y)\}= 2\}= 3}$

(14) says that '3' is the maximal number n, such that a group of n boys ate two and no more apples. Now, imagine a situation in which (between them) four boys - b1, b2, b3, b4 - ate three apples - a1, a2, a3. This is shown in the diagram below, with the arrows indicating which boys ate which apples:



Intuitively, the sentence above should be false. But according to (14), it should be true, because '3' is the maximal number n, such that a group of n boys ate two and no more apples. Notice that the existence of a group of four boys who ate apples is not enough to make the sentence false, because this group ate three, not two apples. The truth conditions corresponding to the representation in which the object scopes above the subject will not give us what we want either, as shown below:

(15) $\mathbf{max\{n : \exists Y : |Y| = n \ \& \ apples(Y) \ \& \ max\{n' : \exists X : |X| = n' \ \& \ boys(X) \ \& \ ate(X, Y)\}= 3\}= 2}$

What (15) says is that '2' is the maximal number n, such that a group of n apples were eaten by three and no more boys. In the scenario considered above, this is indeed the case. Although there is a group of three apples eaten by a group of boys, this group is formed by more than three boys. Since the sentence is intuitively false in that scenario, (15) is not what we need.

Krifka (1999) and Landman (1996, 2000) developed theories along the lines of PL, but in which a maximality component is added to the truth-conditions of sentences with cardinal modifiers, such as 'exactly', 'at most', and 'at least'. Crucially, however, maximality is not directly attached to the meaning of non-increasing NPs, so that the theories do not run into the problem we just mentioned. In the case of Landman's theory, for instance, which is couched within event semantics, maximality applies to the event described by the sentence. Thus, (10) means that there is an event of John eating three apples, which is the maximal event of him eating apples, and (11) means that there is an event of three boys eating two apples, which is the maximal event of boys eating apples. Decreasing NPs, such as 'at most three apples' give rise to conditionalized maximality claims. The meaning of 'John ate at most three apples' comes out as the following: if there are events of John eating apples, the maximal event of John eating apples is an event of him eating at most three apples. Both Krifka and Landman compute maximality with respect to Rooth-style alternatives (as in Rooth's (1985) analysis of 'only'), which, they assume, are induced by cardinal modifiers. The reader is referred to their work for the details of how the ideas are implemented.[8]

1.2 Events and Their Parts

I will now review some basic features of event semantics, and show how they lead to the conclusion that the domain of events should be partially ordered.

1.2.1 Event Variables

We start by considering the sentence in (16a) and the logical representation in (16b):

[8] For an alternative analysis using a different framework, cf. also Remko Scha's (1981) influential work, which uses binary quantification to handle cumulative readings. For an extremely rich and detailed investigation of sentences with non-increasing NPs, see Schein (1993).

(16) a. John kissed Mary.

b. $\exists \mathbf{e} : \mathbf{kiss(e, j, m)}$

$\mathbf{kiss(e, x, y) \leftrightarrow e \text{ is an event of } x \text{ kissing } y}$

I capitalize here on two features of (16b), namely, the presence of an event variable serving as an argument of the verb, and the fact that this variable is bound by an existential quantifier. For the moment, I will ignore any tense-related matter, and will keep myself distant from debates about the nature of predicate-argument association. Thus, whether what is embedded under the existential quantifier is an atomic formula with all arguments directly associated with the verb predicate, as represented in (16b), or the conjunction of atomic formulas with theta-roles mediating the relation between individuals and events (as, for instance, in Parsons 1990) will not be relevant for our purposes right now. For convenience, and only for convenience, I will assume representations like (16b) until section 1.2.3 below.

Among the motivations discussed by Davidson in his original 1967 paper for an ontology including events as individuals are certain anaphoric uses of pronouns like *it*, as in the following discourse sequence:

(17) John kissed Mary. It happened yesterday.

Even if one agrees with Davidson that *it* in the second sentence refers to an event, one might still wonder whether this should force us to conclude that the logical representation of the first sentence contains an event description. A skeptical reasoning would go as follows: natural languages have nominal expressions referring to events, including not only pronouns but also descriptions, such as *the kissing*, or *the explosion*. They also have some verbs, such as *happen* and *occur,* that take event arguments. Moreover, as it happens with other pronouns (and definites), the referents of event pronouns have to be salient in the context of utterance. Now, one can still assume that the verb 'kiss' denotes a relation between two individuals, and that the first sentence in (17) states that (at some point in the past) this relation held of the pair John and Mary. All one would need then is the plausible assumption that this statement is enough to make salient the existence of an event of John kissing Mary.

However, judging from other anaphoric uses of pronouns, such an indirect linking between a pronoun and its referent is not enough to license its use in a discourse. Consider for instance the following pair of examples (from Heim 1990:166, after Cooper 1979 and Evans 1980):

(18) a. John has a wife. She is sitting next to him.

b. John is married. ??She is sitting next to him.

Whereas the use of *she* to refer to John's wife in (18a) is perfectly fine, it's use in (18b) is not, despite the fact that the existence of John's wife can be inferred from the first sentences in (18a) and in (18b) as well. A salient difference between the two cases is that the first sentence in (18a) contains the indefinite description *a wife*, whereas the first sentence in (18b) does not, and this difference seems to be crucial in the licensing of anaphoric pronouns.

Now, the null hypothesis concerning pronouns referring to events is that the same constraints should be in effect there. If so, the sentence *John kissed Mary* should contain an expression denoting an event description, and that would definitely be the case if its verb phrase denoted a set of events:

(19) $[\![\text{kiss}]\!] = \lambda\mathbf{x}.\lambda\mathbf{y}.\lambda\mathbf{e}.\ \mathbf{kiss}(\mathbf{e},\mathbf{y},\mathbf{x})$

$[\![[\text{John kiss Mary}]_{\text{VP}}]\!] = \lambda\mathbf{e}.\ \mathbf{kiss}(\mathbf{e},\mathbf{j},\mathbf{m})$

Another motivation for assuming that verbs have an event argument comes from cases of adverbial modification as first discussed by Davidson. Consider the following example:

(20) a. The object fell.

b. The object fell vertically.

Intuitively, the adverb specifies how the fall was. If the verb phrase itself describes the event, it is just natural to think of the adverb as adding content to this description.

(21) a. $\exists e : \mathbf{fell}(\mathbf{e}, \mathbf{o})$

b. $\exists e : \mathbf{fell}(\mathbf{e}, \mathbf{o})\ \&\ \mathbf{vertically}(\mathbf{e})$

A nice consequence of this treatment of manner adverbs is that given (21a) and (21b), the intuition that sentence (20a) entails sentence (20b) becomes a trivial consequence of the logical representations assigned to them. Other adverbials, such as those expressed by locative and temporal locutions, are amenable to a similar treatment, assuming they introduce relations between events and times/places.

(22) a. The object fell on Sunday.

b. $\exists e : \mathbf{fell}(\mathbf{e}, \mathbf{o})\ \&\ \mathbf{on}(\mathbf{e}, \mathbf{S})$

$\mathbf{on}(\mathbf{e}, \mathbf{t}) \leftrightarrow$ the time of event e is included in the interval t

(23) a. The object fell in Boston.

b. $\exists e : \mathbf{fell}(\mathbf{e}, \mathbf{o})\ \&\ \mathbf{in}(\mathbf{e}, \mathbf{B})$

$\mathbf{in}(\mathbf{e}, \mathbf{l}) \leftrightarrow$ the location of event e is within the location l

1.2.2 Distributivity and Events

Consider now the following sentence:

(24) Every student struck a note (on the piano).

A natural candidate for the logical representation of (24) is (25):

(25) $\forall \mathbf{x} : \mathbf{student}(\mathbf{x}) \rightarrow \exists e \exists \mathbf{y} : \mathbf{play}(\mathbf{e}, \mathbf{x}, \mathbf{y})\ \&\ \mathbf{note}(\mathbf{y})$

Imagine we were talking about a group of ten students. Then, according to (25), (24) asserts the existence of ten events, each of which an event of a student playing a note.[9] From this we may infer the existence of a bigger event having all the smaller events of a single student playing a single note as its parts. But notice that this event is not described in (25). Is this a problem? The examples below suggest that it is (from Schein 1993:7):

(26) a. Unharmoniously, every student sustained a note on the Wurlitzer for sixteen measures.

b. In slow progression, every student struck a note on the Wurlitzer.

The adverbs above qualify the 'ensemble' events. In fact, it does not make much sense to qualify a single event of someone sustaining a single note as either harmonious or unharmonious. Similarly, for qualifying the struck of a single note as being in slow progression. We must then posit two event variables in the logical form of these sentences.

(27) a. $\exists \mathbf{e} : \mathbf{unharmonious}(\mathbf{e})\ \&$
$\forall \mathbf{x} : \mathbf{student}(\mathbf{x}) \rightarrow \exists \mathbf{e}' \leq \mathbf{e} : \exists \mathbf{y} : \mathbf{sustain}(\mathbf{e}', \mathbf{x}, \mathbf{y})\ \&\ \mathbf{note}(\mathbf{y})$

b. $\exists \mathbf{e} : \mathbf{in\_slow\_prog}(\mathbf{e})\ \&$
$\forall \mathbf{x} : \mathbf{student}(\mathbf{x}) \rightarrow \exists \mathbf{e}' \leq \mathbf{e} : \exists \mathbf{y} : \mathbf{struck}(\mathbf{e}', \mathbf{x}, \mathbf{y})\ \&\ \mathbf{note}(\mathbf{y})$

In both cases, the argument of the initial adverb is an event having parts that are events described by the verb phrase. Intervening between the two existential quantifiers in the representations above is the distributive quantifier *every student*, which introduces the partitive relation $\leq$.

(28) $[\![\text{every student}]\!] = \lambda \mathbf{P}_{\langle e,vt\rangle}.\lambda \mathbf{e}.\ \forall \mathbf{x} : \mathbf{student}(\mathbf{x}) \rightarrow \exists \mathbf{e}' \leq \mathbf{e} : \mathbf{P}(\mathbf{x})(\mathbf{e}')$

[9] I am assuming that an event of x playing a note and a event of y playing a note cannot be the same event if x is different from y.

There is, however, one aspect of the meanings of the sentences in (26) that is not captured in the logical representations in (27). Take (26a), for instance. If students and professors were playing together, with the students playing in perfect harmony, and with disharmony coming exclusively from the part of the professors, then (26a) would not be true. But all (27a) requires from the playing by the students is that it be a part of an unharmonious event. What is missing then is the requirement that the unharmonious event have no parts which are not events where a student sustain a note. In other words, it should be possible to partition the unharmonious event in a way that each non-overlapping part be an event of an student sustaining a note. To achieve that, we change the way distributive operators are introduced. In the case of (26), we need to revise the denotation of the determiner *every*. Instead of (29), we now have (30):[10]

(29) $[\![\text{every}]\!] = \lambda \mathbf{P}_{\langle et \rangle}.\lambda \mathbf{Q}_{\langle e,vt \rangle}.\lambda \mathbf{e}.\ \forall \mathbf{x} : \mathbf{P}(\mathbf{x}) \rightarrow \exists \mathbf{e}' \leq \mathbf{e} : \mathbf{Q}(\mathbf{x})(\mathbf{e}')$

(30) $[\![\text{every}]\!] = \lambda \mathbf{P}_{\langle et \rangle}.\lambda \mathbf{Q}_{\langle e,vt \rangle}.\lambda \mathbf{e}.\forall \mathbf{x} : \mathbf{P}(\mathbf{x}) \rightarrow \exists \mathbf{e}' \leq \mathbf{e} : \mathbf{Q}(\mathbf{x})(\mathbf{e}')\ \&$
$\forall \mathbf{e}' : \mathbf{e}' <_{\mathcal{P}} \mathbf{e} \rightarrow \exists \mathbf{x} : \mathbf{P}(\mathbf{x})\ \&\ \mathbf{Q}(\mathbf{x})(\mathbf{e}')$

(31) a. $\exists \mathbf{e} : \mathbf{unharmonious}(\mathbf{e})\ \&$
$\forall \mathbf{x} : \mathbf{student}(\mathbf{x}) \rightarrow \exists \mathbf{e}' \leq \mathbf{e} : \exists \mathbf{y} : \mathbf{sustain}(\mathbf{e}', \mathbf{x}, \mathbf{y})\ \&\ \mathbf{note}(\mathbf{y})\ \&$
$\forall \mathbf{e}' : \mathbf{e}' <_{\mathcal{P}} \mathbf{e} \rightarrow \exists \mathbf{x} : \mathbf{student}(\mathbf{x})\ \&\ \exists \mathbf{y} : \mathbf{sustain}(\mathbf{e}', \mathbf{x}, \mathbf{y})\ \&\ \mathbf{note}(\mathbf{y})$

b. $\exists \mathbf{e} : \mathbf{in\_slow\_prog}(\mathbf{e})\ \&$
$\forall \mathbf{x} : \mathbf{student}(\mathbf{x}) \rightarrow \exists \mathbf{e}' \leq \mathbf{e} : \exists \mathbf{y} : \mathbf{sustain}(\mathbf{e}', \mathbf{x}, \mathbf{y})\ \&\ \mathbf{note}(\mathbf{y})\ \&$
$\forall \mathbf{e}' : \mathbf{e}' <_{\mathcal{P}} \mathbf{e} \rightarrow \exists \mathbf{x} : \mathbf{student}(\mathbf{x})\ \&\ \exists \mathbf{y} : \mathbf{sustain}(\mathbf{e}', \mathbf{x}, \mathbf{y})\ \&\ \mathbf{note}(\mathbf{y})$

Distributive operators associated with plural NPs behave similarly, as attested by the following examples, which have readings equivalent to the ones expressed in (27):

[10] For the sake of readability, I use the formula $\forall e' : e' <_{\mathcal{P}} e \rightarrow \phi[e']$ as an abbreviation for 'there is a partition $\mathcal{P}$ of the plural event e, such that for each member e' of $\mathcal{P}, \phi$ is true of e''. A partition of a plural event e is a set whose members are non-overlapping parts of e satisfying the following requirement: the sum of these parts should equal e.

(32) a. Unharmoniously, the students/they sustained a note on the Wurlitzer for sixteen measures.

b. In slow progression, the students/they struck a note on the Wurlitzer.

Anaphoric reference to these events is also possible, as in the example below, in which 'three hours' refers to the total duration of the group of meetings.[11,12]

(33) John talked to every student (individually). It lasted for three hours.

The source of distributivity can be a quantified adverbial too:

(34) a. Harmoniously, John sustained a note on every keyboard/on the 4 keyboards for sixteen measures.

b. In a crescendo, a note was struck every second.

(34a) can describe a demonstration of keyboard wizardry by John, who managed to sustain four different notes on four keyboards simultaneously using his hands and feet. There are then four events of him sustaining a note on a keyboard, and the initial adverb qualifies the group of events. (34b) can be used to describe a passage from a concert. There, the initial adverb qualifies a series of events each of which identified as an event of a single note being played.

[11] As observed by Geis(??) and Neale (1988), anaphoric pronouns referring to events are invariably singular, regardless of whether the referent is a single event or a group of events:
(i) John talked to Mary. It lasted for thirty minutes.
(ii) Paul talked to every student. It/*They lasted for three hours.
It is only when the antecedent is a nominalized expression, that singular/plural oppositions are attested:
(iii) The meeting is over. It lasted for two hours.
(iv) The meetings are over. They lasted for five hours.
See also Moltmann (1997) for discussion.

[12] Anaphoric reference to the participants of a group of events is possible too:
(i) Every boy ate a sandwich. They were hungry./They were delicious.

1.2.3 Plural Arguments and Separation

In the examples above, an adverb was predicated of an event, which was not identified with the event argument of the verbal predicate. The adverb was introduced after the event argument had been existentially bound and a new event variable had been introduced by a distributive quantifier. We will now turn to some cases discussed in Schein (1993), which show that arguments too can relate to events that are different from the event introduced by the verbal predicate.

Consider the following example from Schein (1993:8):

(35) Three video games taught every quarterback two new plays.

This sentence has a reading according to which the scenario being described is one where three video games were teaching plays to quarterbacks, and each one of the quarterbacks learned two plays from the games. Under this reading, (35) informs us about how many plays each quarterback learned, but it says nothing about how many quarterbacks or how many plays each video game taught. The puzzling point here is that the subject *three video games* is interpreted cumulatively, with no scopal relation with respect to either one of the object NPs, whereas the object *every quarterback* is interpreted distributively, with scope over the second object *two new plays.* Schein's conclusion is that the subject in (35) needs to be 'separated' from the other arguments the same way the initial manner adverbs were separated from the rest of the sentence in the examples (26)-(34) from the previous section. Separation involving arguments requires a neo-Davidsonian framework (as in Parsons 1990), within which the relation between individuals and events are mediated through theta-roles:[13]

(36) $\exists \mathbf{e}\ \exists \mathbf{X} : \mathbf{videogames(X)}\ \&\ |\mathbf{X}| = \mathbf{3}\ \&\ \mathbf{Ag(e)} = \mathbf{X}\ \&$

$\forall \mathbf{y} : \mathbf{quarterback(y)} \rightarrow \exists \mathbf{e'}\ \mathbf{e'} \leq \mathbf{e}\ \&\ \mathrm{To}(\mathbf{e'}) = \mathbf{y}\ \&$

[13] The representation in (36) follows Parsons in treating theta-roles as (partial) functions from events to individuals, tough this is not crucial for the argument. The specific content of each theta-role is not relevant either. In (36), 'Ag' stands for agent, 'Th' for theme, and 'To' for beneficiary.

$$\exists \mathbf{Z} : \mathbf{plays}(\mathbf{Z}) \ \& \ |\mathbf{Z}| = \mathbf{2} \ \& \ \mathrm{Th}(\mathbf{e}') = \mathbf{Z} \ \& \ \mathbf{teach}(\mathbf{e}') \ \&$$

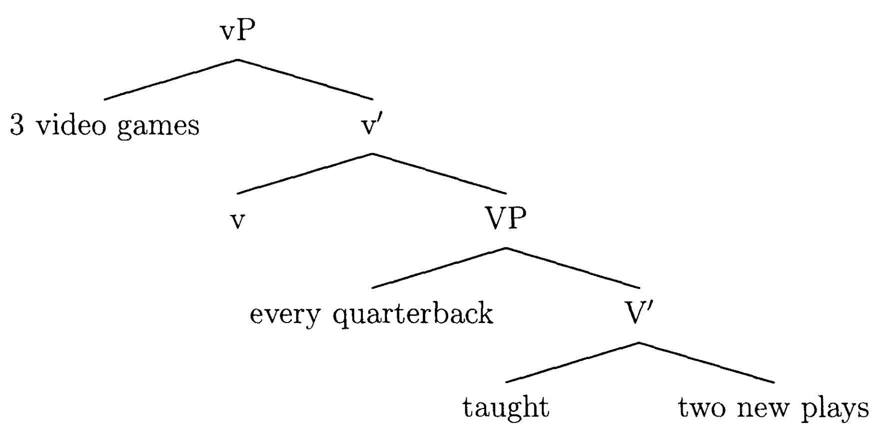
$$\forall \mathbf{e}' : \ \mathbf{e}' <_{\mathcal{P}} \mathbf{e} \rightarrow \exists \mathbf{y} : \mathbf{quarterback}(\mathbf{y}) \ \& \ \mathrm{To}(\mathbf{e}') = \mathbf{y} \ \&$$

$$\exists \mathbf{Z} : \mathbf{plays}(\mathbf{Z}) \ \& \ |\mathbf{Z}| = \mathbf{2} \ \& \ \mathrm{Th}(\mathbf{e}') = \mathbf{Z} \ \& \ \mathbf{teach}(\mathbf{e}')$$

The plural subject of (35) is treated in (36) as the agent of an event that has parts that are teaching events with quarterbacks as beneficiaries and sums of two new plays as themes. The essential feature of (36) is that the event variable serving as the argument of the agent theta-role is not the same variable that serves as argument for the other theta-roles.

Example (35) thus provides evidence for the existence of a mereology of events and for separating the external argument of a verb like 'teach' from the other arguments in the logical representation of the respective sentences. As for a suitable syntax compatible with these results, the following kind of representation, familiar from recent works by Noam Chomsky within his Minimalist Program (Chomsky 1995), would suffice (the correct word order is derived by moving the verb to v, a movement that is assumed to have no semantic import. The labels are not relevant either.):

(37)



The head v is responsible for introducing the external/agentive theta-role, which was dissociated from the verb *teach*. The denotation of the resulting structure is derived through successive instantiations of Functional Application:

(38) $[\![\text{teach}]\!] = \lambda \mathbf{x}.\lambda \mathbf{y}.\lambda \mathbf{e}.\ \mathbf{teach}(\mathbf{e})\ \&\ \text{Th}(\mathbf{e}) = \mathbf{x}\ \&\ \text{To}(\mathbf{e}) = \mathbf{y}$

$$[\![\text{VP}]\!] = \lambda \mathbf{e}.\ \forall \mathbf{y} : \mathbf{quarterback}(\mathbf{y}) \rightarrow \exists \mathbf{e}'\ \mathbf{e}' \leq \mathbf{e}\ \&\ \text{To}(\mathbf{e}') = \mathbf{y}\ \&$$
$$\exists \mathbf{Z} : \mathbf{plays}(\mathbf{Z})\ \&\ |\mathbf{Z}| = \mathbf{2}\ \&\ \text{Th}(\mathbf{e}') = \mathbf{Z}\ \&\ \mathbf{teach}(\mathbf{e}')\ \&$$
$$\forall \mathbf{e}'\ \mathbf{e}' <_{\mathcal{P}} \mathbf{e} \rightarrow \exists \mathbf{y} : \mathbf{quarterback}(\mathbf{y})\ \&\ \text{To}(\mathbf{e}') = \mathbf{y}\ \&$$
$$\exists \mathbf{Z} : \mathbf{plays}(\mathbf{Z})\ \&\ |\mathbf{Z}| = \mathbf{2}\ \&\ \text{Th}(\mathbf{e}') = \mathbf{Z}\ \&\ \mathbf{teach}(\mathbf{e}')$$

$$[\![\text{v}]\!] = \lambda \mathbf{P}.\lambda \mathbf{x}.\lambda \mathbf{e}.\ \mathbf{Ag}(\mathbf{e}) = \mathbf{x}\ \&\ \mathbf{P}(\mathbf{e})$$

$$[\![\text{vP}]\!] = \lambda \mathbf{e}.\ \exists \mathbf{X} : \mathbf{videogame}(\mathbf{X})\ \&\ |\mathbf{X}| = \mathbf{3}\ \&\ \mathbf{Ag}(\mathbf{e}) = \mathbf{X}\ \&$$
$$\forall \mathbf{y} : \mathbf{quarterback}(\mathbf{y}) \rightarrow \exists \mathbf{e}'\ \mathbf{e}' \leq \mathbf{e}\ \&\ \text{To}(\mathbf{e}') = \mathbf{y}\ \&$$
$$\exists \mathbf{Z} : \mathbf{plays}(\mathbf{Z})\ \&\ |\mathbf{Z}| = \mathbf{2}\ \&\ \text{Th}(\mathbf{e}') = \mathbf{Z}\ \&\ \mathbf{teach}(\mathbf{e}')\ \&$$
$$\forall \mathbf{e}'\ \mathbf{e}' <_{\mathcal{P}} \mathbf{e} \rightarrow \exists \mathbf{y} : \mathbf{quarterback}(\mathbf{y})\ \&\ \text{To}(\mathbf{e}') = \mathbf{y}\ \&$$
$$\exists \mathbf{Z} : \mathbf{plays}(\mathbf{Z})\ \&\ |\mathbf{Z}| = \mathbf{2}\ \&\ \text{Th}(\mathbf{e}') = \mathbf{Z}\ \&\ \mathbf{teach}(\mathbf{e}')$$

Notice that although in the lexical entry of the verb *teach*, each individual argument is related to the event argument through theta-roles, this is not crucial for the points made above. The following lexical entry would serve the same purposes equally well, with the metalanguage predicate **teach** holding of a triple $\langle e, y, x \rangle$ if and only if e is an event of x being taught y:[14]

(39) $[\![\text{teach}]\!] = \lambda \mathbf{x}.\lambda \mathbf{y}.\lambda \mathbf{e}.\ \mathbf{teach}(\mathbf{e}, \mathbf{y}, \mathbf{x})$

What is crucial is that the agent theta-role be introduced by a separate head, after the other theta-roles/arguments have already been introduced. The importance of this asymmetry is highlighted by the following contrast, presented in Kratzer (2004):

(40) a. Three copy editors caught every mistake in the manuscript.

b. Every copy editor caught 500 mistakes in the manuscript.

[14] If (i) below has a reading where *three quarterbacks* is interpreted cumulatively, then further separation between the two objects becomes necessary. This would require further syntactic decomposition of the VP in (i). Since the syntax/semantics of double object constructions is not our main concern here, I will not proceed with this discussion
(i) John taught three quarterbacks every play he knew.

