Individual-level Predicates and When-Conditionals

MSc Thesis (*Afstudeerscriptie*)

written by

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To whom it is dedicated to

Contents

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- Michel de Montaigne

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1 Introduction

The present thesis, as the title suggests, is primarily concerned with the distinction between *stage-level predicates* (henceforth SLPs) and *individual-level predicates* (ILPs) and particularly with what we might call *when-conditionals*. The distinction between SLPs and ILPs was first proposed in Carlson's dissertation [8] in which he divides the class of predicates into individual-level, stage-level and kind-level, roughly pertaining to how a given predicate relates to its subject.[1]

According to Carlson, the class of individual-level predicates consists in the stative verbs[2], all predicative NPs ('*be a man*', '*be a mammal*', etc.) and adjectives like '*intelligent*', '*tall*', '*blue*' (vs. '*drunk*', '*available*', etc.). Roughly speaking, individual-level predicates are thought has expressing 'permanent' properties whereas stage-level predicates are assumed to denote 'transient' or 'episodic' ones. For instance, to take only one example from the data, 'John is *tall* in the car.' is odd because *tall* is an individual-level predicate i.e., roughly speaking, it denotes a permanent property (and so, as has been assumed, cannot be restricted to a location). On the other hand, an adjective like '*drunk*', which is stage-level, is perfectly fine in a similar sentence: 'John is *drunk* in the car.'

Since this first proposal, the SLP/ILP distinction has received a considerable amount of attention and different key properties have been identified in the literature as criteria for the characterization of individual-level predicates. Several authors (including Carlson [8], Diesing [19], Kratzer [38] and Chierchia [11]) have claimed that SLPs and ILPs have fundamentally different grammatical properties and that the distinction has repercussions in several modules of grammar.

The first two sections will be dedicated to their proposals. In section 2, I will briefly present the various contrasts that have been proposed as characterizing the SLP/ILP distinction. Those contrasts have been considered as genuine grammatical differences by the aforementioned authors. In this section, these contrasts will be presented under this perspective, i.e. the contrasts are presented as being *the data* to be explained. In section 3, I will present the three main theories aimed at giving a uniform account to the data, namely Carlson's, Kratzer's and Chierchia's. We will begin with Carlson's theory which consists roughly in a sortal distinction. Whether a predicate is stage-level or not boils down on what it takes as its argument, a stage-level predicate takes *stages* as its arguments and an individual-level predicate takes *individuals*; where a stage should roughly be thought as a temporal slice of an individual. In other words, Carlson proposes an ontological difference between two kind of entities in the domain: individuals and stages. The former being 'four-dimensional worms' made up of *stages*.

Kratzer and Chierchia's theories do not make an ontological distinction. Kratzer's theory is that stage-level predicates, as opposed to individual-level predicates, have an 'extra'

[1] Note that Milsark should also be considered as a precursor of the distinction. In his PhD thesis ([46]), he indeed divides the predicates in two groups, *state descriptions* and *properties*, roughly corresponding to SLPs/ILPs, respectively.

[2] like '*know*', '*love*', '*hate*', etc. (vs. '*hit*', '*run*', etc.)

place for a *Davidsonian argument* that should be thought as a spatiotemporal location variables. For example, the logical form of 'Mary is drunk' would be something similar to '$D(m, l)$' (as opposed to '$D(m)$'), where 'l' is the Davidsonian argument. Chierchia, on the other hand, assumes that all predicates have a place for a Davidsonian argument; the difference being that the lexical entry of an individual-level predicate triggers a phonetically covert quantifier in its semantical representation that bounds it.

Two main theses will be defended against the aforementioned authors. The first is that the contrasts that have been subsumed under the SLP/ILP distinction form a disparate set. Section 4 will be dedicated to this issue, where the data identified as belonging to the SLP/ILP distinction will be analyzed in detail. As I will show, the observed contrasts are not uniform but rather a collection of related but different distinctions.

The second thesis is that the predicates called SLPs and ILPs do not differ in their grammatical properties. As I will argue, the main difference between the two kinds of predicates resides in world knowledge: there is no genuinely grammatical distinction between SLPs and ILPs that reflects some fundamental conceptual split. As a matter of fact, the classification of a predicate as belonging to one class or the other turns out to be highly dependent on world and contextual knowledge, while lexical properties are commonly considered to be far less flexible.

The second part of the present thesis will be focused on when-conditionals, one of the main contrasts subsumed under the SLP/ILP heading. When-conditionals are sentences where the when-clause does not set a topic time, as in 'When I was a kid,...', but rather serves as a protasis (i.e. the subordinate clause of a conditional sentence). A prototypical example of when-conditionals is a sentence where the situation described in the when-clause held at least twice at different moments and the consequent is said to hold at these times. For instance, (1-a) is a when-conditional whereas (1-b) is not:

(1) a. When I go to my office, I usually take my umbrella with me.
b. When I went to my office yesterday, I realized I had forgotten my umbrella.

In section 6, we will thus briefly discuss some aspects of when-constructions and which properties they have. This should give us a minimal set of requirements for their semantics. Finally, I will propose a minimal account for when-conditionals in a dynamic framework close to Groenendijk and Stokhof's Dynamic Predicate Logic ([24]) and Veltman's Update Semantics ([67], [66]). The idea is to use DPL in a framework able to model world knowledge. The account is minimal in multiple respects. For instance, when-constructions, as will be explained in section 6, have very particular properties with respect to their behavior with tenses and adverbs of quantification like '*usually*', '*always*', '*sometimes*', etc. Problems with the formalization will be pointed out along the way and possible extensions of the framework will be discussed. The formalization of when-conditionals that will be presented here is not aimed to be definitive or complete but a step forward in their understanding.

2 A Brief Survey of the Data

Various types of data have been proposed to follow from the individual-level/stage-level predicate distinction. In this section, we briefly present them in order to introduce in the next section the theories created to account for them. This section is only a preparation for subsequent ones: the data presented here will be analyzed in more detail afterward.

2.1 Stable Stativity

One of the first, and probably most intuitively appealing contrasts subsumed under the SLP/ILP distinction is that individual-level predicates are considered to be aspectually stative. For instance, they are considered to be ungrammatical in the progressive and to have the subinterval property (i.e. If ϕ is true at an interval t, ϕ is true at all subintervals $t' \subseteq t$).

The only statives that are stage-level are adjectives which express "transient" or "episodic" properties (like *being drunk* or *being sick*, for example) and pure locatives (like *being on the roof*). The difference manifests itself in the behavior of temporal adverbials as one can notice in the following examples.

(1) a. Alice was drunk yesterday/last month/a year ago.
b. ?Alice was tall yesterday/last month/a year ago.

The interpretation of (1-b), as opposed to (1-a), seems to require a special scenario. For instance, one could imagine that Alice suffers from a strange disease that affects her height or that she has some kind of pills that make her tall or small.[1]

Thus, the distinction is not sharp but rather vague. For instance, in uttering "John is sick", one could mean that John is chronically sick, or that he has an occasional ailment. "Sick" could thus be classified as belonging to both classes. As in (1-b), it is generally possible to turn verbs that are normally classified as stable into transient ones, given some special context. Consider the following examples from [11]:

(2) a. John was intelligent on Tuesday, but a vegetable on Wednesday.
b. A friend of mine likes DRT on Mondays and Thursdays and hates it on Tuesdays and Fridays.

The examples in (2) are usually considered to present a shift from ILP to SLP (akin to the shift from mass nouns to count ones). According to most authors, this distinction is a deep conceptual one.

Thus, the first claim that has been proposed concerning the ILP/SLP distinction is that it

[1] The reader who doubts this scenario is invited to "go ask Alice, when she's ten feet tall." (From the Jefferson Airplane' song *White Rabbit*.

allegedly corresponds to a conceptual split between permanent and transient (or episodic) properties.

2.2 There-Insertion

One of the first grammatical structure that appears to single out individual-level predicates is the existential construction with "there". In particular, the coda position of there-sentences does allow adjectives, as in (3-a,c,e), but as it seems to turn out, only stage-level ones (as in (3-b,d,f)).

(3) a. There are firemen available. (SLP)
b. *There are firemen altruistic. (ILP)
c. There are two men drunk/ sick/ available. (SLP)
d. *There are two men intelligent/ white/ altruistic. (ILP)
e. There are several people sick. (SLP)
f. ?There are several people tall.[2] (ILP)

As Chierchia noted, this cannot be construed as a ban against stativity since all adjectives are aspectually stative. It thus seems that we are facing a genuine grammatical manifestation of the ILP/SLP distinction.

Another related observation is shown in (4) [3]:

(4) a. [Workers drunk on workdays] drive Kelvin crazy. (SLP)
b. ?*[Kids intelligent] drive Kelvin crazy. (ILP)

The stage-level predicates hence seem to be the only predicates available to occur as adjectives in the final position of there-sentences. Moreover, they also seem to be the only predicates that can occur in the coda of an NP as seen in (4).

2.3 Bare Plurals & Subject Effects

Another prominent property of individual-level predicates is that they select the universal (or generic) reading of bare plurals, in contrast with stage-level predicates:

(5) a. Humans are mammals. (only generic) (ILP)
b. Firemen are altruistic. (only generic) (ILP)
c. Dogs hate cats. (only generic) (ILP)
d. Lions have manes. (only generic) (ILP)

[2](3-a-d) from [11] & (3-e,f) from [47]
[3]From [62]

(6) a. Firemen are available. (existential or generic) (SLP)
b. Dogs are barking in the courtyard. (existential or generic) (SLP)

This observation played a central role in the theory of Carlson [8]. According to the Milsark-Carlson[4] generalization, ILPs block the existential reading of bare plurals, whereas SLPs allow it:

Milsark-Carlson Generalization:

1. ILPs force the generic reading of bare plural subjects.
2. SLPs allow both the existential and the generic readings of bare plural subjects.

For instance, the bare plural subjects in (5) must all be interpreted universally (or generically) and the bare plural subjects in (6), on the other hand, are naturally interpreted existentially: for bare plurals in (5) an existential interpretation is just impossible.[5]

The two interpretation are thus translated into logical forms as in (7) and (8).[6]

(7) a. Firemen are available.
b. $(\mathbf{G}x : \mathbf{firemen}(x))[\mathbf{available}(x)]$
c. $\exists x[\mathbf{firemen}(x) \wedge \mathbf{available}(x)]$

(8) a. Firemen are altruistic.
b. $(\mathbf{G}x : \mathbf{firemen}(x))[\mathbf{altruistic}(x)]$

This phenomenon is however not restricted to bare plurals. As a matter of fact, Diesing [19] notices that it also occurs with singular indefinites[7]:

(9) a. A fireman is available (existential/generic)
b. A fireman is altruistic (only generic or specific)

Likewise, the range of possible interpretations of weakly quantified subjects is more limited with ILPs than with SLPs. In the latter case, a quantifier like *three children* may

[4]Milsark, in [46], divides the predicates in two groups: state descriptions and properties (which correspond to SLPs and ILPs, respectively). According to his theory, properties (i.e. ILP) can only be predicated of NPs with strong determiner phrases (like *every, the, most, each...*).

[5]Notice that the *object* in (5-d) is interpreted existentially. Sentence (5-d) says roughly that for every lion there is a mane that it has. The object in (5-c) is instead interpreted universally. Sentence (5-c) says that for every dog and every cat the former hates the latter.

[6]Where **G** is some kind of 'Generic quantifier'.

[7]Diesing also notices a syntactic manifestation of this phenomenon in German, what has been called "Diesing's Conjecture". Here are two examples illustrating this:

(i) a. Lehrer haben uns viele geholfen.
b. *Lehrer wissen das viele.

I will return to this point in section 3.2.

be read existentially or partitively. With SLPs, only the second reading is possible (cf. section 4.1.3).

(10) a. Many firemen are available (existential and partitive)
b. Many firemen are altruistic (only partitive)

A further interesting fact, noted by Kratzer [38] is that subjects of individual-level unaccusatives (or passives) can be interpreted existentially. For example:

(11) a. Ponds belong to this property.
b. Counterexamples to this claim are known to me.

Quite clearly, (11-a)'s most natural interpretation is that there are ponds that belong to this property. Similarly for (11-b). Kratzer thus restricted the Milsark-Carlson generalization as:

Milsark-Carlson Generalization (Kratzer's Formulation):

i. The bare plural subject of non-unaccusative individual-level predicates must be interpreted universally.

ii. The bare plural subjects of individual-level unaccusatives and passives, as well as other bare plural arguments of individual-level predicates, can be interpreted existentially.

It thus seems that the ILP/SLP distinction plays an important role in the sentences having bare plural subject: ILPs, in most cases, force a generic reading of the bare plural, but SLPs generally allows an existential one.

2.4 When-Clauses and Restrictions on Modifying Adverbials

Kratzer [38] notes that clauses headed by an ILP cannot serve as the *restrictor* in *when*-conditionals, if all its arguments are definite[8] This observation is exemplified in the following:

(12) a. *When Mary knows French, she knows it well. (ILP/def)
b. When a Moroccan knows French, she knows it well. (ILP/indef)
c. When Mary knows a foreign language, she knows it well. (ILP/indef)
d. When Mary speaks French, she speaks it well. (SLP/def)

[8]She actually says that ILPs can be used in this context, "provided the subject is indefinite". More on this later.

(13) a. When John is drunk, he is always obnoxious.
b. ?When John is intelligent, he is always pleasant.[9]

The sentence in (13-b), which involves an individual-level predicate (*being intelligent*), sounds odd, in contrast with the fully parallel stage-level sentence in (13-a), which is quite natural.[10]

A closely related pattern can also be observed in the absence of a when-clause. Only SLPs can be modified by temporal or frequency adverbials (when the predicate doesn't have an indefinite or a bare plural argument):

(14) a. John always speaks French. (SLP/def)
b. ?John always knows French. (ILP/def)
c. A Moroccan always knows French. (ILP/indef)
d. Moroccans always know French. (ILP/indef)
e. Peter spoke English today/several times. (SLP/def)
f. *Peter knew English today/several times. (ILP/def)

Thus here, too, we seem to have found a pretty regular behavior. The generalization seems to be that sentences involving an adverb of quantification and an individual-level predicate must for some reason have an indefinite or a bare plural as argument.

2.5 Locatives

Another observation concerning the ILP/SLP contrast is that it is generally impossible to modify an individual-level predicate by a locative. This is shown by the following kind of contrast:

(15) ILP:
a. *John is blond/intelligent/a linguist in his car.
b. *John is intelligent in France.
c. *John knows Latin in his office.

(16) SLP:
a. John is always sick in France.
b. John works in his office.

[9] From [11]

[10] Kratzer also notices that *when*-clauses are more selective than *if*-clauses in that they are not able to restrict epistemic modals. Hence the following contrast:

(i) a. *When the library has this book, it must be on the second floor.
b. If the library has this book, it must be on the second floor.

Interestingly, it seems that when a *when*-construction is 'ungrammatical' (or sounds odd), its *if*-counterpart triggers an epistemic reading as exemplified by (i).

c. Maria was tired/hungry/nervous in the car.

As Chierchia puts it:

> "Intuitively, it is as if individual-level predicates were, so to speak, unlocated. If one is intelligent, one is intelligent nowhere in particular. Stage-level predicates, on the other hand, are located in space." [11], p.178

This observation, as we shall see, plays a prominent role in his theory.

2.6 Perception Sentences

As Carlson observed, local PPs are virtually always acceptable in the complement of perception verbs, and nominals are generally excluded.

(17) John saw Mary in the trunk of the car.

But individual-level predicates do not occur felicitously within the 'small clause' complements of perception verbs. For example, consider:

(18) ILP:
a. *I saw John a linguist.
b. *I saw John tall.
c. *I heard John like Mary.

(19) SLP:
a. I saw John drunk.
b. I heard Mary beat John.

At first sight, those examples are quite puzzling. Notice that we cannot explain this by saying that certain states cannot be perceived. As a matter of fact, Height, for instance, is prominently perceivable. Hence, one can see whether John is tall or not. Yet, we cannot describe the perception that John is tall using (18-b). Moreover, one cannot get away with explaining the ungrammaticality of (18-a-c) by saying that it is due to a ban against having states in the complement of perception reports, for "drunk" in (19-a) is a state. It thus seems that perceptual reports seem to exclude just individual-level predicates.

Furthermore, note that the contrast is not exclusively restricted to perception sentences. For instance, closely related phenomenon is seen in:

(20) a. I want Mary happy. (SLP)
b. ?*I want Mary intelligent. (ILP)

In (20), the *want* behaves like in perception reports i.e. ILPs seem to be forbidden in the small clause. Related examples are provided by Higginbotham in [27].

(21) a. The sight of *the crown drunk* sent the kids into tears.
b. ?*The sight of *the crown tall* sent the kids into tears.
c. *The consideration of *Romeo young* tickled Juliet.

Here, again, we seem to have found a regular behavior of perception (and other kind of) verbs with respect to the ILP/SLP distinction: Only stage-level predicates can occur felicitously within the 'small clause' complements of these verbs.

2.7 Lifetime Effects

As Jäger notes [30], predicates in natural language are often relativized to a time of a evaluation. Except in marginal cases (like mathematics, for instance), we are never able to infer from the fact that a predicate holds of some individual at a particular time that it holds at any other time.

(22) Peter is altruistic
Peter will still be alive in ten years
$\not\Rightarrow$ Peter will be altruistic in ten years.

However, the following observation usually holds:

(23) Peter is altruistic
Peter will still be alive in ten years
?$\Rightarrow$ It is more likely that Peter will be altruistic in ten years than that he is not.

(24) Peter is available
Peter will still be alive in ten years
$\not\Rightarrow$ It is more likely that Peter will be available in ten years than that he is not.

A related fact has been noticed by Kratzer [38] and has been subsumed under the heading 'Lifetime Effect' by Musan [50] afterwards. As Kratzer noted, the tense of a clause headed by an ILP apparently applies to the time of existence of the referent of the subject rather than to the predicate itself. So from (25-a) we may infer that Greg is dead, while no such implicature arises from (25-b), where the predicate is stage level.

(25) a. Greg was from America.
b. Greg was in America.
c. My mother had blue eyes.
d. My mother had an headache.

It thus seem that a past tense clause headed by an ILP implicates that the subject is dead which is not the case with SLPs.

2.8 Predicative Adjuncts

The final set of examples that we will consider has been noticed by Rapoport [58] and McNally [44]. They observed that individual-level predicates are excluded in predicative adjuncts. For instance, consider the following:

(26) a. We ate the vegetables raw.
b. ?We ate the vegetables organic.

(27) a. Fleisher played the piano injured.
b. ?Fleisher played the piano talented.

(28) a. John is happy naked.
b. John ran tired.

(29) a. *John is intelligent naked.
b. *John is left-handed tired.
c. *John is happy far-sighted.
d. *John is angry tall.

The contrasts involving depictive and circumstantial[11] adjuncts are illustrated in the previous examples. It appears that only stage-level predicates can serve as such adjuncts.

All the observations that we have seen so far have been subsumed under the ILP/SLP distinction. In the following section, we will present the main theories created in order to account for them. And we shall then return to this data afterward, where all those observations will be studied thoroughly.

[11]Following McNally [44], I use 'circumstantial' for subject-controlled adjuncts, 'depictive' for non subject-controlled adjuncts, and 'predicative' to cover both.

3 Previous Approaches

3.1 Carlson's Theory

Introduction

In order to account for the data presented in the previous section[1], Carlson [8] assumes that stage-level properties and individual-level properties are properties of different types of entities. His solution is thus an ontological one. Indeed, Carlson subscribes to the ontological theory known as 'Four-dimensionalism'[2]. Four-dimensionalism is the thesis that everyday objects (such as you, me, computers and cups of coffee) are "space-time worms" that persist through time by having temporal parts (or *stages*) none of which is identical to the object itself. Objects are aggregates or mereological sums of such temporal parts. In other words, each objects consists of many different 'stages' at different locations and times, and stages are to be thought of as space-time slices of individuals.

Carlson thus postulated a sorted intensional logic similar to Montague's PTQ[3]. He assumes that the set of entities relevant for natural language semantics is split into three hierarchically organized sorts: kinds, objects and stages. Objects correspond to particular objects like John and a particular dog, kinds to generic (kind-referring) NPs like "dogs", "mammals", etc. Kinds and objects are subsumed under the *super-sort* of individuals. That is, the set of individuals, I, is all the objects and kinds combined[4].

Corresponding to the sortal distinctions, we can distinguish between properties of individuals (that are expressed by ILPs) and properties of stages (corresponding to SLPs). SLPs are of type $\langle e^s, t\rangle$ and ILPs of type $\langle e^i, t\rangle$. For example, consider the following sentence:

(1) John is intelligent.

According to Carlson, *John* is an individual of type $\langle\langle e^i, t\rangle, t\rangle$ and *intelligent* is an ILP of type $\langle e^i, t\rangle$. Since *John* and *intelligent* have compatible *sorted* types (i.e., both contain individual level entities $\langle e^i, t\rangle$), the two can combine to make a well formed sentence through functional composition.

Carlson assumes that NPs always denote quantifiers over individuals. In analogy to proper nouns that are names of objects, bare plurals are considered to be names of kinds. Since quantifiers over individuals cannot be combined directly with properties of stages, predication with SLPs has to mediated by a template that transforms SLPs into ILPs. For instance, 'available', being a SLP, so of the type $\langle e^s, t\rangle$, and 'John' being

[1] Note that Carlson was mainly interested by the contrast observed with bare plurals, see section 2.3

[2] The main virtue of four-dimensionalism is that it does away with the problem of identity through change. See, for instance, Quine [57] for a thorough defense of this position. On the general aspects of Four-dimensionalism, the reader is invited to take a look at [61].

[3] See [49]

[4] Notice here that *kinds*, being *individuals*, are also made of *stages*.

an individual-level subject $\langle\langle e^i, t\rangle, t\rangle$, 'John' and 'available' cannot directly compose. To get the proper interpretation of copular constructions involving SLPs, he introduces a relation $\mathbf{R}(a, b)$ between stages and individuals, which is true if and only if a is a stage of b[5]. The mediation between individual subjects and stage-level predicates is done by the copula (be_2). Its semantics is given by Carlson as

(2) $\lambda P^s \lambda x^i . \exists x^s (\mathbf{R}(x^s, x^i) \wedge P^s(x^s))$

where superscripts on variables indicate the sort of the respective variable as ranging over (properties of) stages or individuals. Thus (ignoring matters of tense) a sentence like (3-a) in its existential reading will receive the translation (3-b).

(3) a. John is available.
b. $\exists x_s(\mathbf{R}(x_s, \mathbf{John}) \wedge \mathbf{available}(x_s))$

Crucially, the existential quantifier in (3-b) originates in the lexical meaning of the copula. If a verbal SLP is combined with a subject, the operation corresponding to the meaning of this copula (be_2) is applied to the meaning of the VP without syntactic manifestation. ILPs can be combined with their subjects directly. So in copular constructions involving ILPs, the copula has no semantic function and thus denotes just the identity map on properties of individuals. Hence, as we have seen, the only possible translation of (4-a) is (4-b).