(40a) is just a variation on Schein's example, only simpler in not involving three arguments. The sentence can describe a situation in which each copy editor caught some mistakes in the manuscript, with every mistake being caught by at least one of them. (40b), on the other hand, cannot be used to describe a scenario where 500 mistakes were caught by some editor or another, with every editor catching at least one of those mistakes. Rather, it can only mean that each editor caught a total of 500 mistakes, or that a certain group of 500 mistakes were caught by every editor. This asymmetry is indeed expected if, as above, we assume a syntactic representation of the form [Sub [v [V Obj]]], with v introducing the agent theta-role and the verb *catch* receiving one of the lexical entries below:

(41) a. $[\![\text{catch}]\!] = \lambda \mathbf{x}.\lambda \mathbf{e}.\ \mathbf{catch}(\mathbf{e}, \mathbf{x})$

b. $[\![\text{catch}]\!] = \lambda \mathbf{x}.\lambda \mathbf{e}.\ \mathbf{catch}(\mathbf{e})\ \&\ \text{Th}(\mathbf{e}) = \mathbf{x}$

1.3 Overview

In this introduction, we have reviewed some evidence that the domain of events is a partially ordered domain. In the remainder of this dissertation, we will argue that the singular/plural opposition that we assumed distinguishes between atomic and non-atomic individuals in the domain of objects (type e entities) applies to events as well, with plural events being characterizable as mereological sums having singular events as their minimal parts.

The rest of the dissertation is organized as follows: in chapter 2, I contrast the semantics and pragmatics of habitual sentences with and without adverbs of quantification, as exemplified in (42):

(42) a. When Mary visits John, he always/usually cries.

b. When Mary visits John, he cries.

I claim that whereas a quantificational analysis is adequate for the ones with Q-adverbs, with the adverbs being the counterpart of 'every', 'most' and so on, the ones without them (which I call 'Bare Habituals') should be analyzed as involving plural definite descriptions of events. I assume the presence of a silent habitual/generic operator *hab* for bare habituals, but I assign to this operator the meaning of the English definite determiner *the* (modulo a sortal distinction). I defend this view by highlighting crucial differences between sentences with and without adverbs of quantification, and also several parallels between the nominal determiner *the* and the silent *hab*. According to the idea to be developed in this chapter, (42a) has the logical structure in (43a), and can be roughly paraphrased as 'every event/most events of Mary visiting John overlaps with an event of John crying'. (42b), on the other hand, has the (simplified) logical structure in (43b) and can be paraphrased as 'the events of Mary visiting John overlap with events of John crying'.

(43) a. $\mathbf{All/Most}_e[\lambda \mathbf{e}.\mathbf{visit}(\mathbf{e},\mathbf{j},\mathbf{m})][\lambda \mathbf{e}.\exists \mathbf{e}' : \mathbf{cry}(\mathbf{e}',\mathbf{j})\ \&\ \mathbf{overlap}(\mathbf{e},\mathbf{e}')]$

b. $[\lambda \mathbf{e}.\ \exists \mathbf{e}' :\ \mathbf{cry}(\mathbf{e}',\mathbf{j})\ \&\ \mathbf{overlap}(\mathbf{e},\mathbf{e}')]([\iota \mathbf{E} : \mathbf{visit}(\mathbf{E},\mathbf{j},\mathbf{m})])$

In chapter 3, we turn our attention to some instances of the so-called donkey sentences, such as those in (44), and claim that these sentences too contain a plural definite description of events in their logical forms.

(44) a. Every farmer who owns a donkey beats it.

b. No farmer who owns a donkey beats it.

c. Most farmers who own a donkey beats them.

This plural description is interpreted within the scope of the quantified subject, and the heart of our argumentation in favor of the proposal will be based on a comparison revealing several interpretive similarities between donkey sentences and sentences that contain an overt plural definite under the scope of a quantifier phrase. Moreover, the analysis maintains that quantificational determiners such as 'every', 'no', and 'most' introduce quantification over one variable at a time only, therefore avoiding the proportion problem well-known from the literature on donkey anaphora. It is also compatible with an e-type treatment of the object pronouns in (44) that do not run into the so-called uniqueness problem.

Chapter 4 studies continuous and habitual readings of imperfective sentences such as those in (45):

(45) a. Mary is dying her hair (right now).

b. Mary dyes her hair.

I argue that continuous and habitual readings share the same temporal and the same modal ingredients. I assume the presence of an existential/indefinite event determiner in both sentences and argue that the only difference between the logical representations of (45a) and (45b) is the number (singular/plural) of the event variables being quantified over. Continuous readings involve quantification over singular events, whereas habitual readings involve quantification over plural events. I also claim that the difference between languages like English (or Portuguese) in which (45b) only gives rise to habitual readings, and languages like Italian (or Spanish), in which (45b) is ambiguous between continuous and habitual readings, lies in the event determiner's number sensitivity. In English and Portuguese, the (silent) event determiner behaves like the nominal determiner *some*, which does not care about the number of its argument (*some man/some men*), but in Italian and Spanish, it behaves like the Italian determiner *alcuni* 'some-PL', which selects for plural predicates only (*alcuni uomini/*alcuno uomo*; Chierchia 1998). The analysis thus provides a simple account for cross-linguistic variation within the domain of imperfectivity, reducing the differences to a single parameter related to the 'number' requirements of an existential determiner.

Chapter 2

Bare Habituals, Plurality, and Definiteness

2.1 Introduction

Habitual sentences are used to express non-accidental generalizations based on occurrences of a certain type of situation or event. For instance, if after observing a certain number of events of John having dinner with friends, one notices that in each one of those occasions he drank wine, one might be tempted to conclude that the overlapping between the dinner events and the wine-drinking events is not acidental, but something typical about John's habits. One way of expressing this conclusion is by means of a sentence like (1) below:

(1) When John has dinner with friends, he always drinks wine.

Here, the relation between the type of event described by the adverbial clause and the type of event described by the matrix clause seems to be mediated by the adverb *always*, which brings about a universal flavor similar to the one associated with nominal determiners like *every* and *all.* In fact, adverbs of quantification (AQs) are a common ingredient in habitual statements. Besides *always*, English has others, such as *usually*, and *sometimes*, all contributing a particular force to the generalizations being expressed by the sentences containing them.

(2) When John has dinner with friends, he usually/sometimes drinks wine.

Interestingly, AQs are not a crucial component of habitual sentences. Quite often, generalizations are expressed without the help of any overt AQ, as can be seen in (3), a sentence whose meaning seems quite similar to the meaning of (1) above:

(3) When John has dinner with friends, he drinks wine.

This similarity between habitual sentences with AQs and habitual sentences without them has led to a widespread view according to which, the absence of an adverb of quantification in (3) is only apparent, and that in fact, a covert, phonetically null AQ is present in sentences like that as well (see Farkas and Sugioka 1983; Krifka et al. 1995; Cohen 1999, and references therein). Since then, the task of spelling out the meaning of this covert AQ has been a central issue in the semantics of habituality, and the topic is still a controversial one. For example, are (1) and (3) synonymous? What about (2) with *usually* and (3)?

The aim of this chapter is to investigate semantic and pragmatic differences between habitual sentences with AQs and habitual sentences without AQs, which I will call *bare habituals*. I will argue for the idea that bare habituals involve plural definite descriptions of events, whereas habituals with AQs involve quantification over singular events/situations. More precisely, although I assume the presence of a silent habitual operator in the structure of bare habituals, I assign to this operator the meaning of the English definite determiner *the* (modulo a sortal distinction). I will defend this view by highlighting crucial differences concerning minimal pairs with and without AQs, and also several parallels between the nominal determiner *the* and the silent habitual determiner. Thus, according to the view to be defended here, (1) can be paraphrased as 'Every event of John having dinner with friends overlaps with an event of him drinking wine', whereas (3) is better paraphrased as 'The events of John having dinner with friends overlap with events of John drinking wine.

I will proceed in three steps. First, in section 2, I discuss several contrasting pairs involving singular and plural noun phrases within which singular indefinites are embedded. This particular configuration will prove useful in bringing about certain differences concerning how singular, and especially plural, predicates are derived. Section 3 contains some background on event quantification. In section 4, I claim that similar differences exist in habitual sentences, and propose a similar treatment making crucial reference to plural events. In section 5, pragmatic differences between habituals with and without AQs are discussed and the similarity between plural definite nominals and bare habituals are highlighted. The emerging picture will then be that of bare habituals involving plural definite descriptions of events/situations, as stated in the brief conclusion in section 6.

2.2 Preliminaries

We start by looking at the internal structure of some complex noun phrases, and making assumptions about how singular and plural predicates are formed. We will first look at lexical predicates and then at derived ones.

2.2.1 Pluralities and Lexical Predicates

Consider the pairs of sentences below:

(4) a. Every mother of a one-year old child agreed to sign this form.

b. # The mothers of a one-year old child agreed to sign this form.

(5) a. Every wife of a graduate student came to the party.

b. # The wives of a graduate student came to the party.

(6) a. I will visit every capital of an African country.

b. # I will visit the capitals of an African country.

When uttered in contexts in which it is common ground that each person has only one mother, men are not married to more than one woman, and African countries have only one capital each, the b-sentences above sound rather strange, conveying information that go against these shared assumptions. They suggest the existence of multiple mothers of a single child, multiple wives of a single graduate student, and multiples capitals of a single African country. On the other hand, the a-sentences all sound fine, totally compatible with what is common ground. At the origin of these contrasts is the singular/plural opposition overtly manifested in the pairs of nouns mother/mothers, wife/wives, and capital/capitals. That this is so can be seen by replacing the determiners *every* and *the* by other determiners without altering the number of the noun phrases. As attested below, in examples with the determiners *no* and *some*, which combine with both singular and plural noun phrases, the contrasts are preserved:

(7) a. No mother of a one-year old child agreed to sign this form.

b. # No mothers of a one-year old child agreed to sign this form.

(8) a. No wife of a graduate student came to the party.

b. # No wives of a graduate student came to the party.

(9) a. I will visit no capital of an African country.

b. # I will visit no capitals of an African country.

(10) a. Some mother of a one-year old child agreed to sign this form.

b. # Some mothers of a one-year old child agreed to sign this form.

(11) a. Some wife of a graduate student came to the party.

b. # Some wives of a graduate student came to the party.

(12) a. I will visit some capital of an African country.

b. # I will visit some capitals of an African country.

Let us focus for the moment on the meaning of the noun phrases in question. Notice that these are headed by relational nouns, and that singular indefinites appear at the positions reserved for their first arguments. The only thing that distinguishes the members of the pairs above is the number associated with these NPs. If we assume with Link (1983) and much subsequent work that there are both singular and plural individuals, and that plural individuals have singular individuals as their minimal, proper parts, we can capture the contrasts described above by assigning the singular and plural NPs in (4)-(6) the denotations in (13)-(15), respectively:[1]

(13) a. $[\![$SG mother of a one-year old child$]\!] = \lambda\mathbf{x}.\ \exists\mathbf{y} :\ \mathbf{child}(\mathbf{y})\ \&\ \mathbf{mother}(\mathbf{x}, \mathbf{y})$

b. $[\![$PL mother of a one-year old child$]\!] = \lambda\mathbf{X}.\ \exists\mathbf{y} :\ \mathbf{child}(\mathbf{y})\ \&\ \mathbf{mother}(\mathbf{X}, \mathbf{y})$

(14) a. $[\![$SG wife of a graduate student$]\!] = \lambda\mathbf{x}.\ \exists\mathbf{y} :\ \mathbf{GS}(\mathbf{y})\ \&\ \mathbf{wife}(\mathbf{x}, \mathbf{y})$

b. $[\![$PL wife of a graduate student$]\!] = \lambda\mathbf{X}.\ \exists\mathbf{y} :\ \mathbf{GS}(\mathbf{y})\ \&\ \mathbf{wife}(\mathbf{X}, \mathbf{y})$

(15) a. $[\![$SG capital of an African country$]\!] = \lambda\mathbf{x}.\ \exists\mathbf{y} :\ \mathbf{country}(\mathbf{y})\ \&\ \mathbf{capital}(\mathbf{x}, \mathbf{y})$

b. $[\![$PL capital of an African country$]\!] = \lambda\mathbf{X}.\ \exists\mathbf{y} :\ \mathbf{country}(\mathbf{y})\ \&\ \mathbf{capital}(\mathbf{X}, \mathbf{y})$

Take (14), for example. For an individual to belong to the set represented in (14a), this individual has to be a (singular) woman married to a (singular) graduate student. But for an individual to belong to the set represented in (14b), the individual has to be a plurality whose minimal parts are women married to the same graduate student. Thus, unless there is a graduate student with more than one wife, this set will be empty. That is why the sentence sounds funny with monogamy in the background.

The next task is to make the analysis compositional. I assume that two pieces are put together to form the inflected NPs above: a number morpheme (SG or PL) and a

[1] Variables ranging over pluralities will be represented with capital letters, and variables ranging over singularities with non-capital letters.

bare, 'numberless' noun phrase. I will follow Kratzer (2004), who proposes a semantic universal stating that all lexical predicates are cumulative. In the case of a one-place predicate **P**, this means that if **a** and **b** are both members of **P**, so is **a⊕b**, the plural individual formed by **a** and **b**. Thus, the extension of bare noun phrases denoting one-place predicates may contain both singular and plural individuals. In the case of a 2-place predicate **R**, we have that if both ⟨**a,b**⟩ and ⟨**c,d**⟩ belong to **R**, then ⟨**a⊕c,b⊕d**⟩ also belongs to **R**.[2] Take the lexical predicate *wife* for instance, and suppose that Mary is John's wife and Marta is Paul's wife. Then, the denotation of *wife* would have the pairs ⟨**mary, john**⟩, ⟨**marta, paul**⟩, and ⟨**mary⊕marta, john⊕paul**⟩ as its members. Now, imagine John gives up monogamy and marries Susan too. Then, **R** will have four more members:⟨**susan, john**⟩, ⟨**mary⊕susan, john**⟩, ⟨**susan⊕marta, john⊕paul**⟩and ⟨**mary⊕susan⊕marta, john⊕paul**⟩. Finally, imagine that John and Paul are the graduate students, and let us ask ourselves what the denotation of the predicate *wife- of a graduate student* would be in the scenarios above. We have the following:

(16) Scenario 1: John is married to Mary and Paul is married to Marta.

⟦student-⟧ = {john, paul, john⊕paul}

⟦wife-⟧ = {⟨mary, john⟩, ⟨marta, paul⟩, ⟨mary⊕marta,john⊕paul⟩}

⟦wife- of a student⟧ = {mary, marta} (NB: ⟨mary⊕marta⟩ is not in the set)

(17) Scenario 2: John is married to both Mary and Susan. Paul is married to Marta.

⟦student-⟧ = {john, paul, john⊕paul}

⟦wife-⟧ = {⟨mary, john⟩, ⟨susan, john⟩, ⟨marta, paul⟩, ⟨mary⊕susan, john⟩, ⟨mary⊕marta, john⊕paul⟩, ⟨susan⊕marta, john⊕paul⟩ ⟨mary⊕susan⊕marta, john⊕paul⟩}

⟦wife- of a student⟧ = {mary, susan, marta, ⟨mary⊕susan⟩}

[2] The idea generalizes trivially for other n-place predicates.

Turning now to the role of the number morphemes, SG/PL, I take them to select the atomic/non-atomic individuals in a predicate extension, as represented in the lexical entries below:

(18) a. $[\![\text{SG}]\!] = \lambda \mathbf{P}.\lambda \mathbf{x}^*.\ \mathbf{P}(\mathbf{x}^*) = \mathbf{1}\ \&\ \mathbf{AT}(\mathbf{x}^*) = \mathbf{1}$

b. $[\![\text{PL}]\!] = \lambda \mathbf{P}.\lambda \mathbf{x}^*.\ \mathbf{P}(\mathbf{x}^*) = \mathbf{1}\ \&\ \neg\mathbf{AT}(\mathbf{x}^*) = \mathbf{1}$

Thus, in our previous scenarios, we have:

(19) Scenario 1

$[\![$wife of a graduate student$]\!]$ = {mary, marta}

$[\![$wives of a graduate student$]\!]$ = $\varnothing$

(20) Scenario 2

$[\![$wife of a graduate student$]\!]$ = {mary, susan, marta} $[\![$wives of a graduate student$]\!]$ = $\{\langle \text{mary} \oplus \text{susan} \rangle\}$

Notice that we need to 'give up monogamy' for the plural predicate to be non-empty, and that is exactly what we wanted to explain the contrasts discussed in this section.

2.2.2 Distributivity and Derived Predicates

Consider now the examples in (21) and (22) below, consisting, as in the previous subsection, of minimal pairs containing nouns that contrast in number. This time, however, the nouns are modified by relative clauses.

(21) a. Every woman who has a six-month old child agreed to sign the form.

b. The women who have a six-month old child agreed to sign the form.

(22) a. In my family, every woman who is married to a professor is happy.

b. In my family, the women who are married to a professor are happy.

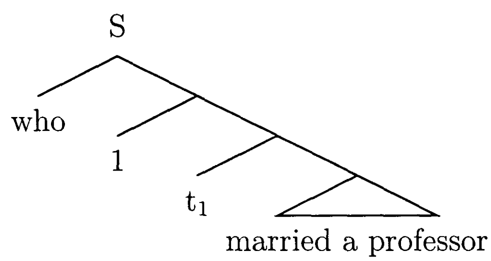
Interestingly, the b-examples do not sound strange. They do not suggest the existence of multiple mothers of a single child or multiple wives of a single professor. In fact, if we compare (21b) and (22b) to (4b) and (5b), repeated below as (23a-b), we see that the first two are much better in this respect than the other two.[3]

(23) a. # The mothers of a one-year old child agreed to sign the form.

b. # The wives of a professor came to the party.

One salient aspect of the examples in (21) and (22) is the clausal nature of the noun modifier, within which the singular indefinite is embedded. The relative clause is formed with the help of a relative pronoun, which moves to the periphery of the clause to create a derived predicate of individuals. I follow the proposal in Heim and Kratzer (1998) according to which syntactic movement generates an index node right below the landing site of the moved element, which is interpreted as a lambda-abstractor, binding co-indexed traces and/or pronouns in its c-command domain. This gives us the following (simplified) representation for the relative clause of (22a):

(24)

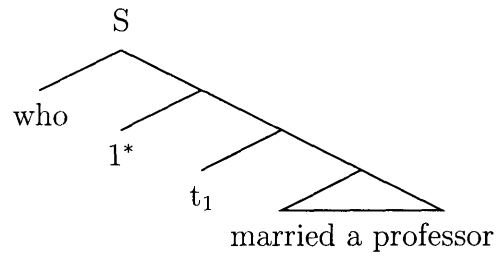


[3] Let me say a word about judgments. Distributive readings in general seem to be more readily detected by speakers in the case of sentences with inherently distributive quantifier phrases, such as 'every NP' than in the case of sentences with plural DPs, such as 'the NPs'. This is true, for instance, of the pairs in (21) and (22). Thus, for some speakers, the distributive readings associated with (21b) and (22b) are not as salient as the (unique) distributive readings of (21a) and (22a). But it does not take long for these speakers to acknowledge the existence of those readings. In fact, this situation does not seem different from detecting scope-inversion readings of sentences with two quantifier phrases, as in 'Some student attended every seminar', where the $\exists\forall$ reading is also not as prominent as the $\forall\exists$ reading. When it turns to cases like (23a)-(23b), however, the situation is different. Even after acknowledging the existence of distributive readings for (21b) and (22b), the speakers I consulted still reported that such readings were missing (or extremely hard to detect) for (23a)-(23b), and that a clear contrast exists between (21b) and (22b) on the one hand, and (23a) and (23b) on the other. The judgments seem to me to be robust enough to justify a syntactic-semantic analysis, as I am doing here.

The relative pronoun itself is vacuous, perhaps only adding selectional requirements in the form of semantic features, such as +HUMAN in the case of *who*.

I would like to suggest that besides its role as a lambda abstractor, the index created by movement can also perform the role of a distributive operator, allowing a predicate to apply to the atomic parts of a plural argument.[4]The idea is that this starred index can be part of the representation of the relative clause in examples like (21b) and (22b):

(25)



The structures in (24) and (25) receive the interpretations in (26) and (27), respectively:[5]

(26) $[\![\text{who 1 } t_1 \text{ married a professor}]\!] = \lambda \mathbf{x}.\ \exists \mathbf{y} : \mathbf{professor}(\mathbf{y})\ \&\ \mathbf{wife}(\mathbf{x}, \mathbf{y})$

(27) $[\![\text{who } 1^* \ t_1 \text{ married a professor}]\!] = \lambda \mathbf{X}.\ \forall \mathbf{x} : \mathbf{x} \leq \mathbf{X} \ \rightarrow \exists \mathbf{y} : \mathbf{professor}(\mathbf{y})\ \&\ \mathbf{wife}(\mathbf{x}, \mathbf{y})$

We have thus established a tight connection between syntactic movement and distributivity, and it should be clear now why there is a contrast between the interpretations of the sentences in the pairs below, all of them containing a plural noun phrase embedding a singular indefinite:

[4] I will limit attention here to atomic distributivity involving one-place predicates. Whether or not distribution to non-atomic parts or simultaneous distribution involving multiple arguments of a single predicate is needed is a controversial topic beyond the scope of this work. For discussion see Schwarzchild (1996), Winter (2000), Beck and Sauerland (2000), Kratzer (2004), among others.

[5] For simplicity, I am omitting event arguments in the representations. The starred index is interpreted as follows:

$[\![i^*]\!]^g = \lambda X.\ \forall x \leq X :\ [\![\alpha]\!]^{g^{x/i}}$

(28) a. # The mothers of a one-year old child agreed to sign the form.

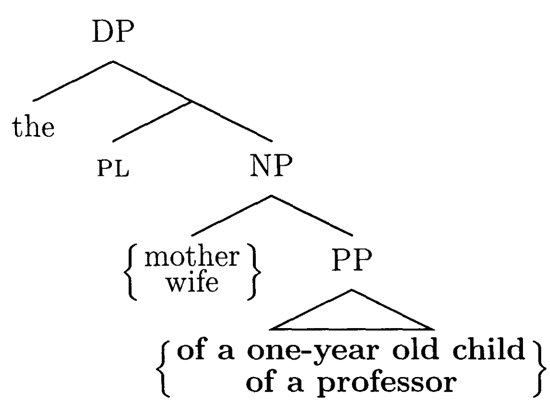
b. The women who have a six-month old child agreed to sign the form.

(29) a. # In my family, the wives of a professor are happy.

b. In my family, the women who are to married a professor are happy.

Distribution is not possible in (28a) and (29a) because there are no predicates within the subject DPs which were created by movement. In fact, I am assuming that the external argument of the relational nouns in these examples are never saturated by a individual-denoting entity in syntax. This goes against a suggestion in Heim and Kratzer (1998) that NPs have the structure of a small clause with a silent PRO-subject first saturating the nominal predicate and then moving to create a derived predicate similar to a relative clause. The representation of these DPs is thus the following[6]:

(30)



Also incompatible with the contrasts seen above would be a proposal that does not assume lexical cumulativity, treating the NP in (30) as a set of singularities and the plural morpheme as an operator that closes off that set under sum formation, as in (31) below (P^* is the transitive closure of P under sum formation):

(31) $[\![\text{wife of a professor}]\!] = \lambda \mathbf{x}.\ \exists \mathbf{y} : \mathbf{professor}(\mathbf{y})\ \&\ \mathbf{wife}(\mathbf{x}, \mathbf{y})$

$[\![\text{PL}]\!] = \lambda \mathbf{P}.\lambda \mathbf{X}.\mathbf{P}^*(\mathbf{X})$

[6] As for the interpretation of quantified expressions inside NP, see section 2.2.5 below

In the set P denoted by the numberless NP 'wife of a professor' would be any woman married to a professor. The set denoted by the plural NP would contain all the sums formed from the members of P. But that is exactly the denotation of the NP 'women who married by a professor' in (29b)(cf. (27)). The contrasts in (28) and (29) would remain unexplained.

Notice that the dependency of distributivity on movement is compatible with the simplest cases that have been used in the literature on plurals to argue for the existence of distributive operators in the grammar. These are transitive sentences with a plural definite subject and a singular indefinite object. (32) is an example taken from Winter (2000), which can be used to describe a situation in which each woman was wearing a different dress:

(32) The women were wearing a dress.

To allow for distributivity here, it is enough to assume that the subject of transitive sentences in English move from a base position inside the verb phrase to the specifier of a higher functional projection, an analytic move that has become standard in the Government and Binding tradition. Also relevant are cases involving raising predicates with plural subjects, as (33) below:

(33) The boys seemed to a police officer to be drunk.

This sentence can be used to describe a situation in which every boy seemed to a different police officer to be drunk. Assuming the subject gets to its surface position via movement, the availability of a distributive reading is again expected.

Finally, the connection between movement and distributivity is consistent with cases involving plural indefinites, as discussed by Ruys (1993) and Winter (1997), among others. Indefinites are notorious for their capacity of taking wide scope, even when they are embedded within syntactic islands. As an illustration, consider the following example from Ruys (1993):

(34) If three relatives of mine die, I will inherit a house.

Sentence (34) is ambiguous: under one reading, it says that I will inherit a house, if any three relatives of mine die. This reading is obtained if the plural indefinite *three relative of mine* takes scope inside the antecedent of the conditional. Under the other reading, for me to inherit a house, it is necessary that three particular relatives of mine all die. If three others die, I will not get any house. This reading results from the indefinite taking matrix scope. (35) and (36) give logical representations for these readings:

(35) $\underline{(\exists \mathbf{X} :| \mathbf{X} |= \mathbf{3} \ \& \ \mathbf{rel\_of\_mine}(\mathbf{X}) \ \& \ \mathbf{die}(\mathbf{X}))} \rightarrow \underline{\mathbf{I\ will\ inherit\ a\ house}}$

(36) $\exists \mathbf{X} :| \mathbf{X} |= \mathbf{3} \ \& \ \mathbf{rel\_of\_mine}(\mathbf{X}) \ \& \ (\underline{\mathbf{die}(\mathbf{X}) \rightarrow \mathbf{I\ will\ inherit\ a\ house}})$

What sentence (34) does not have, however, is a reading according to which there is a set consisting of three relatives of mine, such that, if anyone of them die, I will inherit a house. This reading requires wide scope not only for the indefinite, but also for a distributive operator:

(37) $\exists \mathbf{X} :| \mathbf{X} |= \mathbf{3} \ \& \ \mathbf{rel\_of\_mine}(\mathbf{X}) \ \&$
$\underline{\forall \mathbf{x} \leq \mathbf{X} : (\mathbf{die}(\mathbf{x}) \rightarrow \mathbf{I\ will\ inherit\ a\ house})}$

The absence of this reading would be problematic for the proposal that movement can trigger the insertion of a distributive operator, if the plural indefinite took wide scope via movement. However, although there is much debate around the precise nature of the scope-taking mechanisms for indefinites, there is consensus that movement alone is not enough. Approaches based on choice functions (Reinhart 1997, Winter 1997), for instance, do not assume that the indefinite moves out of the antecedent clause in (34) to get wide scope:

(38) $\exists \mathbf{f} : \mathbf{die}(\mathbf{f}(\mathbf{3\_relatives\_of\_mine})) \rightarrow \mathbf{I\ will\ inherit\ a\ house}$

And if the indefinite remains within the antecedent clause, distributivity should be confined to this domain too.

2.2.3 The *i-within-i* Constraint

If distributivity is indeed tightly connected to syntactic movement, we expect that its availability correlates with other syntactic-semantic phenomena that are also dependent on movement. In the system of Heim and Kratzer (1998), which I am adopting here, variable binding is such a phenomenon. Take for example the case of binding of a pronoun by a quantifier phrase:

(39) everybody [likes his_i mother]

In a structure like (39), if the quantifier does not move, the pronoun will be interpreted as a free variable, and the meaning of this structure will be assignment-dependent. In this case, the pronoun *his* would refer to a contextually salient individual. To get the reading according to which every x is such that x loves x's mother, we have to move the quantifier, so that an index can be inserted and the derived predicate λ**x. x loves x's mother** can be created:

(40) [everybody 1 [t_i likes his_i mother]].

The dependency of both variable binding and distributivity on movement leads to the prediction that in cases where one is not available, the other should not be either. To see that this prediction is indeed borne out, consider the following pair of sentences from Jacobson (1994):

(41) a. * [The wife of the author of her_i biography$]_i$ arrived.

b. [The woman who married the author of her_i biography$]_i$ arrived.

(41a) exemplifies the so-called *i-within-i* constraint. The relevant fact here is that this sentence cannot mean 'the woman x, such that x is the wife of the author of x's biography arrived'. Interestingly, (41b), which one might have expected to mean exactly the same as (41a) can have such meaning. It seems that in the case of (41a), there is no potential binder for the pronoun, which remains free within DP. But notice that this is the same environment that we discussed before in connection to distributivity. There, we saw that plural NPs headed by relational nouns did not give rise to distributive readings within the NP. As I said, this should not be surprising anymore: no movement, therefore no distributivity and no binding. In (41b), with the noun being modified by a relative clause containing the pronoun, there is movement and movement creates a binding configuration, giving rise to the attested interpretation. Distributivity internal to NP, as we saw above, was also possible in these cases. In sum, I take all this as evidence that binding and distributivity are tied to the same formal mechanism, namely, syntactic movement.[7]

2.2.4 NP-internal Cumulation

Consider the following contrasting pair of examples, paying special attention to the subject noun phrases.

(42) a. The wives of these nine boys are happy.

b. # Every wife of these nine boys is happy.

[7] Jacobson (1994) notes that it is not only relative clauses that escape the i-within-i constraint, but also other modifiers, such as participles and adjectival phrases:

(i) [The woman married to her$_i$ childhood sweetheart]$_i$ left.

(ii) [The woman still in love with her$_i$ childhood sweetheart]$_i$ left.

In these cases, distributive readings are attested too:

(iii) The women married to a graduate student left.

(iv) The women still in love with an old boyfriend left.

I assume that these post-nominal modifiers are reduced relatives formed with the help of a silent operator akin to a relative pronoun.

The definite description in (42a) refers to the plural individual whose minimal parts are the women married to one of the nine boys in the context. (42b), on the other hand, sounds odd. It involves quantification over singular women, each married to all of the nine boys in the context. The meaning of the plural subject of (42a) is a direct result of cumulation arising from the presence of two plural arguments associated with the same relational predicate: the plural variable ranging over women and the plural DP *these nine boys.* It follows from cumulativity that if w_1 is the wife of b_1, w_2 is the wife of b_2, and so on (where b_1, b_2, ...,b_9 are the boys in the context), then $w_1 \oplus w_2 \oplus ... \oplus w_9$ is in the extension of the plural predicate *wives of these nine boys.*

(43) $[\![\text{wives of these nine boys}]\!] = \lambda \mathbf{X}.\ \neg \mathbf{at}(\mathbf{X})\ \&\ \mathbf{wife}(\mathbf{X}, \mathbf{the\ nine\ boys})$

On the other hand, the restrictor of *every* in (42b) is a set of singularities directly related, via the predicate *wife* to the plurality denoted by the DP *these nine boys.*

(44) $[\![\text{wife of these nine boys}]\!] = \lambda \mathbf{x}.\ \mathbf{at}(\mathbf{x})\ \&\ \mathbf{wife}(\mathbf{x}, \mathbf{9B})$

To get a reading similar to the one associated with (42a), but with *every*, we have to use a partitive construction, which in English takes the form *one of DP*:

(45) Every one of the wives of these nine boys is happy.

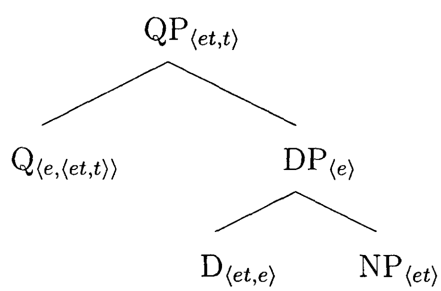
Similar facts obtain when a head noun is modified by a relative clause, as can be seen below:

(46) a. The girls who are married to these nine boys are happy.

b. # Every girl who is married to these nine boys is happy.

(47) Every one of the girls who are married to these nine boys is happy.

The oddness of (42b) and the fact that it contrasts with (45) highlights the difference in their internal structure: the singular restrictor of 'every' in (45) was the result of first forming a type e plurality and then forming a set with the minimal parts of that plurality. The formation of the singular restrictor of 'every' in (42b), on the other hand, does not seem to involve an intermediate layer of plurality, or any partitive operator. This observation becomes relevant in the face of proposals such as Matthewson (2001), who, on the basis of evidence from Salish, claims that the formation of generalized quantifiers proceeds in two steps: first an argumental, type e, constituent is derived and then a distributive/partitive-like operator quantifies over parts of that type-e individual:



This poses the following question: if Matthewson is right, is her proposal in conflict with the contrast between (42b) and (45) and the explanation we offered above? The answer is no, IF the determiner D in question is not quite like the definite article *the* in English, but rather takes a predicate denoting a set of singularities, and returns the sum of its elements, an individual that is not necessarily a member of the original set.

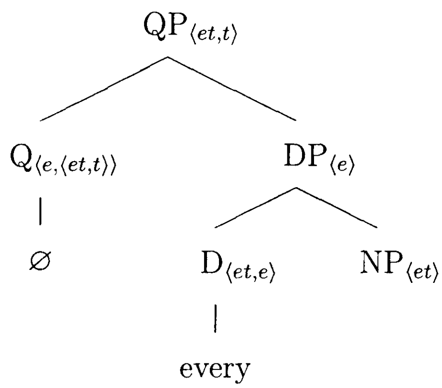
(48) $[\![\mathrm{D}]\!] = \lambda \mathbf{P}_{sg}.\ \sigma\mathbf{P}$

$\sigma\mathbf{P} =$ **the sum of all individuals in P**

$[\![\mathrm{Q}]\!] = \lambda X.\lambda Q.\forall x \leq X : Q(x)$

In fact, Matthewson suggests that *every* itself might be this determiner, and that the quantificational force usually associated with *every* NP phrases comes from a silent distributive operator.[8]

[8] In defending her proposal, Matthewson points out that non-quantificational uses of *every* have been reported in the literature, of which the examples below form a small sample:



Thus, since the restrictor of every continues to be a singular predicate, our explanation for the contrasts noticed above remain valid.

2.2.5 A Note on Quantifier Scope

Examples like the ones in (49) have shown us the necessity of allowing singular indefinites to take NP-internal scope:

(49) a. Every mother of a one-year old child agreed to sign the list.

b. Every wife of a graduate student came to the party.

NP-internal scope is also an option for plural indefinites (including numerical NPs). This is shown by the availability of non-specific interpretations for the indefinites in the examples below:

(50) a. Every daughter of foreign parents was interviewed by a bilingual nun.

---

(1) a. * In this class I try to combine each theory of plurality.
b. In this class I try to combine every theory of plurality. (Landman 2000)

(2) a. * It took each boy to lift the piano.
b. It took every boy to lift the piano. (Beghelli and Stowell 1997)

(3) a. ? She counted each of the proposals.
b. She counted every proposal. (Dowty 1987)

If Matthewson's suggestion is correct, non-quantificational uses of *every* would correspond to cases in which the determiner heads a bare DP, that is, a DP that is not embedded under a QP headed by a distributive operator. For criticism of Matthewson (2001), see Giannakidou (2004).

b. Every mother of three children will receive extra benefits.

Universal and proportional quantifiers, however, behave differently. When these quantifiers appear in configurations similar to the ones in which the indefinites in the examples above appear, NP-internal scope does not seem to be an option for them. Consider, for instance, a situation in which there is a politician who is friends with most (or all) ministers. The following sentences do not sound fine:[9]

(51) a. ??The friend of most ministers is the most powerful man in this city.

b. ??The friend of every minister is the most powerful man in this city.

In a system in which quantifiers are assigned type ⟨et,t⟩, and have to raise and target a type t constituent, in order to make the expressions in which they appear interpretable, it is the behavior of indefinites that is unexpected. This is so, because there is no constituent of type t internal to the NP in the cases discussed above. Therefore, NP-internal scope should not be an option for them. We are then forced to assume that some special interpretive strategy exists that allow an indefinite NP to combine *in situ* with a relational predicate producing the desired reading. One possibility is to treat indefinites as properties (or extensions thereof) and assume the existence of a compositional principle that can turn properties into arguments with existential quantification built-in:[10]

[9] If the examples with *every* discussed above involve non-quantificational uses of this determiner, as sketched in the previous note, then they become irrelevant. If, moreover, *most* can also be given a parallel analysis, according to which it is also a definite determiner meaning 'the majority of', then this whole discussion becomes irrelevant. This is so, because the DPs 'every minister' and 'most ministers' would then be interpreted as pluralities, and, if that is the case, there should be no contrast between 'the friend of every minister' and 'the friend of the ministers' in the case of (51b), for instance. I suspect this might be relevant in understanding why some examples cited in the literature such as 'The head of every public authority in New York was Robert Moses' (from May 1985:72) sound natural to many speakers. See also Fiengo and Higginbotham 1980 for relevant discussion.

[10] A proposal along these lines is developed in Zimmermann (1993) for the analysis of intensional transitive verbs, such as *seek* and *need*. See also van Geenhoven (1998) and Chung and Ladusaw (2004) for related discussion.

$$\left[\!\!\left[\begin{array}{c} \diagup\!\diagdown \\ N_{\langle e,et \rangle} \quad P_{\langle et \rangle} \end{array} \right]\!\!\right] = \lambda\mathbf{x}.\exists\mathbf{y} : \mathbf{P}(\mathbf{y}) \ \& \ \mathbf{N}(\mathbf{y})(\mathbf{x})$$

Alternatively, we can attribute indefinites a flexible type, allowing them to combine with n-ary predicates in general. We can take ⟨et,t⟩ as their basic type and assign them a family of derived ones. The indefinite determiner *some*, for instance, would be assigned the following flexible type:[11]

Basic type: ⟨et,t⟩ $[\![\text{some NP}]\!] = \alpha = \lambda\mathbf{P}.\ \exists\mathbf{x} : \mathbf{NP}(\mathbf{x}) \ \& \ \mathbf{P}(\mathbf{x})$

Derived types: $\langle e^n t, e^{n-1} t\rangle$ $[\![\text{some}_n \text{ NP}]\!] =$

$$\lambda\mathbf{R}_{e^n t}.\lambda\mathbf{x}_1.\lambda\mathbf{x}_2 ... \lambda\mathbf{x}_{n-1}.\alpha(\lambda\mathbf{x}_n.\mathbf{R}(\mathbf{x}_n)(\mathbf{x}_1)...(\mathbf{x}_{n-1}))$$

I would like to mention, though, that for certain morphologically derived nouns, the asymmetry described above tend to disappear, and NP-internal scope becomes an option not only for for indefinites, but for other quantifier phrases as well:[12]

(52) a. The explorer of most Amazonian rivers decided to come to the conference.

b. The explorer of every Amazon river decided to come to the conference.

The question is whether (52a) and (52b) have readings equivalent to (53a) and (53b), respectively:

(53) a. The man who explored most Amazonian rivers decided to come to the conference.

b. The man who explored every Amazon river decided to come to the conference.

[11] $\langle e^n, t\rangle$ stands for ⟨e,⟨e,⟨...(n times), t⟩...⟩⟩, that is, the type of n-ary predicates

[12] Although not every speaker that I talked to detected a contrast between the examples in (51) and the ones in (52).

Assume it is well-known among specialists that every single river in Amazonia has already been explored by more than one person, but there is only one man who explored most (or all) Amazonian rivers, and that this man was invited by the conference organizers to give a lecture. In this scenario, (52a) and (52b) sound fine.[13] Or consider the examples below, when used to refer to the person who owns most (or all) houses in the area:

(54) a. The owner of every house in this block is the richest man in the city.

b. The owner of most houses in this block is the richest man in the city.

Interestingly, these derived nouns also manifest peculiar behavior with respect to the i-within-i constraint discussed in the previous section. According to Jacobson (1994), at least for some speakers, i-within-i effects tend to disappear with noun phrases headed by these transparently derived nouns:[14]

(55) a. ?*The/Every builder$_i$ of his$_i$ house left.

b. ?*The/Every builder$_i$ of her$_i$ mother's house left.

c. ?*The/Every owner$_i$ of his$_i$ mother's condo left.

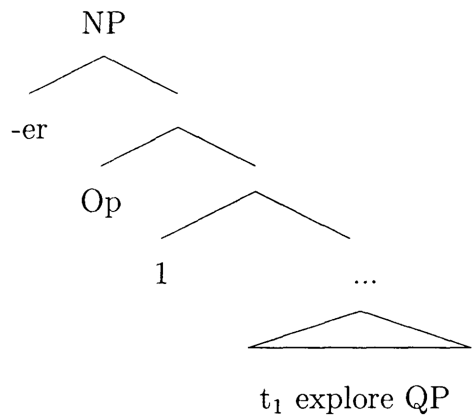
(56) a. *The/Every author$_i$ of her$_i$ mother's biography left.

b. ?*The/Every writer$_i$ of her$_i$ mother's biography left.

The circumvention of both i-within-i effects and quantifier scoping constraints detected above may receive a unified explanation if we assume that the agentive suffix *-er* turns a clausal-like projection that embeds a complete argument structure (and quite possibly aspectual information too) into a nominal projection:

[13] Notice that assigning wide-scope to the quantifiers in these examples would lead to a presupposition failure, since there is no river that was explored by a unique person.

[14] As in the cases above, judgments are subtle, and better viewed as indicative of contrasts, and not of absolute (un)grammaticality. Judgements below are from Jacobson, who pointed out that she herself did not find them impeccable.



⇒ [$_{\textbf{NP}}$ explorer of QP]

The resultant structure would then be similar to a relative clause, leaving enough room for both binding and scope-taking mechanisms to apply NP-internally. I will not elaborate on this any further, leaving it as a suggestion for further investigation.

2.3 Adverbial Quantification over Events

We now return to the main topic of the chapter, namely, the semantics of habitual sentences. Recall our first example, repeated below as (57).

(57) When John has dinner with friends, he always drinks wine.

We have talked informally about (57) as involving universal quantification over events, with the initial adverbial clause acting as the restrictor of the quantifier and the matrix clause (minus *always*) acting as the so-called nuclear scope (cf. de Swart 1991). Let us make this a bit more explicit. As we discussed in the previous chapters, after a verb combines with their individual arguments, the resultant projection (assume it is VP) denotes a set of events. An AQ acts as an event determiner, that is, it combines with a set of events (its restrictor) to form a generalized quantifier (of events), which then combines with another set of events.

Exactly how syntactic material is mapped onto this tripartite structure formed by an adverbial quantifier, a restrictor and a nuclear scope is a much debatable matter. Fronted adverbial clauses, such as the *when*-clause in (57), for example, seem to be systematically interpreted as restricting the quantifier. When not in initial position, however, they can be mapped into the restrictor or the nuclear scope, each choice being accompanied by a characteristic intonational contour (Rooth 1985; Johnston 1994). The following examples from Rooth (1985) illustrate the point (capital letters indicate focus):

(58) a. John always SHAVES when he is in the shower.

b. John always shaves when he is the SHOWer.

(58a), with intonational focus on the verb favors a reading according to which the adverbial clause is interpreted as part of the restrictor. The sentence would mean that every event of John being in the shower overlaps with an event of him shaving. (58b), with focus on *shower* favors a reading according to which the adverbial clause is part of the nuclear scope only: every event of John shaving overlaps with an event of him being in the shower. Notice that the shaving events and the showering events were not equated, but rather related through a spatial-temporal overlap relation. The nature of this relation between events varies from case to case. For instance, for a sentence like 'When John drinks vodka at night, he always gets a headache', a suitable relation would be one that holds between two events e, e′, if e′ happens a few hours after e. This looks like the same kind of context-dependence discussed by Rothstein (1995). Here is an example similar to the ones discussed by her:

(59) Every time Midas touched an object, it turned to gold.

The sentence means that for every event of Midas touching an object, there is an event of that object turning to gold. As this paraphrase suggests the touching events and the turning-to-gold events are not one and the same event. In fact, there is good reason to assume they are not. For instance their temporal location need not coincide, nor even overlap, as the following variations on (59) make clear:

(60) a. Every time Midas touched an object for a second, it turned to gold in one hour.

b. Every time Midas touched an object, it turned to gold the following morning.

Assuming that having the same temporal location is a necessary condition for two events to be identified, assigning the sentences above logical forms as in (61) is clearly a bad idea:

(61) $\forall \mathbf{e} : \mathbf{\Phi}(\mathbf{e}) \rightarrow \mathbf{\Psi}(\mathbf{e})$

What about (62)?

(62) $\forall \mathbf{e} : \mathbf{\Phi}(\mathbf{e}) \rightarrow \exists \mathbf{e}' : \mathbf{\Psi}(\mathbf{e}')$

This looks better, but it is still inadequate, Rothstein claims, since it fails to capture an essential feature of adverbial quantification of events: the *matching effect.* To understand what the matching effect is, consider the following example:

(63) Every time John takes a shower, he shaves.

For (63) to be true, there must be as many shaving events as there are showering events. For instance, (63) cannot be used to describe a situation in which John showers every day but only shaves once a week. This is unexpected if the sentence had truth conditions stating only that for every event of John taking a shower, there is a event of him shaving. To capture this effect, Rothstein assumes that in cases of adverbial quantification over events such as (63), events are related via (partial) functions (called 'matching functions' by her), which maps events described by the matrix clause onto events described by the restrictor of the adverbial quantifier.

(64) $\forall \mathbf{e}$ [$\textbf{John-take-a-shower}(\mathbf{e}) \rightarrow \exists \mathbf{e}' :$ $\textbf{John-shaves}(\mathbf{e}')$ & $\mathbf{M}(\mathbf{e}') = \mathbf{e}$]

Since M is a function, no pair of different events of John taking an shower can be related to the same event of him shaving. This, together with the fact that every showering event is in the range of M guarantees that there are as many shaving events as there are showering events, as desired. By assuming that the matching function is represented as part of the logical representation of a sentence, Rothstein is claiming that the matching effect is semantic, not pragmatic. Therefore, it cannot be cancelled by enriching the surrounding discourse. This is supported by contrasting sentences like (63) with sentences like (65):

(65) Every girl saw a movie.

Although (65) can certainly be used to describe a situation in which every girls saw a different movie, it can also describe scenarios in which they all saw the same movie. These may not be the scenarios that come to mind when (65) is uttered out of the blue, but the speaker can make it clear that a scenario of this kind is what he has in mind without becoming incoherent.

(66) Every girl (and there were many of them) saw a movie last night. In fact they all saw Aladdin. Rothstein (1995:8)

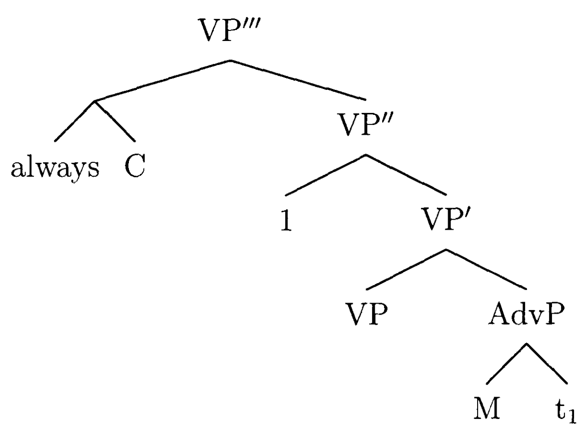
Trying to cancel the matching effect, however, results in incoherence:

(67) # Every time John took a shower last week (and he showered daily), he shaved. In fact he only shaved once.

As for the content of the matching function, Rothstein assumes it is context-dependent. In the case of (59), for instance, it express some sort of causal connection. In (63), spacial-temporal proximity seems the crucial ingredient: a shaving event e is mapped to the showering event that overlaps or happens right after (or before) e. And it can be something more specific, as in 'Every time the bell rings, Mary opens the door' for which Rothstein suggests that the matching function 'might be interpreted as a "response" function, where each door-opening is mapped onto the bell-ringing to which it is a response. We choose this content because of what we know about the normal purpose of ringing the doorbell'(Rothstein 1995:23). To allow for context-dependency, she represents these functions as free variables in the logical form of the respective sentences.

Notice that the 'matching effect' is also observed in (58). For example, for (58a) to be true, there must be as many shaving events as there are showering events. Thus, they cannot be used to describe a situation in which John showers every day but only shaves once a week. Given these similarities, we assume that the logical form of sentences with adverbs of quantification mirrors those of Rothstein's sentences and also contain a free variable referring to a matching function:[15,16]

(68)



(69) $[\![\mathrm{VP}']\!]^g = \lambda \mathbf{e}.\mathbf{VP}(\mathbf{e})\ \&\ \mathbf{M}(\mathbf{e}) = \mathbf{g}(\mathbf{1})$

$[\![\mathrm{VP}'']\!] = \lambda \mathbf{e}'.\lambda \mathbf{e}.\ \mathbf{VP}(\mathbf{e})\ \&\ \mathbf{M}(\mathbf{e}) = \mathbf{e}'$

[15] Cf. Schwarz (1998) and Beaver and Clark (2003) for extensions of Rothstein's ideas to the analyses of sentences with adverbs of quantification.

[16] Barry Schein, Danny Fox and Irene Heim (pc) have pointed out to me some potential counterexamples to the 'matching effect', which suggest that the effect may not be semantic after all. For instance, 'Every time John takes a shower, he shaves on the same day' is perfectly fine even if John showers twice a day, but shaves only once every day. And 'every time I swim, I get sick' is not in conflict with me swimming twice within, say, a week and getting sick only once. Since what is crucial for me in this chapter (as well as in the next one) is the part of Rothstein's proposal that postulates the presence of a free variable ranging over relations between events in the logical form of the relevant sentences, I will leave it open whether this relation should always be a function or not.

$$[\![\text{always C}]\!] = \lambda \mathbf{P}.\ \forall \mathbf{e} : \mathbf{C}(\mathbf{e}) \rightarrow \exists \mathbf{e}' : \mathbf{P}(\mathbf{e}')(\mathbf{e})$$

The set of events P corresponds to the extension of the verb projection to which 'always' is adjoined in the syntax (VP″ above). M is a matching function. What about C, the set of events that restricts the universal quantification introduced by 'always'? We already saw that the placement of an adverbial clause can be important in determining the restrictor of an AQ. But the presence of an adverbial clause is not a necessary ingredient in creating tripartite structures associated with habituality. Sometimes, contextual clues and intonation alone are enough. For example, in a discussion about John's habits in the shower, one can utter (70), conveying exactly what (58a) does.