(4) a. John is intelligent.
b. $\mathbf{intelligent}(\mathbf{John})$

So in order to avoid sortal conflicts, the stipulation of two homonymous copulas is inevitable in Carlson's approach, and this homonymy is central for his explanation of the interpretation of bare plurals.

Bare Plurals

On Carlson's analysis, bare plurals are always interpreted as names of a kind. Given that 'available' and 'altruistic' are stage-level and individual-level, respectively, their respective meanings are given in (5).

(5) a. available
$\lambda y^i \exists x^s [\mathbf{R}(y^i, x^s) \& \mathbf{available}(x^s)]$

[5]The proper rule for using $\mathbf{R}$, of type $\langle\langle s, \langle e^s, t\rangle\rangle, \langle e^i, t\rangle\rangle$, to convert SLPs into functions of individual level entities is given ([8], p.169) by:

S23 If $\alpha \in P_{IV}$ and α is of the form $[\beta]_V(\delta)$, then $\mathrm{F}_{21}(\alpha) \in P_{IV'}$, where $\mathrm{F}_{21}(\alpha) = [\alpha]_{IV'}$.

T23 $\mathrm{F}_{21}(\alpha)$ translates as $\lambda x^i \exists z^s [\mathbf{R}(z^s, x^i) \wedge \alpha'(z^s)]$.

b. altruistic
$\lambda y^i[\mathbf{altruistic}(y^i)]$

Thus, the two different copular constructions involving the bare plural 'firemen' are given as follow:

(6) Firemen are available.
$\exists x^s[\mathbf{R}(\mathbf{Firemen}, x^s)\&\ \mathbf{available}(x^s)]$

(7) Firemen are altruistic
$\mathbf{altruistic}(\mathbf{firemen})$

(6) illustrates the existential reading of bare plurals and (7) the generic reading. The latter says that the kind of firemen is altruistic while the former says roughly that there is some stage x^s the realizes the kind of firemen and x^s is available.

However, we have seen in section 2.3 that sentences like (6) have also a generic reading[6], roughly translated as

(8) Firemen are usually available.

In order to account for this, Carlson introduces a generic operator **G**. Carlson postulates that **G**, of type $\langle\langle s, \langle e^s, t\rangle\rangle, \langle e^i, t\rangle\rangle$, is always available during the derivation.[7] In other words, one can always apply the rules for **G** instead of the rules for **R**. On its generic reading, "firemen are available" is thus translated as

(9) $\lambda P^{\vee} P(\mathbf{firemen})(^{\wedge}\mathbf{G}^{\wedge}\mathbf{available}) = \mathbf{G}(^{\wedge}\mathbf{available})(\mathbf{firemen})$

The **G** operator is subject to restrictions formalized as meaning postulates. The idea behind its behavior is the following. Let us take any stage-level predicate ϕ and let m_n with $n \in \mathbb{N}$ to represent stages. If $\phi(m_1), \phi(m_2), \phi(m_3), ..., \phi(m_n)$ is true for enough times, and $m_1, m_2, m_3, ..., m_n$ are stages of b, then $\mathbf{G}(^{\wedge}\phi)(b)$ is considered to hold. Carlson call this process Generalization and postulates that there must be at least two different occasions in which it holds to be true. For instance, 'John smokes' on its generic reading will be true if and only if there exists at least two occasions where John is actually smoking is true.

[6] As genericity is not the prime purpose of this thesis, we will not go into it much detail here. For more discussion on this topic, see e.g. [8] and [39].

[7] The proper rule for using **G** is given ([8], p.169) by:

S21 If $\alpha \in P_{IV}$ and α is of the form $[\beta]_V(\delta)$, then $\mathrm{F}_{19}(\alpha) \in P_{IV'}$, where $\mathrm{F}_{19}(\alpha) = [\alpha]_{IV'}$.

T21 If α translates as α', $\mathrm{F}_{19}(\alpha)$ translates as $\mathbf{G}[^{\wedge}\alpha']$.

where the expression $[^{\wedge}\alpha]$ is, as usual, interpreted as denoting the *intension* of the expression α.

In summary, Carlson formulates a sorted type intensional logic to distinguish SLPs and ILPs. Two new functions, **R** and **G** are used to produce the generic and existential readings for bare plurals with SLPs.

There-Insertion

In order to account for the ungrammaticality of individual-level in the coda position of there-sentences, Carlson proposed the following rule:

S27 If $\alpha \in P_{IV}$ and α is of the form $[_{IV} be_2 X]$,
and if $\beta \in P_T$ and β is not of the form $[_T he^h_n]$ or $[\$they^h_n]$,
then $F_{22}(\alpha, \beta) \in P_t$,
where $F_{22}(\alpha, \beta) = [_t[_T \text{There}]\text{to}][_{IV} be_2 \beta X]]$

The rule won't operate if the predicate does not begin with be_2 and hence, only stage-level predicates can appear in the last position of there-sentences thus avoiding sentences like

(10) *There are men intelligent.

and avoiding there-constructions where the subject NP is a variable (i.e. avoiding wide-scope readings for the subject.)

As he noticed himself[8], the rule **S27** is however incomplete in a number of different ways. First of all, nothing is said about definiteness restriction on the subject NP as in

(11) ??There is the man over here.

Moreover the passive *be* is not included, nor will the rule work for predicates other than *be*. Finally, the theory is not able to give us sentences like "there are kangaroos" (which may however be a distinct case of there-insertion). At the end, this rule can only be a rough approximation of the phenomenon involved in there-sentences.

Perception Sentences

Carlson analyzes *see* in sentences like "I saw them drunk" as if it says that the subject saw a *stage* of the direct object. He thus defines see_2 as a function which takes an IV phrase to make a transitive verb:

$\boldsymbol{see_2}$ $\lambda Q \lambda P \lambda x^i \, {}^\wedge P(\hat{y}^i \exists w^s \exists v^s [\mathbf{R}(w^s, x^i) \wedge \mathbf{R}(u^s, y^i) \wedge \underline{see}^+(w^s, v^s) \wedge^\vee Q(v^s)])$

[8] [8], p.128

The contrast in perception reports thus fall out straightforwardly from Carlson's sortal distinction. He assumes that a verb like see_2 primarily denotes a relation between stages, while the embedded predicate is considered to be a secondary predicate applying to the accusative NP. So (12-a), for instance, is translated as (12-b) and (13-a) and (13-b).

(12) a. John saw Mary drunk.
b. $\exists x^s \exists y^s [\mathbf{R}(x^s, \mathbf{John}) \wedge \mathbf{R}(y^s, \mathbf{Mary}) \wedge \mathbf{see}_2(x^s, y^s) \wedge (\hat{}\mathbf{drunk})(y^s)]$

(13) a. Martha saw men running.
b. $\exists x^s \exists y^s [\mathbf{R}(x^s, \mathbf{Martha}) \wedge \mathbf{R}(y^s, \mathbf{men}) \wedge \mathbf{see}_2(x^s, y^s) \wedge \underline{Prog'}(\hat{}\mathbf{run})(y^s)]$

Under this approach, a sentence like

(14) *John saw Mary intelligent.

is ungrammatical due to a mundane sortal clash: the second argument of *see* has to be a stage, the argument of *intelligent* has to be an individual, and the lexical semantics of see_2 requires these to arguments to be identical in this respect.

Discussion

The sorted type intensional logic formulated by Carlson to distinguish SLPs and ILPs faces various problems, a lot of them already acknowledged in his dissertation. The problems concerning bare plurals and genericity have been discussed at length elsewhere.[9] Since this topic is not our main concern here, we will not go in much detail here.

Apart from the problems that Carlson's theory, as well as Kratzer's and Chierchia's, is subjected too - these will be discussed at length below - it faces four main problems. First, it is not clear at all what it means to be a stage-level or an individual-level property. Consider, for instance, the predicate *young*.[10] According to Carlson, this predicate should be classified as belonging to the set of individual-level predicates. As a matter of fact, sentences like

(15) a. ?There are two men young in the park.
b. ?I saw John young.
c. ?When John is young, he is kind.
d. ?John is young in the park.

[9]For instance, Schubert and Pelletier [60] noted that Carlson's theory cannot account for scope ambiguities of generics in sentences like "Sheep are black or white". For other problems of this kind with Carlson's theory, see [39], especially 116ff.

[10]Carlson was aware of what follows i.e. the fact that permanence is neither necessary nor sufficient for a property to be individual level. He makes this point himself by comparing, like I will do, *alive* and *young*.

sound odd. But that means that *young* denotes a property of individuals i.e. the individual denoted by *John* is intrinsically young which is rather counterintuitive and undermine the intuitively appealing idea that some properties are exemplified by stages (the transient or episodic ones) and others are permanent. For instance, consider the property of *being alive*. One would think that if a property should be exemplified by an individual it should be this one: a man that is alive is alive at every time of his existence after all. However, *alive* is, most of the time, stage-level as shown by the following set of sentences:

(16) a. There are two men alive in the park.
b. I saw John alive.
c. John is alive in the park.
d. ?When John is alive, he's nice. But when he's not, watch out!

The intuitive background of his theory is thus undermined by these facts which will be analyzed in detail in the next section.

The second problem is that Carlson's theory predicts subject effects to occur only with bare plurals. But we already saw in section 2.3 that they are pervasive with all sorts of indefinites. As Jäger noted[11], every attempt to extent his treatment of bare plurals to other indefinites would undermine the central concern of his theory, namely to explain the differences between bare plurals and other indefinites.

Thirdly, his semantics of perception reports is a variant of what Barwise [3] had called "the naive realist's theory of perception" with its specific problems.[12] Consider the following adaptation of Davidson's famous argument[13] about the identity of events. Let us imagine that a metal sphere is simultaneously rotating and heating. In other words, every stage of the sphere that is rotating is also heating and vice versa. Now, consider the sentence[14]

(17) John saw the sphere rotate, but he didn't see it heat.

Carlson's translation would be as follow:

(18) $\exists x^s \exists y^s [\mathbf{R}(x^s, \mathbf{John}) \wedge \mathbf{R}(y^s, \mathbf{sphere}) \wedge \mathbf{see}_2(x^s, y^s) \wedge (\hat{}\mathbf{rotate})(y^s)] \wedge$
$\exists w^s \exists v^s [\mathbf{R}(w^s, \mathbf{John}) \wedge \mathbf{R}(v^s, \mathbf{sphere}) \wedge \neg\mathbf{see}_2(w^s, v^s) \wedge (\hat{}\mathbf{heat})(v^s)]$

But, by hypothesis,

$$\forall y^s [(\mathbf{R}(y^s, \mathbf{sphere}) \wedge (\hat{}\mathbf{rotate})(y^s)) \leftrightarrow (\mathbf{R}(y^s, \mathbf{sphere}) \wedge (\hat{}\mathbf{heat})(y^s))].$$

[11] [31], p.69

[12] As Barwise noted ([3], p.285) translating "Whitehead saw Russell wink" to '$\mathbf{see}(w, r) \wedge \mathbf{wink}(r)$' won't do since it is the translation of "Whitehead saw Russell and Russell winked (at the same time)". We can of course imagine a case, where Whitehead saw Russell when he winked without seeing him winking.

[13] [16]

[14] We assume as in [1] that naked infinitive constructions are extensional w.r.t. designators but intensional w.r.t. verb phrases.

Thus, (17) cannot be true in Carlson's system while it is quite easy to imagine a scenario where it is.

The last problem with Carlson's theory we will consider was also noted by himself in [7] and used by Kratzer in ([38], p.138ff.). They noticed that

(19) Typhoons arise in this part of the Pacific.

has two readings. On the first, it may mean that it is a typical property of typhoons that they arise in this part of the Pacific i.e. something like 'Most typhoons arise in this part of the Pacific. On the second one, it may means that it is a typical property of this part of the Pacific that there are typhoons that arise there i.e. something similar to 'In this part of the Pacific, a lot of typhoons arise'.

Carlson's analysis only predicts the first of those two readings. The difficulty with the second reading is that the verb *arise* is understood generically, but the bare plural NP *typhoons* can get an existential reading. On Carlson's proposal, the existential reading of a bare plural can only be provided by a stage-level predicate (using the rules for **R**). But if *arise* in the example is translated as a stage-level predicate, the resulting translation is

(20) $\exists x^s[\mathbf{R}(x^s, \mathbf{typhoons}) \wedge \mathbf{arise\text{-}in\text{-}this\text{-}part\text{-}of\text{-}the\text{-}Pacific}(x^s)]$

which clearly won't do since it means that typhoons *are arising* in this part of the Pacific.

To sum up so far, Carlson's sortal ontology seems unable to fully explain the contrasts between bare plurals and indefinites that he addresses, and alternative explanations are called for. There is thus no particular compelling reason to assume two sortally distinguished readings of the copula in English and this especially since we have seen that his ontology does not fit, at least in certain cases (as *alive* and *young*, for instance), the way we actually conceive things. Finally, his treatment of perception sentences is deficient and his rule for 'there-insertion' does not provide explanations but 'blocks' the formation of this kind of sentences with individual-level predicates in coda position in a rather *ad hoc* way. Of course, there might be alternative explanations and different ways of fixing these defaults. However, as I shall argue in section 4, putting the distinction between SLPs and ILPs in the lexicon is not the way to account for it and, thus, there is no particular reason for adopting this kind of ontology.

3.2 Kratzer

Introduction

Like Carlson, Kratzer [38] believes that SLPs are distinct from ILPs in that they contain an explicit reference to a place and a time. Kratzer's basic hypothesis is that stage-level and individual-level predicates differ in argument structure. Stage-level predicates, as

opposed to individual-level ones, are *Davidsonian* in that they have an extra-argument position for spatiotemporal locations, l. It is generally the case, in the neo-Davidsonian paradigm, to add an event variable to all predicates, but Kratzer assumes that it is present only with stage-level predicates; individual-level predicates are supposed to lack this argument position.

Kratzer's account of the stage-level/individual-level contrast is not only based on a difference in argument structure. She adopts a generative syntax, where we have at least three levels of representation: D-structure, S-structure and Logical Form.[15]

In Kratzer's proposal, the difference in argument structure between stage-level and individual-level predicates is reflected in the syntax in the following way. The arguments of a predicate are linked to their syntactic positions in D-structure according to Williams' Argument Linking Principle:

> **Argument Linking Principle**
>
> "In D-structure, all arguments except the external argument are realized within the maximal projection of their predicate." [70]

She assumes that if a predicate has a Davidsonian argument, it will always be its external argument. At D-structure, it is thus realized outside the VP. Given that only one of the arguments can be external, subjects of stage-level predicates must be base-generated inside the VP. At D-structure they occupy the position SpecVP. Individual-level predicates, which lack a Davidsonian argument, select their subject as the external arguments, which is therefore base-generated in the position SpecIP.[16]

Arguments which are internal at D-structure can move to an external position at S-structure or Logical Form. This is in accordance with Diesing's hypothesis [19] that subjects of individual-level predicates can only occur in the outer subject position, whereas subjects of stage-level predicates can be either internal or external at S-structure. In Diesing, the two subject positions are related to the interpretation of the bare plural. Diesing's proposal involves a mapping between S-structure and Logical Form such that material outside the VP is mapped onto the restrictive clause of a quantifier, whereas material inside the VP goes into the nuclear scope. This mapping between S-Structure and Logical Form thus predicts that subjects of individual-level predicates, never get existential readings, but are always generic.

Now, before seeing in details how Kratzer's theory deals with the data, let us briefly depart from it in order to present the Lewis' treatment of adverbs of quantification.

[15] As noted in the introduction of this thesis, not much concern will be given for syntactic issues. The purpose of this brief subsection is to be able to understand fully some problems that will become apparent later. For more information about the, rather unusual, syntactic elements of Kratzer's account, the interested reader is encouraged to read Kratzer's paper [38], Diesing's [19] and de Swart's dissertation [63], p.48ff.

[16] Kratzer actually claims this to be true only for individual-level predicates that are not unaccusatives. For simplicity, we will thus ignore examples containing predicates such as 'belong to' 'be known to', etc.

A Short Digression on Adverbs of Quantification

In his very influential [40], Lewis considers the following six groups of adverbs:

1. Always, invariably, universally, without exception.
2. Sometimes, occasionally.
3. Never
4. Usually, mostly, generally, almost always, with few exceptions.
5. Often, frequently, commonly
6. Seldom, infrequently, rarely, almost never.

He then notes that these adverbs cannot be quantifiers over time. For instance, *Always* cannot be a modifier that combines with a sentence ϕ to make a sentence *Always*ϕ that is true if and only if the modified sentence ϕ is true at all times. Since this will imply that a sentence like:

(21) John always orders *La Chouffe* for everyone.

means that John was, is and will be ordering some *La Chouffe* for everyone.

First, we may note that the times quantified over need not be moments of time. They can be suitable stretches of time instead like, for instance:

(22) John usually drinks a beer before lunch.

means that the sentence modified by *usually* is true on most days, not at most moments. The range of quantification in (22) is also restricted. It means something like on most of all the days of a (contextually salient) part of his life he drinks a beer before lunch.

Lewis then notices that the adverbs at hand neither are quantifiers over events since we sometimes quantify not over a single event but over enduring states of affairs as in:

(23) A man who owns a donkey always beats it now and then.

where the continuing relationship between a man and his donkey (punctuated by beatings) cannot be thought as events in any commonplace sense.

Finally, he asserts that adverbs of quantification are quantifiers over cases. His final argument consists in the fact that adverbs of quantification may be used in speaking of abstract entities (that have no location in time nor participate in any events), as in

(24) a. A quadratic equation never has more than two solutions.

b. A quadratic equation usually has to different solutions.

Lewis' idea is to treat Q-adverbs as *unselective quantifiers*. He observes that in example like in (25), if we are quantifying over cases, then we must have a case corresponding to each admissible assignment of values to the variables that occur free in the modified sentence.

Taking m, n, p as variables over natural numbers, and x, y, z as variables over persons:

(25) a. Always, p divides the product of m and n only if some factor of p divides m and the quotient of p by that factor divides n.
b. Sometimes, p divides the product of m and n although p divides neither m nor n.
c. Sometimes it happens that x sells stolen goods to y, who sells them to z, who sells them back to x.
d. Usually, x reminds me of y if and only if y reminds me of x.

Thus (25-a) is true only if every assignment of natural numbers as values of m, n, and p makes the open sentence after *always* true i.e. if and only if all triples of natural numbers satisfy the open sentence. Similarly, (25-b) is true if and only if some triple of numbers satisfy the open sentence after *sometimes*; (25-c) is true if and only if some triple of persons satisfies the open sentence after *sometimes*; and so on.

The unselective quantifiers '$\forall$' and '$\exists$' bind all the variables in their scope indiscriminately:

(26) a. $\forall\phi$ is true *iff* ϕ is true under every admissible assignment of values to all variables free in ϕ.
b. $\exists\phi$ is true *iff* ϕ is true under some admissible assignment of values to all variables free in ϕ.

The unselective $\forall$ and $\exists$ can show up as the adverbs *always*, and *sometimes*. Likewise $never, usually, often$, and *seldom* can serve as the unselective analogs of the selective quantifiers '*for no x*', '*for most x*', '*for many x*', and '*for few x*'.

Lewis is thus taking the Q-adverbs as quantifiers over cases, where a case is conceived as the tuple of its participants; these participants being values of the variables that occur free in the open sentence modified by the adverb. In other words, cases are the admissible assignments of values to these variables.

Finally, Lewis used these unselective quantifiers to account for restrictive if-clauses and when-clauses, like:

(27) When m and n are positive integers, the power m^n can always be computed by successive multiplications.

and proposed *whenever* to be thought as the contraction of *Always if* (*always when* to form a complex unselective quantifier that combines two sentences as in (28).

(28) a. Whenever x is a man, y a donkey, and x owns y, x beats y now and then.

Lewis proposal for the treatment of Q-adverbs had a great posterity through the, also seminal, works of Kamp [34] and Heim [26]. And, as we shall see now, it also plays a prominent role in Kratzer's theory.

When-conditionals

The probably most striking argument in favor of Kratzer's view that stage-level predicates, as opposed to individual-level ones, have an extra-argument position for Davidsonian spatiotemporal locations variables l is illustrated by the when-conditional constructions.

Kratzer follows Heim [26] in the assumptions that

(a) conditional sentences are mapped to a tripartite Logical Form consisting of a quantifier, a restrictive clause, and a nuclear scope, and

(b) that indefinites are interpreted as open formulas introducing a free variable into the Logical Form.

The translations of the sentences of example (12) in section 2.4 are thus as follow:

(29) a. *When Mary knows French, she knows it well.
Always[**knows**(**Mary**, **French**)][**knows-well**(**Mary**, **French**)]

b. When a Moroccan knows French, she knows it well.
Always$_x$[**Moroccan**(x) & **knows**(x,**French**)][**knows-well**(x, **French**)]

c. When Mary knows a foreign language, she knows it well.
Always$_x$[**foreign-language**(x) & **Knows**(**Mary**, x)][**knows-well**(**Mary**,x)]

d. When Mary speaks French, she speaks it well.
Always$_l$[**speaks**(**Mary**,**French**,l)][**speaks-well**(**Mary**, **French**, l)]

e. *When Mary speaks French, she knows it well.
Always$_l$[**speaks**(**Mary**, **French**, l)][**knows-well**(**Mary**, **French**)]

f. *When Mary knows French, she speaks it well.
Always[**knows**(**Mary**, **French**)]$\exists l$[**speaks-well**(**Mary**, **French**, l)]

In order, to account for the alleged ungrammaticality of (29-a), she proposes the following principle[17]:

> **Prohibition against Vacuous Quantification**
> For every quantifier Q, there must be a variable x such that Q binds and occurrence of x in both its restrictive clause and nuclear scope.

Under this perspective the 'ungrammaticality' of (29-a) is thus easily accounted for by means of the 'prohibition against vacuous quantification' since the adverb 'always' has no variable to bind. Similarly, (29-e-f) is considered ungrammatical by the same principle since 'always' must bind a variable in both the restrictive clause and nuclear scope.

(29-d) is explained by the assumption that SLPs have an additional "Davidsonian" argument place for the spatiotemporal location of the eventuality described as opposed to ILPs where this argument is missing in the argument structure. Under the assumption that indefinites must be interpreted as open formulas introducing a free variable into the Logical Form, (29-b) becomes grammatical.

The interpretation of (29-c) is however more problematic. Recall that Diesing's proposal requires all material in the VP to be mapped onto the nuclear scope, which is closed off by existential quantification. If we take for granted the usual assumption that object NPs have a position inside the VP, this means that objects automatically end up in the nuclear scope, which results in an existential reading. This approach thus renders (30) ungrammatical:

(30) *Always when Pedro has a donkey, he beats it.