(70) John always shaves.

And yet other times, properties of lexical items internal to the sentence are the most relevant factor in determining the restrictor of an AQ, as in the following example adapted from Schubert and Pelletier (1987):

(71) John always beats Mary at ping-pong.

A very natural interpretation for (71) is that whenever John and Mary play ping pong, he beats her. Here, the restrictor of 'always' is identified with what one may call a lexical presupposition triggered by the verb 'beat', namely, that a person can only beat another person at a game if they play the game. Importantly, as pointed out by Beaver and Clark (2003), this reading is available even if focus is placed on 'ping pong', showing that, sometimes, focus effects can be overridden by other factors in determining the restrictor of 'always'.

The examples above are enough to illustrate the variety of factors involved in the process of specifying the restrictor of an AQ. An investigation into the complexities of this process is well beyond the scope of this thesis.[17]. At this point, we could follow von Fintel (1994) and represent the restrictor of AQs as pronominal variables ranging over sets of events. In the examples above, they would be free variables, being interpreted on a par with other unbound pronouns, as 'he' in 'he left'. Ultimately, the adequate use of a free pronoun depends on the presence of a salient referent of the appropriate kind (individuals, set of events, etc.). Under this view, the connection between grammatical devices, such as word order, focus placement, or presence of lexical items that trigger presuppositions, and the identification of the referent of these pronouns is only indirect. The devices either reflect the presence of salient discourse entities (topicalization, focus placement/deaccenting) or help bring them to the scene (use of presupposition triggers), and it is to these entities that free pronouns refer.

2.3.1 On Aspect and Adverbs of Quantification

Before moving on, let me make some comments on certain modal effects usually associated with habituality, such as tolerance of exceptions and support of counterfactuals. Take our sentence (57), repeated below for convenience:

(72) When John has dinner with friends, he always drinks wine.

Imagine that one night John is having dinner with friends at a restaurant, but when he tells the waiter that he is going to have a glass of wine, the waiter informs him that due to an unexpected problem with the suppliers, they ran out of wine that night. John then decides to drink water that night. An extraordinary occasion like this is not enough to falsify (72), revealing a certain tolerance with exceptions, despite the apparent universal force of 'always'. The same can be observed with 'every time': (73) below is as tolerant with extraordinary occasions as (72) is:

[17] For in-depth discussions of this topic, see von Fintel (1994), Partee (1995) and Hajičová et al. (1998)

(73) Every time John has dinner with friends, he drinks wine.

Moreover, both (72) and (73) support counterfactual reasoning: if yesterday John decided to stay at home and not have dinner with his friends, one could say, based on (72) or (73) that if he had dinner with his friends, he would have drunk wine (assuming nothing extraordinary would come up). Should we add a modal component to the meaning of 'always' (and 'every time')? I believe we should not. First, these modal effects are not always there. Imagine we have started investigating John's life, and we observed that last month he had dinner at a certain restaurant fourteen times, and that ...

(74) In those occasions, he always sat next to the window.

Now, (74) can be understood as reporting a purely accidental sequence of events, leading to no conclusion about whether next time John goes to the restaurant, he will sit next to the window or not. Things become more interesting when we consider the counterpart of 'always' in Romance languages. Take the following pair from Portuguese[18]:

(75) a. (No semestre passado), às segundas-feiras, o João sempre ia pra escola de trem.

'Last semester, on Mondays, John always went-IMP to school by train'.

b. (No semestre passado), às segundas-feiras, João sempre foi pra escola de trem.

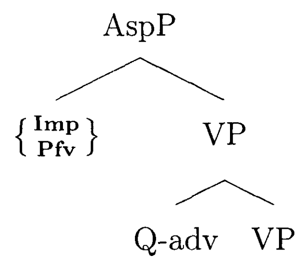
'Last semester, on Mondays, John always went-PFV to school by train'.

The only difference between the sentences is the aspect of the the verb: in (75a) the verb appears in the imperfective, while in (75b) it appears in the perfective. What is relevant is the following: in (75a), with an imperfective form, modal effects

[18] For similar facts in Italian, see Lenci and Bertinetto 2000.

are unavoidable: the statement has a law-like flavor, it tolerates exceptions, and it supports counterfactuals. In (75b), with a perfective form, there is no modal flavor, and the statement is not necessarily indicative of John's habits.

My conclusion from these facts is that AQs like 'always' in English and 'sempre' in Portuguese are not modal quantifiers. What happens is that sometimes (imperfective sentences), they appear in the scope of a modal operator (let us call it the imperfective operator), and modal effects arise. As I will argue in chapter 4, these are the same modal effects that arise in another kind of imperfective sentences, namely, progressive ones.[19]



In the remainder of this chapter, we will ignore modal issues.

2.4 Bare Habituals and Plurality

With this much as background, consider the following scenario: You know that John, a pop singer, is busy right now writing a new romantic song. You need to talk to him, but you don't know where he is. You tell a friend that you will call him at home, but your friend discourages you, replying with (76):

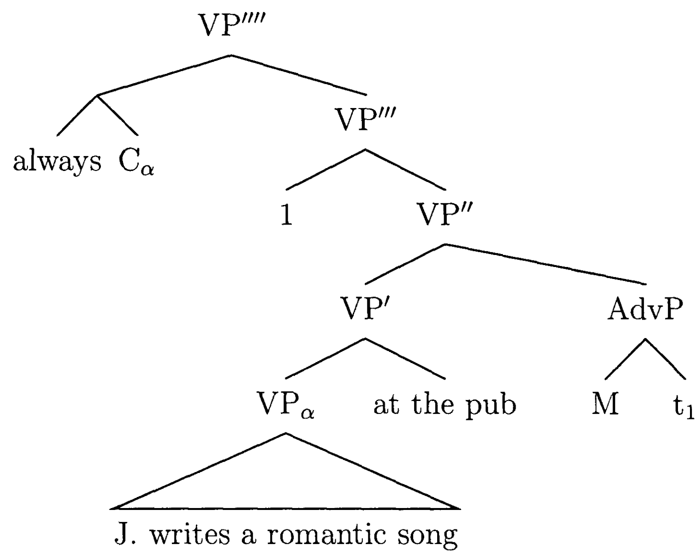
(76) John always writes a romantic song at the MAIN STREET PUB.

What your friend is trying to tell you here is that whenever John is writing a romantic song, he does that at the Main Street Pub, so you would not find him at home. (76)

[19] That, of course, does not mean that there are no modal AQs. Possible candidates are 'normally' or 'generally'. In fact, their Romance counterparts do not fit well in perfective sentences.

is a habitual sentence in which material from the matrix clause ends up acting as the restrictor of the adverbial quantifier. In this case, it is the predicate denoted by the verb phrase (excluding the locative) that serves this function, as schematized below:

(77)



(78) $[\![\text{VP}'']\!]^g = \lambda \text{e}.\ \exists \mathbf{y} : \mathbf{r.s(y)}\ \&\ \mathbf{writes(e,j,y)}\ \&\ \mathbf{at\ the\ pub(e)}\ \&\ \mathbf{M(e) = g(1)}$

$[\![\text{VP}''']\!] = \lambda \text{e}'.\lambda \text{e}.\ \exists \mathbf{y} : \mathbf{r.s(y)}\ \&\ \mathbf{writes(e,j,y)}\ \&\ \mathbf{at\ the\ pub(e)}\ \&\ \mathbf{M(e) = e'}$

$[\![\text{always C}]\!] = \lambda \mathbf{P}.\ \forall \mathbf{e} : \exists \mathbf{y} : \mathbf{r.s(y)}\ \&\ \mathbf{writes(e,j,y)} \rightarrow \exists \mathbf{e}' : \mathbf{P(e')(e)}$

$[\![\text{VP}'''']\!] = \forall \mathbf{e} : \exists \mathbf{y} : \mathbf{r.s(y)}\ \&\ \mathbf{writes(e,j,y)} \rightarrow \exists \mathbf{e}' : \exists \mathbf{y} : \mathbf{r.s(y)}\ \&\ \mathbf{writes(e',j,y)}$
$\quad \&\ \mathbf{at\ the\ pub(e')}\ \&\ \mathbf{M(e') = e}$

[Assuming M is the identity function, we have the following:]

$[\![\text{VP}'''']\!] = \forall \mathbf{e} : \exists \mathbf{y} : \mathbf{r.s(y)}\ \&\ \mathbf{writes(e,j,y)} \rightarrow \exists \mathbf{y} : \mathbf{r.s(y)}\ \&\ \mathbf{writes(e,j,y)}$
$\quad \&\ \mathbf{at\ the\ pub(e)}$

Any event of John writing any romantic song will belong to the restrictor set. Notice the presence of a singular indefinite within VP in (77), which makes the predicate of events combining with the AQ in (78) similar to the nominal predicates we discussed in section 3.2 in connection with examples like (5a), repeated below as (79). And indeed, they behave just the same, with the indefinite scoping inside the restrictor.

(79) Every wife of a graduate student came to the party.

Now, compare (76) with its counterpart without an adverb of quantification:

(80) # John writes a romantic song at the MAIN STREET PUB.

Contrary to (76), (80) sounds quite odd in this context. It cannot be used to express a generalization over events of John writing romantic songs. To the extent that it is possible to make sense of it at all, it suggests that John has the habit of writing the same song again and again, always at the pub. In fact, it sounds as weird as (81), an example in which it is clear that a specific song is at issue.

(81) # John writes that romantic song at the MAIN STREET PUB.

Replacing the verb *to write* by another verb that gives rise to a repeatable event helps in this case, but notice that we are still talking about multiple events involving the same song. (82), for instance, could be used in a context in which you and I know that John was hired by a department store to play a certain Christmas song. I know it was Filene's, but you think it was Macy's. You say you are going to Macy's to watch him playing, but I advise you not to, by using sentence (82).

(82) John plays a Christmas song at FILENE'S.

But (82) cannot be used to generalize over events of John performing Christmas songs.

Notice that the behavior of the singular indefinite in (80) mirrors the behavior of singular indefinites inside plural noun phrases that we discussed before in cases like (5b), repeated here as (83):

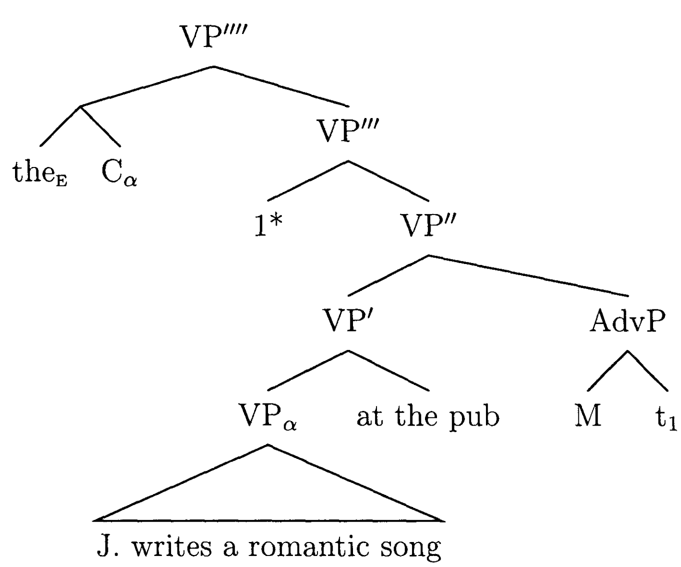
(83) # The wives of a graduate student came to the party.

To account for this behavior, I would like to suggest that bare habituals involve plural definite descriptions of events. More precisely, I would like to propose that the structure of bare habituals contain a covert plural definite determiner, meaning what the English nominal determiner *the* means (modulo a sortal distinction), that is, it takes a set and returns its maximal element.[20]

(84) $[\![\text{the}_E]\!] = \lambda \mathbf{P}.\mathbf{max}\{\mathbf{x}^* : \mathbf{P}(\mathbf{x}^*) \ \& \ \neg \mathbf{AT}(\mathbf{x}^*)\}$

This silent determiner appears at the same position that AQs appear in other habitual sentences. For (80), I assume that the following representation feeds the interpretive system:

(85)



(86) $[\![\text{VP}'']\!]^g = \lambda \mathbf{e}.\ \exists \mathbf{y} : \mathbf{r.s}(\mathbf{y}) \ \& \ \mathbf{writes}(\mathbf{e},\mathbf{j},\mathbf{y}) \ \& \ \mathbf{at\ the\ pub}(\mathbf{e}) \ \& \ \mathbf{M}(\mathbf{e}) = \mathbf{g}(\mathbf{1})$

The denotation of VP''' is obtained with the help of the following rule:

$$\left[\!\!\left[\;[\, 1^* \quad \alpha_{\langle vt \rangle} \,]\; \right]\!\!\right]^g = \lambda \mathbf{X}.\ \forall \mathbf{x} : \mathbf{x} \leq \mathbf{X} \rightarrow \exists \mathbf{e} :\ [\![\alpha]\!]^{g^{x/1}}(\mathbf{e})$$

$[\![\text{VP}''']\!] = \lambda \mathbf{E}.\ \forall \mathbf{e} : \mathbf{e} \leq \mathbf{E} \rightarrow \exists \mathbf{e}' : \exists \mathbf{y} : \mathbf{r.s}(\mathbf{y}) \ \&$

$\mathbf{writes}(\mathbf{e}',\mathbf{j},\mathbf{y}) \ \& \ \mathbf{at\ the\ pub}(\mathbf{e}') \ \& \ \mathbf{M}(\mathbf{e}') = \mathbf{e}$

$[\![\text{the}_E\ \text{C}]\!] = \iota \mathbf{E} : \exists \mathbf{y} : \mathbf{r.s}(\mathbf{y}) \ \& \ \mathbf{writes}(\mathbf{E},\mathbf{j},\mathbf{y})$

[20] Being plural, the event definite determiner imposes the requirement that the maximal element that it returns be a plurality.

$$[\![\text{VP}'''']\!] = \forall \mathbf{e} : \mathbf{e} \leq [\iota\mathbf{E} : \exists\mathbf{y} : \mathbf{r.s}(\mathbf{y})\ \&\ \mathbf{writes}(\mathbf{E}, \mathbf{j}, \mathbf{y})] \rightarrow \exists\mathbf{e}' : \exists\mathbf{y} : \mathbf{r.s}(\mathbf{y})\ \&\ \mathbf{writes}(\mathbf{e}', \mathbf{j}, \mathbf{y})\ \&\ \mathbf{at\ the\ pub}(\mathbf{e}')\ \&\ \mathbf{M}(\mathbf{e}') = \mathbf{e}$$

[Assuming M is the identity function, we have the following:]

$$[\![\text{VP}'''']\!] = \forall \mathbf{e} : \mathbf{e} \leq [\iota\mathbf{E} : \exists\mathbf{y} : \mathbf{r.s}(\mathbf{y})\ \&\ \mathbf{writes}(\mathbf{E}, \mathbf{j}, \mathbf{y})] \rightarrow \exists\mathbf{y} : \mathbf{r.s}(\mathbf{y})\ \&\ \mathbf{writes}(\mathbf{e}, \mathbf{j}, \mathbf{y})\ \&\ \mathbf{at\ the\ pub}(\mathbf{e})$$

Given what we said before when we dealt with cases like (83), a quick inspection at (85)-(86) should be enough to understand why the indefinite is behaving the way we have just described. The event determiner selects the maximal, plural event satisfying its restrictor. That is the plural event whose minimal parts are different events of John writing the same song. But that presupposes that one can write the same song more than once, giving rise to the oddness we attributed to that sentence. This is just the same explanation we gave to the oddness associated with (83), which presupposed the existence of multiple wives of a unique man. Moreover, (85)-(86) contrasts with (77)-(78) containing the AQ *always* precisely because *always* quantifies over the atomic events in its restrictor. The same explanation was behind the contrast between (79) and (83). The only difference is the absence of overt morphology related to number distinctions in the event domain.

Consider now cases in which a singular indefinite appears within an adverbial *when*-clause:

(87) a. When John writes a romantic song, he always goes to the Irish pub.

b. When John writes a romantic song, he goes to the Irish pub.

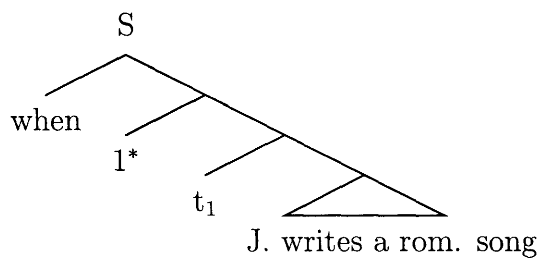
Despite the fact that the adverbial clauses act as restrictors in both (87a) and (87b), there is no contrast between them, and neither presupposes that John keeps writing the same song again and again. This should not be surprising, if we recall previous examples from section 3.2 in which singular indefinites were embedded in a relative clause modifying a head noun.

(88) a. In my family, every woman who married a professor is happy.

b. In my family, the women who married a professor are happy.

If we assume that the word *when* heading the adverbial clauses in (87) saturates the event argument introduced by the verb 'write' and that it later moves to 'open' the sentence and create a predicate of events again, then the same explanation we offered for why (88b) is fine becomes available for (87b) as well. Recall that the crucial point was the assumption that relative clauses are derived by movement and movement can give rise to distributivity. Thus, the (basic) structure of the *when*-clause in (87b) would be as in (89) below:[21]

(89)



(90) $[\![\mathrm{S}]\!] = \lambda \mathbf{E}.\ \forall \mathbf{e} : \mathbf{e} \leq \mathbf{E} \ \rightarrow \exists \mathbf{y} : \mathbf{romantic\_song(y)}\ \&\ \mathbf{write(e, j, y)}$

The restrictor in (90) is a set of pluralities, with their minimal parts being events of John writing (different) songs. The covert definite description of events in (87b) refers to the maximal element in this set, which would be the sum of all events in which John writes a romantic song. In the case of (87a), distributivity is not even necessary, since I am assuming that *always* is, so to speak, inherently distributive, quantifying over singular events only.

[21] Notice that for my explanation of the contrast between (81) and (87b) to go through, I have to assume that the predicate in (90) is not available for the restrictor C in (85). A possibility for why this is so is that a 'distributive' restrictor, as in (90), can only be made salient if it corresponds to the denotation of an expression represented in the logical form in question, as in the case of the 'when'-clause in (87b).

2.4.1 Event Cumulation

We turn now to some cases of cumulativity involving the event argument of verbs. Consider the examples in (91):

(91) a. When John's kids turn 15, he throws a party.

b. When John's kids turn 15, he always throws a party.

Both (91a) and (91b) mean roughly the same thing. They are about John's habits concerning the events in which one of his kids turns 15. They say that in each such occasion, he throws a party. Interestingly, neither example suggests that John's kids were all born at the same time. They are perfectly fine to describe a situation in which John has nine children, two of them have already turned 15, each having gotten a birthday party when he or she turned 15, and it is John's intention to do the same for every other child of his.

In the case of the bare habitual in (91a), this is expected, given the analysis based on plurality that was proposed for these sentences in the previous section. In the adverbial clause of (91a), the event argument and the plural subject of the predicate *turn 15* cumulate, and the restrictor of the silent definite event determiner correspond to the set in (92) below:

(92) $[\![\text{when John's kids turn 15}]\!] = \lambda E.\ \textbf{turn\_15}(\textbf{The Kids}, E)$

The fact that the same interpretation is available for (91b) suggests that (92) is also the restrictor of *always* in this example. That is unexpected, however, if, as we proposed before, *always* only combines with predicates of singularities. In fact, that would lead us to expect a contrast between (91a) and (91b) of the same nature of the one observed above with (42a) and (42b), repeated below in (93).

(93) a. The wives of these nine boys are happy.

b. # Every wife of these nine boys is happy.

I will then assume that a covert partitive turn the predicate of pluralities denoted by the *when*-clause into a predicate of singularities. This covert partitive has the same effect on a predicate of events that the overt *one of* has on the predicates of individuals in (47). For (91b), we get the following:

(94) $\text{ALWAYS}_e\ [\lambda e.\ e \leq \iota E : \textbf{turn\_15}(\textbf{John's Kids}, E)]$

It is possible thus to maintain the analysis of habituals sentences with AQs as involving quantification over singularities, and preserve our results obtained in connection with the discussion about singular indefinites. By allowing the presence of a covert partitive when the restrictor of the adverb was a predicate of pluralities, we were able to expand the analysis to cover cases involving event cumulation.

2.5 Bare Habituals and Definiteness

Plurality has hitherto been the central issue in our discussion of the contrasts between habituals with AQ and bare habituals. Although we have explicitly treated bare habituals as involving definite descriptions, we have not relied as much on the definite character of the silent habitual determiner as we have on its selection for plural predicates. It was this feature that played the most crucial role in teasing apart that determiner and AQs, such as *always*, which were treated as selecting for singular predicates. In this section, it is definiteness that will play the central role, and the contrasts we will be looking at will crucially involve definite descriptions and quantifier phrases.

2.5.1 Homogeneity

Consider the following pair of negative sentences:

(95) a. The boys didn't come.

b. Every boy didn't come.

Sentence (95a) with a plural definite as its subject is true if, and only if, none of the boys came. If at least some of them did, then it is false. This is somewhat surprising. Imagine the boys in question are John and Bill. Then the positive sentence 'The boys came' is equivalent to 'John came and Bill came'. But then the negative sentence (95a) should be equivalent to 'It is not the case that 'John came and Bill came', which is compatible with 'John came but Bill didn't come'. What is peculiar then to negative statements with plural definite descriptions is the fact that they seem to validate inferences from $\neg\mathbf{F}(\mathbf{A})$ to $\neg\mathbf{F}(\mathbf{a}_1) \wedge \neg\mathbf{F}(\mathbf{a}_2) \wedge \ldots \neg\mathbf{F}(\mathbf{a}_n)$, where $\mathbf{a}_1, \mathbf{a}_2, \ldots, \mathbf{a}_n$ are the minimal parts of the plural individual $\mathbf{A}$. (95b) behaves differently. It has a reading (perhaps its most salient reading) according to which negation scopes above the universal quantifier, and the sentence can be true even if some boys came, but others did not.

Right now, we will not look for an explanation for this asymmetry, but I will suggest one in chapter 3, section 3.6.[22] What is relevant for us at this point is the fact is that plural definites, but not universal quantifiers, give rise to 'all or nothing' or homogeneity effects, as attested by the contrast discussed above. Now, what about habitual sentences? Here we also observe a similar contrast in that only bare habituals give rise to 'excluded middle' effects. Consider (96):

(96) a. When Bob gets hurt, he doesn't cry.

b. When Bob gets hurt, he doesn't always cry.

(96a) is false if Bob cries approximately half of the times in which he gets hurt. (96b), on the other hand, can be true in such a situation. This is exactly parallel to what we just discussed in connection with DPs, and it receives a straightforward explanation,

[22] See also Löbner (1985) for discussion

once we assume that bare habituals involve plural definite descriptions of events.[23]

2.5.2 Implicatures

There is a sense in which sentence (97a) is stronger than (97b). Although it is not clear where exactly the difference resides, hearers are prompt to judge (97a) as expressing a bolder statement than (97b).

(97) a. When my dog sees a blond girl, it always barks.

b. When my dog sees a blond girl, it barks.

This is reminiscent of the phenomenon discussed by Dowty (1987) Brisson (1998), where she detected a similar contrast between plural definite descriptions and universally quantified expressions. For example, she observed that (98a), but not (98b), can be true in a situation consisting of, say, 12 girls, and in which only eleven jumped into the lake.

(98) a. The girls jumped into the lake.

b. Every girl jumped into the lake

Whether this difference in judgments reflects differences built into the truth conditions of these sentences, or purely pragmatic phenomena (acts of Gricean charity?) is an important question that requires further investigation. What I want to stress here is the parallel between bare habituals and plural definite DPs on the one hand, and habituals with the AQ *always* and universally quantified statements on the other.

Acknowledging that bare habituals are 'weaker' than their counterparts with *always* may lead to the conclusion that the silent habitual operator should have the meaning of a proportional quantifier whose force is weaker than that of a universal

[23] Similar effects are observed with bare conditionals and bare habituals (Fintel 1997). This may be indicative of the existence of a cross-categorial silent definite determiner, but I will not explore this unifying approach in this dissertation. Also relevant in this respect is Gajewski's (2004) analysis of Neg-raising predicates as plural definite descriptions of possible worlds.

quantifier. For instance, it could mean something like 'usually', 'generally', or 'typically'. However, contrary to habitual sentences with these quantifiers, bare habituals do not give rise to implicatures denying the corresponding universal statements, as the examples below attest.

(99) a. When John arrives at work, he is sober.

b. When John arrives at work, he is usually/generally/typically sober.

Notice the dramatic consequences this difference may have on the use of these habitual sentences. Imagine we are trying to defend John from rumors that he works drunk. Something like (99a) would be the right kind of thing to say in his support. (99b), however, would produce the opposite effect, suggesting that he sometimes arrives drunk at work. The use of this sentence might in fact be a good, subtle way of rising the level of suspicion against John's bad working habits.

Once again, AQs behave like their corresponding quantificational determiners, whereas the silent habitual operator behave like a definite determiner.

(100) a. The dogs barked.

b. Most dogs barked.

(100b) implicates that not every dog barked, whereas if (100a) implicates something, it is that every dog barked.

2.6 Conclusion

In this chapter, I contrasted the semantics and pragmatics of habitual sentences with and without adverbs of quantification (AQ), and claimed that whereas an analysis based on quantification over singular events is adequate for the ones with AQs, the ones without them, which I called 'Bare Habituals', are best analyzed as involving plural definite descriptions of events. I assumed the presence of a silent habitual operator for bare habituals, but I assigned to this operator the meaning of the English definite determiner *The* (modulo a sortal distinction). Several differences were discussed concerning minimal pairs with and without AQs, and several parallels were established between the plural nominal determiner *The* and the silent habitual determiner. Taken together, they point to the conclusion that plurality and definiteness are crucial ingredients in the interpretation of bare habituals.

Chapter 3

Plural Events and Donkey Anaphora

In the previous chapter, I developed an analysis of 'bare habituals', according to which the logical form of these sentences contained a covert plural definite description of events. In this chapter, we turn our attention to some instances of the so-called donkey sentences, such as those in (1), and claim that these sentences too contain a plural definite description of events in their logical forms.

(1) a. Every farmer who owns a donkey beats it.

b. No farmer who owns a donkey beats it.

c. Most farmers who own a donkey beats them.

This plural description is interpreted within the scope of the quantified subject, and the heart of our argumentation in favor of the proposal will be based on a comparison revealing several interpretive similarities between donkey sentences and sentences that contain an overt plural definite under the scope of a quantifier phrase. Moreover, the analysis maintains that quantificational determiners such as 'every', 'no', and 'most' introduce quantification over one variable at a time only, therefore avoiding the proportion problem well-known from the literature on donkey anaphora. It is also compatible with an e-type treatment of the object pronouns in (1) that do not run into the so-called uniqueness problem.

3.1 Donkey Sentences

We start by considering the classical example in (2), under the reading conveying that farmers who are donkey-owners beat their donkeys:

(2) Every farmer who owns a donkey beats it.

If we treat pronouns as referential expressions, it is clear that under this reading the reference of 'it' should co-vary with farmers. Thus, if farmer Joe owns donkey *d*, according to (2), he beats *d*, and if farmer Paul owns donkey *d'*, he beats *d'*, and so on. According to the unselective binding approach (Kamp 1981; Heim 1982 and much subsequent work), the pronoun 'it' in (2) corresponds to a plain bound variable. This is made possible by the assumptions that indefinites do not bear existential force, being interpreted as restricted variables, and that quantificational determiners like 'every' can bind multiple variables at once. What (2) means can then be represented as in (3):

(3) $\forall\langle \mathbf{x}, \mathbf{y}\rangle : \mathbf{farmer}(\mathbf{x})\ \&\ \mathbf{donkey}(\mathbf{y})\ \&\ \mathbf{own}(\mathbf{x}, \mathbf{y}) \rightarrow \mathbf{beat}(\mathbf{x}, \mathbf{y})$

This represents an alternative to the so-called 'e-type' approach of Evans (1980), which maintains the standard assumptions that indefinites have existential force, and quantificational determiners bind just one variable, but treats the pronoun 'it' in (2) as a definite description, namely, 'the donkey he owns'. Co-variation results from the presence of a variable within the description which is bound by the quantifier in subject position. One way of implementing this proposal is to assume that an e-type pronoun is the spell-out of a definite determiner with an elliptical complement. The complement corresponds to a contextually salient function applied to an individual variable. In the case of (2), this function would be the 'donkey-owned-by' function, and the sentence would receive the interpretation in (4):[1]

(4) $\forall \mathbf{x} : \mathbf{farmer(x)}\ \&\ \exists \mathbf{y} : \mathbf{donkey(y)}\ \&\ \mathbf{own(x,y)} \rightarrow \mathbf{x\ beats\ THE\ R(x)}$

$\mathbf{R} = \lambda \mathbf{x}.\lambda \mathbf{y}.\ \mathbf{y\ is\ a\ donkey\ owned\ by\ x}$

An advantage of the unselective binding approach over the e-type approach is that it does not run into the so-called 'uniqueness problem'. The problem is that singular definite descriptions trigger the presupposition that there is only one individual that satisfy the content of the description, and if the pronoun 'it' is to be interpreted as 'the unique donkey owned by x' under the scope of $\forall x$, one expects that (2) could only be felicitously used in contexts in which every farmer who owns a donkey owns exactly one donkey (cf. Every farmer who owns a donkey beats the unique donkey he owns.). But that does not seem a presupposition we associate with (2). Imagine there are several farmers who own more than one donkey and beat all the donkeys they own. Sentence (2) seems perfectly fine, and speakers consistently judge it true. Examples with other quantifiers lead to the same conclusions: (the following example is from Rooth 1987)

(5) No parent with a son still in high school has ever lent him the car on a weekend.

Felicitous uses of this sentence are not incompatible with the existence of parents with more than one child still in high school. And if there are such cases, the sentence will be considered true only if no parent has ever lent the car to ANY of his children still in high school. Once again, the unselective binding approach delivers the right results: for no pair $\langle x, y \rangle$, where x is a parent and y is a son of x still in high school, x lends y the car on a weekend.

Of even more dramatic consequences for the e-type approach are the following examples (due to Heim 1982):

[1] See Cooper (1979) and Heim and Kratzer (1998).

(6) a. Every woman who bought a sage plant here bought eight others along with it.

b. Most people who owned a slave owned his children and grandchildren too.

These sentences should never have appropriate uses in any circumstances if the pronoun *it/his* is interpreted as 'the (unique) plant that the woman bought/the (unique) slave that the person owns'. That, of course, is not the case, the sentences being perfectly fine.[2]

3.2 Rescuing the E-type Approach

Heim (1990), borrowing ideas from Berman (1987), reconsiders the e-type approach under the light of Situation Semantics (Kratzer 1989) and show how it can avoid the uniqueness problem. Situations are understood as parts of worlds. A situation in which a farmer owns a donkey will have a farmer, a donkey owned by him, and possibly other things in it. A minimal situation of a farmer owning a donkey, however, will contain nothing but the farmer and the donkey. A situation can be part of another situation, in which case the latter is said to be an extension of the former. For instance, a minimal situation of a man owning a donkey can be extended into a situation containing other individuals including other farmers and donkeys.

The basic idea in Heim's (1990) proposal is to treat quantificational determiners as introducing quantification over individuals and situations. One way of implementing this idea is to let determiners quantify over individual-situation pairs. 'Every man who owns a donkey beats it', for instance, would mean that for every pair $\langle x, s \rangle$ in which x is a farmer and s is a minimal situation where x owns a donkey, there is s', an extension of s, such that in s', x beats **the donkey he owns in s**. Since the variable s ranges over minimal situations containing exactly one donkey, the presupposition

[2] See Heim (1982) for a detailed criticism of the classical e-type approach.

triggered by the definite description becomes harmless.

Quantifying over pairs, however, exposes the analysis to a threat that became known as the 'proportion problem' in the literature. Consider the following sentence:

(7) Most farmers who own a donkey are rich.

Critics of the unselective binding approach have pointed out that treating the indefinite 'a donkey' as non-quantificational, and the determiner 'most' as a quantifier over farmer-donkey pairs generates a reading for (7), according to which for most pairs $\langle x, y \rangle$ where x is a farmer, and y a donkey owned by x, x is rich. As a consequence the sentence is predicted to be true in a scenario with one rich farmer who owns 100 donkeys, and 99 poor farmers who own only one donkey each, since in this case there would indeed be more farmer-donkey pairs with a rich farmer than farmer-donkey pairs with a poor farmer. But this is counter-intuitive, speakers being firm in judging (2) false in such circumstances. This proportion problem (so dubbed by Kadmon 1987) would be avoided, of course, if we stick to more traditional approaches, according to which the indefinite is an existential quantifier and 'most' quantifies over individuals. (2) would then mean that the number of farmers who own a donkey and are rich is bigger then the number of farmers who own a donkey but are not rich.

Notice that quantifying over pairs of individuals and minimal situations will run into the same problem. Since the relevant situations in this case contains exactly one donkey, there will be a one-one correspondence between pairs formed by a farmer and a donkey he owns, and pairs consisting of a farmer and a minimal situation where that farmer owns a donkey. Enriching the e-type approach with quantification over pairs has thus created a tension between the solution to the uniqueness problem and the solution to the proportion problem.

Heim (1990) mentions some attempts to deal with the uniqueness problem with examples involving relative clauses, which do not give up the idea that they involve quantification over individuals and not over tuples, and therefore do not run into the proportion problem. The idea is to attribute to these sentences logical forms with two or more quantifiers in 'cascade'. Here are some paraphrases from Heim (1990:162) for some of the sentences presented above, which mimic the core idea of the approaches:

(8) Every man who owns a donkey beats it.

$\approx$

for *every* man who owns a donkey: for *every* donkey he owns: he beats it

(9) Most people who owned a slave also owned his offspring.

$\approx$

For *most* people who owned a slave: for *every* slave they owned: they also owned his offspring

(10) No parent with a teenage son lends him the car.

$\approx$

For *no* parent with a teenage son: for *any* teenage son he or she has: he or she lends him the car

The strategy can be applied equally well to the Situation Semantics version of the e-type approach, as Heim pointed out:[3]

(11) Every man who owns a donkey beats it.

$\approx$

for *every* man who owns a donkey: for *every* minimal situation s where he owns a donkey: he beats the donkey he owns in s.

(12) Most people who owned a slave also owned his offspring.

$\approx$

For *most* people who owned a slave: for *every* minimal situation s where they owned a slave: they also owned the offspring of the slave they owned in s.

[3] For recent e-type analysis within situation-based frameworks, see Elbourne (2002) and Büring (2004).

(13) No parent with a teenage son lends him the car.

$\approx$

For *no* parent with a teenage son: for *any* minimal situation s where he or she has a teenage son: he or she lends the car to the teenage son he or she has in s.

Notice that the paraphrases contain an implicit secondary quantifier, whose quantificational force varies according to the nature of the determiner present in the surface structure of the sentences: *every* and *most* triggers the presence of a universal, while *no* triggers the presence of an existential quantifier.

As Heim (1990:163) points out, "there are two big questions about this kind of approach: One is whether there is any principled way of predicting the force of the implicit secondary quantifier.[...] The second question is how to implement the analysis without ad hoc maneuvers in either the syntax or the semantics." I will address the second question by claiming that there is more in the logical form of these sentences than what is overtly represented in their surface structures. But I will claim that the extra ingredients are not *ad hoc* insofar as they are independently motivated by the analysis of distributivity in event semantics discussed in chapter 1 and the analysis of adverbial quantification over events proposed in chapter 2. As for the first question, I will claim that the paraphrases given above are misleading and that there is no secondary quantifier, but rather a definite description of events. The seemingly disparate 'quantificational' force of this secondary element is explained as a consequence of the way definite descriptions behave under the scope of different quantifiers.

3.3 Donkey Sentences in Event Semantics

Let us first recast the e-type approach described above in terms of the event-based framework of our previous chapters. Events (including states) will take the place of minimal situations. A sentence like (14) describes an event involving two and only two participants: John and one donkey.[4]

(14) John owns a donkey.

$\exists e \exists x : \mathbf{own}(e)\ \&\ \mathbf{donkey}(x)\ \&\ \mathbf{Ext}(e) = \mathbf{j}\ \&\ \mathbf{Int}(e) = \mathbf{x}$

Now, it may be the case that John owns more than one donkey. But even so, if e is an event of the type described in (14), it involves only one participant performing the role 'Ext' and only one participant performing the role 'Int', John and one donkey respectively.[5] We can thus safely refer to the donkey that participates in the event e by using the description 'the donkey x, such that Int(e)=x' or anything equivalent, without the risk of violating the uniqueness presupposition triggered by the singular definite description.[6]

Given that, and also what we saw in the previous section, the meaning of 'every man who owns a donkey beats it' can be roughly paraphrased as follows: For every man who owns a donkey, for every event e of him owning a donkey: he beats the donkey he owns in e (i.e. the donkey d such that Int(e)=d). I will now turn to the question of how this meaning is derived. To approach this question, we need to be

[4] Since I am not interested in the specific content of different thematic relations, I will represent the role associated with external arguments as 'Ext' and the one associated with internal arguments as 'Int', regardless of the nature of the verb.

[5] This follows from the assumption that theta-roles are functions from events to individuals. Notice that the assumption becomes untenable if there are symmetric predicates that assign the same theta role to more than one participant in the events they introduce, as one might think is the case of verbs like 'meet'. See Parsons (1990) and references therein for discussion. This issue is also connected to the 'problem of indistinguishable participants' (Heim 1990), discussed in connection with examples such as 'if a bishop meets a bishop, he blesses him'. I refer the reader to the discussions in Heim 1990, Neale 1990, and Elbourne 2002, among others.

[6] With the reservations from the previous note.

more precise about the logical form of donkey sentences. That is the goal of the next section.

3.4 Donkey Sentences and The Event Determiner

Recall from chapter 2 the different logical forms we assigned to sentences like the ones in (15) below:

(15) a. When John has dinner with friends, he always drink wine.

b. When John has dinner with friends, he drinks wine.

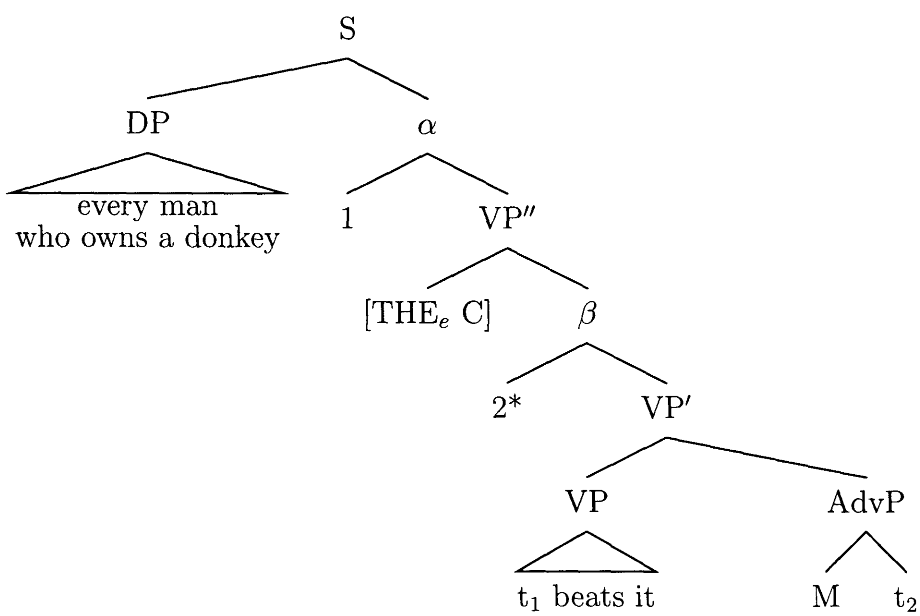
In the case of (15a), the adverb 'always' was analyzed as an event determiner, introducing universal quantification the same way the determiner 'every' does. In the case of (15b), we postulated the presence of a silent plural event determiner (THE_e), meaning what the definite determiner 'the' means in English (modulo a sortal distinction), but selecting for plural predicates. The restrictors of both 'always' and 'The_e' are contextually determined, and in the examples above, they are identified with the help of the initial *when*-clauses. As for the link between the events described by the adverbial clause and the events described by the matrix clause, we followed Rothstein's (1995) work on adverbial quantification over events, and assumed the presence of an implicit 'matching' function M, mapping events to events, and whose content varies from context to context. In (15), M could be identified as expressing temporal overlap.[7]

I would like to suggest now that an analysis along the same lines can be applied to the case of donkey sentences we discussed above. More precisely, I want to propose that in sentences like 'every man who owns a donkey beats it', there is a covert event description acting as an adverb and linked to the event described by the verb phrase via a matching function. This function will map 'beatings' to 'ownerships', the later

[7] See chapter 2 for a detailed analysis of the logical forms and interpretations of (15a-b).

being viewed perhaps as what legitimates the beatings. An event of a man beating a donkey will be mapped by the matching function to the event of that man owning that donkey. The event description appears under the scope of the universal quantifier ‘every donkey-owner x’, and will be interpreted as ‘the (sum of) events of x owning a donkey’. For every event e that is a minimal part of this sum, there must be an event of x beating the donkey d such that Int(e) = d. This singular definite description ‘the donkey d: Int(e) = d’ corresponds to the interpretation of the object pronoun ‘it’, which is an e-type pronoun. Below is the logical form of ‘every man who owns a donkey beats it’, followed by the relevant steps of the derivation of its interpretation.

(16)



$$[\![VP']\!]^g = \lambda e.\ \mathbf{beat(e, g(1), d)\ \&\ d = the\ donkey\ in\ g(2)\ \&\ M(e) = g(2)}$$

$$[\![\beta]\!]^g = \lambda \mathbf{E}.\lambda \mathbf{E'}.\ \forall \mathbf{e} \leq \mathbf{E} :\ \exists \mathbf{e'} \leq \mathbf{E'} : \mathbf{beat(e', g(1), d)\ \&\ d = the\ donkey\ in\ e}$$
$$\mathbf{\&\ M(e') = e}$$

$$[\![\mathrm{THE}_e\ \mathrm{C}]\!]^g = \sigma \mathbf{s} : \mathbf{s\ is\ a\ state\ of\ g(1)\ owning\ a\ donkey}$$

$$[\![\text{VP}'']\!]^g = \lambda \mathbf{E}.\forall \mathbf{s} : \mathbf{s} \text{ is a state of } \mathbf{g(1)} \text{ owning a donkey} \rightarrow \exists \mathbf{e} \leq \mathbf{E} : \mathbf{beat(e, g(1), d)} \ \& \ \mathbf{d} = \text{the donkey in } \mathbf{s} \ \& \ \mathbf{M(e)} = \mathbf{s}$$

$$[\![\alpha]\!] = \lambda \mathbf{x}.\lambda \mathbf{E}.\forall \mathbf{s} : \mathbf{s} \text{ is a state of } \mathbf{x} \text{ owning a donkey} \rightarrow \exists \mathbf{e} \leq \mathbf{E} : \mathbf{beat(e, g(1), d)} \ \& \ \mathbf{d} = \text{the donkey in } \mathbf{s} \ \& \ \mathbf{M(e)} = \mathbf{s}$$

$$[\![\text{DP}]\!]^8 = \lambda \mathbf{P}.\forall \mathbf{x} : \mathbf{x} \text{ is a man} \ \& \ \mathbf{x} \text{ owns a donkey} \rightarrow \exists \mathbf{e} : \mathbf{P(x)(e)} = \mathbf{1}$$

$$[\![\text{S}]\!] = \mathbf{1} \text{ iff } \forall \mathbf{x} : \mathbf{x} \text{ is a man} \ \& \ \mathbf{x} \text{ owns a donkey} \rightarrow \exists \mathbf{E} : \forall \mathbf{s} : \mathbf{s} \text{ is a state of } \mathbf{x} \text{ owning a donkey} \rightarrow \exists \mathbf{e} \leq \mathbf{E} : \mathbf{beat(e, g(1), d)} \ \& \ \mathbf{d} = \text{the donkey in } \mathbf{s} \ \& \ \mathbf{M(e)} = \mathbf{s}$$

Notice that we have the determiner 'every' introducing universal quantification over individuals, and the pronoun 'it' as a singular definite description in disguise.[9] Intervening between them is a covert plural definite description of events. This description is within the nuclear scope of the universal quantifier and its reference co-varies with the donkey-owners that are being quantified over. The pronoun is below the event description and also contains an event variable that is bound by the distributive operator associated with the event description. The net result is that the interpretation of the pronoun also co-varies with the donkey-owners, as desired.

3.5 Plural Event Descriptions and Homogeneity

Recall now the challenge faced by theories that attacked the uniqueness problem by postulating a secondary quantifier in the logical form of the relevant sentences, as we saw in (8)-(10) and (11)-(13). The secondary quantifier was sometimes universal (when the 'primary' quantifier was 'every' or 'most') and sometimes existential (when

[8] For simplicity, I suppress the event argument of the QP, as well as the partitive relation over events that it introduces. See chapter 1 for details.

[9] This is a crucial respect in which my analysis differs from the one suggested in Neale (1990), where the singular pronoun 'it' is treated as a numberless description 'the donkey or the donkeys owned by x'. See Elbourne (2002) and Kanazawa (2001) for criticism of Neale's proposal.

the 'primary' quantifier was 'no'), and there was no real explanation for this variability. Is it possible to understand this variability without having to stipulate its effects via complex lexical entries for determiners?

In the analysis offered above, we have relied on the presence of a plural definite description of events in the scope of the 'primary' quantifier. As a consequence, there is no difference in the logical forms under discussion. Variability is only apparent, an illusion created by paraphrases such as (8)-(10) and (11)-(13). But why do these paraphrases seem so appropriate? That is because the way plural definite descriptions behave within the scope of quantified expressions. Consider the following scenario: a group of boys were given toys as Christmas presents, each boy being given several toys. Later, they all gathered at the house of a common relative for Christmas lunch. Now, imagine the following observations about the gathering:

(17) a. Every boy brought the toys he had gotten.

b. Most boys brought the toys they had gotten.

c. No boy brought the toys he had gotten.

(17a) conveys that every boy brought every toy he had gotten. (17b) conveys that most boys brought every toy he had gotten. And (17c) conveys that no boy brought any toy he had gotten. Here, it is (17c) that deserves special comments. Given a boy b, the description *the toys that b had gotten* refers to the sum of all toys that b got. Shouldn't (17c) then just convey that no boy brought every toy he had gotten, or equivalently, that for every boy, there is at least one toy that the boy did not bring? It seems that the use of a plural definite description licenses the following inference in this case: if there is a toy that x did not bring, then there is no toy that x brought. Or, to express it in a different way: if there is a toy that x brought, then x brought every toy. The property of licensing this inference is something that universal quantifiers do not share with plural definites, as attested by the fact that after hearing (18) below, one understands that for every boy, there is a toy that the boy did not bring, but do not conclude anything about whether or not there is any boy who left all his toys at home.

(18) No boy brought every toy he had gotten.

Notice that even if it is clear that the plural definite is interpreted distributively, the inference mentioned above is still licensed:

(19) a. Every boy sent a postcard to his friends in Europe.

b. Most boys sent a postcard to their friends in Europe.

c. No boy sent a postcard to his friends in Europe.

Imagine each boy we are talking about has many friends in Europe, each one of them leaving in a different country. (19a) can be used to convey that every boy sent a different postcard to every one of his friends. Now, (19c) conveys that no boy sent a postcard to any of his European friends. Once again, (19c) contrasts with (20) below with a universal quantifier replacing the plural definite:

(20) No boy sent a postcard to every friend of his in Europe.

Specially relevant here is the fact that the plural descriptions in (19) are under the scope of a quantifier, and are interpreted distributively. This is exactly how the plural event description that I posited in (3.4) is interpreted, and I am now claiming that it is this 'all or nothing' effects that are typical of plural definites (cf. Löbner 1985) that is responsible for the variability in interpretation observed above in connection with (8)-(10) and (11)-(13). Whether these effects should be treated as entailments, presuppositions or implicatures is a delicate matter, but I will suggest in the next section that it is a presupposition, because it projects like a presupposition. In any case, my main point here is that by positing a plural definite description in the logical form of donkey sentences as we did here makes it possible to reduce the problem of interpretational variability discussed above to a more general problem concerning the behavior of plural definites under the scope of an operator.

As a final remark, notice that the generalizations in (17) above do not exclude boys who might have been given only one toy. According to (17a), for instance, if there are such boys, then each one of them must have brought his toy, and according to (17c) none of them must have brought it. This is also true of 'every farmer who owns a donkey beats it', where farmers with only one donkey are not excluded form the generalization expressed by the sentence. At first, this might look problematic for the analysis I am advocating in this chapter, because of the presence of the plural description 'the events of x owning a donkey' that was posited as part of its logical form. But as we have just pointed out, admitting singular referents is a property that plural descriptions containing a variable bound from outside have, and this is not peculiar to to the event descriptions in donkey sentences. On the contrary, this should be viewed as another commonality between the silent description being postulated here and other plural (overt) descriptions.

3.6 Homogeneity and Presupposition Projection

Let us assume that a plural definite description triggers a homogeneity presupposition. The presupposition amounts to the following: if a non-collective predicate P applies to a plural definite XP, then either P is true of all parts of the denotation of XP or P is not true of any part of the denotation of XP. Here I will focus on distributive readings, where a plural definite combines with a derived distributive predicate, as in (21), under the reading that John sent a flower to each one of the relevant girls.

(21) John sent a flower to the girls.

LF: [[$_{XP}$ the girls] [$_{YP}$ 1* [J. sent a flower to t_1]]]

In cases like this, the homogeneity presupposition can be described as in (22)

(22) $:$ [XP [1* YP]] presupposes that $\forall x < [\![\text{XP}]\!] : [\![1\ \text{YP}]\!](x)$ OR $\forall x < [\![\text{XP}]\!] :$ $\neg[\![1\ \text{YP}]\!](x)$

What (21) conveys then amounts to the following:

(23) John sent a flower to the girls

Assertion: for every girl x, John sent a flower to x.