In order to follow Diesing's proposal, Kratzer has to assume that there can be an embedded nuclear scope within the restrictive clause. As a consequence, the restrictive clause of (30) is split up in (31):

(31) [**exist-now**(Pedro$_3$) & $\exists x$[**donkey**(x) & **have**(he$_3$,x)]]

The part '[exist-now(Pedro$_3$)' constitutes the restrictive clause of the restrictive clause. The indefinite object *a donkey* has an existential interpretation, because it is in the VP of the *when*-clause, which is mapped onto the nuclear scope of the restrictive clause. The overall structure of (30) is thus:

(32) *__Always__[[**exist-now**(Pedro$_3$) & $\exists x$[**donkey**(x) & **have**(he$_3$,x)]]
[$\exists l$[**location**(l) & **beat**(he$_3$, τx[**donkey**(x) & **have** (he$_3$, x)],l)]]]

The formula thus means something like 'in the present life of Pedro there is a donkey which he owns, and there is a location at which he beats the donkey he owns.' and the sentence is ungrammatical due to vacuous quantification.

[17] See [12] for a similar proposal.

Kratzer gives the following examples to argue for the ungrammaticality of this kind of sentences[18]:

(33) a. When a proof contains this line of argumentation, it is seriously flawed.
b. *When this proof contains a mistake, Mary will point it out to us.

(34) a. When a proposal requires his formal approval, it is doomed to failure.
b. *When this proposal requires a formal approval, we will try to obtain it soon.

(35) a. When a lot is close to Lawrence Swamp, it is subject to many restrictions.
b. *When this lot is close to a swamp, construction must be kept 200 feet away from it.

(36) a. When a farmer has a donkey, he beats it.
b. *When Pedro has a donkey, he beats it.

The when-conditionals above all contain an individual-level predicate in the when-clause. This ensures that they can only satisfy the prohibition against vacuous quantification if a variable is introduced by an indefinite noun phrase. All conditionals considered are arranged in pairs: the (a)-sentences contain indefinite subjects and the (b)-sentences indefinite objects. According to Kratzer, while the (a) sentences are grammatical, the (b)-sentences are not.

But then, one might wonder how our sentence repeated here has (37) can be grammatical.

(37) When Mary knows a foreign language, she knows it well.

(37) is predicted to be just as ill-formed as (36-b), but it is not. Since *know* is an individual level predicate we cannot quantify over spatiotemporal locations. The only indefinite NP around is in object position, where it is bound by existential closure in accordance with Diesing's proposal. This means that there is no variable that the adverb *always* can bind, and the sentence is predicted to be out because of a violation of vacuous quantification.

At this point, Kratzer is thus forced to distinguish between 'well-behaved' indefinite objects and 'ill-behaved'. She provides us with the following examples of "Ill-Behaved" Objects (p.151):

(38) a. When sue likes a movie, she recommends it to everyone.
b. When Ann appreciates a paper, she tries to really understand it.
c. When Mary knows a foreign language, she knows it well.
d. When Robin isn't responsible for a mistake, he won't correct it.
e. When this assignment is too hard for a student, you may offer to help him.

[18] "Provided that the main predicates in their antecedents are interpreted as **true** individual-level predicates. **I emphasized above that most individual-level predicates can also be used as stage-level predicates.**" [38], p.148. (my emphasis)

f. When these dresses don't fit a customer, we will alter them for her.

All predicates in the antecedents of these conditionals are individual-level predicates. This is shown by the ungrammaticality of the following examples:

(39) a. *When sue likes "Wings of desire", she recommends it to everyone.
b. *When Ann appreciates this paper, she tries to really understand it.
c. *When Mary knows French, she knows it well.
d. *When Robin isn't responsible for this mistake, he won't correct it.
e. *When this assignment is too hard for Chris, you may offer to help him.
f. *When these dresses don't fit your daughter, we will alter them for her.

If all predicates in the antecedent of the conditionals (38) are individual-level predicates, the prohibition against vacuous quantification can only be satisfied if their indefinite objects can move into the embedded restrictive clause (of the main restrictive clause) when Logical Forms are constructed. She thus suggests that the ill-behaved objects can scramble out of the nuclear scope into the restrictive clause at the level of logical form in order to escape violation of the prohibition of vacuous quantification.

Perception Sentences, Locatives and Adjuncts

Kratzer's idea accounts for the other contrasts mentioned in section 2 without further ado. Let us start with the contrasts in perception reports. It is more standard nowadays to analyze a sentence like (40-a) as reporting a relation between the perceiver and an abstract eventuality that is described by the complement of the perception verb. The nature of the perceived eventuality is still a matter of debate, it has been proposed that it is a situation in the sense of situation theory [3], and event in the Davidsonian sense [27]. Under both accounts, the logical form of (40-a) will come out roughly as (40-b).

(40) a. John saw Mary sneeze.
b. $\exists e(\mathbf{see}(\text{John}, e) \wedge \mathbf{sneeze}(\text{Mary}, e))$

Under Higginbotham's perspective, the perceived event is identical to the event that fills the Davidsonian argument place of the embedded predicate. In other words, verbs of perception select descriptions of events as their complements. Therefore, one might adopt Higginbotham's idea in Kratzer's framework and claim that since only predicates that supply such a description are licit there, only SLPs can occur felicitously within the 'small clause' complements of perception verbs. Doing so provide a straightforward explanation for the contrast in (41).

(41) a. *I saw John tall.
b. I saw John drunk.

We have seen in section 2 that ILPs seem to not be able to be modified by temporal adverbials and local modifiers. Like (42) shows.

(42) a. *Peter is intelligent today.
b. *Peter was intelligent in Paris.

Provided one follows Davidson [15], Higginbotham [28], Parsons [53] and many others in the assumption that those adverbials are predicates of the event argument. If the latter is missing, this kind of modification fails. It thus falls out of Kratzer's Hypothesis as follow:

(43) a. Manon is dancing on the lawn.
[**dancing**(**Manon**, l) & **on-the-lawn**(l)]

b. Manon is dancing this morning.
[**dancing**(**Manon**, l) & **this-morning**(l)]

c. Manon is a dancer.
Dancer(**Manon**)

d. *Manon is a dancer this morning.
Dancer(**Manon**) & **this-morning**(?)]

According to Rapoport [58], a similar story can be told about the contrasts with predicative adjuncts as in (44).

(44) a. We ate the vegetables raw.
b. ?We ate the vegetables organic.

Rapoport identifies transitoriness with stage-levelhood and proposes the following licensing principle to account for the apparent failure of non-transitory (i.e. individual level) properties to appear as predicative adjuncts:

> **Licensing Principle:**
> Every phrase in a syntactic structure must be licensed through the direct linking of a position in its theta-structure[19] to a position in the theta-structure of the head of its clause, within the government domain of that head. (p. 170)

She then proposes that a spatiotemporal or event argument is the crucial mediator in the licensing of the adjunct. Specifically, the adjunct is licensed just in case an event argument in its theta structure can be linked to an event argument in the theta structure of the main predicate with which it is associated, by some relation holding between the

[19]Roughly its argument structure plus its logico-semantic representation

described events (like "simultaneity" or "result"). If either of the clauses involved does not describe an event, the construction will be ungrammatical. By hypothesis, individual level predicates lack an event argument; consequently, they cannot be linked in this way and are thus not licensed.

Bare Plurals

On the discussion over Carlson's proposal, we saw that the sentence

(45) Typhoons arise in this part of the Pacific.

has two reading according to Kratzer. Along the lines of Lewis, Heim and Kamp's analysis, she proposes to treat bare plurals like other indefinites i.e. as predicates introducing variables into the logical representation. The two readings can now be represented as

(46) a. $\mathbf{G}x[\mathbf{typhoon}(x)]\exists l[\mathbf{this\text{-}part\text{-}of\text{-}the\text{-}Pacific}(l)\&\mathbf{arise\text{-}in}(x,l)]$
b. $\mathbf{G}l[\mathbf{this\text{-}part\text{-}of\text{-}the\text{-}Pacific}(l)]\exists x[\mathbf{typhoon}(x)\&\mathbf{arise\text{-}in}(x,l)]$

where **G** is some king of adverb of quantification, a generic operator like *typically*[20].

Furthermore, we saw in the introduction of this section that, in Diesing, the two subject positions are related to the interpretation of the bare plural. Diesing's proposal involves a mapping between S-structure and Logical Form such that material outside the VP is mapped onto the restrictive clause of a quantifier, whereas material inside the VP goes into the nuclear scope. This mapping between S-Structure and Logical Form thus predicts that subjects of individual-level predicates, never get existential readings, but are always generic.

Following Diesing's syntactic solution, Kratzer hence predicts that a bare plural subject of *available* may have an existential or a generic reading but not *altruistic*, being an individual-level predicate (that is not unaccusative): Diesing's proposal implies that a bare plural subject of *altruistic* cannot get an existential reading through existential closure of the nuclear scope.

We thus get the following different readings for "Firemen are available" and "Firemen are altruistic" shown in (47) and (48), respectively.

(47) a. $\exists_{x,l}$ [**fireman**(x) & **available**(x,l)]
b. $\mathbf{G}_{x,l}$ [**fireman**(x) & **be**(x,l)] [**available**(x,l)]
c. $\mathbf{G}_{l}$ [**here**(l)] $\exists_x$[**fireman**(x) & **available**(x,l)]

(48) a. $\mathbf{G}_{x}$ [**fireman**(x)] [**altruistic**(x)]

[20]Its exact nature is mysterious and not defined. Kratzer suggest the reader to substitute **G** by an overt quantifiers like *always* or *usually*, the exact nature of **G** not being at issue in her paper. (p. 140)

So, (47-a) says that there are firemen available, (47-b) that it is a characteristic property of a fireman that he is available and (47-c) that there are typically firemen available around here. (48-a) says that a fireman is typically altruistic and is considered the only possible reading of "firemen are altruistic".

lifetime effects and Discussion

Finally, Kratzer accommodates the lifetime effects in a rather simple manner. All that has to be stipulated is that tense always applies to the external argument of the VP it attaches to. In case of ILPs this is the spatiotemporal argument which is located in time by tense. But with ILPs, this is the subject. Thus, according to Kratzer, the logical form of (49-a) is (49-b).

(49) a. Henry was French.
b. [**before-now**(Henry) & **French**(Henry)]

The property of 'being before now' is not predicated of a spatiotemporal location, but of the individual denoted by the subject. (49) says that the individual Henry is located in the past and has the property of being French. Since the individual Henry is located in the past, we may infer, according to Kratzer, that Henry is dead.[21]

As de Swart noted ([63], p.63), this argument is based on a very restrictive view on individual-level predicates, namely that their location in time corresponds exactly to the life of an individual.

There is also another reading for (49-a), namely that Henry used to be French, but now he has become, say a Dutch citizen. In Kratzer's opinion, it is the past tense here that turns the ILP into a SLP[22]. The property of *being before now* is thus predicated of the Davidsonian argument:

(50) [**before-now**(l) & **French**(Henry, l)]

There are numerous problems with this treatment of the 'lifetime effects'. The first one is similar to one we already addressed against Carlson's analysis. For instance, it is true that some ILP like '*being from Canada* can hardly be conceived has not holding throughout the life of the subject to which it is predicated to[23]. However, this is usually

[21] See [38], p. 155-6

[22] According to Kratzer, the past tense is a powerful tool to turn ILPs into SLPs.

[23] Indeed, in this case, one can without risk infer that the subject is dead when the sentence makes use of the past tense. Compare:

(i) a. Rachel is from Canada.
b. Rachel was from Canada.

Note, however, that this observation doesn't not hold in certain context as "I met a girl at the store today called Rachel and she was from Canada too!"

not the case. For instance, the predicate *being famous* has nothing to do with the lifetime of its possible subjects: John F. Kennedy is famous, even if he died almost forty-five years ago and everyone knows some singers that got really famous at some point and has been completely forgotten since. Thus, one can utter:

(51) Davy Jones (a random member of The Monkeys) was famous in the 60's.

without implying (or implicating) that he is dead. Moreover, predicates like *knowing French* do not necessarily last from birth to death. As de Swart pointed out ([63], p.63), if any temporal information of the kind expressed in(50) means that the predicate is turned into a stage-level one, we would expect bare plurals to give rise to existential readings, predication in existential sentences to be acceptable, quantification over locations to be possible, etc. However, they seem much harder to get as shown in the following:

(52)
a. At that time, diplomats were French (generic reading only)
b. ?There were three candidates French
c. ?Henry was usually French.
d. ?I saw Henry (be) French.

Moreover, Kratzer treats individual variables and location variables on a par, for instance with respect to the prohibition of vacuous quantification. We saw that this constraints rules out sentences in which the quantifier does not bind the same variable x in both the restrictive clause and the nuclear scope and we that this condition was necessary in order to rule out sentences like:

(53)
a. *When Mary knows French, she usually speaks it well.
b. *When Mary knows a language, she is usually intelligent.

However, things are not that simple at all. As de Swart also pointed out, Kratzer's use of the location variable l is clearly insufficient to account for the type of examples in (54):

(54)
a. When Pierre washes the dishes, Anne usually read the paper.
b. Before she goes to bed, Mary always takes a shower.
c. Whenever a farmer buys a donkey, he sells it six months later.

In none of the sentences in (54) it would make sense to say that all assignments of values to the spatiotemporal locations variables that makes the first clause true are also assignments that makes the second true. There is thus much more to be said on those spatiotemporal variables and their referents.

Finally, we saw that she must posits the existence of ill-behaved objects that can scramble out of the nuclear scope into the restrictive clause at the level of logical form in order to escape violation of the prohibition of vacuous quantification. I take this solution to be completely *ad hoc*. For instance, she provides no argument in order to prefer that sentences like (55-a) be the rule as opposed to sentences like (55-b) being the exception.

(55) a. *When this lot is close to a swamp, construction must be kept 200 feet away from it.
b. When sue likes a movie, she recommends it to everyone.

And this goes without saying that a sentence like (56), strictly analogous to (55-a) is perfectly fine (But maybe we are interpreting *being close to a swamp* as a stage-level predicate in that case?).

(56) When I am close to a swamp, I go catch frogs around it.

Furthermore, sentences like:

(57) ?When a farmer owns Smokey, he always beats it.

cannot be ruled out in Kratzer's system because subjects of individual-level predicates are supposed to always supply variables for binding by a sentential operator.[24]

Like Carlson's proposal, Kratzer's theory faces various problems, most of them not being restricted to her analysis, we will continue the critique in the section 4 and in section 5, the latter being devoted specifically to *when*-conditionals. The last approach that will be presented is Chierchia's.

3.3 Chierchia

3.3.0.1 Introduction

Chierchia [11] does not inherit the problems related to the generative syntax Kratzer assumes since his analysis is semantically oriented. For instance, he doesn't make a difference between indefinite NPs in subject and object position and no distinction is made by him between 'well-behaved' and 'ill-behaved' objects.

Chierchia shares with Carlson and Kratzer the view that predicates come in just two types, namely stage-level and individual-level predicates, and that the type of the predicate is already determined in the lexicon. As opposed to Kratzer, Chierchia adopts the neo-Davidsonian view according to which *all* predicates introduce an event (*situation*) arguments. Thus, SLPs and ILPs do not differ in this respect.

Roughly, Chierchia suggests that individual-level predicates have a lexically given feature which triggers a **Gen** quantifier, a phonologically covert adverb of quantification, in the semantic representation. The idea is that such predicates are semantically underspecified, and require binding by **Gen** to be fully interpretable. Leaving aside the ex-

[24] I take it for granted that she will consider the sentence ungrammatical since she considers (i) to be:

(i) *When Pedro has a donkey, he beats it.

act mechanics of the formalism, the crucial point is that individual-level predicates, as opposed to stage-level predicates, are so marked in their lexical representations as to automatically force the presence of the generic operator **Gen** in their local environment, local corresponding to the maximal projection of the predicate. It is in that sense that they are, according to Chierchia, "inherently generic".

In a nutshell, the lexical meaning of an individual-level predicate α is as follows[25]:

(58) $\alpha = \lambda x_1, ..., \lambda x_n \mathbf{Gen}\ s[\mathbf{in}(x_1, ..., x_n, s)][\alpha^+(x_1, ..., x_n, s)]$

An example:
know $\Rightarrow \lambda x_1 \lambda x_2 \mathbf{Gen}\ s[\mathbf{in}(x_1, x_2, s)][\mathbf{know}(x_1, x_2, s)]$

Each stage-level predicate is free to occur or not occur, in the syntax, with **Gen** appearing in the specifier position of an aspectual habitual functional projection, resulting in either a habitual individual-level reading or a normal stage-level reading, of one and the same predicate. In other words, an habitual individual-level interpretation of a predicate arises only when the maximal projection of that predicate, e.g. the VP, is dominated by an aspectual habitual functional projection containing **Gen** (or possibly some other Q-adverb) in its specifier position.

Locatives and Perception Sentences

In order to account for the SLP/ILP contrast in combination with locatives, Chierchia introduces a distinction between two kinds of events: SLPs refer to *location dependent events* whereas ILPs refer to *location independent events.*[26] In other words, the generic quantifier present in the argument structure od ILPs ranges over situations that are *arbitrarily* located. The observed behavior with respect to locatives follows under the assumption that only location dependent events can be located in space. In Chierchia's own words:

> "Intuitively, it is as if individual-level predicates were, so to speak, unlocated. If one is intelligent, one is intelligent nowhere in particular. Stage-level predicates, on the other hand, are located in space." ([11], p. 178)

Formally, the contrast is formally explained as follows. According to Chierchia, the translation of (59-a) is (59-b):

[25] The full-blown version is slightly more complicated than this. It read as

$$\mathbf{Gen}\ x_{i_1}, ..., x_{i_n} s[!x_{i_1}\mathbf{NP}_{i_1} \wedge ... \wedge !x_{i_n}\mathbf{NP}_{i_n} \wedge \mathbf{C}(x_{i_1}, ..., x_{i_n}, s)][\mathbf{XP}_s].$$

where $!_y$ is a type-shifting function that turns indefinites into open formulas defined as

$$!_y\mathrm{NP} = \lambda\mathbb{P}\mathbb{P}(\lambda x[y = x]) \text{ if } \mathbb{P} \text{ is indefinite, else undefined.}$$

For the technical details we refer the reader to the Chierchia's paper ([11])

[26] See also [45]

(59) a. John knows Latin
b. $\exists s'[\mathbf{Overlap}(s', \mathbf{now}) \wedge \mathbf{Gen}\ s[\mathbf{Overlap}(s, s') \wedge \mathbf{in}(\mathbf{j}, s)]$
$\exists s''[\mathbf{Overlap}(s, s'') \wedge \mathbf{know}^{+}(\mathbf{j}, \mathbf{L}, s)]]$

In (59-b), there are three possible targets for a locative modifier: a modifier could restrict the external situation s', the internal one s, or the scope situation s''. Now, modification of s is ruled out since it already contains a locative (i.e. '**in**'). Scope modification would yield:

(60) $\exists s'[\mathbf{Overlap}(s', \mathbf{now}) \wedge \mathbf{Gen}\ s[\mathbf{Overlap}(s, s') \wedge \mathbf{in}(\mathbf{j}, s)]$
$\exists s''[\mathbf{Overlap}(s, s'') \wedge \mathbf{know}^{+}(\mathbf{j}, \mathbf{L}, s) \wedge \mathbf{in\text{-}office}(s'')]]$

But this is logically false since it says that *any* situation s where John is or might be located (and hence, situations where he is not in the office) is a situation in which he is in his office.

Finally, the external situation modification results in:

(61) $\exists s'[\mathbf{Overlap}(s', \mathbf{now}) \wedge \mathbf{in\text{-}office}(s') \wedge \mathbf{Gen}\ s[\mathbf{Overlap}(s, s') \wedge \mathbf{in}(\mathbf{j}, s)]$
$\exists s''[\mathbf{Overlap}(s, s'') \wedge \mathbf{know}^{+}(\mathbf{j}, \mathbf{L}, s)]]$

But this formula is equivalent to the unmodified sentence 'John knows Latin'. The argument goes as follow. Assume that there is a situation **s'** such that

$$[\![[\mathbf{Overlap}(s', \mathbf{now}) \wedge \mathbf{in\text{-}office}(s') \wedge \mathbf{Gen}\ s[\mathbf{Overlap}(s, s') \wedge \mathbf{in}(\mathbf{j}, s)]$$
$$\exists s''[\mathbf{Overlap}(s, s'') \wedge \mathbf{know}^{+}(\mathbf{j}, \mathbf{L}, s)]]\!]^{g[s'/s'']} = 1.$$

For this to hold, any situation temporally overlapping with **s'** must satisfy a certain condition. If this is the case, than an *arbitrary* situation **s*** temporally overlapping with **s'**, no matter what its spatial location, cannot fail to also verify

a. $\exists s'[\mathbf{Overlap}(s', \mathbf{now}) \wedge \mathbf{Gen}\ s[\mathbf{Overlap}(s, s') \wedge \mathbf{in}(\mathbf{j}, s)]$
$\exists s''[\mathbf{Overlap}(s, s'') \wedge \mathbf{know}^{+}(\mathbf{j}, \mathbf{L}, s)]]$[27]

when assigned as a value to the variable s'. In other words, if there is any situation in the world that constitutes a verifying assignment for s' in the last formula, then any actual situation temporally overlapping with it will and among such situations, there will be some whose spatial location is the office.[28]

The explanation for the behavior of ILPs with respect to perception sentences is explained in a similar way. Chierchia interprets perception sentences like in the following example:

[27]Here, **Overlap** is, I suppose, defined in the usual mereological way i.e.

$$\mathbf{Overlap}(x, y) \Leftrightarrow \exists z(\mathbf{Part}(z, x) \wedge \mathbf{Part}(z, y)).$$

[28]See [37] for a similar claim in her situation-based semantics

(62) a. I see John on the roof.
b. $\exists s[\mathbf{see}(\mathbf{I}, s) \wedge \mathbf{on\text{-}the\text{-}roof}(\mathbf{j}, s)]$

The 'ungrammaticality' of sentences like (63-a) is explained as follow, the logical translation of (63-a) given as (63-b):

(63) a. ?I see John tall.
b. $\exists s'[\mathbf{see}(\mathbf{I}, s') \wedge \mathbf{Gen}\ s[\mathbf{Overlap}(s, s') \wedge \mathbf{in}(\mathbf{j}, s)][\mathbf{tall}(\mathbf{j}, s)]]$

Chierchia affirms that for the same reason discussed in connection with locatives above, "if the right conjunct is true of some s' in the actual world, it will be true of every s'. Consequently, (63) says nothing more than 'John is tall and I saw something (possibly totally unrelated to John's tallness)." [11] p. 209-210.

There-sentences and When-conditionals

The translation of a there-sentence with an ILP (as (64-a)) leads to the following translation ((64-b)):

(64) a. ??There is a man tall.
b. $\exists \mathbf{Gen}_{x,s}[\mathbf{a\ man}_x \mathbf{tall}_s]$

Chierchia appeals to the 'prohibition against vacuous quantification' principle and since the existential quantifier in (64-b) has nothing to bind, the sentence thus being ill-formed.

Chierchia, as opposed to Carlson[29], can account for sentences like "There is a man in the garden". The derivation of its meaning goes as follow:

(65) a. $[_{sc}$ a man in the garden$] \Rightarrow \lambda P \exists x[\mathbf{man}(x) \wedge \mathbf{in\text{-}the\text{-}garden}(x) \wedge P(x)]$
b. There be $[_{sc}] \Rightarrow [_{sc}](\mathbf{exist})$ where $\mathbf{exist} = \lambda x[x = x]$; cf. [4]
c. There is a man in the garden $\Rightarrow$
$\lambda P \exists x[\mathbf{man}(x) \wedge \mathbf{in\text{-}the\text{-}garden}(x) \wedge P(x)](\mathbf{exist})$
$= \exists x[\mathbf{man}(x) \wedge \mathbf{in\text{-}the\text{-}garden}(x) \wedge \mathbf{exist}(x)]$
$= \exists x[\mathbf{man}(x) \wedge \mathbf{in\text{-}the\text{-}garden}(x)]$

As we have mentioned earlier, Chierchia doesn't make a difference between indefinite NPs in subject and object position and no distinction is made by him between 'well-behaved' and 'ill-behaved' objects.

As he remarks, after de Hoop and de Swart [17], the contrast between the behavior of ILPs in when-conditionals like in (66) is not, contra Kratzer, restricted to individual-level predicates: SLPs follows the same pattern with respect to this phenomenon as shown in (67).

[29] See the Discussion subsection of section 3.1

(66) a. ?When John knows Latin, he usually knows it well.
b. When an Italian knows Latin, he usually knows it well.

(67) a. ?When John kills Fido, he kills him cruelly.
b. When John kills a dog, he kill it cruelly.

Following de Hoop and de Swart [17], he claims that what plays a role in this kind of contrast is that the event described in (66-a) and (67-b) are not naturally iterable i.e. two instances of the same events (with the same protagonists) cannot naturally occur. The explanation makes use of a *non-vacuity presupposition* principle:

> **Non-Vacuity Presupposition**:
> Q-adverb must quantify over a situation variable satisfiable by more than one entity.

Intuitively, if it is known that there is only one situation assignable to a situation variable s(e.g. John kills Fido), the Q-adverb is useless. According to Chierchia, individual-level predicates are naturally non-iterable since they have a tendential stability which triggers a presupposition that there is going to be at most one state of the relevant sort, which clashes with the non-vacuity principle.

Discussion

The first problem that comes to mind with Chierchia's proposal is that a permanent state of an individual is not the same as a disposition or a habit. Individual-level predicates such as *know French* or *be tall* simply do not have exceptions in the way that "John smokes after dinner" or "Cats chase mice" may have.

The idea would seem to require an extension of the way in which the **Gen** quantifier is interpreted since the point about an individual-level predicate is that it is supposed to be true of all stages of a given interval of an individual lifetime, it is not just 'generally' true.

For instance, if John is judged to be intelligent/tall/a doctor, John is judged to be intelligent/tall/a doctor in all the stages of a given interval of an individual lifetime (i.e. the continuous time interval in which he is intelligent/tall/a doctor). It seems odd to think that there might be exception to his being tall or a doctor as shown by (68).

(68) a. John is a doctor.
b. ?John is usually a doctor (but he's not on Fridays afternoon).

Of course, (68-b) goes against the non-vacuity principle in Chierchia's framework. But the point is that according to him, the meaning of (68-a) *is* (68-b). On the other hand, the truth of (69-a) interpreted, as Chierchia does, as (69-b)

(69) a. John smokes

b. **Gen** $s[C(\mathbf{f}, s)][\mathbf{smoke}(\mathbf{f}, s)]$.[30]

remains secure even if there are occasions when John is not smoking. The problem is that Chierchia ([11], p.198-9) does not provide a detailed account of this discrepancy, but only suggests that a predicate like *be a doctor* lacks exceptions when applied to its subject because there are effectively no non-trivial felicity conditions associated with the predicate (compared to *smoke*, for instance).

Finally, since individual-level predicates are always interpreted as inherently generic, the subject of ILP is always forced to be part of the restriction.[31] This has the unfortunate consequence that bare plurals (and indefinites for that matter) subject of an individual-level predicates are interpreted generically. It might do the trick for sentences like (70), but it definitely won't do for sentences in (71).[32]

(70) a. Monkeys live in trees.
b. Tycoons own banks.

(71) a. Monkeys live in that tree.
b. Tycoons own that house.
c. Plates are dirty.

Some explanations are definitely needed here since these last examples undermine seriously is treatment of bare plurals and indefinites. Chierchia's account also faces other defects which are however typical of most approaches dealing with the individual-level/stage-level discussion. We shall now turn to those problems in the subsequent section.

3.4 Conclusion

We have seen that all the previous account faces their respective problems. For instance, Carlson's sortal ontology fails to fully explain the contrasts between bare plurals and indefinites, Kratzer's theory fails to account for some type of when-conditional constructions and her treatment of the lifetime effects is definitely too strong. Finally, Chierchia's

[30] where C as some felicity conditions (for Fred's smoking) as value, See [11], p.195ff.

[31] This is due to his splitting algorithm:

$$[_{XP}\ \mathrm{NP}_1, ..., \mathrm{NP}_n\ \mathrm{ADV}\ \mathrm{XP}_s] \rightarrow \mathrm{ADV}\ x_1, ..., x_n[!x_1\mathrm{NP}_1 \wedge ... \wedge !x_n\mathrm{NP}_n \wedge C(x_1, ..., x_n, s)][\mathrm{XP}]$$

where (again) $!_y$ is a type-shifting function that turns indefinites into open formulas defined as

$$!_y\mathrm{NP} = \lambda\mathbb{P}\mathbb{P}(\lambda x[y = x]) \text{ if } \mathbb{P} \text{ is indefinite, else undefined.}$$

See [11] p. 193-4 and p.212-215

[32] The subsequent examples are from Fernald (except the very last one which is due to McNally [44]) who calls this contrast the "specificity effect". Note that Kratzer discussed related examples and claims that this effect is due to the un-accusativity of the verbs involved. Fernald's examples show that this explanation cannot be correct.

theory fails to account for what Fernald as called the "specificity effect" and his treatment of individual-level predicates as 'inherently generic' seems not only counter-intuitive but is in need of some more explanation on what it means exactly to be 'inherently generic'.

All the theories that we have discussed share one thing: they all agree that the distinction between stage-level and individual-level predicates is written in the lexicon. Hence, the contrasts between their behavior is considered to be a grammatical effect that follows from a fundamental cognitive division of the world. In other words, all the sentences that we have seen marked by an asterisk in the data won't receive a compositional semantic representation; they are grammatically ill-formed.

However, it is usually very easy to 'turn' an individual-level into a stage-level one. For instance, if John suffers from multiple sclerosis, it is likely that he has unpredictable attacks (where he gets blind for instance) followed by periods of remission and, in that context, the sentences (72) are perfectly fine.

(72) a. John was blind yesterday, but he can see now.
b. For the last few years, John has been blind most of the time.
c. When John is blind, he mostly listens to radio.

Even sentences like (73) can get a natural reading. Suppose you are following a lecture on the evolutionary ecology of a particular lake, the Lake Titicaca for example. Suppose furthermore that on a period of one thousands years, some swamps appeared and disappeared around the lake every hundred years. The lecturer might utters (73) and be perfectly fine.

(73) (We thus have some strong evidence that) When a swamp is closed to the lake, frogs invade it.

But if individual-level predicates represent characteristics of individuals over an extended period of time and if this is determined already in the lexicon, then how is it possible for these predicates to lose their individual-levelhood so that they can give rise to a stage level reading in sentences such as (73)?

For instance, Kratzer is well aware of the fact that those allegedly individual-level predicates are sometimes interpreted as stage-level. In discussing the following example

(74) *When Pedro has a donkey, he beats it.[33]

she claims that it is ungrammatical, "provided that the main predicates in their antecedents are interpreted as true individual-level predicates." ([38], p.148) She then stresses herself that most individual-level predicates can also be used as stage-level predicates. For example, she says that (74) is fine when interpreted as stage level e.g. if (74) relates to donkeys that Pedro occasionally borrows from his neighbors like the most natural reading of "When John has a spare dollar, he buys a lottery ticket with it."

[33]The asterisk is hers.

The same goes evidently for Carlson and Chierchia.[34] So again how can they deal with all those exceptions to these lexical rules? One answer that comes to mind is that the individual-level predicate *be intelligent* and the stage-level predicate *be intelligent* might be two separate but homophonic items of the lexicon. But this line of reasoning would only take us back square one: the question of whether individual-level predicates and their corresponding homophonic stage-level predicates are separate items of the lexicon, or whether we are dealing with one and the same predicate in both cases.

Most of them thus agrees that there must be some kind of type-shifting devices to transform ILP to SLP akin to the shift from mass nouns to count ones. But why is this is not clear at all. For instance, let us imagine a bizarre treaty between the province of Québec and Canada. Suppose that after a referendum about the independence of Québec from Canada, the difference between the 'For' and 'Against' is so close that the authorities decide that Québec will be a country, but only on weekends; on weekdays, it is a province belonging to Canada and the persons from Québec who want can also keep their Canadian citizenship on weekends. I take all the following sentences to be perfectly fine in this context:

(75) a. Usually, I am Canadian but, on weekends, I need to use the *Québéquois* passport.
b. When I'm Canadian, there is a portrait of Her Majesty Queen Elizabeth II on the coins I use.

But things are not quite as simple. Even given this special scenario, given that some people keep their Canadian citizenship on weekends, (76-a) seems to still lack an existential reading, and (76-b) sounds odd despite past tense and supporting context which should help to reinterpret *(be) Canadian* as SLP.

(76) a. People from Québec were Canadian last weekend. (only generic?)
b. *We saw Pierre (be) Canadian.[35]
c. ?John is a Canadian in his office.

(76-c) seems to be a borderline case. For instance, "John is always a Canadian in his office" sounds correct.

To conclude, we have seen that all the previous accounts of the contrasts attributed to the ILP/SLP distinction face some problems. Moreover, they share in common the assumption that the contrast is represented in the lexicon and we already have seen some reasons to doubt it. Furthermore, it seems that a type-shifting device to transform ILP into SLP would not readily solve all the problems. The next section will thus be devoted to the data again where the contrasts used to argue for the ILP/SLP distinction will be given a closer look and where we should see how those different contrasts relate to each other, if they do.

[34] the latter being however more parsimonious in the use of asterisks and preferring '??'.
[35] Maybe the sentence get better as "We never saw Pierre Canadian".

4 Reducing the Problem

As we have seen earlier, it is not clear at all wether one can describe stage-level predicate, as opposed to individual-level, has being 'transient' or 'episodic' properties. For instance, we saw some examples that show how easy it is to 'shift' individual-level predicates into stage-level ones. The previous approaches all make appeal to this intuitive distinction and it is intuitive in the sense that, out of the blue, sentences like in (1) sound odd.

(1) a. Alice was tall yesterday
b. When Alice is small, she can pass through the little door.

However, the previous approaches put the distinction in the lexicon and thus affirm that sentences in (1) are ungrammatical. They thus need to postulate some kind of device that can transform individual-level predicates into stage-level given a certain context. The question now to be asked is thus: Is there a genuine grammatical difference between the two? This section will be devoted to this question. We will first see again the data used by Carlson, Kratzer and Chierchia in more detail. Afterwards, we will compare the different contrasts to see how they relate to each other. Finally, we will argue that the distinction between ILPs and SLPs lies in our knowledge of the world. The distinction is thus essentially a pragmatic one and has no place in the lexicon: the meaning of 'tall' and 'small' in (1), for instance, are not different as their respective instantiation in (2).

(2) a. Alice is tall for her age.
b. Alice is really small, she needs to use a ladder to reach the cookie jar.

There is no shift in meaning, but rather a shift in what is considered possible or less likely to happen.

4.1 A Closer Look at the Data

4.1.1 There-Insertion

Milsark ([46][47])[1] was the first to claim the unavailability of individual level predicates in there-sentences, as shown in (3):

(3) ?There are two men intelligent/white/altruistic around.

According to Chierchia, there is however *nothing patently wrong* with the meaning of the sentences in (3):

[1]He also noticed that definite descriptions, proper names or pronouns are usually excluded from existential sentences, as well as quantified noun phrases introduced by a universal quantifier such as *every* or *most*.

> "It is quite clear what they should mean, if they were grammatical. They ought to mean something like:
>
> (4) There are two intelligent/white/altruistic men around.
>
> Yet we cannot express what (4) does by means of (3)." ([11], p. 179)

According to Chierchia's claim, there is thus no difference in meaning between (5-a) and (5-b):

(5) a. There are firemen available.
b. There are available firemen.

But is that so? In the following I will briefly argue that there is an important difference. My hypothesis is that there is some kind of overt *being* hidden in (5-a)[2] and thus that the two sentences in (5) should be interpreted in a similar fashion as sentences (6-a) and (6-b), respectively.

(6) a. There are firemen looking for a better job.
b. There are firemen.

The first argument in favor of this hypothesis is the following. Everyone would agree that the sentences in (7-a,b) and (7-c,d) are fine

(7) a. There is a man crying.
b. There is a man begging for something.
c. There is a man crying and begging for help.
d. There is a man crying, begging for something.

Here, it is important to note that the 'and' and the comma in sentences (7-c,d) play a crucial role. As a matter of fact, (8) is ungrammatical:

(8) *There is a man crying begging for something.

It is worth noting that the 'SLPs' behaves exactly the same way:

(9) a. There is a man looking for a new job.
b. There is a man available and looking for a job.
c. There is a man available, looking for a job.

[2]This would thus be a syntactic feature. Note that I am not claiming that there is actually the present participle of *be* hidden but that there is something that gives the same kind of meaning. I will briefly sketch my argument for this but I won't go in much details. The point is to give some intuitive ideas about what is going on with there-insertion involving ILPs and I think that this hypothesis should provide the reader the right kind of ideas I have in mind.

d. *There is a man available looking for a job.

(10) a. *There is a man drunk asleep.
b. There is a man drunk *and* asleep in the yard.

Interestingly enough, neither the comma nor the conjunction is necessary when the adjectives are placed before the noun they modify as shown in (11).[3]

(11) a. There is a dirty drunk man in the yard.
b. There is a tall dirty man in the yard.
c. There is a drunk tall man in the yard.

There seems to be a genuine grammatical difference here: just as present participles cannot be put together without the use of the conjunction or the comma, adjectives[4] appearing after the noun they modify cannot. This would be trivially explained if there was a covert present participle '*being*' hidden before the predicate (Or something acting like it). Also there is nothing patently wrong with there-sentences occurring with an instance of (the present participle) *being*; the sentences in (12) are also perfectly fine:

(12) a. There is a man being crucified/hung/pursued
b. There are politicians being honest.[5]

It is worth noting that the last examples are all individual-level predicates. Indeed, their counterparts without *being* sounds extremely odd.[6]

(13) a. ?There is a man crucified/hung/pursued
b. ?There are politicians honest.

[3]There seems to be, however, cases where the use of the conjunction is highly preferable. Compare, for instance, "?There is a stoned drunk man in the park" and "There is a stoned and drunk man in the park."

[4]Or adjective + present participle

[5]There is of course a major difference between the two examples. (12-a) roughly says that there is an event happening in which some people are nailing a man on a cross. I believe however that (12-b) can get a reading that states the existence of *honest politician.* The plural seems to play a crucial role here since such reading seems impossible with

(i) There is a politician being honest

Interestingly enough, the reading gets available again using '*must*':

(ii) There must be a politician being honest.

[6]One could argue that in the cases presented in (12), there is some kind of coercion going on and so the predicates are interpreted as stage-level. I hope to show that this is not the case, we shall come back to this issue in subsequent sections

The information that seems to be conveyed by the position of the adjectives (when being after the noun it modifies) is that there is a 'situation' that is happening now. For instance, (12-a) conveys the information that a present situation is such that it involves a man and at that precise moment he is *being* crucified. No such reading can appear with a sentence like 'there were dinosaurs'.[7] My claim is that the difference between (14-a) and (14-b) is similar.

(14) a. There is a man drunk.
b. There is a drunk man.

As the reader would notice, the natural reading of (14-b) is however quite similar to the one of (14-a). The reason for this is that 'being drunk', in our everyday world, denotes an episodic property. In other words, from (14-b) we have a general tendency to infer (14-b) and *vice versa*. Since we know that *being drunk* is an episodic property, we infer, for instance, that if there exists a drunk man, he will probably be sober in a short stretch of time while still being a man and thus follows the similarity between the two sentences.

The second argument I will propose in favor of this hypothesis is best exemplified by contrasts noted by Stowell [62]:

(15) a. Workers drunk on workdays drive Kelvin crazy.
b. *Kids intelligent drive Kelvin crazy.

As (15-a) is perfectly fine, (15-b) is terribly odd. However, compare with the following two sentences:

(16) a. ??Workers drunk drive Kelvin crazy.
b. ??Drunk workers on workdays drive Kelvin crazy.

This contrast is again best explained if we assume the existence of a covert *being*. Sentence (15-a) says, something like, that workers being drunk on workdays is a situation that drives Kelvin crazy. On the other hand, (16-a) states that workers being drunk is a situation that drives Kelvin crazy, but this clearly doesn't make any sense: 'workers being drunk' is a type of situation or should be interpreted as 'workers being drunk *now*.' On the latter interpretation, (16-a) should be in the progressive forms as (17) suggests:

(17) Workers drunk are driving Kelvin crazy.

[7]Of course, sentences like 'There are alligators' can refer to a 'situation' if someone points at them uttering it. But then its meaning would be something like 'There are alligators (*being*) over there'. The difference in meaning is subtle but there. For instance, compare with the following dialogues:

- Men are selfish.
- No, there are altruistic men.

Obviously, the speaker is not asserting that there are altruistic men over there but asserting the existence of such objects. No situations is described there.

A slightly modified version of (16-b) is the following:

(18) On workdays, drunk workers drive Kelvin crazy.

This sentence is fine, but one cannot convey the meaning of the first sentence of example (15) by using it. What (18) means is that drunk workers drive Kelvin crazy *on workdays* i.e. that there might be drunk workers in the weekend that don't drive him crazy. But this is not the meaning of the first sentence of (15) which means that the situation consisting in workers being drunk on workdays drives Kelvin crazy: it is not the workers that drive Kelvin crazy but the fact that they are drunk on workdays. This is again shown by the following contrasts[8]:

(19)
a. *Drunk students in class is an unacceptable situation.
b. *Workers male remains the sort of situation we want to avoid.
c. *I consider biscuits hard the worst situation we have to face.
d. *Students as tall as me is an unfortunate situation.

(20)
a. Workers too sick to work is the worst situation we have to face.[9]
b. Students drunk in class is an unacceptable situation.
c. Drunk students in class have unacceptable behaviors. (Predicative reading)
d. Having drunk students in class in an unacceptable situation.
e. The presence of drunk students in class in an unacceptable situation.
f. Students knowing the answers is always a delightful situation.

It thus seems that there is a genuine difference in meaning according to the position of the adjectives which seems to be due to some kind of syntactic feature playing the same role as the present participle '*being*' i.e. like other present participles, conveys the meaning that some situation is happening. This said, it is worth asking ourselves if this contrast is related with the ILP/SLP distinction. There are various reasons to doubt so. One of them, for instance, is that the range of copular stage-level predicates[10] that can

[8]Some of those examples were taken from [52]

[9]Note that only 'sick' (instead of 'too sick to work') gives a very bizarre sentence:

(i) *Workers sick is the worst situation we have to face.

The same goes with different constructions. For instance, compare:

(ii)
a. I consider workers angry about their pay the worst situation we have to face.
b. *I consider workers angry the worst situation we have to face.

Also note, that bare plurals (sometimes indefinite seems to work as well), as well as a spatiotemporal location, are essential in the 'situational reading' .

[10]It is indeed only restricted to the copular individual-level predicates i.e. predicates of the form "*be* + NP" as the following examples shows:

(i)
a. There is a man having blue eyes.
b. There is a man knowing French.
c. There are buildings towering the house.

appear after the noun they modify is rather restricted when uttering out of the blue:

(21) a. ?There is cat dirty.
b. ?There is a man alive.
c. ?There is a man unshaved.
d. ?There is a man sick.

As a matter of fact, special scenarios seem to be required to make sense of them. For instance, the best way to interpret the sentences in (21) is to imagine that someone had uttered that every man is the antonym of the predicates:

(22) - Everyone is clean/dead/shaved/healty!
- No, look, there is a man dirty/alive/unshaved/sick over there!

As we have seen, there-sentences have some very interesting peculiarities that unfortunately fall outside the scope of this thesis. Some further research is definitely needed on this topic since it is no clear at all what is exactly going on. However, as I intended to show the distinction is not related to a grammatical SLP/ILP contrast. The best test I have found that seems to predict the correct reading of there-sentences is the insertion of '*being, on that particular occasion,*':

(23) a. There was a fly [*being, on that particular occasion,*] in my soup.
b. There was a fireman [*being, on that particular occasion,*] available.
c. There was a girl [*being, on that particular occasion,*] kind enough to help me find my way home.
d. ??There was a fly [*being, on that particular occasion,*] dead.
e. ??There were many people [*being, on that particular occasion,*] intelligent.

If my claim is correct, it would follow that the position of the adjective restricts somehow the claim of the utterer. (23-a) says that there was a fly which was, on this very occasion, in my soup. Nothing is said about the fly in general but rather the state of a fly at a particular moment. The distinction might be clearer in (23-c). (23-c) doesn't say that the girl is always kind enough to help me find my way home. It only says that on this particular occasion, she was. Finally, the oddity of (23-d-e) is thus easily explained: it doesn't make any sense to say that a fly was, on a particular occasion, dead. A fly can be dying on a particular occasion but not dead. If something is dead, it is dead whatever the situation is.[11][12]

[11] Also note that (23-e) can gets an 'ironic' reading roughly meaning 'pretending to be intelligent'

[12] Note that this only work with copular predicates. We already saw that other predicates (like '*have blue eyes*', '*know French*', for example) can always appear in their present participle form. This is a rather puzzling fact (Why aren't we force to say 'that knows French', for instance?) and their might be other factors to explain this. As a matter of fact, (i) is odd.

(i) ?There is a woman knowing, *on that particular occasion*, Nahuatl.

But wasn't it exactly what Carlson, Kratzer and Chierchia were claiming? Not exactly. I do agree that when copular ILPs appear in the coda position of the NP, the sentences they composed are odd. The difference is that, as opposed to them, I do not claim that the difference is intrinsic to the predicates and pertains to their lexical meaning. What I claim is that there is a difference in meaning between the two type of sentences (i.e. the one with the copular predicates appearing in front of the noun and the other right after it.). In other words, I say that when the copular predicate appears in the coda position of the NP, we restrict the claim (that would be made using the other form): something is predicated of the subject as holding on a specific occasion. On the other hand, with the copular predicates in front of the subject, no such restriction is made: it only means that there is such an object (as a drunk man, for example). I assent that the difference is subtle, but there are some facts that make this claim viable. Finally, as opposed to the previously mentioned authors, I am not claiming that the difference is a grammatical[13] one pertaining to the lexical meaning of predicates, but rather that the difference belongs to our knowledge of the world. We shall now leave this aside for a moment and take a closer look at the other, seemingly related, contrasts.