Presupp: either for every girl x, John sent a flower to x, or for every girl x, he did not sent a flower to x.

Ass+Presupp= for every girl x, John sent a flower to x.

In this case the presupposition does not add anything to the assertive content, and the sentence conveys the same content that the sentence 'John sent a flower to every girl' does.

Now consider the case of a negative sentence, with a definite description under the scope of negation:

(24) John didn't send a flower to the girls.

LF: [not [[$_{XP}$the girls] [$_{YP}$ 1* [J. sent a flower to t_1]]]]

Since presuppositions project over negation, we expect the homogeneity presupposition triggered by the plural definite to behave this way too:[10]

(25) John didn't send a flower to the girls.

Ass: it is not the case that for every girl x, John sent a flower to x.

Presupp: either for every girl x, John sent a flower to x, or for every girl x, John did not sent a flower to x.

Ass+Presupp= For every girl x, John did not send a flower to x.

[10] As an example, consider 'John does not know that Mary is pregnant', which presupposes that Mary is pregnant, just like 'John knows that Mary is pregnant' does. The presupposition trigger here is the factive verb 'know'.

Sentence (24) should then convey something stronger than what the sentence 'John did not send a flower to every girl' conveys (under the reading with negation scoping above the universal quantifier), and that seems correct.

Consider now the following sentence (=(19a)), under its distributive reading, according to which each friend got a (personalized) postcard:

(26) Every boy sent a postcard to his friends in Europe.

In (26) the plural definite is under the scope of a universal quantifier, and the sentence conveys what the sentence 'every boy sent a postcard to every friend of his' does. The homogeneity presupposition would indeed be innocuous if it projected universally, that is, if (26) presupposed that for every boy x, either x sent a postcard to every friend of x, or x did not send a postcard to any friend of x. But that is the way presupposition-triggers within the nuclear scope of a universal quantifier seem to behave, as attested by cases like (27) discussed by Heim (1983), which presupposes that every nation has a king.[11]

(27) Every nation cherishes its king.

Consider now the case of (28):

(28) No boy sent a postcard to his friends in Europe.

The plural definite appears now within the scope of a negative quantifier. The sentence conveys that no boy sent a postcard to any of his friends in Europe, something stronger than what the sentence 'no boy sent a postcard to every friend of his in Europe' conveys. We would be able to derive the correct results if the homogeneity presupposition projected universally:

(29) No boy sent a postcard to his friends in Europe.

Ass: For no boy x, x sent a postcard to every friend of x in Europe.

[11] The relevant presupposition here is the existence presupposition induced by the singular definite description 'its king'(=the king of x).

Presupp: for every boy x, either x sent a postcard to every friend of x in Europe, or x did not send a postcard to any friend of x in Europe.

Ass+presupp = for every boy x, x did not send a postcard to any friend of x in Europe

In this case too, the homogeneity presupposition seems to behave like other presuppositions, as can be seen in (30) (also from Heim 1983), which presupposes that every nation has a king:[12]

(30) No nation cherishes its king.

What about plural definites under the scope of an existential quantifier?

(31) A boy sent a postcard to his friends in Europe.

What (31) conveys (under the relevant reading) is that there is a boy x such that for every friend y of x, x sent a postcard to y. Here, if the homogeneity presupposition projects universally, we would get the wrong result:

(32) # A boy sent a postcard to his friends in Europe.

Ass: there is a boy x such that for every friend y of x, x sent a postcard to y.

Press: every boy x is such that either for every friend y of x, x sent a postcard to y or for no friend y of x, x sent a postcard to y.

The problem with the presupposition above is that together with the assertion, it should convey that there is no boy who sent a postcard to some, but not all, of his friends in Europe. That is too strong. For (31) to be true it is enough that there is a boy who sent a postcard to every one of his friends in Europe, and the existence of

[12] At least that is the judgment I got from every native speaker I asked. It conforms to the predictions made by Heim's (1983) theory, who acknowledged, however, that judgements had been reported in the literature, according to which (30) presupposes merely that some nation has a king. She also warns about the possibility of contexts in which the universal presupposition may be weakened via local accommodation. Cf. also Beaver (2001) and the references cited there for relevant discussion.

other boys who sent postcards to some of their friends is certainly compatible with what the sentence conveys. This would be an argument against the homogeneity presupposition, if we had evidence that presuppositions under the scope of an existential quantifier projected universally. But that is not the case, as can be seen from the following example (Kartunnen and Peters 1979, Heim 1983):

(33) A fat man was pushing his bicycle.

What this sentence presupposes is that the fat man who pushed the bicycle had a bicycle.[13] By analogy, we should expect (31) to presuppose that the boy who sent a postcard to every one of his friends in Europe either sent a postcard to every one of his friends in Europe or to none of them, which is a vacuous presupposition, a result in accordance with what we saw above.

Finally, consider the following case involving the proportional determiner 'most':

(34) Most boys sent a postcard to their friends in Europe.

All speakers I consulted agreed that for this sentence to be true, it is necessary that most boys x be such that for all friends y of x, x sent a postcard to y. What I found interesting though was the fact that when I asked them to provide me situations in which the sentence would be true, they all told me stories in which the boys were divided into two groups: the ones (the majority of the boys) who sent postcards to all of their friends, and the ones who did not send postcards to any of their friends. Also interesting was the fact that when the speakers were presented with sentences with a universal quantifier in the place of the plural description, as in (35), then the scenarios they created contained boys who sent postcards to some, but not all of his friends.

(35) Most boys sent a postcard to every friend of theirs in Europe.

[13] How to derive this result is a question that will not concern us here. See, among others, (Heim 1983), Beaver 2001, and the references cited there.

If these judgments prove to be representative of how native speakers of English interpret plural definite descriptions, the contrast above constitutes additional evidence for the existence of a homogeneity presupposition triggered by these plural definites that projects universally (at least as a default) when the definite appears under the scope of a proportional quantifier. Together with the other facts discussed in this section, they point to the conclusion that the homogeneity effect associated with plural definites is indeed a presupposition, the reason being that it projects like a presupposition when embedded under negation and quantified noun phrases. And together with the main claim in this chapter that the logical form of donkey sentences have a plural definite description of events within the scope of a quantifier phrase, we arrive at an explanation of the quantificational variability we discussed before, which can now be viewed as a reflex of the projection of a presupposition triggered by a plural definite description.

Chapter 4

Imperfectives and Plurality

4.1 Introduction

Imperfectivity, understood as a semantic notion, can be informally described as expressing the idea that an event, state, or habit is ongoing. For instance, the English progressive sentence in (1) says that, at the time when I saw Mary, there was an ongoing event of her crossing Vassar Street, and the 'simple present' sentence in (2) says that Mary is currently in the habit of smoking:

(1) Mary was crossing Vassar Street (when I saw her).

(2) Mary smokes.

In an event-based framework, the intuitions mentioned above can be formalized by using the relation of temporal inclusion. According to this view, someone who uttered (1) would assert that the time at which I saw Mary is included in the time of an event of Mary crossing Vassar Street. Similarly, someone who uttered (2) would assert that the utterance time is included in an interval corresponding to the duration of a habit of Mary smoking. But what does it mean for a time interval to be the time of an event of Mary crossing the street? And what exactly constitutes a habit of Mary smoking? Suppose we answer the first question by saying that the interval of an event of Mary crossing the street is an interval corresponding to a complete event of Mary crossing the street, beginning when she is on one side of the street and starts crossing, and finishing only when she gets to the other side. Then, we would face the problem of explaining why a sentence like (3) below is judged true, when uttered at a time right after Mary started crossing the street, despite the fact that she never got to the other side:

(3) Mary was crossing Vassar Street, when a bus hit her.

A way out of this puzzle is to introduce a modal component as part of the meaning of progressive sentences with the effect that the utterer does not commit himself to the existence in the actual world of a complete event of the sort described by the sentence. A proponent of this view is then left with the task of spelling out what kind of modality is involved in these sentences.[1]

What about habituals? In chapter 2, habitual sentences with adverbs such as *always* or *usually* were analyzed as involving quantification over events. The adverbs were treated as quantificational determiners and their (covert) restrictors as variables ranging over event predicates. Habitual sentences with no adverbs of quantification - bare habituals - were analyzed as being structurally similar, but with the (silent) event determiner identified as a plural definite determiner. In both cases, identifying the restrictors of the determiners required the help of linguistic and/or extra-linguistic context. Adverbial clauses, such as the initial *when*-clause in (4a) below, and presuppositions triggered by lexical items such as *beat* in (4b) are among the linguistic material that helps determining these restrictors. The influence of extra-linguistic context, such as the salience of a discourse topic, is usually accompanied with intonational cues, as in (4c), where the verb receives a special pitch accent:

[1] Dowty (1977), Landman (1992), and Portner (1998) are among the works that have undertaken this task. See also Bonomi (1997b) for an event-based analysis that share some of the ideas developed by those authors. For a different view on the matter, cf. Vlach (1981), Bach (1986) and Parsons (1990)

(4) a. When John showers, he (always) shaves.
Every event/The events of John showering ...

b. Mary usually beats John at ping-pong.
Most events of John and Mary playing ping-pong ...

c. Mary [writes]$_F$ to her mother.
The events of Mary communicating with her mother ... [in a discussion about how daughters and mothers living apart communicate.]

There are, however, certain habitual sentences, which I will call 'simple habituals', that seem to behave differently. These sentences can be uttered out of the blue and still sound natural and informative, despite the absence of adverbial clauses, presupposition triggers, or any special focus marking. Some examples are provided in (5):

(5) a. John smokes.

b. Mary dyes her hair.

c. Sally jogs.

Take (5a) for instance, and imagine it uttered out of the blue. It is not clear at all what could play the role of the covert restrictor of an event determiner in this case. For instance, there are so many different circumstances under which a certain person can smoke, that it seems impossible to identify a set of events without being too vague ('every appropriate time to smoke, Mary smokes') or just trivial ('every time Mary smokes, she smokes'). One can smoke just because he or she feels like it from time to time, or every day at noon, or maybe because someone is forcing him or her to do so. It does not matter. A sentence like 'Mary smokes' can be uttered without the intention to link events of Mary smoking to any other kind of event, and a hearer does not feel compelled or invited to accommodate any set of events either. What seems to be at issue here is the existence of events of Mary smoking.

Suppose then that we say that a habit of Mary smoking is a sequence of events of her smoking. A problem arises here that is similar to the one we discussed in connection to the progressive sentence in (3). Imagine Mary died a couple of minutes after someone had uttered (2), and that in fact she used to smoke before she died. One would not conclude from the facts that the speaker was wrong when he uttered (2), despite the fact that the time of that utterance followed the final time interval at which Mary smoked, and therefore was not included within an ongoing sequence of events of Mary smoking. Once again, a way out of this problem would be to include a modal component in habitual sentences, so that someone who utters (2) can avoid committing himself to the existence in the actual world of future events of Mary smoking.

In this chapter, I subscribe to the view that habitual and continuous readings connected with imperfectivity have both a temporal and a modal component. However, I will go further and defend a stronger position, namely, that continuous and habitual readings share the same temporal and the same modal ingredients. The only difference between them is that the former asserts the existence of a singular event of the kind described by the verb phrase, whereas the latter asserts the existence of a plural event of the kind described by the verb phrase.

The rest of the chapter is organized as follows: in section 2, I present the relevant details of how temporal relations such as inclusion and precedence are to be understood when they hold of intervals of plural events. In section 3, I suggest that verb phrases combine with number morphemes forming constituents denoting sets of singular or plural events, and I discuss the temporal component of imperfectivity. In section 4, I analyze some crosslinguistic data involving imperfective constructions and argue that the aspectual operators involved in them display a sensibility to 'number' (singular/plural) that is very similar to what is observed with determiners in the nominal domain. In section 4, I discuss habitual sentences with singular and plural indefinites and propose a revision in the meaning of the imperfective operator to account for the absence of cumulative readings in simple habituals with plural indefinites. In section 5, I present Portner's work on the modal semantics of progressive sentences in English, and argue that it can be extended to habitual sentences. The upshot is that the logical forms underlying continuous and habitual readings become identical, modulo the number specification of the time intervals involved. Finally, section 6 discuss sentences with two layers of imperfectivity, with quantifiers intervening between two imperfective operators. Section 7 is a brief summary.

4.2 Events and Their Times

Since the occurrence of events in time will be at the center of our discussion, some preliminary technical remarks about how events and times relate are in order.

In addition to the mereology of events that we have been talking about throughout this dissertation, I also assume that there is a mereology of time intervals. The definition of a time interval can be built upon the notion of time point. The set of time points together with the relation $<$ (precedence) form what is called a dense linear order. A time interval i can be defined as a convex set of time points, that is, a set such that for any time points p_x, p_y, p_z, if p_x and p_y belong to i, and $p_x < p_z < p_y$, then p_z also belongs to i. Intuitively, convex intervals correspond to continuous portions in a time line. I call them singular intervals. In addition to singular intervals, I will assume that D_i, the domain of all time intervals, also contain plural intervals, understood as mereological sums have singular intervals as their minimal parts. I take the set D_i to correspond to the set formed by closing off the set of singular intervals (I_{sg}) under sum formation.

Once we acknowledge the existence of plural intervals, we have to redefine relations such as precedence and inclusion, extending them to cases involving sums as well. The relevant definitions are given below.

(6) *Right Boundary/Left Boundary*

A time point p is the right/left boundary of an interval i *iff* p belongs to a minimal part of i, and for every time point p', if p' belongs to a minimal part of i, then p'$\leq$ p/p $\leq$ p'.

(7) *i-precedence*

An interval i i-precedes an interval i' *iff* the right boundary of i precedes the left boundary of i'.

(8) *i-inclusion*[2]

An interval i is i-included ($\subseteq_i$) in an interval i' *iff* the left boundary of i' precedes the left boundary of i, and the right boundary of i precedes the right boundary of i'.

As far as minimal, atomic intervals are concerned, the definitions above are quite intuitive, so the interval corresponding to March/2001 precedes the interval corresponding to August/2001, and is i-included in the interval corresponding to the first semester of 2001. Now, consider what happens when sums of intervals enter the picture. Let i_1 correspond to March/2001, i_2 to August/2001, and i_3 to the plurality January/2001$\oplus$May/2001. According to (8), i_1 is i-included in i_3, since i_3's left boundary precedes i_1's left boundary, and i_1's right boundary precedes i_3's right boundary. Notice that the fact that the time points belonging to i_1 do not belong to any part of i_3 is irrelevant. Less surprisingly, according to (7), i_3 i-precedes i_2, since i_3's right boundary precedes i_2's left boundary. These definitions will become relevant when we discuss the semantics of aspectual operators.

Finally, I assume that there is an homomorphism τ between the structured domain of events and the structured domain of intervals, so that for any events *e*, *e'*, $\tau(e \oplus e') =$

[2] I use the name *i-inclusion* and the notation $\subseteq_i$ to avoid confusion with the notion of subinterval, standardly defined upon the set-theoretic relation of inclusion $\subseteq$.

$\tau(e) \oplus \tau(e')$. I refer to $\tau(e)$ as the time of the event e.

4.3 The Imperfective Operator

As a starting point, I assume that aspectual operators denote functions that take sets of events as their input and return sets of intervals as their output. As far as temporal semantics is concerned, the main job of an aspectual operator is the introduction of a relation between time intervals in the logical representation of a sentence (cf. Klein 1994). In sentences with a single layer of aspectuality, these relations hold between the interval corresponding to the temporal specification of the clause (past/present/future), and an interval belonging to the denotation of the verb phrase. A typical clause skeleton will then look like (9):[3]

(9) $[_{TP}$ T $[_{AspP}$ Asp $[_{VP}$ ... V...]]]

I will treat verb phrases (VPs) in the same way I treated common nouns (NPs) in chapter 2. VP-denotations may contain atomic as well as non-atomic events. Number morphemes combine with a bare VP selecting its relevant members (atomic/non-atomic).

(10) VP_{sg} = [sg VP] VP_{pl} = [pl VP]

(11) $[\![sg]\!] = \lambda \mathbf{P}.\ \lambda e.\ \mathbf{P(e)}$ & **e is atomic**

$[\![pl]\!] = \lambda \mathbf{P}.\ \lambda e.\ \mathbf{P(e)}$ & **e is non-atomic**

$[\![VP_{sg/pl}]\!] = \lambda e.\ [\![\mathbf{VP}]\!](e)$ & **e is atomic/non-atomic**

[3] I will follow the tradition inaugurated with Partee (1973), according to which tenses are treated as pronouns. Thus, when not bound by an operator, T nodes refer to context salient time intervals. Distinctions among tenses, e.g. past vs. present can be encoded as presuppositions in their lexical entries. Following the notational conventions in Heim and Kratzer (1998), lexical entries of tenses would look like the following:
(i) $[\![past_1]\!]^g$ = g(1) if g(1) precedes the utterance time; and undefined otherwise.
(ii) $[\![pres_1]\!]^g$ = g(1) if g(1) is the utterance time; and undefined otherwise.
For our purposes, g can be viewed as a function provided by the context of utterance, mapping indices to contextually salient entities.

I will start by encoding the semantics of imperfectivity in a morpheme, which I will call *Imp*. This morpheme introduces the inclusion relation between intervals, as shown in the lexical entry in (12):

(12) $[\![\text{Imp}]\!] = \lambda \mathbf{P}_{\langle vt \rangle}.\ \lambda \mathbf{t}.\ \exists \mathbf{e}:\ \tau(\mathbf{e}) \supseteq \mathbf{t}\ \&\ \mathbf{P}(\mathbf{e})$

Before looking at a concrete instance of an English sentence containing this morpheme, consider the logical forms in (13) and (14):

(13) $[_{\text{TP}}$ Past$_1$ $[_{\text{AspP}}$ Imp $[_{\text{VP-sg}}$ sg $[_{\text{VP}}$ John paint the house]]]

(14) $[_{\text{TP}}$ Past$_1$ $[_{\text{AspP}}$ Imp $[_{\text{VP-pl}}$ pl $[_{\text{VP}}$ John paint the house]]]

Now, imagine the following scenario: Last year, John painted his house once every month. He always started on the 15th and finished on the 17th of each month. Let the events of him painting the house be e_1, $e_2, \ldots$, e_{12}. Assuming these were the only occasions in which John painted the house, the extension of the bare VP in (13) and (14) is (15):

(15) $[\![\text{VP}]\!] = \{\mathbf{e}_1,\ \mathbf{e}_2,\ \mathbf{e}_1 \oplus \mathbf{e}_2,\ \mathbf{e}_3,\ \mathbf{e}_1 \oplus \mathbf{e}_2 \oplus \mathbf{e}_3,\ \ldots,\ \mathbf{e}_1 \oplus \mathbf{e}_2 \oplus \mathbf{e}_3 \ldots \oplus \mathbf{e}_{12}\}$

Given the semantics of *Imp* above, the truth-conditions for (13) and (14) should be as in (16) and (17), respectively:

(16) $[\![\text{TP}]\!]^g = 1$ *iff* $\exists \mathbf{e}:\ \tau(\mathbf{e}) \supseteq \mathbf{g(1)}\ \&\ \mathbf{e\ is\ atomic}\ \&\ \mathbf{paint}(\mathbf{e}, \mathbf{j}, \mathbf{h})$

(17) $[\![\text{TP}]\!]^g = 1$ *iff* $\exists \mathbf{e}:\ \tau(\mathbf{e}) \supseteq \mathbf{g(1)}\ \&\ \mathbf{e\ is\ non\text{-}atomic}\ \&\ \mathbf{paint}(\mathbf{e}, \mathbf{j}, \mathbf{h})$

Now, assume that Past$_1$ refers to June 16th. Then (13) should be true, since e_6, for instance, verifies the formula embedded under the existential quantifier in (16). What if Past$_1$ refers to June 20th? Now (13) should be false, since there is no event in the denotation of VP$_{sg}$ whose time includes June 20th. The situation changes with (14). If Past$_1$ refers to June 20th, (14) is true, since $e_5 \oplus e_7$, for instance, verifies the formula embedded under the existential quantifier in (17). We need to invoke a plural event this time, but that is fine, since the denotation of VP_{pl} has plural events as its members. Finally, if $Past_1$ refers to June 16th, (14) is still true, but not because this interval is included in the time of e_6, but because it is included in the time of some plural events, such as $e_5 \oplus e_7$. The conclusion is that logical forms containing *Imp* can express not only the existence of an on-going event at a certain time, but also the existence of on-going sequences of (two or more) events of John painting the house. The choice will depend on whether *Imp* combines with singular or plural VPs.

One can imagine more specialized versions of *Imp*, in which this operator selects for either sets of singularities (P_{sg}) or sets of pluralities (P_{pl}) as its first argument.[4] As a consequence, only singular or plural events are quantified over in the logical representations of sentences containing these operators:

(18) $[\![\text{Imp}_{sg}]\!] = \lambda \mathbf{P}_{sg}.\ \lambda \mathbf{t}.\ \exists \mathbf{e} : \tau(\mathbf{e}) \supseteq \mathbf{t}\ \&\ \mathbf{P}(\mathbf{e}) = \mathbf{1}$

(19) $[\![\text{Imp}_{pl}]\!] = \lambda \mathbf{P}_{pl}.\ \lambda \mathbf{t}.\ \exists \mathbf{e} : \tau(\mathbf{e}) \supseteq \mathbf{t}\ \&\ \mathbf{P}(\mathbf{e}) = \mathbf{1}$

Now, logical forms containing Imp_{sg} can only express that an event, but not a sequence of events, is ongoing. On the other hand, logical forms with Imp_{pl} can only express that sequences of events are ongoing. My suggestion is that the so-called progressive or continuous readings of imperfective sentences are derived from logical forms like (13), and that habitual readings are derived from logical forms like (14). Thus, as far temporal semantics is concerned, continuous and habitual sentences are nearly synonymous, their logical forms differing minimally, and only with respect to the number specification of the VPs that combine with *Imp*. At this point, I beg the reader to disregard issues concerning modality. I will discuss those issues in detail in section 4.7, where I will supplement the meaning of *Imp* with quantification over possible worlds. As will become clear, I will try to argue that both continuous and

[4] A parallel with the nominal domain will be discussed in the next section.

habitual readings involve the same kind of modality. In this way, what I presented above can be seen as a first step towards a unified semantics for the continuous and habitual readings associated with imperfectivity. However, before we enter the modal domain, I want to present some data illustrating the view I am advocating here.

4.4 Cross-linguistic Variation

According to what we saw in the previous section, sensitivity to number leads us to expect the existence of three different imperfective operators: Imp, Imp_{sg} and Imp_{pl}. Imp combines with both singular and plural VPs; Imp_{sg} combines only with singular VPs and Imp_{pl} combines only with plural VPs. The sensitivity to number that I am proposing for these aspectual operators is similar to what happens in the nominal domain, where we find determiners like *some*, which combines with both singular and plural noun phrases ('some boy/some boys'), *every*, which combines only with singular noun phrases ('every boy/*every boys'), and *many*, which only combine with plural noun phrases ('*many boy/many boys'). In this section, I argue that all three imperfective operators are attested in natural languages. Simple present sentences with accomplishments and activities in English and Portuguese, as illustrated in (20) below, give rise to habitual readings only, suggesting that Imp_{pl}, in this case a phonetically null operator, is part of their logical forms.

(20) a. Mary dyes her hair.

b. A Maria tinge o cabelo.
The Maria dyes the hair.
'Mary dyes her hair.'

Simple present sentences in Italian, French and Spanish are ambiguous between continuous and habitual readings, suggesting that Imp is available for these languages. The same is true of another well-known construction in Romance, namely, the past imperfect, as illustrated in (21).[5]

(21) A Maria tingia o cabelo.
The Maria dye-IMP the hair.
'Mary was dying/used to dye her hair.'

The progressive in English and Portuguese also gives rise to continuous and habitual readings, although the use of progressive sentences to express habituality is limited to recently acquired habits in both languages.[6,7]

(22) a. [Mary used to stay at home the whole day, but now] she is exercising.

b. A Maria está se exercitando.
The Maria is self exercising.
'Mary is exercising.'

Ambiguity between continuous and habitual readings is attested in several other languages as well (Dahl 1985, 1995), and, according to what I suggested above, it reduces to the possibility of Imp combining with both singular and plural VPs. Finally, earlier stages of Turkish provide an example of a morpheme instantiating Imp_{sg}:

[5] As its name suggests, the past imperfect is an aspectual operator used only in combination with the past tense. I will encode this restriction in its lexical entry, by means of a logical presupposition (the notation is from Heim and Kratzer (1998)).

(i) $[\![\text{Past Imp}]\!]^g = \lambda P_{<vt>}.\lambda t : t < g(0).\exists e : \tau(e) \supseteq t \& P(e) = 1$

In (i), 0 is a designated index, which the assignment g always maps to the utterance time. After $[\![\text{Past Imp}]\!]$ combines with its first argument, the result is a function from intervals to truth values. The formula after the colon indicates that this function is a partial function, only defined for past intervals. The Past Imperfect behaves in this respect as the expression 'used to' in English, which only combines with the past tense: John used to smoke/*John uses to smoke.