4.1.2 Perception Sentences

Direct perception reports were one of Carlson's main motivation to assume the division of predicates into SLPs and ILPs. As he noted, adjectival phrases and infinite verb phrase do not behave uniformly as (24) shows:

(24) a. John saw the president naked
b. *John saw the president intelligent.
c. John saw Mary talk to Bill
d. *John saw Mary love Bill

As was noticed by him, copula constructions seem to never show up as infinitival complements of perception reports[14]:

(25) a. *Mary saw the policeman be naked.
b. *John saw the Mary be tired.

If it were the case that (i) restricts the claim in a similar way (ii) shouldn't be fine:

(ii) There is a woman knowing Nahuatl (over there).

[13]If there is a grammatical difference, it is only that SLPs seem to be more likely to appear without the present participle of '*be*'

[14]There are some counterexamples to this claim i.e. where copula constructions seem to be fine in infinitival complements of perception. Consider, for instance:

(i)

a. I later saw him be pushed by another boy twice his size.

Now, it is generally assumed that the meaning conveyed by perception reports constructed with naked infinitive is that the perceiver sees the *totality* of a the given event. For instance, (26-a) means that Mary saw the whole event, as opposed to (26-c) which means that she saw part of John's running.

(26) a. Mary saw John run.
b. Mary saw John running.

It is thus generally assumed that what is perceived is at least an eventuality (in the sense of Bach ([2])). However, stative verbs (like *believe*, *know*, *seem* and *have*, for instance) are generally excluded:

(27) a. *Mary saw John having two children.
b. *Mary saw John liking the color blue.
c. *Mary saw John believing in god.

It thus seems that we can rule out most of the statives since perception verbs take eventualities as argument that are usually dynamic. Thus, ILPs like *know*, *believe*, *have two children*[15] are already excluded.

What we are left with is construction like

(28) a. Mary saw John alive/naked/tired/drunk.

Now, I would like to stress that what is meant by examples in (28) is that Mary saw John '*being*' alive/naked/tired/drunk. For instance, it doesn't make much sense to say that she saw the whole 'state' of John being alive, naked or tired. In other words, even if it is not what is meant by sentences in (28), it follows from them that when Mary saw John, he was in a state of *aliveness/nakedness/tiredness/drunkness* **at this very moment**[16] i.e. copular predicates in direct perception reports function similarly as present participles:

(29) a. I saw John thinking about this problem.
b. We saw John looking for his keys.

---

b. I saw him be decapitated.
c. I saw him be very kind to the young man.
d. I saw them be critical once.

It also seems that using *never* makes thing easier:

(ii) a. I never saw him be anything but a first-class gentleman.
b. I never saw him be rude or dismissive to any of the fans.
c. I never saw him be on some kind of weird ego trip.

[15]Of course, *having two children* has a dynamic reading if what is meant is that Mary is giving birth to twins, for instance.

[16]Or Mary saw John **while** he was (being) alive/naked/tired/drunk.

I hence would like to hypothesize that the distinction here is similar to what happens with there-constructions. Consider the following:

(30) ??There is a traffic light red./There is a traffic light being red. (ILP)

Again, it seems that one has to put a *being* in front of the adjectival phrase in certain contexts which provides some evidence that there is something acting like a covert *being* in sentences without it explicitly.

Several authors ([13], [45], [31], for instance.) have reported that *coercing* a permanent property into a temporary one does not alter its status as ILP. To argue for this claim, Jäger provides the following example:

> Imagine a bizarre treaty between Canada and the Netherlands stating that people from either country may decide to be Dutch citizens on sunny days and Canadian citizens if it is rainy.

Contrary to (31-a) that is perfectly fine, (31-b) sounds odd despite past tense and supporting context which should help to reinterpret *(be) Dutch* as SLP.

(31) a. John is usually Dutch.
b. *We saw Henry (be) Dutch.

There are two main problems with this example. First of all, it is rather difficult to imagine a situation exemplifying a state of *dutchness* that one could see. The scenario proposed here is deficient with this respect. That John decides to be Dutch on sunny days doesn't change his appearance, there's no perceptive change that one could notice.[17] The second problem with the argument is that it is assumed that the correct representation of a perception report is (31-b). But as we have briefly argued, its correct representation should be something like:

(32) ??We saw Henry being Dutch.

which is of course odd since we don't know what kind of situations would exemplify Henry's dutchness at the moment of perception. I would thus like to propose another example. Consider a situation in which there is a chameleon that changes its color according to its mood. The following sentence is rather odd:

(33) There is a chameleon yellow.

But I take (34) to be fine:

[17]Maybe one can imagine that having the Dutch citizenship in the scenario makes you invariably tall and blond though. But then 'being Dutch' would imply 'being tall and blond'.

(34) There is a chameleon being yellow.

Now, suppose that a man, named John, is not aware of the chameleon's property of being able to change its color. He take a look at it while it is yellow, leave the room where the chameleon is, and come back to see it fifteen minutes later. But unexpectedly the chameleon, being in a specially bad mood at the moment, is now green. John, surprised, shouts: 'But I saw it yellow two minutes ago!'. In this context, there doesn't seem to be any problem with (35):

(35) John saw the chameleon being yellow and then saw it being green.

Note that this in the context, (36) is informative since the chameleon can change its color which wouldn't be the case it couldn't[18] As a matter of fact, various direct perception constructions are fine with predicates commonly assumed to be individual-level:

(36)
a. But we saw a politician being altruistic.
b. I saw him being red like a lobster once.
c. Then I saw it red like fire.
d. He saw the traffic light being green and therefore he immediately pressed the gas pedal all the way down.
e. He never saw the traffic light being red.
f. (Talking about a picture) When I saw it small I thought "that's the one to save."[19]

Of course, in all the examples cited in (36), the properties expressed by the predicate are thought as transient or episodic. But again, if we assume as Carlson, Kratzer and Chierchia that the difference resides in a grammatical distinction belonging to the lexical meaning of the predicates, we face various problems. The most important is that sentences like appearing in (37-a-b) sound odd as opposed to (37-c-d), for instance.

(37)
a. We saw Alice being small.
b. When Alice is small, she cannot reach the cookie jar.
c. We saw the picture small.
d. When the picture is small, it looks better.

But did we *coerce* the meaning of '*small*' in these examples? For instance, is there any difference between '*yellow*' in (38-a) and '*yellow*' in (38-b)?

[18] Compare with

(i) John saw the cat being black.

[19] For another similar example, the following quote was found in the New York Post (June 19, 2007):

"When we were shooting, we saw it small, on the monitor - but on the big screen, every hair on his butt is like a pine tree," says Apatow.

(38) a. I saw the chameleon (being) yellow.
b. ??I saw the car (being) yellow.[20]

We shall come back to this topic at the end of this section. For the moment, one should only remember that it seems possible, in certain context, to use ILPs in direct perception reports. The topic is of direct perception reports is a very complicated one. I do not claim having a satisfactory theory of their properties[21]. My only claim is that direct perception sentences with copular predicates are only felicitous if the properties denoted by the predicates is assumed to be transient or episodic and that 'being episodic or transient' is not written in the lexical entry of predicates, but is a matter of world knowledge (as I shall argue extensively at the end of this section).

4.1.3 Bare Plurals and Subject Effects

As we have seen in section 2, the interpretation of bare plurals (or, more generally, what has been called by Fernald ([22]) the *subject effects*). This topic is closely related to *genericity* which is a rich topic but falls outside of this thesis.[22] In this subsection, I will thus limit myself in providing some examples that show that the SLP/ILP distinction plays no role here either.

According to the Milsark-Carlson generalization, ILPs force the generic reading of bare plural subjects, whereas SLPs allow both the existential and the generic readings of bare plural subjects. However, there exist important counterexamples to the Milsark-Carlson generalization. For instance, all the following examples (due to Kiss [35]) are constructed with ILPs[23]but a generic reading of bare the plural subjects is impossible:

(39) a. Forests border the castle.
b. Trees line the road.
c. Large cities are situated at this river.

Moreover, Condoravdi ([13],[14]) has shown that bare plurals subjects have a third reading, a *quasi-universal*, which is clearly distinct from both the generic and the existential readings. On the quasi-universal, bare plurals "are understood as referring to the totality of the contextually relevant entities that satisfy the descriptive content of the bare plural subjects([20])." For instance, the following examples (all constructed with SLPs) do not allow an existential reading[24]:

[20]As opposed, to something like :'When I saw the car, it was yellow.'
[21]Actually, I do not claim having any theory on them.
[22]See [39] for an introduction to the topic
[23]

(i) a. ??When the tree borders the castle, it has beautiful leaves.
b. I saw the trees line the road.

[24]As a matter of fact, romance languages, standardly use noun phrases with a definite article to

(40) a. Students were cheerful.
b. Policemen were nervous.
c. Demonstrators were angry.
d. Committee members are bored.
e. Dinner plates were filthy.
f. Graduate students were sleepy at the meeting.

An example that exemplified the distinction between the generic reading and the quasi-universal is provided by [20]. In both (41-a) and (41-b), the existential reading is impossible. However, whereas (41-a) exemplifies a plain generic reading, (41-b) is quasi-individual: the bare plurals do not refer to the 'kind' students, but rather to a definite group of students, those of Berkeley in 1985.[25]

(41) a. Students are intelligent.
b. I was in Berkeley in 1985. Students were intelligent there.

To sum up, the ILP/SLP distinction does not to predict correctly the readings of bare plurals and the Milsark-Carlson generalization is false: there are ILPs that don't force the generic reading of bare plural subjects and SLPs that forbid the existential (as well as the generic) reading of bare plural subjects. This closes our discussion of bare plurals.

4.1.4 When-Conditionals

The subject of 'when-conditional' sentences occupies a central position in this thesis. As a matter of fact, section 5 will be entirely dedicated to them. Here we shall limit ourselves to a brief exposition.

In [17], de Hoop and de Swart argues that *when*-conditionals aren't sensitive to the stage/individual distinction. Instead the distinction has to be drawn between predicates that denote iterable eventualities and once-only predicates. For instance, they notice that when an individual-level predicate is contextually known to express a transitory property, as in (42), the predicate is felicitous in the *when*-clause[26]:

(42) It seems like Madonna dyes he hair every other week.
When she's blond, she vaguely resembles Marilyn Monroe.

express genericity (or quasi-universality) and the translation of the sentences (40) is not correct using an indefinite article. Most of the examples are due to [45]

[25]Examples ambiguous between the two readings ([20]):

(i) a. Linguistic theories have posited abstract representations.
b. Rescue teams have rescued 28,950 victims.
c. Details will be presented tomorrow.
d. Prices went up today.

[26]A similar phenomenon is noticed by Condoravdi with respect to bare plurals ([13]):

Moreover, they point out that there are several predicates that are stage-level but are still unacceptable with frequency adverbials and in the protasis of *when*-conditionals.[27] Typical examples are *to die* or*to grow up*.

(43) a. ??Peter grew up twice.
b. ??When Peter grows up, he inherits a fortune.
c. ??Peter died several times.
d. ??When Peter dies, he does it consciously.

According to de Hoop and de Swart, all predicates that are "once-only" are excluded in these contexts. In other words, all predicates that cannot stop holding of a particular individual and start holding again later are excludes. For them, permanent predicates are trivially "once-only", but since the reverse does not hold, the SLP/ILP distinction is not operative here.

As a matter of fact, in Norwegian, for instance, there are two different words for the English '*when*' i.e. '*når*' and '*da*'. Whereas 'når' is used with iterable eventualities, 'da' is used to express the 'time of reference'[28]as seen in the following examples:

(44) a. *Da* jeg kom hjem, drakk jeg et glass melk
When I got home, I drank a glass of milk.

b. *Når* jeg ser deg begynner hjertet mitt å slå fortere.
When I see you, my heart starts beating faster.

It is part of the meaning of 'når' that the protasis of the sentences where they appear is iterable.

However, it is not clear which kind of theory de Hoop and de Swart actually propose. According to them, in the case of frequency adverbials, "once-only" predicates lead to a plain contradiction. For conditionals, they assume a plurality presupposition that is violated if there is only one maximal time span where the protasis is true. But is this distinction grammatical or belongs to pragmatics? It is not certain what would be their answer to this question. For instance, de Swart writes:

> Both the uniqueness presupposition and the plurality condition have a strong pragmatic flavor. Still, they play a role in the semantics, because uniqueness

(i) Around here everyone dyes their hair every other day.
Look, today firemen have blond hair.

[27]Provided its arguments are definite.

[28]There is however an exception. In the future tense, even if the eventuality described by the *when*-clause refers to a particular one. One need to use 'når':

(i) a. Vi ordner det *når* jeg ser deg imorgen.
When I see you tomorrow, we will fix that.

and plurality seem to have consequences for the *well-formedness* of quantified sentences. ([63], p. 60)

and

> The combination of a Q-adverb and predicates such as '*posséder*' and '*avoir les yeux bleus*' is infelicitous, because such temporary events are not made available by these predicates: they denote permanent properties which the subject either has or does not have. If we want an explanation of these facts we have to give **a semantic characterization of different classes of predicates in connection with their quantificational possibilities** . This can be found in the contrast between 'temporary states' and 'permanent properties'.[29](*Idem*, p.43 (*my emphasis*))

To sum up, de Hoop and de Swart assume that there is a semantic difference between some predicates (even if the distinction has a pragmatic flavor): frequency adverbials with 'once-only' predicates lead to plain contradiction. But this is unlikely to be true. For example, suppose that a man never had drawn a circle in all his life (or that he did it only once). The following sentences are clearly infelicitous, but in no way they are contradictory.

(45) a. When he draws a circle, he chews on a chewing-gum.
b. Usually, he draws circles when he is bored.

But why not posit that all cases are similar to this one, instead of assuming that there is a grammatical difference between predicates with respect to their *once-onlyness*? As I shall argue extensively later, one shouldn't accept a lexical division between predicates to explain this contrast; the phenomenon is purely pragmatics: no predicates are intrinsically *once-only* by virtue of their meaning alone.

4.1.5 Predicative Adjuncts

As McNally ([44]) correctly demonstrates, the claim that predicative adjuncts must be transitory or stage-level is not quite true as her following examples show:

(46) a. Jane entered the Army an enthusiastic advocate of U.S. interventionism.
b. She left the Army a fervent noninterventionist.
c. Poe died a pauper.

[29]But compare with

> The distinction between stage-level and individual-level predicates is pragmatic, because the classification depends on knowledge of the world. There are many dubious cases or situations where we switch from one level of interpretation to another. (*Idem*, p.43)

d. George was a Presbyterian for years. Today he's sitting in church a convert to Catholicism.

The function of predicative adjuncts is to express that, at the time the state of affairs described by the main predicate holds, the referent of their controller is in a certain state. Thus it follows from (46-b) that *When she left the army, she was a fervent nonintervention-tionist*[30]and from (47-a-b) that *When we ate the vegetables, they were raw* and *When Fleisher played the piano, he was injured*, respectively.

(47) a. We ate the vegetables raw.
b. Fleisher played the piano injured.

As noted Dobrovie-Sorin ([20]), stage-level adjuncts will always be felicitous with stage level main predicates because, "as a rule, it will not trivially be the case that a stage-level property holds contemporaneously with any other arbitrary stage-level property." For example, the sentence *Mary went to work tired* denotes a past situation in which Mary simultaneously goes to work and is tired. Since the lexical semantics of predicates such as *go* and *tired* imply nothing in particular about when or how long a 'going event' or a 'state of tiredness' holds, it is quite easy to imagine various cases in which Mary goes to work without being tired and other in which she is tired even though she is not going to work. Hence, it is not trivial that the situation described is simultaneous with the state in which the referents of its participants are.

As a contrast, consider the following sentence in which the predicative adjunct is individual-level:

(48) ??Fleisher played the piano intelligent.

Under normal assumptions, we can assume that if Fleisher is intelligent, he will be intelligent for any arbitrary subinterval of his entire life. But then, it will trivially be the case that if Fleisher played the piano, he was intelligent when he did so. Under normal assumptions, the sentence is thus similarly as irrelevant and non-informative as:

(49) ??When Fleisher played the piano, he was intelligent.

There thus seems to be a strong correlation in felicity between sentences whose VPs contain predicative adjuncts and their 'paraphrases'[31] of those sentences in which either

[30]Note that both Dobrovie-Sorin ([20]) and McNally ([44]) not only assume that the when-sentences follow from the predicative adjunctival ones, but they are paraphrases. I am not sure to which extent this stronger claim is true. It does predict correctly some oddities. For instance, compare "John played the sonata available." with "When John played the sonata, he was available." The analysis of predicative adjuncts however falls outside the scope of this thesis. As a consequence, I will leave this matter aside. For the sake of my argument, it is sufficient that the 'when-sentences' logically follow from the predicative adjunctival ones.

[31]See the previous footnote

the main predicate or adjunct predicate appears in a temporal *when*-clause. Showing that sentences like (49) are not ungrammatical but pragmatically infelicitous would of course not prove that (48) is grammatical. However, it would provide some strong evidence to think so. We shall come back to the allegedly 'ungrammaticality' of (49) in a subsequent section. Now, we turn to a closely related phenomenon: the 'locatives' contrasts.

4.1.6 Locatives

Let us recall that Carlson, Kratzer and Chierchia observed that it is generally impossible to modify an individual-level predicate by a locative. Their argument is supported by the following contrast:

(50) a. *John is blond/intelligent/a linguist in his car.
b. *John is intelligent in France.
c. *John knows Latin in his office.

(51) a. John is always sick in France.
b. John works in his office.
c. Maria was tired/hungry/nervous in the car.

It is worth noting that the locatives appearing in the examples of (51) do not all behave the same. First, it is important to notice that 'always' in (51-a) plays an important role in the interpretation of the sentence, as the following shows:

(52) ?John is sick in France.

But more importantly, it is not the case that in (52-c) the locative modifier 'in the car' locates the Maria's *tiredness/hungriness/nervousness*. This is shown by the following contrast:

(53) a. - Where is John working?/Where does John work?
- John is working in his office./John works in his office.
b. ??- Where is Maria tired/hungry/nervous?
- Maria is tired/hungry/nervous in the car.

As (53-b) shows, the locative modifier in this kind of sentence does not play the role of locating the situation, but rather serves to restrict the topic time of the sentence.[32] Hence, the meaning of 'Maria was tired/hungry/nervous in the car' can be rendered as something like: there is a topic time $t*$, when Maria was in the car, and Maria is tired/hungry/nervous at $t*$.

This observation has been discussed at length by Claudia Maienborn ([41], [42], [43]). She distinguishes three kind of locatives modifiers: 'external modifiers' (as in (54-a)),

[32] See [36]

'internal modifiers' ((54-b)) and 'frame-setting modifiers' ((54-c)).

(54) a. Eva signed the contract in Argentina.
b. Eva signed the contract on the last page.
c. In Argentina, Eva still is very popular.

The locative in (54-a) refers to the place where the signing of the contract by Eva took place. The locative in (54-b) does not express a location for the whole signing event but only for one of its parts, viz. Eva's signature. Finally, the locative in (54-c) is not event related but sets a frame for the proposition expressed by the rest of the sentence. Frame-setting modifiers are not part of what is properly asserted but rather restrict the speaker's claim.[33] An example that was puzzling for Chierchia[34] is repeated here as (55):

(55) In Italy, five-years-olds know how to play soccer.

His problem was to explain why "locatives become more acceptable if the sentence contains an indefinite or bare plural."[35] According to him, the locative should be understood as modifying the noun and thus (55) should be interpreted as:

(56) [Five-years-olds in Italy] know how to play soccer.

But with Maienborn's account, this is not puzzling anymore. Leaving aside the details, the important point here is that a speaker may use the 'locative frame' to restrict the time for which he makes his claim (topic time)[36]. As she noted, "SLPs and ILPs do not differ in their ability to be located in space; they both resist spatial location"([42], p. 163). This is best shown by data from German, where the temporal adverbials make sure that the locative is a VP-modifier and therefore event-related. As can be seen in (57), all of the sentences in which a SLP is combined with an 'event-related locative' are ungrammatical:

(57) a. *Das Kleid ist auf der Wäscheleine nass.
The dress is on the clothesline wet.
b. *Paul war (zu dieser Zeit) unter der Straßenlaterne betrunken.
Paul was (at this time) under the street lamp drunk.

[33]Indeed, their admission does not necessarily preserve truth.

(i) In Argentina, Eva still is very popular $\not\Rightarrow$ Eva still is very popular.

[34]See the footnote in [11], p. 178.

[35]Note that this is not only true of indefinite or bare plurals. For instance, (i) is perfectly fine:

(i) a. In Australia, the swans are black.
b. In Argentina, Eva still is very popular.

[36]Just as in sentences like 'In his youth, John was a punk.'

c. *Der Sekt ist (immer noch) im Wohnzimmer warm.
The champagne is (still) in the living room warm.
d. *Maria ist (gerade) im Auto müde.
Maria is (at the moment) in the car tired.

Moreover Maienborn's theory correctly predicts the behavior of SLPs and ILPs with respect to locatives. For instance, leaving out the reading on which Maria was 'usually hungry', (58-a) sounds terribly odd, as opposed to (58-b) which is fine:

(58) a. ?Maria was hungry in Canada. (SLP)
b. John was blond in France. (ILP)

Indeed, paraphrasing the sentences in (58) as in (59), this makes perfect sense:

(59) a. ?Maria was hungry in Canada. (SLP)
(i) ?In Canada, Maria was hungry
(ii) ?When she was in Canada, Maria was hungry.
(iii) ?When she was hungry, Maria was in Canada.
b. John was blond in France. (ILP)
(i) In France, John was blond.
(ii) When he was in France, John was blond.
(iii) When he was blond, John was in France.

The contrast is now easily explained: (59-a) sounds odd (on the usual reading of hungry) because, under normal assumptions, one is is usually in Canada for a much longer stretch of time than he is hungry. On the other hand, (59-b) seems perfectly fine. We can easily imagine a scenario in which John went to study in France for one year, and decided to change the color of his hair for the whole year.

Here again, the contrasts observed do not provide any good reason to postulate a grammatical distinction between stage-level and individual-level predicates. It is our world knowledge that tells us that the average time of 'being in a car' and of that of 'being tired' fit together, whereas 'being blond' normally lasts for a much longer period. This can only be understood by "taking into account our rich conceptual knowledge about possible or typical temporal extensions of properties and how they can be adjusted ([42], p.168)." Once again, no grammatical distinction is warranted here.

4.1.7 Lifetime Effects

Finally, what has been called 'lifetime effects' might be the most straightforward example of default inferences. It is worth noting here that only Kratzer 'predicts' lifetime effects semantically.[37] I will thus be very in brief on this topic, limiting myself to providing few

[37]As a matter of fact, we have seen in section 3.2 that in Kratzer's theory, one has to shift the individual-level predicate into a stage-level one when a sentence is on the past tense and involved a

examples.

The first thing to be noticed is that the subject of the sentence plays a crucial role in the lifetime effect. For instance, from (60-a) one cannot infer that John is dead. However, from (60-b), concluding that the cities do not exist anymore seems justified.

(60) a. A year ago, John was on this side of the canyon.
b. A year ago, cities were on this side of the canyon.[38]

Finally, the inference to the conclusion that John is dead in sentences like:

(61) John had blue eyes.

is in most situation (not to say in all) completely unwarranted. Indeed, it might be that John has hazel eyes i.e. eyes that change color from blue to light brown, depending on different factors. In a case like this, a sentence like (62-a) is not ungrammatical at all but make perfect sense:

(62) a. John had blue eyes yesterday.
b. John had blue eyes last year.

(62-b), which has often been claimed to be ungrammatical[39], is also perfectly fine since it is known that often, newborns have blue eyes, which change to another as they grow older. In other words, it might well be that John is three years old, say, and that last year he had blue eyes and now they are light brown. We will not pursue this discussion any further.

4.2 Conclusion: What Are the Real Contrasts?

To sum up the discussion so far, we have seen that when-conditional constructions (as well as temporal and frequency adverbials) need the eventuality (in the sense of Bach ([2])) denoted by the protasis of the sentence to be iterable. This is due to the meaning of 'when' (when interpreted as 'when-conditional' i.e. the Norwegian 'når'). As I shall argue at length in the subsequent sections, no predicates are 'iterable' or not, by virtue of their meaning alone.

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subject denoting an alive (or existing) individual.

[38]The reader who believes that "being on this side of the canyon" means two different things in (60) is invited to change the examples by:

(i) a. Yesterday, John was close to this swamp.
b. Yesterday, a tree was close to this swamp.

and explain me the difference in meaning between the two reading of "being close to this swamp."

[39]see for instance, [31], p.77 and [63], p.45

On the other hand, locative modifiers and predicative adjuncts need not be iterable.[40] We have seen that from both these constructions it follows that a certain eventuality holds at the moment where the eventuality denoted by the VP does. For instance, "John played the piano injured" is true only if 'the time interval in which he played the piano is included in (is a part of) a time interval in which he is injured'. Likewise, 'John was drunk in the yard' is true only if 'the time interval in which he was drunk is included in (is a part of) a time interval in which he is in the yard' or 'the time interval in which he is in the yard is included in (is a part of) a time interval in which he is drunk.' In other words, the time interval in which one holds must at least overlap with a time interval in which the other does.

Similarly, we have seen that there-sentences and direct perception sentences convey the meaning that the eventuality is holding at the precise moment. For instance, that a sentence like "there was a man drunk in the park" should be interpreted as "At some specific time interval, a man was in the park and he was drunk at this very moment." Direct perception reports behave in a related manner with respect to the contrast at hand: From "I saw John drunk", it follows that John was drunk at the precise moment where I saw him.

Finally, we saw that the SLP/ILP distinction is not operating in the interpretation of bare plurals. The conclusion to be drawn from this is that, not only Carlson, Kratzer and Chierchia identified different, and independent, contrasts as belonging to the same distinction[41]but they also postulate a genuine grammatical distinction between two kind of predicates. But as we shall see in the next section, the matter is not grammatical at all but a pure matter of world knowledge.

[40]Fleisher might has been injured only once in his life but if he played the piano (while being injured) the sentence "Fleisher played the piano injured" is true.

[41]Jäger ([31], p. 74ff.) showed that the the existential reading of indefinites subjects, infinite complement of verbs of perception and transitoriness effect (lifetime effects and predicative adjuncts) are all independent in providing examples for each. I do not agree with all his examples, as the reader would realize comparing this section with his paper. However, it is worth noticing that it is possible to give example for each lines of the following table where:

1. A predicate is [+WS] iff it admits a weak/existential reading of indefinites subjects.
2. A predicate is [+PR] iff it can occur in the infinite complement of verbs of perception.
3. A predicate is [+TR] iff it denotes a transitory, i.e. it admits temporal modification without lifetime effects and can occur in depictive adjuncts.

	[WS]	[PR]	[TR]
A	+	+	+
B	+	+	-
C	+	-	+
D	+	-	-
E	-	+	+
F	-	+	-
G	-	-	+
H	-	-	-

5 Individual/Stage-level Predicates and World Knowledge

In this short section, I intend to show that the SLP/ILP distinction has nothing to do with grammar but is a matter of world knowledge. What I mean by world knowledge should become clearer in this section. As we have already seen, different unrelated contrasts have been subsumed under the SLP/ILP distinction heading and thus any solution that identifies all those contrasts is doomed to failure. As I had already argued in the previous sections, I believe that most, if not all, of these contrasts depend on knowledge of the world. This section is dedicated to this issue.

5.1 Coercion and Individual-Level Predicates.

A brief survey of the literature on the stage-level/individual-level distinction is enough to realize that the amount of sentences labeled as ungrammatical is extremely large. For instance, according to most authors, the two following sentences are grammatically ill-formed:

(1) a. Françoise always has green eyes.[1]
b. When Pedro has a donkey, he beats it (now and then).[2]

I have argued in the previous sections that they are not. For example, if someone claims falsely that Françoise has hazel eyes, one could utter 'No, Françoise always has green eyes.' As for (1-b), the sentence means that on every 'occasion' such that Pedro has a donkey, he beats it now and then. But those 'occasions' can take years. The only thing necessary to make it true is that there exists at least three, let say, different interval when Pedro had a donkey which are interrupted by time intervals when he doesn't own one.[3]

According to the authors discussed, what we just did is *coercing* an ILP into a SLP since the status of a predicate as SLP or ILP is ultimately rooted in the lexicon. However, it is extremely easy to turn an individual-level predicate into stage-level. The contrasts are frequently (if not always) slippery and contextual and lexical meaning is usually thought to be much less flexible than that.[4]

Coercion indeed happens in certain cases: an uncontroversial example being *a beer*. Here a count determiner (*a*) co-occurs with a mass noun (*beer*) following an internal type shift, which creates a coerced relation in the construction. Examples are as following:

(2) a. Mary labeled the wine.

[1] From [63], p.45, but see also [31], p.77.
[2] From [38] , p.148, but also in [63], p.42. The '*now and then*' is mine.
[3] We shall come back to this issue in the next section.
[4] For example, that the suffix *-able* can only be added to transitive verbs i.e. such that 'readable' is grammatical but 'cryable' is not.

b. The ham sandwich is waiting for his check ([51])
c. I just finished Madame Bovary.

Note however that all sentences in (2) can be paraphrased in the intended meaning:

(3) a. Mary labeled the *bottles of* wine.
b. The *person who ordered the* ham sandwich is waiting for his check ([51])
c. I just finished *the book entitled* Madame Bovary.

And other type of coercion that is well-known is related to the Aktionsarten (or Aspectual classes). Since Vendler ([68]), it is generally assumed that verbs divide into at least the following four categories:

1. *States*: know, love, be beautiful.
2. *Activities*: run, push a cart, draw.
3. *Accomplishments*: cross the street, build a house, draw a letter.
4. *Achievements*: begin, reach, arrive.

Several linguistic tests were developed to distinguish them, as, for example, their behavior with adverbial modification like *for two hours*. As shown in the following examples, 'for two hours' is licit with activities but not not with accomplishments or achievements:

(4) a. John pushed a cart for two hours.
b. *John crossed the street for two hours.
c. *John reached the top for two hours.

One type of coercion that occurs with respect to aspectual classes is exemplified in (5).

(5) Pollini played the sonata for two days [5]

Since "Pollini played the sonata" is an accomplishment, it 'shouldn't' be used with for-adverbials as pointed out above, as opposed to "Pollini played the sonata in 20 minutes." The coercion involved here consists in the shifting the accomplishment "Pollini played the sonata" to an iterative reading. As pointed out in [65], we have to rely on extralinguistic knowledge such as the timespan it usually takes to play a sonata to derive this meaning.

Interestingly enough, we can paraphrase (5) as the examples in (6) show:

(6) a. For two days, Pollini played the sonata *several times*.
b. For two days, Pollini played the sonata *twice a night at the opera*.

[5] From [65]

The question now is the following: can we paraphrase the coerced meaning of an allegedly ungrammatical sentence involving an individual-level predicate? In other words, given that we coerce the meaning of the individual-level predicate, what could count as a paraphrase that would give us the understood meaning? Considering again examples in (7), we must admit that it is not clear at all what their paraphrase should look like.

(7) a. Françoise always has green eyes.
b. When Pedro has a donkey, he beats it (now and then).

Fernald ([21]) has however a proposition. He proposed a logical rule for coercion using examples similar to the following:

(8) a. Tom is sometimes tall.
b. Ben is seldom funny.
c. John is not always stupid.

In all those examples,the individual-level predicates,*tall, funny* and *stupid* are taken to behave likes as stage-levels which is, of course, due to the Q-adverbs. According to Fernald, a spatio-temporal variable *à la* Kratzer has to be bound by the Q-adverbs. According to him, the only possible interpretation of (8-a) is that Tom sometimes *acts* as though he is tall i.e. the implicit word or phrase in all these examples is something along the lines of *acting* ϕ or *behaving as though he were* ϕ. With these examples in mind, he then states the logical rule for coercion as follows:

> **Evidential Coercion:**
> Let α be an ILP with interpretation α'. α can be used as an stage-level predicate with the following interpretation:
>
> $$\lambda x\ \lambda l_j\ \exists Q\ [G_{y,l}\ (Q(y,l))\ [\alpha'(y)] \wedge Q(x,l_j)]$$
>
> . ([21], p.124)

Roughly, the meaning of evidential coercion is that

> Given an entity x and spatiotemporal point l_j, there exists some stage-level predicate Q such that Q is true for x and l_j and it is true that in general for an entity y and a spatiotemporal variable l, if y and l satisfy the SLP Q then y is true of the individual-level predicate α'.

In other words, the rule is supposed to coerce sentences such as (7-a), to get the interpretation that Tom generally participates in activities, α', and when he does, one would say that he is tall. The activity Q in which the referent of the subject is participating is usually *acting* or *behaving* but could be almost anything: its determination rests upon the listener. If no such activity can be thought of, the coercion derails because Q cannot be determined.

The sentences in (8) then all boil down to something like:

(9) a. Tom is sometimes *acting as though he is* tall.
b. Ben is seldom *behaving as though he is* funny.
c. John is not always *acting as though he is* stupid.

But these paraphrase are clearly wrong. If someone utters (8-a), a normal reaction would be uttering a 'what?'. I, personally, would never reach (9-a). Moreover, (9-b) is obviously a bad paraphrase of (8-b). The reason is simple: there is nothing patently wrong with the former. If (8-b) is true, it is not because it rarely happens that Ben pretends to be funny, it is because he rarely is. Finally, (9-c) is clearly wrong also. Indeed, it implicates that John is generally stupid but usually pretends not to be which is the opposite of what is meant by (8-c). Since, I cannot find any suitable Q, the coercion should derail. But I still understand sentences in (8). The obvious conclusion to be drawn here is that no coercion happens in such cases.

5.1.1 *When an Individual-level predicate becomes Stage-level.

As Chierchia puts it, if we "imagine that John has a double personality which involves switching his mental capacities on and off in an abnormal manner ([11], p. 178)", (10) is fine:

(10) John was intelligent on Tuesday, but a vegetable on Wednesday.

What does Chierchia to make sense of the sentences is to invite the reader to imagine a special scenario. In other words, he invites us to change our background knowledge, not the meaning of '*intelligent*'. No such scenario is necessary nor sufficient in case of coercion. As a matter of fact, claiming that we somehow coerce the meaning of '*intelligent*' in (10) in providing a special scenario would be like saying that a special scenario could coerce the meaning of (11):

(11) The ham sandwich is waiting for his check.

But this is not what one does when interpreting (11). The difference is that (11) in its 'sentence meaning' doesn't make any sense. One could try as hard as he can to find a scenario that would make it true, it is not going to happen: ham sandwiches cannot wait for a bill. This is why coercion happens; since the sentence, on its plain 'sentence meaning', doesn't make any sense, we reinterpret 'the ham sandwich' (by 'the person who ordered the ham sandwich', for instance) in order to make sense of an utterance of it. If (11) had a proper 'sentential meaning' (i.e. if the sentence (11) would actually **mean** something), no coercion would happen. We have a totally different phenomenon at hand in interpreting (10).

Therefore, no so called shift from individual-level predicates to stage-levels can count as an instance of coercion. One of the main argument for this is that "whether a predicate is permanent or not does not depend solely on the meaning of the predicate itself but may determined by the subject or the prepositional phrase as well. ([31], p.77)" This is shown in the following examples:[6]

(12) a. The secretary of state was in Africa
$\not\Rightarrow$ He is dead.
b. Carthago was in Africa
$\Rightarrow$ Carthago does not exist anymore.
c. Riga was in the USSR
$\not\Rightarrow$ Riga does not exist anymore.

In (12-a), the predicate *be in Africa* is temporary and iterable (as "When the secretary of state is in Africa, he usually goes for a photo-safari." shows). However, (12-b), in both cases, is not: a city cannot change its position. However, as (12-c) shows it can be temporary.

The same goes with the iterability necessary for when-conditionals:

(13) a. Mary is prettier when her eyes are blue.
b. ?My shoes are prettier when they are blue.

(13-a) can be true only if has hazel eyes that turn to blue to green, say. Similarly, (13-b) can be true if there are at least two different time intervals in which they are blue separated with at least a time interval where they are not. Under normal assumptions, the sentence is a little bit strange. Of course, it can be true if someone paints his shoes now and then. Finally, as we have seen before, the timespan when a subject has a certain property may vary according to the subject.

(14) a. The traffic lights were all green on the road.
b. ?My shoes were green on the road.

Again, (14-b) is odd because in normal circumstances, the time interval of time when shoes have a certain color doesn't fit well with the timespan in which they can be situated on the road.

What these examples show is that to stipulate an ambiguity in predicates is entirely *ad hoc*. The distinction observed are entirely determined by world knowledge and should not be represented in grammar at all.

[6]These examples are also due to Jäger, aforementioned.

5.1.2 Understanding Science-Fiction

In this brief subsection, I will propose a fantastic scenario that turns and ILP (*tall*) into a 'SLP' for each of the contrasts observed so far. The reason for doing this is twofold. The first is to show that there is no grammatical distinction at all between SLPs and ILPs. And this is best shown by turning the most reluctant individual-level predicates into stage-level ones. Indeed, in the little scenario, the only thing that will be assumed is that a certain property that is commonly assumed to hold throughout the life of individuals (or an important part of it) is episodic.

It is important to note that by the mere fact that you understand a sentence like 'This kind of guinea pigs can get extremely tall on full moon', implies that you understood the meaning of 'being tall' (i.e. as something like having a size greater than the average) in the sentence. In other words, shifting an individual-level into a stage-level one already presupposes that we understand the meaning of the predicate: nothing is said on how one should interpret '*tall*' because one should interpret '*tall*' as 'tall'.[7]

The other reason is to show how much our knowledge of the world plays a role in all kinds of reasoning involved in the interpretation of sentences. As a matter of fact, in the fantastic stories that I will propose only some default assumptions about the world are dropped. Indeed, science-fiction and fantastic's language is after all the same language as we use in realistic discourse: the main difference consists in what is conceived to be possible or likely to happen. Fantastic stories are thus an excellent example of the difference between knowledge of the world and knowledge of the language and how they interact with each other in default reasoning.

A Stage-level Shifting Story

Once upon a time, a group of druids had invented a magic potion that could make dwarves that would drink it six feet tall for five minutes. Being such tiny creatures, dwarves got really interested. A new world was opening to them. The apple in the tree that could take hours to get, now was a matter of seconds: some magic potion, a little jump and the apple was ready to be eaten. Of course, the dwarves usually waited to get tiny again before eating the apples: it would be a lost eating it while being tall. But quickly the dwarves got addicted. The druids lost the control of the situation and it was not seldom that a dwarf would drink the potion in his house and thus suddenly destroying it as he would get bigger. The druids all met to discussed possible solutions to the problem.

The druid's master spoke: "It is anarchy around here! The dwarves cannot control themselves, one is using the potion every seconds, it cannot continue like this. Look over there! **There is again a dwarf being tall** that just exploded is house![8]

And another druid took on: "And this dwarf, called Rokkt, is violent. **When he is**

[7]Note that no such possibilities is available for real coercion cases. There is no way to make understand 'The ham sandwich' example by giving a scenario using 'the ham sandwich' without defining it.

[8]There-insertion

tall, he can be very dangerous! [9] And this other, Ort, seems to be always tall. Has anyone **seen him small** these days? [10]

Another druid answered: "Yes, **he was small in his house** one hour ago." [11]

"And this one, **he punched me being tall**!" [12]

The druids decided to stop the production of magic potion. Everything went back to the way it was before. But everyone remembered all their life when **dwarves were tall**. [13]

THE END

As we have seen in this short fantastic story, all the contrasts subsumed under the SLP/ILP distinction have been represented. What we did is to change some of our minimal background assumptions.[14] The meaning of no words is in disparity with normal, everyday English. I would also like to stress that even predicates '*born in the Netherlands*' can get an iterative reading given some special scenarios.[15] Indeed, suppose that reincarnation is possible and that a medium of some sort have somehow access to our previous and future lives. While analyzing the different lives of John, the medium utters: "It seems that whenever John is born in the Netherlands, he is blond and tall." Interestingly enough, if one feels like the meaning of some words in this last example are not their regular ones, it would be 'life' or 'John', not 'being born' nor 'blond and tall'.

5.1.3 Summing up

As we have seen, it is generally easy to shift an individual-level predicate into a stage-level one. Indeed, it seems that it is always possible. The way to do this is to change some background assumptions about what is possible or more likely to happen; this has nothing to do with the meaning of the predicates. There is thus no reason to postulate a grammatical difference between the two predicates; the different contrasts are a matter of what is compatible with a certain context and involves some default reasoning about the world. Uttered out of the blue, the sentences that had been considered ungrammatical sound odd. But this is only because they cannot (or are unlikely to) be true in the actual world. As Chierchia noticed, if a predicate considered as individual-level would end by denoting a transient property, then it would be classified as stage-level.[16] But this would be due to a shift in our background assumptions and what is considered normal, not a shift in meaning.

[9] When-conditionals

[10] Direct perception report

[11] Locative

[12] Predicative adjunct

[13] Bare plural, no generic reading (quasi-universal: 'I remember when firemen were drunk') and no lifetime effects

[14] There exists some tiny creatures called dwarves that eat apples, some druids that invented a magic potion that can make the dwarves tall.

[15] This observation is due to Ansten Mørch Klev

[16] See [11], p.178

Moreover, one should be careful about what should be ungrammatical and not. That a sentence like (15) is unlikely to be uttered, doesn't make it ungrammatical:

(15) When Giulia was born in Italy, she was an excellent cook.

As we have seen, this sentence can get an interpretation in a reincarnation setting without changing the meaning of the predicates used. Claiming that the oddity expressed by (15) is grammatical, is not only completely *ad hoc*, it is also false. For example, some sentences cannot get an interpretation. Indeed, one cannot imagine any situation in which it would be true that *an object has simultaneously two different colors at the exact same place on all its surface*. But does this mean that the sentence is ungrammatical? Claiming so, would basically be like saying the logical formula '$\phi \wedge \neg\phi$' is not well-formed because it is a contradiction. Moreover, as we have seen, the SLP/ILP distinction does not even give rise to this kind of contradictions by themselves. If they are in contradiction with something, it is with our background assumptions on what the world is like.

Finally, not only the idea of coercion seems not applicable in this case, but it is an expensive solution. If, as I have argued, *all* individual-level predicates can be coerced into stage-levels, then, for all ILPs, there exists an homonymous SLP. For methodological reasons, as Grice put it,

> "I am inclined to think that if one can avoid saying that the word so-and-so has THIS SENSE, THAT SENSE, and the other sense, or THIS MEANING, and ANOTHER MEANING, if one can allow them to be variants under a single principle, that is the desirable thing to do: *don't multiply senses beyond necessity*." ([23], p.291).

6 When 'When' Is a Conditional When.

The present section is dedicated to *when*-conditionals. When-conditionals are complicated constructions and their full analysis would take us too far.[1] According to Lewis ([40]) the semantic function of a *when*-clause, like *if*-clauses, in a 'quantificational' sentence is to provide the restriction for the adverb of quantification. For instance, the reading of (1-a) is that on all occasions that Marcia is at the cafe, she writes a letter. This reading can be represented 'pseudo-formally' as the tripartite structure in (1-b).

(1) a. Marcia always writes letters when she is at the cafe.
b. **always'** [*when she is at the cafe*]$_{\text{restriction}}$
[*Marcia writes a letter*]$_{\text{Nuclear Scope}}$

For sentences in which *when* (or *if*) does not occur, Partee ([54]) proposes that the context provides the restriction function. For example, (2-a) has an interpretation which is that in all relevant intervals it is the case that Francesca goes running. This can be represented as in (2-b) where the symbol **C** is intended to represent a contextual restriction function that gives the appropriate intervals from context. The condition in the nuclear scope is that each of those intervals contain an eventuality of Francesca going running.

(2) a. Francesca always goes running.
b. **always'** [**C**] [*Francesca goes running*]

This seems to be the correct interpretation. The problem is now of course to define what is a *case* (or an *eventuality*) and to explain how they are dealt with semantically. In this section, I will only briefly expose some interesting features of when-constructions. This section might thus look like an enumeration of some aspects: I will not go in any details. The first part consists on some observations on the relation between 'when' and 'if' and some similarities between 'when', and the prepositions 'before' and 'after'. The second will briefly show the importance of tenses in the interpretation of 'when' as conditional or as setting a 'topic time' in Romance languages. This should enable us to have a clearer picture of what are *when*-conditionals. Finally, we will see some important problems that one faces when trying to account for the semantics of *when*-constructions.

6.1 Some Observations

6.1.1 A Remark on 'When' and 'If'

An interesting observation noticed by Kratzer ([38]) is that when-constructions involving 'individual-level predicates', thus requiring a special scenario, all become perfectly fine as

[1] Indeed this thesis could have been entirely devoted to this subject without exhausting all its aspects and peculiarities

soon as we replace *when* with *if*. The interesting point, is that all those kind of sentences turn into *epistemic conditionals* after the replacement:

(3) a. If Mary knows French, she knows it well.
b. If Mary speaks French, she knows it well.
c. If Mary knows French, she speaks it well.[2]

Indeed, what is meant by the examples in (3) is something like 'I don't know if φ is the case, but if it is, then ψ is the case'. Many times *if*-clauses restricting adverbial quantifiers, like '*usually*' for instance, are interchangeable with *when*-clauses.

(4) a. Marcia always writes poems if she is at the cafe.
b. Whenever she is at the cafe, Marcia writes poems.