[6] As for other Romance languages, one finds a lot of dialectal variation related to geographical and social factors. For data and discussion, see Squartini (1998) and the references cited there.

[7] Habitual readings of progressive forms are more salient when the progressive is embedded under the Perfect in English:

(i) Mary has been exercising lately.

In Portuguese, the present perfect alone expresses habitual readings, also conveying the idea that the habit is recent (see Schmitt 2001):

(i) A Maria tem se exercitado.
. The Mary has self exercised
. 'Mary has been exercising'.

(23) mektup yazyor

'he is writing letters'

According to Dahl (1985:418), "relatively recently, the -yor forms seem to have had progressive meaning only."

In conclusion, the analysis proposed here provides a simple account of cross-linguistic variation within the domain of imperfectivity, reducing the differences to a single parameter related to the 'number' requirements of an aspectual operator.[8]

4.5 Habituals and Indefinites

By invoking pluralities in the analysis of habitual readings associated with the simple present, we are able to explain why singular indefinites are not fine in sentences like (24) below:

(24) John smokes a cigarette.

The logical representation of (24) is given in (25):

(25) $\exists \mathrm{e}: \ \tau(\mathrm{e}) \supseteq \mathbf{Pres}\ \&\ \mathbf{e\ is\ non\text{-}atomic}\ \&\ \exists \mathbf{y}: \mathbf{cigarette(y)}\ \&\ \mathbf{smoke(e, j, y)}$

Since the variable e in the formula $smoke'(e, j, y)$ corresponds to a plurality, and the variable y to an atomic individual, (24) could only be true if John smoked the same

[8] However, as Sabine Iatridou pointed out to me, the continuous/habitual opposition is not the only relevant one in understanding the use of imperfective morphology across languages. It is quite common for languages to require imperfective morphemes (Imp) as an ingredient of counterfactual morphology, and, when they do, the following cross-linguistic pattern is observed: "Imp can appear in progressive, generic, or CF sentences. However, if genericity and the progressive take different forms, then counterfactuality will always pattern with the former, never with the latter". She then adds: "I would like to emphasize that if the sameness of form of the verb in ongoing events and generics suffices to tempt us in the direction of reductionist accounts, then the sameness of form of the verb in generics and CFs should compel us much more. The reason is very simple: the languages in which ongoing events and generics share the same form are a subset of the languages in which generics and CFs share the same form.[...] I have not encountered a language where CFs and ongoing events have one form, and generics a different one". Iatridou (2000:258-259) I agree with her that these facts call for a more ambitious research agenda, but I will have to leave this for another occasion. See Iatridou (2000) for a detailed discussion.

cigarette over and over again. The oddness is then due to the fact that an event of smoking a cigarette consumes the whole cigarette, preventing the possibility of other events where the same cigarette is smoked again. Different verbal predicates do not conflict with iterativity, and are just fine in the simple present:

(26) John babysits a one-year-old boy.

Notice, however, that for (26) to be true there must be a certain boy that John takes care of regularly. It would not be true if, say, every night he takes care of a different boy. That is what we expect if the logical form of (26) is as in (27) below:

(27) $\exists e: \tau(e) \supseteq \mathbf{Pres}\ \&\ \mathbf{e\ is\ non\text{-}atomic}\ \&\ \exists \mathbf{y} : \mathbf{boy}(\mathbf{y})\ \&\ \mathbf{babysit}(\mathbf{e}, \mathbf{j}, \mathbf{y})$

Sentence (24) becomes fine if a distributive quantifier intervenes between the imperfective operator and the singular indefinite, as shown in (28):

(28) John smokes a cigarette every morning.

$[_{\text{TP}}\ \text{Pres}\ [_{\text{AspP}}\ \text{Imp}_{pl}\ [_{\text{VP}'''}\ \text{every morning}\ [_{\text{VP}''}\ 1\ [_{\text{VP}'}\ \text{VP}\ [_{\text{AdvP}}\ (\text{on})\ \text{t}_1\ ]\ ]\ ]\ ]\ ]\ ]$

Here, it is not the VP 'John smokes a cigarette', but rather the higher VP‴ 'John smokes a cigarette every morning' that is the argument of the imperfective operator. Therefore, there is no requirement that VP be a plural predicate. What we have to worry about is whether the predicate denoted by VP‴ has pluralities in it or not. As the derivation below shows, it does.[9]

(29) $[\![\text{VP}']\!]^g = \lambda \mathbf{e}.\exists \mathbf{y} :\ \mathbf{cigarette}(\mathbf{y})\ \&\ \mathbf{smokes}(\mathbf{e}, \mathbf{j}, \mathbf{y})\ \&\ \mathbf{on}(\mathbf{e}, \mathbf{g}(1))$

$[\![\text{VP}'']\!] = \lambda \mathbf{t}.\lambda \mathbf{e}.\ \exists \mathbf{y} : \mathbf{cigarette}(\mathbf{y})\ \&\ \mathbf{smokes}(\mathbf{e}, \mathbf{j}, \mathbf{y})\ \&\ \mathbf{on}(\mathbf{e}, \mathbf{t})$

$[\![\text{every morning}]\!] = \lambda \mathbf{P}_{\langle i,vt\rangle}.\lambda \mathbf{e}^*.\ \forall \mathbf{t} : \mathbf{morning}(\mathbf{t})\ \&\ \mathbf{t} \subseteq \tau(\mathbf{e}^*) \rightarrow \exists \mathbf{e}' \leq \mathbf{e}^* :$
$\mathbf{P}(\mathbf{t})(\mathbf{e}') = \mathbf{1}\ \&\ \forall \mathbf{e}' : \mathbf{e}' \leq \mathbf{e}^* \rightarrow \exists \mathbf{t} : \mathbf{morning}(\mathbf{t})\ \&\ \mathbf{P}(\mathbf{t})(\mathbf{e}') = \mathbf{1}$

$[\![\text{VP}''']\!] = \lambda \mathbf{e}^*.\ \forall \mathbf{t} : \mathbf{morning}(\mathbf{t})\ \&\ \mathbf{t} \subseteq \tau(\mathbf{e}^*) \rightarrow \exists \mathbf{e}' \leq \mathbf{e}^* : \exists \mathbf{y} : \mathbf{cigarette}(\mathbf{y})\ \&$

[9] For simplicity, I treat the noun 'morning' as denoting a set of time intervals.

$$\mathbf{smokes(e',j,y)} \ \& \ \mathbf{on(e',t)} \ \& \ \forall \mathbf{e'} : \mathbf{e'} \leq \mathbf{e^*} \rightarrow \exists \mathbf{t} : \mathbf{morning(t)} \ \& \ \mathbf{t} \subseteq \tau(\mathbf{e}) \ \& \ \mathbf{smokes(e',j,y)} \ \& \ \mathbf{on(e',t)}$$

Variable e^* ranges over events having parts that are events of John smoking a cigarette. But there is no requirement that the same cigarette is consumed in each one of these parts. Since VP″ denotes a set of pluralities, the imperfective operator Imp_{pl} can take it as its argument, and the sentence will have truth conditions requiring that the utterance time be included in the time of a plural event e*, and that (i) there is an event of John smoking a cigarette on every morning within the time of e*, and (ii) each part of e* is an event of John smoking a cigarette in a morning.

The same explanation can be used to account for why habitual sentences with adverbs of quantification, or bare habituals with the silent definite determiner that we postulated in chapter 2 are also fine:

(30) a. [When he gets angry,] John always smokes a cigarette.

b. [When he gets angry,] John smokes a cigarette.

The logical forms of these sentences are similar to the logical form of (28), with the adverb of quantification or the silent definite determiner replacing the QP 'every morning':

(31) [When he gets angry,] John always smokes a cigarette.

$[_{TP}$ Pres $[_{AspP}$ Imp_{pl} $[_{VP'''}$ [always C] $[_{VP''}$ 1 $[_{VP'}$ VP $[_{AdvP}$ M t_1]]]]]]

$$[\![\text{always C}]\!] = \lambda \mathbf{P}.\lambda \mathbf{e^*}. \ \forall \mathbf{e} : \mathbf{C(e)} \rightarrow \exists \mathbf{e'} \leq \mathbf{e^*} : \mathbf{P(e)(e')} = \mathbf{1} \ \& \ \forall \mathbf{e'} : \mathbf{e'} \leq \mathbf{e^*} \rightarrow \exists \mathbf{e} : \mathbf{C(e)} \ \& \ \mathbf{P(e)(e')} = \mathbf{1}$$

(32) [When he gets angry,] John smokes a cigarette.

$[_{TP}$ Pres $[_{AspP}$ Imp_{pl} $[_{VP'''}$ $[\text{THE}_E$ C] $[_{VP''}$ 1* $[_{VP'}$ VP $[_{AdvP}$ M t_1]]]]]]

$$[\![\text{THE}_E\ \text{C}]\!] = \mathbf{max}\{\mathbf{x}^* : \mathbf{C}(\mathbf{x}^*)\ \&\ \neg\mathbf{AT}(\mathbf{x}^*)\}$$

$$[\![1^*\alpha_{\langle vt\rangle}]\!]^{\,g} = \lambda\mathbf{X}.\ \lambda\mathbf{E}.\ \forall\mathbf{x} : \mathbf{x} \leq \mathbf{X} \rightarrow \exists\mathbf{e} \leq \mathbf{E} :\ [\![\alpha]\!]^{g^{x/1}}(\mathbf{e})$$
$$\&\ \forall\mathbf{e} \leq \mathbf{E} : \exists\mathbf{x} \leq \mathbf{X} : [\![\alpha]\!]^{g^{x/1}}(\mathbf{e})$$

4.5.1 Plural Indefinites

If the oddness of (24) is due only to the fact the indefinite is singular, one expects that replacing it by any plural indefinite should produce a contrast in acceptability. However, as (33) below shows this is not the case. Uttered out of the blue, (33) sounds as weird as (24):

(33) # John smokes five cigarettes.

The only way for (33) to be true is if there are five different cigarettes and John smoke each one of them over and over again. But that is not what our current theory predicts, as shown by the logical representation it assigns to (33):

(34) $\exists\mathbf{e} :\ \tau(\mathbf{e}) \supseteq \text{Pres}\ \&\ \mathbf{e\ is\ non\text{-}atomic}\ \&\ \exists\mathbf{X} : |\mathbf{X}| = \mathbf{5}\ \&\ \mathbf{cigarettes}(\mathbf{X})\ \&\ \mathbf{smoke(e,j,X)}$

The fact that 'five cigarettes' introduce quantification over pluralities leads us to expect that contrary to what we saw in the case of (24), cumulation should not force the existence of multiple events where the same cigarette is smoked. We can avoid this problem by assuming that the imperfective operator requires the VP-predicate to hold not only of the plural event whose existence is being asserted, but of its proper parts as well:

(35) $[\![\text{Imp}]\!] = \lambda\mathbf{P}_{\langle vt\rangle}.\ \lambda\mathbf{t}.\ \exists\mathbf{e} :\ \tau(\mathbf{e}) \supseteq \mathbf{t}\ \&\ \mathbf{P}(\mathbf{e})\ \&\ \forall\mathbf{e}' \leq \mathbf{e} : \mathbf{P}(\mathbf{e}')$

The logical representation of (33) is now the following:

(36) $\exists \mathbf{e}: \ \tau(\mathbf{e}) \supseteq \text{Pres} \ \& \ \mathbf{e \ is \ non\text{-}atomic} \ \& \ \exists \mathbf{X}: |\mathbf{X}| = \mathbf{5} \ \& \ \mathbf{cigarettes(X)} \ \& \ \mathbf{smoke(e, j, X)} \ \& \ \forall \mathbf{e'} \leq \mathbf{e}: \exists \mathbf{X}: |\mathbf{X}| = \mathbf{5} \ \& \ \mathbf{cigarettes(X)} \ \& \ \mathbf{smoke(e', j, X)}$

The oddness of (33) results from the fact that the proper parts of a plural event of John smoking five cigarettes are events of him smoking one, two, three or four cigarettes, but not five.

Let us now replace the singular indefinite in (26) with a cardinal plural indefinite:

(37) John babysits three boys.

The sentence is fine but for it to be true there must be three boys such that for each one of them, there are multiple events of John taking care of him. How can we get this result? The fact that the imperfective morpheme requires the existence of a VP-event with proper parts that are also VP-events is welcome since the only way for this to be possible in the case of (37) is if there is more than one event of John babysitting the same boy. We want more, however: we want that every child be babysit more than once. But the requirement that EVERY proper part of such an event be an event of John babysitting three children is too strong a requirement. We need to relax the universal quantification over parts introduced by the imperfective morpheme. It should be enough if a VP-event can be partitioned into proper parts that are also VP-events. For example, if there are three boys, and John has babysit each one of them twice, then the sum of all six events can be partitioned into two proper parts which are also events of John babysitting three boys. The same if there is a third round of babysitting, and a fourth, and a fifth, and so on. If, however, John babysit each boy only once, there will be a plural VP-event, but with no proper part that is also a VP-event. The following revised lexical entry for the imperfective operator gives us what we need:[10]

(38) $[\![\text{Imp}]\!] = \lambda \mathbf{P}_{\langle vt \rangle}. \ \lambda \mathbf{t}. \ \exists \mathbf{e}: \ \tau(\mathbf{e}) \supseteq \mathbf{t} \ \& \ \mathbf{P(e)} \ \& \ \exists \mathbf{e'}, \mathbf{e''} < \mathbf{e}: \mathbf{e'} \otimes \mathbf{e''} \ \& \mathbf{P(e')} \ \& \ \mathbf{P(e'')}$

[10] The formula $e \otimes e'$ says that events e and e' do not overlap, that is, they do not have any part in common.

By inspecting (38), one expects that a plural indefinite under the scope of IMP_{pl} should always be fine if it imposes no cardinality requirement on the variable being existentially bound. That is presumably the case with bare plurals in a sentence such as (39):[11]

(39) John smokes cigarettes.

(40) $\exists \mathbf{e}: \tau(\mathbf{e}) \supseteq \text{Pres} \ \& \ \mathbf{e} \text{ is non-atomic} \ \& \ \exists \mathbf{Y}: \mathbf{cigarettes(Y)} \ \& \ \mathbf{smoke(e, j, Y)}$
$\& \ \exists \mathbf{e}', \mathbf{e}'' < \mathbf{e} : \mathbf{e}' \otimes \mathbf{e}'' \ \& \exists \mathbf{Y}: \mathbf{cigarettes(Y)} \ \& \ \mathbf{smoke(e', j, Y)} \ \&$
$\exists \mathbf{Y}: \mathbf{cigarettes(Y)} \ \& \ \mathbf{smoke(e'', j, Y)}$

4.6 On Statives

As we have discussed above, sentences like those in (41) do not require that at the utterance time there be an event of the kind described by the verb phrase:

(41) a. John smokes.

b. Mary dyes her hair.

Thus, John does not have to be smoking when (41a) is uttered for the sentence to be true. Similarly, Mary does not have to be dying her hair while (41b) is being uttered.

[11] One might wonder about cardinal modifiers such as *at least* or *at most*, and why (i)-(ii) are not fine:

(i) # John smokes at least five cigarettes.

(ii)# John smokes at most five cigarettes.

After all, a plural event of John smoking at least/at most five cigarettes can have proper parts which are also events of him smoking at least/at most five cigarettes. One possibility is that the internal structure of NPs with cardinal modifiers have two components, an existential determiner and a maximality degree operator (Hackl 2000), with the maximality operator always scoping above Imp. Sentences like (i-ii) would be roughly paraphrased as follows: the maximal n such that **John smokes n cigarettes** is equal or smaller/greater than 5. What is interpreted below the imperfective operator is then not different from VP-denotations with plain cardinals such as *five cigarettes.* Notice that this treatment has to be extended to the determiner 'some', given the oddness of 'John smokes some cigarettes. Here too the oddness would be attributed to the meaning assigned to the sentence: the maximal n such that **John smokes n cigarettes** is greater than 1. The open question here is how to enforce scope splitting across the imperfective operator.

This is due to our assumption that the imperfective morpheme in English simple present sentences selects for plural predicates of events and that the time of a plural event can include an interval without any of its parts overlapping with that interval. In this respect, the presence of certain distributive quantifiers under the scope of the imperfective morpheme does not change the picture. Both (42a) and (42b) below can be uttered on a Thursday evening and still be true:

(42) a. John smokes every morning.

b. John dyes her hair every Monday.

There is a class of predicates, however, that behaves differently. These are the so called stative predicates, as exemplified in (43):

(43) a. John is in Boston.

b. John lives in New York.

For (43a) to be true, it is necessary that John be in Boston at the utterance time, and for (43b) to be true, it is necessary that John lives in New York at the utterance time. For instance, even if John visits Boston regularly, if when (43a) is uttered he is in New York, the sentence is simply false. Similarly, knowing that John has just moved from New York to Los Angeles is enough to conclude that (43b) is false, even if he plans to move back to New York in a few years. Judgments change, however, if quantifier phrases like *every morning/every year* are inserted:

(44) a. John is in Boston every morning.

b. ?John lives in Boston every year.

Frequent travels to Boston, for instance, can make (44a) true, no matter where John happens to be at the utterance time.[12]

[12] For reasons that I do not understand, (44b) is not perfect (maybe not even acceptable). This might be due to some stability properties attributed to the subject argument by the predicate *live*. In general, statives formed with the verb *to be* are fine in this context, but 'lexical' statives such as *live, love, know, own* are not. I do not have anything interesting to say about this contrast.

To account for the behavior of stative predicates, I suggest that these predicates have a property that I will call *interval density.* That means the following: if two events e, e' whose times do not overlap are in the extension of a stative predicate S, then their sum $e \oplus e'$ is included in S if, and only if, for every time interval t included in $\tau(e \oplus e')$, there is e'' such that $\tau(e'') = t$ that is also in S. For example, imagine that John was in Boston twice last week, first on Monday and then on Friday again, and stayed there the whole day each time. Then, there will be an event/state of John being in Boston whose time correspond to the whole Monday morning, and another one whose time corresponds to the whole evening of that day. The sum of these events will be in the denotation of the predicate JOHN-BE-IN-BOSTON, since he stayed in Boston the whole afternoon, and therefore there is an event in the extension of this predicate whose time corresponds to the afternoon. Now, although the event of John being in Boston the whole Monday and the event of him being there the whole Friday are both members of the extension of JOHN-BE-IN-BOSTON, their sum is not, since there is no event of him being there on Wednesday for instance.[13]

Returning to the examples in (43), we can now explain why these sentences entail that John is in Boston/lives in Boston at the utterance time. The imperfective operator requires the existence of a plural event of John being/living in Boston whose time includes the utterance time. That, *per se*, does not require that he is/lives in Boston at the utterance time. *Interval density*, however, does, and that is why the sentences can only be true if John currently is/lives in Boston.

The situation with the examples in (44) is different due to the intervention of a distributive quantifier between the verb phrase and the imperfective morpheme. There, the plural event whose existence is being asserted is formed by parts that belong to the stative predicate, but the plural event itself does not have to be in the

[13] Notice that this represents a departure from Kratzer's (2004) hypothesis that all lexical predicates are cumulative, unless, of course, one finds evidence that stative predicates are complex entities formed by smaller units, which are themselves cumulative.

extension of that predicate.

(45) John is in Boston every morning.

$[_{TP}$ Pres $[_{AspP}$ Imp_{pl} $[_{VP'''}$ every morning $[_{VP''}$ 1 $[_{VP'}$ VP $[_{AdvP}$ (on) t_1]]]]]]

As we discussed in the previous section when example (28) was analyzed, VP‴ is the argument of the imperfective operator, and in this case, VP‴ denotes a set of plural events whose minimal parts are events of John being in Boston in the morning. This set of plural events results from the presence of the distributive quantifier 'every morning' and does not correspond to the denotation of the stative VP 'John-be-in-Boston'. Only the minimal parts of the plural events belonging to VP‴ have to belong to the stative VP.

4.7 Imperfectivity and Modality

In the previous sections, by focusing the discussion on issues concerning temporal semantics, I neglected an important component in the meaning of imperfective sentences. It is now time to revise it. Let us start by looking at continuous readings, exemplified here by the English progressive. I will call the aspectual operator present in these sentences Prog. Since, for the moment, we will only be dealing with continuous readings, the meaning of Prog will be the meaning we assigned to Imp_{sg} before. According to the lexical entry of this aspectual operator, a sentence of the form [T Prog VP] entails the existence of a singular time interval at which an event of the type described by the VP takes place. However, as has been acknowledged in the literature since the seventies, this seems to be too strong, as attested by examples like (46) below:

(46) John was building a house (when he died).

(46) can be true even if John has never finished building a house. It seems that it is enough that he was in the process of building one for the sentence to be true. This

intuition is corroborated by examples like the following:

(47) John was crossing the street (when a bus hit him).

Again, for (47) to be true, all we have to check is whether or not John had started walking toward the other side of the street, when the bus hit him. What is interesting about this case is that the sentence can be true even if, when John started crossing the street, the likelihood that he was going to finish it was very low, for instance, if the traffic was heavy, cars were running fast, and the pedestrian light was red. Thus, it appears that external obstacles, no matter how likely they are to interfere in the ongoing event, are not taken into account when we assess the truth of (47). By external obstacles, I mean people or objects other than John and the street he was crossing. What happens when an event is interrupted not by an external obstacle, but by the limitations of one of the participants of the event? Consider a variation of (47) (due to Fred Landman):

(48) John was crossing the Atlantic.

Imagine (48) being uttered five minutes after John started swimming on the West Coast of Africa towards the Brazilian Coast on the other side of the Atlantic. This sentence is very likely to be judged false, and, apparently, the reason for that is the fact the Atlantic is a huge portion of water, and the John that we have in mind is probably a normal human being. Since any human being would give up or die before being even close to Brazilian waters, the fact that our John had started swimming before the reference time (five minutes after he started in the scenario above) is not enough to make the sentence true. Contrary to the buses and cars in the case of (47), the relevant obstacle here has to do with John's physical conditions and, also, the size of the Atlantic. On the other hand, if John is known to have supernatural powers, judgments change, and the sentence is considered appropriate to describe the situation. These facts tell us that progressive sentences with accomplishment VPs can be false, even when the process constituting the event being described by the sentence is already going on. When animate participants are involved, not only their physical conditions, but also their mental state seem to matter. Consider (47) again, but this time uttered under different circumstances. Imagine John is standing on one side of the street when he sees a one hundred dollar bill right in the middle of the street. He then starts walking there to pick up the bill, when a bus comes and hit him. (47) is judged false in this case, and this can only be due to the fact he did not intend to cross the street, since apart from that, the scenario is identical to the other one we discussed above in connection to the very same sentence. What is needed then is a supplement to our current lexical entry for Prog that takes into account the facts discussed above. In this section, I will present Paul Portner's modal analysis of the progressive (Portner 1998), which has its roots in the influential work by David Dowty back in the seventies (Dowty 1977). After showing how his analysis of Prog can handle the relevant facts, I will argue that habitual readings can be analyzed along the same lines, once we maintain the unified temporal treatment of habituals and progressives proposed in the previous section. The final result will be a complete unification (temporal and modal) between these two notions.

4.7.1 Portner (1998): The Progressive in Modal Semantics

Portner's background is Angelika Kratzer's semantics for modality (Kratzer 1981), which has three crucial ingredients: a quantifier over possible worlds, a modal base, and an ordering source. Given a world w (the world of evaluation), the modal base (M) provides a set of propositions M(w), which constrain the set of worlds that are being quantified over. Only worlds in which every proposition in the set provided by the modal base is true ($\cap$M(w)) are relevant for the interpretation of the sentence. The ordering source (O) also provides a set of propositions (O(w)), a set understood as an ideal according to which worlds can be ranked. A world w' is at least as close to the ideal as world w" (w'$\leq_o$ w") if, and only if, every proposition that is true in w' is also true in w". The core feature of the proposal is that, when evaluated with respect to a world w, quantification is restricted to the worlds belonging to ($\cap$M(w)) that are ranked best according to O(w) (Best M,O,w). Crucially, choices of modal bases and ordering sources vary from context to context, being usually determined by both linguistic and extralinguistic material. Portner's proposal is to analyze the meaning of progressive sentences as involving universal modal quantification, along the lines summarized above. The question then is what kinds of modal base and ordering sources are involved in these sentences. His suggestion is that the modal base is a variety of circumstantial one, and that the ordering source is based on the ideal that the event described by the sentence (under VP) is not interrupted by any 'outside' factor. Let us consider the example he used to illustrate what he has in mind:

(49) Mary was climbing Mount Toby.