However, this is not always the case. For instance, (5-a-b) could be paraphrased by 'most time intervals in which it is the case that John showers, are also time intervals in which it is the case that John shaves.' On the other hand, (5-c) seems to convey something like 'for most time intervals in which it is the case that John shaved, it is also the case that he showers.' In other words, (5-b) seems to convey the meaning that John usually shaves at the moment of the day he showers, whereas (5-c) seems to mean something like 'Most of days that are such that John shaved are also days such that John showered.'

(5) a. When John showers, he usually shaves.
b. John usually shaves when he showers.
c. John usually shaves if he showers.

A more striking example is noticed by Lewis ([40]):

(6) a. ?If Caesar woke up, he usually had tea.
b. When Caesar woke up, he usually had tea.

Here, the 'if' and 'when' clauses are clearly not interchangeable. Indeed, the *if*-variant suggests that there was a question for each day quantified over whether Caesar would wake up or not. As von Fintel[3] puts it, "since people do wake up regularly, the *iffiness* contributed by *if* makes the sentence odd." This seems to be again a matter of world knowledge since as soon as it is available that the event described in the protasis can happen or not[4], the sentence with *if* is fine:

[2]Compare with:

(i) a. When Mary knows French, she knows it well.
b. When Mary speaks French, she knows it well.
c. When Mary knows French, she speaks it well.

[3][69], p.8

[4]i.e. the restrictive clause is *iffy* as von Fintel calls it.

(7) a. If Caesar woke up early, he usually had tea.
b. When Caesar woke up early, he usually had tea.[5]

This is a very interesting contrasts. We will leave it as it is for now. The important thing to remember is that, as opposed to *if* constructions, *when*-clause is assumed to occur and to have occurred. In other words, as opposed to *if*-constructions, *when*-conditionals are only felicitous if the eventuality described in the protasis was true on at least two different occasions.

6.1.2 When, Before, After, Whenever

'*Before*' and '*after*' are sometimes used in a similar way as *when*-conditionals. For instance, compare the following sentences:

(8) a. When Mary telephones, John seldom answers.
b. Before John makes a phone call, he always lights up a cigarette.
c. After John makes a phone call, he usually makes a coffee.

As we can see, Q-adverbs also fit well with *before* and *after*. Moreover, the sentences in (8) are very similar in meaning. Indeed, they can paraphrase as follows:

(9) a. Most of the time Mary telephones, John doesn't answer.
b. Every time John makes a phone call, he lights up a cigarette just before making it.
c. Most of the time John makes a phone call, he makes a coffee right after it.[6]

The first observation that should be made is thus that just as with '*when*', '*after*' and '*before*' can restrict a Q-adverbs in a similar way, being somehow more precise with the time interval where the protasis should hold.[7] The second conclusion that should be

[5]Note here that we do not necessarily have a temporal adjacency. In other words, it is not necessary for the sentence to be true that Caesar had a tea right after he woke up on days on which he woke up early.

[6]Or, equivalently:

(i) a. When John makes a phone call, he always lights up a cigarette just beforehand.
b. When John makes a phone call, he usually makes a coffee right after it.

[7]As a matter of fact, '*when*' is more ambiguous in this respect. For instance, (i-a) can mean that Johns has an headache during the time he drinks beer or right after (inclusive disjunction) and even that he drinks beer because he has a headache.

(i) a. When John drinks beer, he usually has a headache.
b. Before John drinks a beer, he always showers.

For (i-b), this sentence is definitely odd. But is it ungrammatical?

drawn is that '*when*', '*after*' and '*before*', as the examples in (10) show, need not be coupled with a Q-adverb.

(10) a. When Mary telephones, John doesn't answer.
b. Before John makes a phone call, he lights up a cigarette.
c. After John wakes up, he makes a coffee.

In those cases, the sentences have a generic reading like if there were a 'usually,' in front of them.[8]They are not universally quantified (like with '*always*') since they allow for exceptions. This means that, as Partee notices:

> There are at least two ways to express universal quantification over eventualities, either by using *whenever* to introduce the subordinate clause or by using a plain *when* (or *before, after*, etc.) and putting *always* in the main clause. ([54], p. 269)

The important point is that this is probably due to an implicit modalization in the main clause rather than to an ambiguity in *when*. The main reasons being that:
(a) a main clause alone can have a similarly generic or habitual reading, and
(b) the same phenomenon occurs with *before, after*, etc., which have no counterparts with *-ever* and for which there is no independent reason to posit ambiguity.[9] That is, we can interpret *whenever* as '*always, when*':

(11) a. Whenever Mary telephoned, Sam was asleep.
b. When Mary telephoned, Sam was always asleep.

Of course, *before, after* can set a topic time just as *when* can:

(12) a. When I woke up, I had a headache.
b. After I woke up, I made myself a cappuccino.

We shall now turn to the importance of tense in Romance *when*-constructions.

[8]In Italian (and French), the same phenomenon occurs. There is an invisible (universal) quantifier with the plain *when* that is neutralized when an explicit adverb of quantification (that doesn't coincide with '*always*') occurs.

(i) a. Sempre, quando mi vedeva, il portiere apriva la porta.
⇔ Quando mi vedeva, il portiere apriva la porta.
b. Always, when the doorman see (past, imp.) me, he open (past, imp.) the door.

c. A volte, quando mi vedeva, il portiere apriva la porta.
d. Sometimes, when the doorman see (past, imp.) me, he open (past, imp.) the door.

It is not clear what kind of syntactic and semantic devices neutralize the default quantifier when an explicit adverb of quantification is present.

[9]*Idem*

6.1.3 Tense and When-Conditionals in Romance Languages

Bonomi ([6]) notices the importance of tense in the interpretation of *when*-sentences i.e. if they are what we call *when-conditionals* or they set a topic time. In other words, as opposed to Norwegian for instance, in which, as we have seen, there are two different words for the English '*when*' i.e. '*når*' and '*da*' where 'når' is invariably used for the conditional *when*.[10] In Romance language, the difference is made by the tense used in the different clauses of the sentence. Bonomi considers four types of when-structures where the only difference is whether the past tense used is the *passato remoto* or *imperfetto* i.e. past perfect or past imperfect. Consider his examples:[11]

(13) a. Quando alloggiò al Grand Hotel Proust aveva al proprio servizio una segretaria privata.
b. Lorsque il logea au Grand Hotel, Proust avait une secrétaire personelle pour l'assister.
c. When Proust lodge (past, perf.) at the Grand Hotel, he have (past, imp.) a private secretary assisting him.

(14) a. Quando alloggiava al Grand Hotel Proust ebbe al proprio servizio una segretaria privata.
b. Lorsque il logeait au Grand Hotel, Proust eut une secrétaire personelle pour l'assister.
c. When Proust lodge (past, imp.) at the Grand Hotel, he have (past, perf.) a private secretary assisting him.

(15) a. Quando alloggiò al Grand Hotel Proust ebbe al proprio servizio una segretaria privata.
b. Lorsque il logea au Grand Hotel, Proust eut une secrétaire personelle pour l'assister.
c. When Proust lodge (past, perf.) at the Grand Hotel, he have (past, perf.) a private secretary assisting him.

(16) a. Quando alloggiava al Grand Hotel Proust aveva al proprio servizio una segretaria privata.
b. Lorsque il logeait au Grand Hotel, Proust avait une secrétaire personelle pour l'assister.
c. When(ever) Proust lodge (past, imp.) at the Grand Hotel, he have (past, imp.) a private secretary assisting him.

In each of these examples, there is a different characterization of the temporal relations between the event described by the when-clause and the one referred to by the main clause: (13) says that there is a past event of Proust's lodging at the Grand Hotel which

[10] See section 4.1.4 of the present thesis.

[11] [6], p.470-471. The [b] sentences are mine. As in the Italian sentences, the French translations give the same four types.

is temporally *included* in a past event of Proust's having a private secretary assisting him. In (14) the same events are said to be in the reverse relation and (15) states that they are temporally "coinciding", in a very broad sense.

On the other hand, (16) (where the subordinate clause and the main clause are *both* in the imperfective), unlike the other sentences, has a reading which *cannot* be paraphrased in terms of an "existential quantification" over events and/or times: what is meant is that *every* time Proust lodged at the Grand Hotel, he was assisted by a private secretary.[12]

Using the symbol '$\subseteq$' to express the temporal inclusion between events, '$\supseteq$' for the reverse relation and '$><$' for temporal coincidence and assuming that E_1 and E_2 are the events denoted by the when-clause and the main clause respectively, as Bonomi notes, the above examples are a good illustration of the following general paradigm:

	When-clause	Main clause	Temp. rel. between E_1 & E_2
(1)	Perf.	Imp.	$\subseteq$ (once)
(2)	Imp.	Perf.	$\supseteq$ (once)
(3)	Perf.	Perf.	$><$ (once)
(4)	Imp.	Imp.	$><$ (whenever...)

One should note that the imperfective does not have a progressive meaning here, (16) means that *every* time that Proust lodged at the Grand Hotel, he had a private secretary assisting him i.e. the imperfective is used to express a regular connection between two types of events.[13]

6.2 When Will We Have An Account For 'When'?

Kratzer's Proposal

We already saw that there were numerous problems with Kratzer's proposal with respect to *when*-conditionals. Romance languages provide some more problems for a Kratzerian

[12]Note that the sentence allows for another reading according to which the when-clause is not the restrictor of an adverb of quantification but is simply a "background" time adverbial. In other words, the *when*-clause sets the topic time. However, this reading is only available if the context makes clear that there is such events of Proust lodging at the Grand Hotel (for example). Out of the blue, these kind of sentences always get the 'when-conditional reading'. Finally, it seems that in these case, the interpretation is more likely to be a universal quantification instead of a generic one. Indeed, the sentence doesn't seem to allow exception. It might be that in Romance languages, as opposed to English, the default Q-adverb that comes with 'when' is 'always' and not 'usually'.

[13]Also note that in cases where the eventuality described is definitely 'repeatable', using the *imperfetto*, makes the sentence really odd uttering out of the blue.

(i) a. Il portiere apriva la porta
b. Le portier ouvrait la porte.
c. The doorman open (past, imp.) the door.

theory. We already saw that according to Kratzer's proposal, the verb *know* should be classified as an individual-level predicate in a sentence like *Lia knows Portuguese*, but should be classified as a stage-level (thus, as a three-place predicate) in a sentence like *Lia knows how to dress her hair* since a sentence such as:

(17) When Lia knows how to dress her hair, she is happy.

is perfectly in order and knowing how to dress one's hair is not a permanent property. One of my arguments against Kratzer was that there was no reason to multiply 'meaning' beyond necessity i.e. that there are no reason why one should conclude that a predicate like *know* is lexically ambiguous and that the number of its arguments can vary given the context.

As we have just seen, in Romance languages (at least French and Italian), the role of tense is crucial for the meaning of '*when*'. For instance, the following sentence is ambiguous:

(18) a. Quando era depresso, Leo era aggressivo.
b. Lorsque (Chaque fois que) Leo était en dépression, il était aggressif.
c. When Leo was depressed, he was aggressive.

(18) can have both the universal meaning (whenever...) and the 'topic time' one (in the period in which...). (19), on the other hand, will be invariably interpreted has the 'frame', 'topic time' (in the period in which...):

(19) a. Quando sapeva il portoghese, Lia lo sapeva bene.
b. Lorsqu'elle connaissait le portugais, Lia le connaissait bien.
c. When Lia know (past, imp) Portuguese, she know (past, imp.) it well = When Lia knew Portuguese, she knew it well.

We need to explain why (as Kratzer intends to do) (19) is unacceptable, but we must also account for the acceptability of (18) which has no apparent justification in Kratzer's framework other than the a SLP/ILP shift.[14]

Once-Only

For *when*-conditionals to be felicitous, there must be numerous distinct eventualities that meet the description specified by the restrictive clause: if just one eventuality of the kind

[14]Moreover, (i) for instance, is perfectly fine on its 'topic time' reading:

(i) a. Quando sapeva il portoghese e lo parlava a scuola, Lia leggeva molti giornali brasiliani.
b. When Lia know (past, imp.) Portuguese and speak (past, imp.) it at school, she read (past, imp.) many Brazilian newspaper.

The problem with Kratzer's proposal is that here the two predicates *know Portuguese* and *speak Portuguese* are on the same level. It is thus not clear at all how to make this fact consistent with the idea that they are structurally different i.e. *know* is a binary predicate but *speak* is a ternary one.

should be available, universal quantification would be infelicitous.

Indeed, if, for instance, the doorman has never seen me, or if he saw me just once, a sentence like next cannot be true:[15]

(20) When the doorman sees me, he opens the door.

This seems to be exactly what is going on: for all φ such that φ occurs in the protasis of a when-conditional, the question 'How many times φ?' is not senseless. That is, a question such as '*How many times did you know Portuguese?*' is senseless in ordinary situations[16] and thus, '*When I know Portuguese, I know it well*' is.

This is exactly de Hoop and de Swart proposal ([17], [63]). They associate individual-level predicates and what they refer to as 'once-only' predicates. *Once-only predicates* can be ascribed to an entity *only once*. For instance, *die* is a paradigmatic example and as a matter of fact, (21) is odd:

(21) ?When John dies, he does it consciously.

They assume a uniqueness presupposition on the Davidsonian argument[17] define as follows:

> **Uniqueness Presupposition on the Davidsonian Argument**:
> The set of spatiotemporal locations that is associated with an individual-level or a 'once-only' predicate is a singleton set for all models and each assignment of individuals to the arguments of the predicate. ([63], p.59)

According to de Swart, Q-adverbs are not unselective binders (as opposed to Lewis and Partee for instance), but generalized quantifiers over events or situations. She defines the Q-Adverbs as follows:[18]

ALWAYS:	(A)(B)=1	iff $A \subseteq B$
NOT ALWAYS:	(A)(B)=1	iff $A - B \neq \emptyset$
NEVER:	(A)(B)=1	iff $A \cap B = \emptyset$
SOMETIMES:	(A)(B)=1	iff $A \cap B \neq \emptyset$
TWICE:	(A)(B)=1	iff $\lvert A \cap B \rvert \geq 2$
MOSTLY:	(A)(B)=1	iff $\lvert A \cap B \rvert > \lvert A - B \rvert$

Thus, for example, (22-a) is interpreted as (22-b) in her system:

[15] And since I believe in the excluded-middle, it means that the sentence is false and not only 'without truth value' or 'undefined'. One could of course argue that the sentence lacks a truth-value but replying to this definitely falls outside the scope of this thesis. I think that when someone use 'when' in a *when*-conditional sentence, he actually *says* that the eventuality described in the protasis occurred more than once. I will not, however, argue for this.

[16] As I have argued, this depends solely on world knowledge.

[17] On the Davidsonian argument: See [15] & [29]. For a different approach on events: [48].

[18] i.e. the regular definitions for *all, not all, none, some, two, most.*

(22) a. When Mary knits a sweater, it is always a Norwegian one.
b. ALWAYS ((∃y (Mary knits y sweater), (Mary knits a Norwegian sweater))
⇔
$\{e|\ \exists y(\text{Mary knits } y \text{ sweater})(e)\} \subseteq \{e|\ (\text{Mary knits a Norwegian sweater})(e)\}$

Finally, she proposes another condition:

> **Plurality Condition On Quantification**:
> A Q-adverb does not quantify over a set of cases if it is known that this set has a cardinality of less than two.
> A set of cases is known to be a singleton if:
>
> 1. the predicate contained in the sentence satisfies the uniqueness presupposition on the Davidsonian argument, and
> 2. there is no (in)definite NP present in the sentence which introduces a variable available for binding by the sentential operator.

The proposal of de Swart (and de Hoop) is mostly right. There are, however, some problems. First, the 'Uniqueness Presupposition on the Davidsonian Argument' asks that the set of spatiotemporal locations (or events) that is associated with an individual-level (or a 'once-only' predicate) be a singleton set for *all models* and each assignment of individuals to the arguments of the predicate. This a too strong condition. As I have previously argued at length, that an 'eventuality' is once-only is a matter of world knowledge. Since we can usually build up some scenarios where a when-conditional involving a 'once-only' predicates can be true, one shouldn't force the predicate too be a singleton in *all models* but only in the models that corresponds to *what might be the real world*. In other words, the uniqueness presupposition and the plurality condition do not have consequences for the well-formedness of quantified sentences: they have consequences in the *truth value* of these sentences.

Secondly, by the Plurality Condition, a Q-adverb is said to not quantify over a set of cases if it is known that this set has a cardinality less than two. It would be more accurate to say that a sentence involving some Q-adverbs is *false* if the set of cases has a cardinality of less than two. In other words, it is part of the meaning of *when* in when-conditional constructions that the protasis held at least twice. Finally, the last problem I shall consider here is the status of the Davidsonian arguments or eventualities. In the following section, I shall argue that their use is not warranted if we do not know what they are exactly.

6.3 But What Are Davidsonian Arguments?

The second clause of the Plurality condition states that an eventuality is not a singleton if there a(n) (in)definite NP present in the sentence which introduces a variable available

for binding by the sentential operator. Indeed, if for instance, an Italian knows French, the 'knowing French' is a different eventuality for each Italian. This is intuitive enough. The question thus boils down to 'why is that so?' What are those eventualities, after all?

Davidsonian event arguments have become a very familiar *all-purpose* linguistic instrument over the past decades, and recent years have seen a continual extension of possible applications far beyond the initial focus on verb semantics and adverbials. But why should something be added to 'John punched Mary', for instance? We do not say much in saying that there is an event in a 'punching' relation with John and Mary. If there is an event that corresponds to 'John punched Mary' it is the event described by 'John punched Mary'. In other words, 'John punched Mary' is true if and only if there is an event that makes 'John punched Mary' true i.e. if and only if John punched Mary. But if this is true, the event only occurs in the semantics, not in the syntax. This thesis is not the place to argue at length against the use of Davidsonian arguments. The only thing I would like to point out is that it seems an easy way to say things like "the set of events that is associated with a 'once-only' predicate is a singleton set for all models and each assignment of individuals to the arguments of the predicate." More difficult is to answer the question 'why would that be so?' Suppose that John never drank a spritz in his life. I contend, (23) is false in that case:

(23) When John drinks a spritz, he enjoys it.

But drinking a spritz is not an 'once-only' predicate. It is 'once-only' in that situation. And there is no apparent reason why this case should be treated on a par with the other strange cases like (24):

(24) When John is tall, he enjoys it.

A Quick Note on the Proportion Problem

The so-called proportion problem[19] associated with Discourse Representation Theory ([33], [34], [26], etc.) consists in the fact that Q-adverbs do not always unselectively quantify over the values of all variables introduced in their restriction. For instance, following Lewis ([40]), it was generally assumed that the meaning of the Q-adverbs should be something like:

1. Always $[\varphi, \psi]$ is true if and only if every assignment to the free variables in φ which makes φ true also makes ψ true.
2. Usually/Often $[\varphi, \psi]$ is true if and only if more than fifty percent of the assignments to the free variables in φ which make φ true also make ψ true.
3. Seldom $[\varphi, \psi]$ is true if and only if few assignments to the free variables in φ which make φ true also make ψ true.

[19] [54], p. 278ff., [5], [32], [59], etc.

In a nutshell, the 'original' problem arises when a non-universal quantifier such as *most* functions as an unselective quantifier binding more than one variable, as in (25) for instance.

(25) Most women who own a dog are happy.

Now if we suppose that there are ten women in total in the domain of discourse, that one of them owns fifty dogs and is happy, and that the other nine women own exactly one dog each and are all terribly depressed, intuitively, in that case, (25) should be false. The problem is that the unselective binding analysis of *most* predicts it's truth: for the woman, call her a, that owns the fifty dogs, counting all the pair $\langle a, x\rangle$ such that x is one of her dog, we get fifty cases against the nine other pairs.

The problem occurs also in when-conditional:

(26) When a farmer owns a donkey, he beats it now and then.

What has been called ([32], [59]) the *asymmetric reading* of (26) quantifies over donkey-owning farmers whereas its *symmetric reading* quantifies over pairs of individual. Again, on its symmetric readings, if one farmers own most donkeys and beats them, (26) could be counter-intuitively predicted as true even if all the other farmers do not beat any donkeys.

Moreover, the problems is not limited to sentences containing two indefinites. For instance, it appears also in cases, where a *situation* is 'repeatable' as in (27):

(27) When a man crosses the street, he usually takes more than 45 seconds.

Consider the difference in truth-conditions between (28-a) and (28-b).

(28) a. Almost every man who crossed the street took more than 45 seconds.
b. In almost every case, if a man crossed the street, he took more than 45 seconds.

In (28-a), the quantifier is combined with *man* and so we have to count men i.e. the asymmetric reading. On the other hand, in (28-b), we need to count cases of 'street crossing' and the same man might well be involved in many of these.

Another related issue is exemplified in the following two examples, where '$[\alpha]$' means that focal stress is on α or that α is topical:

(29) a. If a [drummer] lives in an apartment complex, it is usually half empty.
b. If a drummer lives in an [apartment complex], it is usually half empty.[20]

[20] [10]

In the (29-a), with focal stress on *drummer*, we may find quantification over apartment complexes in which a drummer lives. The example then states that most apartment complexes where a drummer lives are usually half-empty. In the second example, where we find focal stress on *apartment complex*, the adverb may be taken to quantify over drummers. On this reading, the sentence says that most drummers that live in an apartment complex live in an half empty apartment complex.[21]

An Hypothesis

The proportion problem is a very interesting one and this because it is not trivial at all what could count as a proper solution. Here I shall propose an hypothesis that will be used in the next section where I will present a dynamic setting to account for when-conditionals. This hypothesis might turn out to be false and I will not argue for it here. The only thing that is important is that it seems to give us the right results in most of the cases. The hypothesis is as follows:

Double Quantification Hypothesis:
For all when-conditional χ of the form '$\textsc{when}\varphi, \psi$', χ contains at most one overt Q-adverbs, either in the first position (i.e. before the *when* as in 'Usually, when a man...') or in ψ (e.g. 'When a man drinks, he usually...')[22]:

1. If no Q-adverbs occurs in χ, the meaning of χ is:

   "For most topical-x , in most φ-cases: $\psi(x)$", where x refers to an individual that fits the description in ψ (e.g. John if John is in the domain and 'a man' is topical in φ.). In other words, when-conditionals always get the 'Usually' Q-adverbs by default.

2. If a Q-adverb appears in front of χ (i.e. the sentence is of the form 'Qχ') than its meaning is defined with respect to Q i.e. "For Q topical-x, in Qφ-cases: $\psi(x)$." For example, if Q is 'sometimes', the meaning is "For *some* topical-x, in *some* φ-cases: $\psi(x)$."

3. If a Q-adverb appears in front of ψ than its meaning is defined with respect to Q in the following way: 'For **most** topical-x, in Qφ-cases: $\psi(x)$." For instance, if Q is 'sometimes' then the meaning is "For **most** topical-x, in *some* φ-cases: $\psi(x)$."

According to this hypothesis, there is always only one overt Q-adverb in each when-construction. This seems to be in accordance with the rules of English:

[21] It is the other way around when the 'drummer' is topical instead of having the focal stress on it

[22] Note that then, a sentence like 'When a man always drinks, he is an alcoholic' is not accounted for. However, there are some reasons to believe that this case is different. For instance, these kind of sentences allow the occurrence of two Q-adverbs.