Circumstantial modal bases take into consideration what the relevant facts are in a certain context The modal base for (49) would deliver a set of propositions, expressing the relevant facts about Mary's current physical and mental conditions (her strength, her age, her dispositions, etc), Mount Toby's physical state (its height, its soil, its shape, etc ..), and also what Mary is doing (Has she started climbing MT? Is she heading the right way? Is she lost?). This set might look like (50) below:

(50) M(w) = {'Mary is in good physical condition', 'Mary does not give up easily', 'It was raining lightly on Mount Toby at 7', 'Mary was headed the right way on the trail at 7', }

Given the circumstances above, (49) is intuitively true. However, notice that among the worlds in which every proposition in (50) is true, there are worlds in which Mary will never manage to climb MT. Think about worlds in which she gets eaten by a bear, or in which she slips and gets seriously injured. Things like that are not necessarily uncommon when people climb mountains, especially if they are not professionals. However, the possibility that these events happen seems to be irrelevant when computing the truth-conditions for (49). That is when the ordering source enters the scene in Portner's analyses. In the case of (49), it would look something like (51):

(51) O(w) = {'Mary does not get eaten by a bear', 'Mary does not slip and hurt her ankle', 'A surprise summer blizzard does not start on MT', 'Mary does not get lost', }

Together, the propositions in (51) express an ideal set of worlds in which Mary encounters no obstacle in her way towards the top of MT. In a sense, in these worlds (the worlds in ∩O(w)), whether or not Mary manages to climb MT depends exclusively on how they look like at the relevant time. According to (50) and (35), Best (M, O, w) contains all the worlds in which Mary and Mount Toby are similar to what they are in the actual world at the relevant time, and no outside factors like bears, rocks, blizzards interrupt the climbing. The idea is that (49) will be true just in case all such worlds are ones in which Mary climbs Mount Toby. Under the circumstances in (50), (49) is predicted to be true. On the other hand, if it is snowing heavily on MT, the proposition 'It was raining lightly on MT' would be replaced by 'It is snowing heavily on Mt' in M(w). Now, Mary could never make it to the top, even if she tries hard. In this case, Best (M,O,w) would contain worlds in which Mary does not climb MT, and the sentence is predicted to be false. Both predictions are borne out. At this point, it should be clear how Portner's theory could handle the puzzling contrast between (47) and (48), discussed in the beginning of this section. It is clear from what we saw above that both the modal base and the ordering source depend on the description of the event under VP. Thus, in the case of (47), M(w) includes all the relevant facts about John and the street he is crossing, whereas in the case of (48), it includes all the relevant facts about John and the Atlantic Ocean, including the fact that it is a huge portion of water. In this case, even if we restrict attention to worlds in which all potential obstacles for the completion of an event of John crossing the Atlantic were removed (no sharks, no unexpected storms, etc), given John's limited physical conditions, and the size of the ocean, most, if not all, worlds in this set would be worlds in which he fails to cross the Atlantic. Accordingly, the sentence is judged false. In the case of (47), if the street is an average street, e.g. if it is 30 feet large, then this information is part of M(w). Since John will manage to cross the street in all of then, as soon as we remove the external obstacles (oncoming buses, cars running fast, etc), the sentence is predicted to be true, the correct result. The new lexical entry for Prog that emerges from this discussion is given below:

(52) $[\![\text{Prog}]\!]^w = \lambda\wp_{\langle s,vt\rangle}.\ \lambda t.$ for every world w' in BEST(M, O, w, t), there is an event e, such that $t \subseteq \tau(e)$, and $\wp(w')(e) = 1$.

(53) BEST(M, O, w, t) = the set of worlds w' in ∩M(w, t), such that there is no world w" in ∩M(w, t) where w"$<_{o(w,t)}$w'.

Notice that the first argument of Prog in (52) is the intension of a VP denotation, a function from worlds to sets of events. I also added an extra argument for BEST, which captures the fact that the set of propositions delivered by the modal base and the ordering source is sensitive not only to the world of evaluation, but also to what is usually called the reference time. Modal bases and ordering sources change as time goes by. For instance, for a sentence like 'At three o'clock, Mary was climbing Mount Toby', what counts as relevant is not Mary's physical conditions when she was a young child, or how tall Mount Toby was during the Paleolithic. On the contrary, it is their conditions at three o'clock that matters.

4.7.2 Integrating Habituality into the Picture

According to what I said in previous sections, habitual and continuous readings of imperfective sentences share the same temporal semantics. I argued there that the difference between those readings come from a difference concerning the plurality of the time intervals being quantified over, singular intervals in the case of continuous readings, plural intervals in the case of habituals. We have just seen that progressive sentences expressing continuous readings have also a modal component. I will now argue that habitual readings share the same modal component, thus maintaining the view that continuous and habitual readings have the same source (modulo number specification), namely, Imp morphemes: Imp, Imp_{sg} and Imp_{pl}. Consider the following scenario: John, who loves soccer, does not live far from college, where the only soccer field in the neighborhood is located. He goes there regularly to play with his friends. Sentence (54) below is true under these circumstances:

(54) John plays soccer.

(54) tells us something about John's current dispositions. Unless some external factor interferes, he will walk to the campus and play soccer again in the future, as he has been doing for a while. The proviso 'unless some external factor interferes' is crucial since a speaker who utters (54) does not commit himself to the existence of future events of John playing soccer regardless of what might happen to John. Thus, if John suddenly dies before tomorrow morning, of course, he will never walk to the campus again, let alone play soccer. Also, if tomorrow John gets a message saying that the campus has closed, and that all departments and facilities, including the soccer field, are being transferred to another location, which happens to be 10 miles away from John's house, he will stop playing soccer. But these possibilities do not interfere in the truth of (54). In assessing the truth of (54), we seem to ignore all possible interruptions of a current sequence of events of John playing soccer. In fact,

sentences like (55) can perfectly be true:

(55) John used to play soccer, when he died.

Notice the striking similarity between what we saw before in the case of continuous readings of progressive sentences, and what we have just seen above with respect to habitual readings. In particular, compare our discussions of (47), 'John was crossing the street', and (54). In the former, we discarded all potential external obstacles to the completion of a singular event, whereas in the latter we discarded all potential obstacles to the continuation of a sequence of events, which, according to our previous discussions, is nothing but a plural event. Since the singular/plural distinction was factored out from the meaning of Imp, it is natural to conclude that the modal component integrated into the meaning of Imp/Prog discussed in relation to continuous readings carries over to the cases involving habitual readings as well. In other words, the logical forms associated with continuous and habitual readings of imperfective sentences are identical, except for the number specification of the aspectual operator Imp. Before I go through the details of these logical forms, and discuss some important consequences, let me present another fact that strengthens the parallel between continuous and habitual readings. Recall Landman's discovery that in the case of sentences like (48), 'John was crossing the Atlantic', which are judged false if John is not a superhero, what is crucial is the fact that John's physical conditions, and the Atlantic's huge dimensions make it impossible for him to cross the ocean, even if we grant that external obstacles are going to be removed. Thus, in this case it is not enough that John believes he can cross the Atlantic, and intends to do so. The conclusion was that the actual physical features of the participants in the events described under VP are also taken into account by the circumstantial modal base. Are there similar situations involving habituality? I believe there are. Consider the following cartoonlike scenario: One of the hobbies of a certain superhero is to cross the Atlantic to keep his shape. However, yesterday night, while he was sleeping, he lost his superpowers forever, and became a normal human being. He does not know that, so tomorrow morning he will wake up and prepare for his exercise, just like he does every day. Now, sentence (56) below is not judged true, despite the fact that the superhero's dispositions have not changed.

(56) The superhero crosses the Atlantic.

As in the previous case, the relevant circumstances here take into consideration physical facts about the superhero and the ocean, and that is why the sentence is judged false. Thus, we seem to be dealing with the same kind of circumstantial modal base that Portner proposed for the continuous readings of progressive sentences. I will assume that is the case, and propose the (simplified) logical form in (57) for the habitual reading of sentence (54):

(57) $[_{\text{TP}}$ Pres$_i$ $[_{\text{AspP}}$ Imp-pl $[_{\text{VP-pl}}$ pl $[_{\text{VP}}$ John play soccer $]]]]$

The truth-conditions are given below:

(58) $[\![\text{TP}]\!]_w = 1$ *iff* for every world w' in BEST(M, O, w, t), there is a plural event e that occurs in w', such that Pres $\supseteq \tau(e)$ & *play_soccer*(e,j).

First, imagine (54) uttered at a time before the campus was closed. The set of worlds yielded by the circumstantial modal base M at that time would look like (59) below:

(59) M(w, t) = {John played soccer with his friends several times recently, John is in good physical conditions, John intends to play soccer again, there is a soccer stadium close to John's house, }

59 contains relevant information about John's physical and mental states at the utterance time, about the existence of a stadium in the neighborhood, and also about past occurrences of John playing soccer. I assume these are the minimal relevant circumstances taken into consideration by the modal base in simple habitual sentences.

What about the ordering source? The propositions in the set delivered by the ordering source O encode the conditions for a sequence of events of the type described under VP not to be interrupted. In our case we have something along the lines of (60):

(60) O(w,t) = {John does not die tomorrow, John does not get arrested, the stadium does not close, }

The set BEST (M, O, w, t) will then consist of the worlds in ∩M(w,t) which rank best according to O(w,t). (58) requires that there be a plural time interval at which John plays soccer in all these worlds. This plural interval should include the time of utterance. As a result, if John does not happen to be playing soccer right at the utterance time, (58) requires the existence of both past and future singular intervals at which John plays soccer. In our case, since M(w,t) and O(w,t) are consistent, BEST will contain worlds in which John keeps playing soccer. Therefore, the existence of future playing events in these worlds is guaranteed. Imagine, for instance, that John cannot control the movements of his legs anymore due to a tragic car accident, and that (54) was uttered after these facts became known. This crucial aspect of the new scenario has a direct impact on M(w,t):

(61) M(w, t) = {John played soccer with his friends several times recently, John cannot move his legs, there is a stadium close to John's house, }

Given (61), the worlds in BEST are not worlds in which there are future events of John playing soccer. As a consequence, they are not worlds in which there is a plural interval that includes the utterance time at which John plays soccer. (54) is correctly predicted to be false in this case.

As for past events, in the case of (54), it is quite likely that a person uttering that sentence intends to talk about John's routine, and if so it is natural to assume that the modal base contains information about whether or not there were previous playing events in the world of evaluation. Thus, in the scenario we had sketched above, the worlds in BEST are worlds in which there were events of John playing soccer before the utterance time, and (54) is correctly predicted to be true under those circumstances. Notice that the sentence would be false if John had never played soccer before the utterance time. Since M(w,t) would contain this information, there would never be a plural interval that included the utterance time in the worlds in BEST, at which John played soccer. I believe this is correct. If John had never played soccer before the utterance time, then (54) is unlikely to be judged true.

There are cases, however, that behave differently. In (62), for instance, what is likely to be at stake is not the actual behavior of the machine, but its design features and capabilities.

(62) This machine crushes oranges.

What (62) means is that the machine, if used appropriately (most likely as specified in the owner's manual or something equivalent), is capable of crushing oranges. My suggestion is that (62) should be treated on a pair with the sentence 'this machine can crush oranges', with the overt modal *can* replaced by a silent modal with the same meaning. Thus, (62), under its most salient reading, does not involve Imp-pl, and is therefore structurally different from the other simple present sentences that we have been discussing in this chapter. Evidence for this claim is that the presence of a singular indefinite does not make the sentence convey the idea of a sequence of events involving the same individual. For instance, if you come to me very proud of your new food processor, and tell me how easily it can peel an orange or an apple, I can reply pointing to my own machine and say:

(63) Well, this machine peels a pineapple.

This contrasts with the behavior of singular indefinites in cases where a habit is really what is at issue. That was the case with our previous example 'John smokes cigarettes/# a cigarette', which, as was discussed above, sounds weird when the singular indefinite is used, the reason being that for such a sentence to be true, according to the theory I proposed, the same cigarette has to be smoked again and again.

Notice that if the progressive is used, the ability reading does not seem an option.

(64) This machine is/has been crushing oranges.

We predict then that in its habitual (that is, non-continuous) reading, the sentence can only be true if a sequence of events of the type described by the sentence is already going on, which means that there must have been past events of the machine crushing oranges. That seems correct, and indeed, that is what we expect, if the logical form of (64) involves Imp-pl. Sentence (64) cannot be used to talk about a brand new machine that has never being put to use. We also predict that the use of a singular indefinite should make the sentence sound weird, conveying that the same orange is crushed multiple times. This prediction is borne out. Sentence (65) below cannot mean what (64) does:

(65) This machine is/has been crushing an orange.

Finally, and this is a purely speculative remark, simple present sentences used to describe profession-like activities, as in (66) below, also do not require any event of the relevant type to be true:

(66) John sells vacuum-cleaners.

Under the intended reading, (66) does not differ in meaning from (67), with the derived noun 'seller' being formed by the nominalizer suffix *-er* attaching to the stem *sell-*.

(67) John is a vacuum-cleaner seller.

Both (66) and (67) are true if John's job contract specifies that he is in charge of selling vacuum-cleaners, even if he has never sold any. It might be the case that English has a zero-affix, which is a verbal counterpart of the nominalizer *-er*, taking eventive predicates as its argument and returning stative, though still verbal, predicates. Of course, to substantiate the proposal, we would have to be precise about the meaning of these stativizer affix, and, ideally, find cross-linguistic evidence that there are overt counterparts of this morpheme. I will not undertake these tasks here.

Summarizing the discussion in this section, habitual readings of imperfective sentences can be analyzed as involving the same kind of modality observed in connection to continuous readings. Since their temporal components are also the same, we arrive at a unified semantics for the aspectual operators involved in imperfective sentences. The origin of the distinction lies elsewhere, in the number of the VP-predicate with which the imperfective operator combines: singular in the case of continuous readings, plural in the case of habitual readings. We discussed English sentences in the progressive and the simple present, but the same is true of the other instances of imperfectives that we mentioned before, such as the past imperfect in Romance.[14]

4.8 Quantification Over Ongoing Events and Double Modality

We have been assuming so far that the imperfective operator takes a set of events as its argument and returns a set of time intervals. We have also assumed that adverbs of quantification such as *always* and *usually* are event determiners that together with their implicit restrictors form generalized quantifiers that quantify over event variables. The same is true of QPs of the form *every time S*, where S is a sentential

[14] With the possible exception of Italian, whose Imperfect has been claimed to lack a modal component. Cf. Giorgi and Pianesi (1998).

constituent. However, there seem to be cases where these event quantifiers scope above the imperfective operator, suggesting that the result of applying this operator to a set of events is, in fact, another set of events, not a set of intervals. The clearest examples involve continuous readings with the progressive, as in the examples below:

(68) a. When I visit Mary, she is always eating an apple.

b. Every time I visit Mary, she is eating an apple.

In these cases, for every event of me visiting Mary, there must be an ongoing event of her eating an apple. Sets of ongoing events can also restrict the event quantifiers:

(69) a. When Mary is drinking a beer, she is always smoking a cigarette too.

b. Every time Mary is drinking a beer, she is smoking a cigarette too.

Quantification over intervals is not enough to handle these cases as the following exemple shows:

(70) When Mary is drinking a glass of wine, she holds it with her left hand.

Here, we need quantification over events. A scenario in which Mary is drinking two glasses of wine at the same time, holding one glass with her right hand and the other with her left hand would count as a counter-example to the truth of (70). Moreover, the most natural interpretation for the pronoun in the matrix clause is the definite description 'the glass of wine she (Mary) is drinking, something problematic if the restrictor is a set of intervals, some of them being intervals at which there is more than one glass of wine that Mary drinks.

Are there cases of habituals under the scope of an event quantifier? The sentences in (71) suggest that there are:

(71) a. When John plays golf, he always plays soccer too.

b. Every time John plays golf, he plays soccer too.

These sentences are actually ambiguous. First, they can mean that for every event of John playing golf, there is an event of him playing soccer. These are like the sentences discussed in Rothstein (1995), as we saw in chapter 2, in which every event described in the adverbial clause is matched by an event of the type described in the matrix clause. But these sentences can also mean that whenever John is in the habit of playing golf, he is also in the habit of playing soccer. Here, it does not matter if John plays golf daily, but play soccer once a week, for example. [15]

To allow for event quantifiers to scope above the imperfective operator, we need to revise the denotation of Imp, so that after combining with a set of events, it returns another set of events:

(72) $[\![\text{Imp}]\!]^w = \lambda\wp_{\langle s,vt\rangle}.\ \lambda e.$ for every world w' in BEST(M, O, w, τ(e)), there is an event e', such that $e \leq e'$, and $\wp(w')(e') = 1$.

The adverb of quantification in (69a), for instance, will then quantify over events that in the BEST-worlds ('the inertia worlds') are parts of (complete) events of Mary drinking a beer.[16]

Finally, since neither the imperfective morpheme nor the the event quantifiers discussed above have a time interval argument anymore, we need an operator that 'converts' sets of events into sets of intervals, otherwise the tense morpheme could not 'connect' to the rest of the sentence. To express the fact that the generalizations

[15] This ambiguity is not the same ambiguity discussed in Bonomi (1997a), who discusses the Italian counterpart of 'When Leo played golf, he won a lot of money', with both verbs in the past imperfect form. As noticed by the author, besides having a reading paraphrasible as 'there was a time t in the past, such that for every every event of John playing golf within t, there is a related event of him winning money', the sentence has also another reading in which the *when*-clause acts as a time frame, and not a restrictor of the adverb of quantification. Thus, if John used to play golf in 1980, the sentence would mean that in 1980, John used to win a lot of money, with no necessary correspondence between particular events of him playing golf and particular events of him wining money. The second reading I detected for (71a) and (71) is different from both readings discussed by Bonomi, and, as far as I can tell, was not addressed by him in his paper.

[16] Since the VP is singular in this case, the part-of relation should be understood here in a way that is parallel to the relation of material part of Link (1983). Thus, the event of Mary drinking the first half of a can of beer is a part of the event of her drinking the whole can of beer.

in (69) and (71) are described as ongoing at the utterance time, I assume that the inclusion relation between intervals is part of the meaning of this operator:

(73) $[\![\supseteq_i]\!] = \lambda \mathbf{P}_{\langle vt \rangle}.\lambda \mathbf{t}.\ \exists \mathbf{e} : \tau(\mathbf{e}) \supseteq \mathbf{t}\ \&\ \mathbf{P}(\mathbf{e}) = \mathbf{1}$

The logical form of the sentences in (69) and (71) will then display the following scopal ordering: $\supseteq_i \succ$ *always/every time* $\succ$ *Imp*

Notice that the events quantified over by the universal quantifiers need not be actual events, as attested by the fact that a sentence like (69a), for example, support counterfactuals as in the following passage: Mary is not drinking beer right now, but if she were, she would be smoking too. I conclude from that that the $\supseteq_i$ is also a modal operator restricted by a circumstantial modal base and a 'normality-based' ordering source. In other words, it is just like IMP, but relating the intension of a set of events and a time interval (the reference time) instead of an event. What (69a) says then is that in every world w in which Mary is just like she is in the actual world and nothing extraordinary happens, there is an event whose time t includes the utterance time, and for every event included in t that becomes an event of Mary drinking a beer in all the worlds in which Mary is just like she is in w and nothing extraordinary happens, there is an event in w that becomes an event of Mary smoking a cigarette in all worlds in which she is just like she is in w.

4.9 Conclusion and Open Issues

This chapter provided a unified semantics for continuous and habitual readings of imperfective sentences. Based on the assumption that there are both atomic and non-atomic events, I argued that the only difference between continuous and habitual readings concerns the number (singular or plural) of the events that are quantified over in the logical form of the sentences. I proposed that the source of imperfectivity is an aspectual operator, which introduces existential quantification over events and universal quantification over possible worlds. We went through several cases suggesting that both readings involve the same kind of modality, one that involves a circumstantial modal base and an ordering source based on an ideal in which an ongoing event of the kind described by the sentence is not interrupted by external factors, as proposed by Portner (1998) for the English progressive. I argued that the difference between continuous and habitual readings is related to the fact that in the former it is singular events that are not interrupted, whereas in the latter it is plural ones that are not. I looked at different imperfective operators in Romance and English, and concluded we can reduce the difference between them to the number specification restricting the kinds of events they can quantify over, in a way that is very similar to what happens with determiners in the nominal domain.

Before finishing, I will add some remarks about two constructions whose meanings share certain features with the meaning of imperfective sentences, which suggest that there might be a common core underlying them. How to adequately represent these commonalities is a question that I will leave open.

4.9.1 Imperfectivity and *before*-clauses

We have seen how examples such as (74a) and (74b) were used to motivate a modal analysis of the progressive (Dowty 1977; Landman 1992; Portner 1998 among others), one that does not enforce the existence of an event of the type described by the sentences in the actual world, but only in the worlds that share with it the relevant circumstances at the reference time (the time of the when-clauses in (74)), and in which no external obstacle intervenes.

(74) a. John was crossing the street, when Mary saw him.

b. John was crossing the street, when a bus hit him.

In the case of (74a), for instance, after the sentence is uttered, we come to know that the circumstances were such at that time when Mary saw John, that, if no external obstacle intervened, John would cross the street. Whether John actually crossed the street or not remains open. (74b) is similar, except that, due to our knowledge that people hit by buses get seriously injured, we are likely to conclude that John did not cross the street. The statement then gets a counterfactual flavor: if the bus had not hit John, he would have crossed the street.

Consider now (75):

(75) a. John left the party before there was any trouble.

b. The police defused the bomb before it exploded.

After (75a), we conclude that the circumstances were such at the time when John left the party that, if nothing extraordinary happened, there would be trouble. Whether there was trouble or not remains open. (75b) is similar, except that world knowledge leads to the inference that if the bomb was defused, it did not explode. The statement then gets a counterfactual flavor: if the bomb had not been defused by the police, it would have exploded.

Examples like (75a) and (75b) have been recently used by Beaver and Condoravdi (2003) to motivate a modal analysis of *before*. In fact, their analysis shares several aspects of modal analyses of the progressive, although they did not establish any connection between *Prog* and *before*. Is the parallel between (74a)-(74b) and (75a)-(75b) accidental? It is interesting that both the progressive and *before* are used to locate some event in the **future** of another event: in the case of the progressive, it is the culmination of the event described by the sentence that is put in the future of the 'reference time', and in the case of *before* it is the event in the subordinate clause that is put in the future with respect to the time of the event of the matrix clause. I suspect that we are facing a semantic universal here: every lexical item whose meaning involves futurity, in the sense described above, is a modal operator.

4.9.2 Habituals and *for*-adverbials

The standard characterization of the distribution of *for*-adverbials is that they combine with atelic, but not with telic predicates.

(76) a. John was sick for two days.

b. John slept for two hours.

c. * John ate the cake for 40 minutes.

d. * John reached the top for 10 minutes.

However, telic predicates are fine under the so-called iterative reading(Dowty 1977; Zucchi and White 2001; van Geehoven 2004):

(77) a. John dialed the number for ten minutes.

b. John kicked the ball for twenty minutes.

When it comes to their interaction with indefinites, the iterative reading of *for*-adverbials and the habitual readings that we discussed in connection with the simple present behave strikingly similar. When a singular indefinite is used, for instance, a sentence with a *for*-adverbial can only be true if there are multiple events involving the same individual:

(78) John dialed a local number for ten minutes. (it has to be the same number)

The situation changes when bare plurals are used:

(79) John dialed local numbers for ten minutes.(he dialed more than one number)

With other plural indefinites the same (plural) individual is involved:

(80) a. John dialed two numbers for ten minutes. (the same two numbers)

b. John hit some golf balls for 30 minutes. (the same balls)

If a universal quantifier intervenes between the indefinite and the adverbial, the requirement that the same individuals be involved disappears, as can be observe in the example below:

(81) John hit fewer than four balls every 20 minutes for 2 hours.

All this replicates what we saw in this chapter with respect to habitual readings of imperfective sentences.

(82) a. Mary babysits a boy. (the same boy multiple times)

b. Mary babysits three boys. (the same three boys multiple times)

c. Mary babysits a boy every night. (possibly different boys)

Should we conclude that *for*-adverbials in the sentences above and the operator *Imp* that we postulated for English simple present sentences introduce the same kind of quantification over events? Although it is tempting to answer this question positively, things become more complicated once we realize that despite all the similarities shown above, there are crucial differences as well. For instance, an activity predicate in a simple present sentence gives rise to a habitual reading only, and a sentence like (83) is never about a (singular) ongoing event of John jogging, but rather about multiple events of him jogging (plus modality effects, which I am disregarding here).

(83) John jogs.

But a *for*-adverbial can combine with an activity predicate and measures a singular event. In other words, what is being measured in (84) below is the duration of a singular event of John jogging. There is no requirement of there be multiple jogging events, contrary to what happened in (83):

(84) John jogged for two hours.

Of course, iterative readings are also possible with this kind of predicate, but the relevant point here is that they are not forced by the presence of the adverbial, as it is in the presence of the morpheme Imp, which we assumed is part of the logical form of a sentence like (83).

Another point that is worth mentioning is the fact that singular indefinites within stative predicates under the scope of a *for*-adverb do not necessarily convey that the same individual is being referred to throughout the interval measured by the adverbial phrase:

(85) John owned a car for five years.

This sentence would be true if John changed his car every year, but never being without one during the whole five-year period. The same can be said of plural indefinites. Thus, for (86) to be true, John does not have to have owned the same three cars for five years.

(86) John owned three cars for five years.

Examples (85) and (86) contrast then with the examples in (80) and also (82a) and (82b). Why this is so remains an open issue, whose investigation will certainly require a better understanding of how telicity, event plurality and quantification interact.[17]

[17] For discussions of telicity in event-based frameworks, see Krifka 1998; Rothstein 2004; Schein 2002.

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