(30) a. ?Usually, when a man loves a woman, he always tries to kiss her.[23]
b. ?Always, when a man loves a woman, he never tries to kiss her.

Now, what the 'Double Quantification Hypothesis' says is that we get the following translation of canonical examples for each cases:[24]

(31) Usually, when a man loves a woman, he buys her flowers.
⇔
When a man loves a woman, he usually buys her flowers.
⇔
When a man loves a woman, he buys her flowers.
⇔
Most men are such that in most occasions in which they love a woman, they buy her flowers.

(32) When a man loves a woman, he sometimes buys her flowers.
⇔
Most men are such that in some occasions in which they love a woman, they buy her flowers.

(33) Sometimes, when a man loves a woman, he buys her flowers.
⇔
Some men are such that in some occasions in which they love a woman, they buy her flowers.

(34) When a man hates a woman, he seldom buys her flowers.
⇔
Most men are such that in few occasions in which they hate a woman, they buy her flowers.

(35) Seldom, when a man hates a woman, he buys her flowers.
⇔
Few men are such that in most occasions in which they love a woman, they don't buy her flowers.

(36) When a man hates a woman, he never buys her flowers.
⇔
Most men are such that in all occasions in which they hate a woman, they don't buy her flowers.[25]

[23]This sentence might get a normal reading according to which for most occasions in which a man loves a woman, he always tries to kiss her during the time interval in which he loves her. Thus, the hypothesis might need to be adjusted to allow this kind of case.

[24]'Always' and 'never' do not exactly fit the hypothesis. For instance, the sentence "When a man crosses the street, he always does it in ten minutes." does not seem to have a reading on which most men are such that on occasions in which they cross the street, they do it in ten minutes. Moreover, sentences of the form "Never, when ϕ, ψ." do not seem to be allowed by the rules of English. This forms an interesting topic that I cannot pursue here.

To sum up, the hypothesis says that there is always one Q-adverb that appear in a when-constructions, but that there are always two quantifications involved. One that quantifies over the topical NP and one that quantifies over the situations described. In other words, to verify a when-conditional, we need to first look at all topical NP and then look, for each of them, if the quantifier over occasion makes the statement true. After this is done, we need to see if Q of the members of the topical NP are like that. This would give us, in most cases, the correct predictions.

If the Q-adverb appears in front of the *when*, it binds everything given the restriction stated in the hypothesis. Of course, this will only works when indefinites occur in the sentence and the indefinite is topical.

A sentence like

(37) a. When John kisses a woman, shes likes it.
b. When John kisses Mary, she hates it.

Different Truth-Values

Let the domain of individuals be such that the men are members of the set $\{j, k, l, m, n\}$ and women, members of the set $\{a, b, c, d, e\}$. Now, consider the following sentences:

(38) When a man kisses a woman, she enjoys it.

Suppose that the "man kissing a woman" pairs are the following:

$$\{\langle j, a\rangle, \langle j, b\rangle, \langle j, c\rangle, \langle j, d\rangle, \langle j, e\rangle, \langle k, b\rangle, \langle k, c\rangle, \langle l, d\rangle, \langle l, e\rangle, \langle l, b\rangle, \langle m, b\rangle, \langle n, b\rangle\}$$

Furthermore, suppose that for some reasons, b never enjoys a kiss but all other women always enjoy it. In this situation, if *man* is topical then we get the following cases:

j:	a,	$\underline{b}$,	c,	d,	e	YES
k:	$\underline{b}$,	c,				NO
l:	$\underline{b}$,	d,	e			YES
m:	$\underline{b}$					NO
n:	$\underline{b}$					NO

Where the first column corresponds to the various men y, the second to kisses and the last to the truth-value of 'most x such that y kissed x are such that x enjoyed it'. Underlying

[25] Notice that there does not seem be a difference between *stative* and *non-stative* verbs with respect to the antecedent:

(i) When a man crosses the street, he sometimes does it in less than one minute.

(ii) When a man loves a woman, he always buys her flowers (at least once)

the letter in the 'kisses' column means that the woman did not enjoy the kiss. Thus, in other words, only j-kisses and l-kisses are such that in most cases the woman kissed enjoyed it. And since only two men out of five pass this first test, the sentence in (38) is false. However, if *woman* is topical, we get the following table:

a:	j	YES
$\underline{\text{b}}$:	$j,\ k,\ l,\ m,\ n$	NO
c:	$j,\ k$	YES
d:	$j,\ l$	YES
e:	l	YES

Then the sentence is true on this reading: most women are such that in most occasions in which they are kissed by a man, they enjoy it. This is rather puzzling and I am afraid I have no explanation to offer for this peculiarity.

Aunts, Mafiosi, Letters & Cigarettes

There is another related problem,[26] which was noted by Kadmon ([32], who attributes it to Bäuerle and Egli ([5])). Consider the example in (39):

(39) a. When an aunt comes, I usually go to the cinema.
b. Usually [x is an aunt & x comes at t, I go to the cinema at t]

If "usually" quantifies over aunt-time pairs, (39-a) is predicted to be false in the following situation: at one time, ten aunts came together and I did not go to the cinema, but ten other times a single aunt came, and I did go to the cinema. Similarly, imagine that I was always at home when a letter arrived for me, say fifty times, except one time when sixty letters were delivered in one package and that in all the other times the letters arrived one at a time. Consider the following sentence:

(40) Usually, when a letter arrives for me, I am at home.

Now, if the adverb *usually* requires to quantify over particular letter arrivals, then (40) would turn to be false. However, most people are inclined to judge the sentence true, because it is taken to quantify over moments at which (or situations in which) letters are delivered. The idea is that the situation in which letter a arrives is not different from the situation in which letter b arrives if the arrivals are part of one delivery. The same goes with the following example:

(41) Usually, when a mafioso enters my restaurant, I call the police.

[26] Most of the examples here are taken from [18], p.15ff.

What counts are 'enterings' of one or more mafiosi, and calls to the police and *not* individual mafioso 'enterings'. In all those cases, quantifying over pairs makes counter-intuitive predictions. It seems that what we need to do here is to quantify over intervals at which some aunt comes, not over interval-aunt pairs; over intervals at which some letter arrives, not over interval-letter pairs; and over moments at which some mafioso enters, not over moment-mafioso pairs. The problems associated with these cases suggest that adverbial quantifiers may be selective quantifiers. This is a rather puzzling facts. Note however that in all those examples, the variable introduced by the NP does not occur in the consequent. This seems to be important for the reading. For instance, compare all the previous examples with the following:

(42) a. When an aunt comes, I usually offer her some tea.
b. Usually, when a letter arrives for me, I immediately throw it in the paper basket.
c. Usually, when a mafioso enters my restaurant, I offer him a limoncello.

This is very interesting and it is not clear why it is so. The last problems I shall consider here was pointed out by Schubert and Pelletier ([55]:200), who discuss the following example:

(43) If I have a quarter in my pocket, I will put it in the parking meter.

The DRT semantics requires that if the speaker has some quarters in his pocket, he or she puts all of them into the parking meter. Consider a temporally equivalent problem:

(44) Before John makes a phone call, he always lights up a cigarette.

According to Partee's analysis (and my previous hypothesis), (44) is predicted to be false in the following situation: one day John makes two phone calls in a row, and he only smokes before the first phone call. On other days, he makes one phone call per day, and he smokes immediately before each phone call. However, our intuition is that (44) is true in this situation. It seems that if John makes two phone calls in a swoop, they count as "one collective event", so to speak, on a par with the other phone calls which were made in isolation. And the adverb always quantifies over such situations, not in reference to the individual phone calls. Another example is:

(45) a. When John smokes, Mary always puts on her gas mask.
b. Always [x is a cigarette & e is John's smoking x & t is immediately after e, Mary puts on her gas mask at t]

This representation predicts that the sentence is false in the following situation: Whenever John smokes, he smokes many cigarettes, not just one. As soon as he starts smoking, Mary puts on her gas mask, and she does not take it off until he stops smoking. This is repeated every day. This means that she does not put on her mask every time he starts

smoking a new cigarette. However, the judgment seems to be that (45) is true in the current scenario.

In all the problematic examples we have seen, authors make use of the Davidsonian argument. The Davidsonian argument is useful, especially in that it transfers the problem on something else, mainly on what are those events referred to. In the next section, I will propose a formal analysis of when-conditionals that does not make use of the Davidsonian argument. There are two main reasons for this. The first is that it forces us to construct cases directly in the model. In other words, there is no event-layer between the syntax and the semantics. The good aspect with such an analysis is that we can see exactly what is going in the system itself. The second reason is that I do not believe that there should be a Davidsonian argument at all: a sentence, as a whole, may refer to an event but not a variable stipulated to occur in it. Thus the main advantage of the system that will be presented in the next section is that it is completely transparent.

6.4 Conclusion

To conclude this section, we have seen some interesting aspects of when-conditional constructions. Most of these were briefly stated and no solutions were proposed. The point of this section was to get straight on the data and see what kind of problems and facts one as to think when trying to account for when-conditionals.

I have proposed an hypothesis that will be used in the next section. It could turn out to be false, but it seems to be a correct approximation for the time being. As I have argued at length in previous sections, the 'oddness' of when-constructions should be model through world knowledge. In the next section, I will propose an analysis that models this idea by using possible worlds as epistemic possibilities and where the growth of knowledge is worlds elimination.[27] In other word, the 'odd' sentences that have been considered ungrammatical will be analyzed as sentences in which there are no worlds that can make them true.

The dynamic setting that will be presented is not meant to be the final chapter of the when-conditional story. Most of the problems related to what has been called the 'proportion problem' will be left unexplained. However, as one should see in the next section, the system proposed allows one to see what is going on exactly and thus is a proper logical system to conduct further research on '*when*'.

[27] As in [67], [66]

7 Toward a Dynamic Setting for When-Conditionals

This section is dedicated to the presentation of a logic extending Groenendijk and Stokhof's Dynamic Predicate Logic (DPL) [24]. The basic idea behind this logic (that we will call *DUQ*[1] for brevity), is to formalize the claims that had been advanced so far concerning the individual-level/stage-level predicates distinction, the nature of when-conditionals and the nature of a *case*, (a *situation* or an *event*).

Like other dynamic systems, the meaning of a sentence in DUQ is not thought as lying in its truth conditions, but rather in the way it changes the information of the interpreter. The meaning of a sentence is viewed as the change an utterance of it brings about, and the meanings of non-sentential expressions consist in their contributions to this change: *meaning is information change potential*. As in [25], we shall distinguish two types of information: the *information about the world* (or factual information) and the *information about the discourse*.

The former is what matters the most in information exchange type of discourse. In other words, the prime purpose of the type of discourse we will be interested in is to get as best informed as possible as to know what is the world like. As in Update Semantics, ([67], [66]), information about the world will be represented as a set of possible worlds; the worlds that, given the information available, might still be the real one. Partiality of information about the world is accounted for by representing it as a set of alternative possibilities. In a nutshell, gaining information about the world amounts to eliminate worlds which were still considered possible. Hence, an agent know which world is the real one if and only if he has gained complete *information about the world*.

The second type of information, *discourse information*, is modeled with possible assignments. Assignments are used as usual, i.e. as total functions from the set of variables to the domain. To get better informed with respect to the discourse consists in eliminating possible assignments. Of course, discourse information can provide information about the world, as in [25], by the elimination of the last assignment left with respect to some world, this world gets eliminated. We will assume that the reader has basic acquaintance with both DPL and Update Semantics throughout this section.

7.1 Some Preliminaries to DUQ

It is sometimes useful to explain the reader what the logic is intended to do and how it does it before presenting it. The ideas behind DUQ is to account for the oddity of individual-level predicates in when-conditionals and Q-adverbs constructions. As we have discussed throughout this thesis, the oddity is not due to a grammatical difference, but rather caused by our world knowledge. That sentences like (1) are odd, has nothing to

[1] DUQ stands for 'Dynamic Update Q-adverbs'

do with their grammar, it has to do with the fact that it describes something that is unlikely to happen in the actual world.

(1) When Alice is tall, she can reach the cookie jar.

This is something we can model in Update Semantics using some of the insights presented in [67].

DUQ does not make use of any variables ranging over *eventualities* (or *spatiotemporal locations*). It is thus closer in spirit to Montague ([48]) than to Davidson ([15]). We have presented some arguments in the last section to prefer the former to the later. A consequence is that it makes the system slightly more complicated. We have to somehow construct the *eventualities* in the semantics. In order to avoid extreme complexity, we will assume a very naive conception of time. In the minimal DUQ presented here, time is thought as a finite set of time intervals on which we can define a successor and a predecessor function. We shall discuss later some ways of extending the system in order to have a more accurate conception of time.

We have seen in the previous section that tenses play an important role in making 'when' conditional. This is not going to be modeled here. The version of DUQ that will be presented here is minimal in a lot of respects and only after the presentation of the system, I shall discuss some possible extensions of it. Some are straightforward and has been left-out for ease of presentation. Some are more difficult to implement as I shall point out.

Finally, we have seen in the last section that when-conditionals have a strange relation with Q-adverbs and we have seen that the proportion problem is related to this. I have proposed an hypothesis: semantically, there are always two quantifications involved in when-conditional constructions. This will be modeled in DUQ and what the hypothesis involves should, by the same token, become clearer.

7.2 Syntax

The basic syntax of DUQ is the same as classical predicate logic with the the addition of the operator 'WHEN' and a set of connectives called QADVERBS containing adverbs of quantification.

More precisely, the non-logical vocabulary of DUQ consists of a finite set of n-place predicates $\mathbb{P}$, a finite set of individual constants $\mathbb{C}$ and a finite set of variables $\mathbb{V}$.

Logical constants are negation $\neg$, conjunction $\wedge$, disjunction $\vee$, implication $\rightarrow$, the existential and universal quantifiers $\exists$ and $\forall$, identity $=$, members of the QADVERBS$=$ $\{$ALWAYS, SOMETIMES, USUALLY, NOT-ALWAYS$\}$[2] and the connective 'WHEN'.

[2]This is a non-exhaustive list. As Q-adverbs will be treated as generalized quantifiers, there is no other reason than convenience for not allowing more. However, this can be done in the present version of DUQ only with WHEN. Indeed, sentence of the form USUALLYϕ if ϕ is not somehow related to WHEN

The formulas of DUQ are defined inductively in the following definition:

Definition 1 (Syntax)

1. If $\alpha_1, ..., \alpha_n$ are variables or individual constants, R is an n-place predicate, then $R\alpha_1...\alpha_n$ is a formula.
2. If α_1 and α_2 are individual constants or variables, then $\alpha_1 = \alpha_2$ is a formula.
3. If ϕ is a formula such that neither 'WHEN' nor Q $\in$ QAVERBS occur, then $\neg\phi$ is a formula.
4. If ϕ and ψ are formulas, then $[\phi \wedge \psi]$ is a formula.
5. If ϕ and ψ are formulas such that 'WHEN' does not occur, then $[\phi \vee \psi]$ is a formula.
6. If ϕ and ψ are formulas such that 'WHEN' does not occur, then $[\phi \rightarrow \psi]$ is a formula.
7. If ϕ is a formula, and x is a variable, then $\forall x\phi$ is a formula.
8. If ϕ is a formula, and x is a variable, then $\exists x\phi$ is a formula.
9. If ϕ is a formula such that no Q $\in$ QAVERBS occurs in ϕ, then for Q $\in$ QADVERBS, [Q ϕ] is a formula.[3]
10. If ϕ and ψ are formulas such that no Q $\in$ QAVERBS occur in ϕ and such that 'WHEN' does not occur in neither ϕ nor ψ, then [WHENϕ, ψ] is a formula.
11. Nothing is a formula except on the basis of 1-10.

The clauses 1-8 of ensure that any well-formed formula of ordinary predicate logic is also a well-formed formula in DUQ.

By clause 9, no adverbs of quantification can occur in the scope of another. This is in accordance with natural languages:

(2) I sometimes smoke but seldom drink.
SOMETIMES $Sa \wedge$ SELDOM Da.

will be well-formed but not, as one would expect, sentences of the form

(3) a. *Sometimes seldom it rains.[4]
SOMETIMES SELDOM p.

will not get a semantic representation. The reason should become apparent when we will discuss the semantics.

[3]Note again that sentences of the form 'usuallyϕ where no 'when' is involved will not be represented semantically.

[4]'Sometimes, it seldom rains' could get an interpretation but we won't deal with this kind of sentences. They are different in different respects and they are also more complicated to deal with.

b. *SELDOM[SOMETIMES $p \wedge q$].

By clause 3, no negation can occur in front of a Q-adverb or a WHEN. This is also in accordance with natural languages (with the exception of 'not always' which is being treated as a Q-adverb in itself).

Clause 5, forbids that two when-conditional combine with the connective 'or'. This is also in accordance with natural language:

(4) a. ??When I drink coffee, I smoke or when I smoke, I drink coffee.
b. ??When a farmer owns a donkey, he beats it or when a farmer owns a turkey, he eats it.

Finally, clause 10 and 9 makes sure that at most one Q-adverbs can occur with a when-conditional, in front of it, or in the antecedent.[5]This also seems to be required by natural languages:

(5) a. When a farmer owns a donkey, he beats it.
b. When a farmer owns a donkey, he usually beats it.
c. Usually, when a farmer owns a donkey, he beats it.
d. ??Usually, when a farmer owns a donkey, he seldom beats it.[6]

7.3 Semantics

Definition 2 (Model)

Fix a finite (non-empty) set $\mathcal{D}$ of individuals and a finite set $\mathcal{T}$ of time intervals[7] linearly ordered by $\leq$. A model for a basic DUQ language with a set of n-place predicates $\mathbb{P}$ is a quintuple $\mathcal{M} = \langle \mathcal{D}, \mathcal{T}, \mathcal{I}, \mathcal{W}, F \rangle$ defined as follows:

1. We define $\mathcal{I}$ to be a set of total functions f_i with the set of predicate letters $\mathbb{P}$ as its domain, and such that for each predicate letter P of arity n, $f_i(P) \subseteq \mathcal{D}^n$.

[5]There are some cases in natural languages where an adverb of quantification can occur in the protasis:

(i) a. When a man often coughs, he is ill.
b. When a man is always drinking, he is an alcoholic.

Those sentences are different in a lot of aspects with the other cases. Their treatment falls outside the scope of this thesis.

[6]Note however that the DUQ would be strong enough to give this sentence a meaning.

[7]For the sake of simplicity, we will assume here that $\mathcal{T}$ is a finite linearly ordered set where the intervals should be thought of as a partition of a given time span. In other words, if the time span involved is one specific day d, $\mathcal{T}$ can be thought as the partition of d into the 24 different hours of d i.e., in that case, $\mathcal{T} = \{[0.01, 1], [1.01, 2], [2.01, 3], [3.01, 4], ..., [23.01, 24]\}$ in that order, where it is assumed, again for simplicity, that for arbitrary $n \in \{0, 1, 2, ..., 23\} : [n, n.01] = \emptyset$.

2. We define $\mathcal{W}$ to be a set of total functions w_i with the set of time intervals $\mathcal{T}$ as its domain and with $\mathcal{I}$ as its range.

3. A *possible world* is a $w_i \in \mathcal{W}$ ordered by $\preceq$ in the following way:

$$\text{For all } t_n, t_m \in \mathcal{T} \text{ and for all } f_i, f_j \in \mathcal{I} \text{ such that } \langle t_n, f_i\rangle, \langle t_m, f_j\rangle \in w_i;$$
$$\langle t_n, f_i\rangle \preceq \langle t_m, f_j\rangle \Leftrightarrow t_n \leq t_m$$

   where $\leq$ is the linear order on $\mathcal{T}$.

4. F is an interpretation function from constant in $\mathbb{C}$ with $\mathcal{D}$ as its range.

By construction, all possible worlds in a model for DUQ share one single domain.[8] A model for DUQ is thus a set of possible worlds, each of them being finitely partitioned into time intervals consisting of first-order models. The picture that emerges is something that looks like the following (where each $\mathfrak{M}_n$ is a first-order model):

	t_1	t_2	...	t_n
w_1	$\mathfrak{M}_1$	$\mathfrak{M}_2$	$\mathfrak{M}_3$	$\mathfrak{M}_4$
w_2	$\mathfrak{M}_5$	$\mathfrak{M}_6$	$\mathfrak{M}_7$	$\mathfrak{M}_8$
...	$\mathfrak{M}_9$	$\mathfrak{M}_{10}$	$\mathfrak{M}_{11}$	$\mathfrak{M}_{12}$
w_m	$\mathfrak{M}_{13}$	$\mathfrak{M}_{14}$	$\mathfrak{M}_{15}$	$\mathfrak{M}_{16}$

We use assignments (denoted by 'g', 'h', and so on) as usual i.e. as total functions from the set of variables $\mathbb{V}$ to the domain $\mathcal{D}$. G is the set of all such assignment functions. As in DPL, by '$h[x]g$' we mean that assignment h differs from g at most with respect to the value it assigns to x. The function assigning semantic values to an expression is denoted by '$[\![\ ]\!]$'. For any term $\alpha \in \mathbb{V} \cup \mathbb{C}$, we define $[\![\ ]\!]_g$ as follows:

1. If α is a variable $\in \mathbb{V}$, then $[\![\alpha]\!]_g = g(\alpha)$

2. If α is an individual constant $\in \mathbb{C}$, then $[\![\alpha]\!]_g = F(\alpha)$.

Definition 3 (Information States)

Let $w_i \in \mathcal{W}$ and $\emptyset \neq A_i \subseteq G \times G$. An **Information State** over a model M is a set of pairs INFO $= \{\langle w_i, A_i\rangle\}$ such that if $\langle x, y\rangle, \langle x', y'\rangle \in$ INFO and $x = x'$ then $\langle x, y\rangle = \langle x', y'\rangle$.

Intuitively, an information state is the set of pairs $\langle w_i, A_i\rangle$ such that w_i might still be the real world and A_i is its unique set of assignment pairs. If INFO$=\emptyset$, we call it the absurd state.

[8] The reason for this choice is again pure logical convenience.

Definition 4 (Update - Simple Cases)

Define INFO_M and FORM as follows:

$\text{INFO}_M := \{\text{INFO} : \text{info is an information state over } M\}$

$\text{FORM} := \{\varphi |\ \varphi \text{ is a DUQ-formula}\}$

An update is a function $\mu : \text{INFO}_M \times \text{FORM} \rightarrow \text{INFO}_M$

To define μ we first define an auxiliary $\sigma : \text{INFO}_M \times w \rightarrow G \times G$

$$\sigma(\text{INFO}, w) = \iota A; \langle w, A\rangle \in \text{INFO}$$

where ιA should be understood as 'the unique A such that'.

Updating INFO with ϕ (written $\mu(\text{INFO}, \phi^t)$)[9] is defined as follows (for the simple cases):

For all ϕ such that 'WHEN' does not occur in ϕ:

$$\mu(\text{INFO}, \phi) := \{\langle w, A\rangle |\ A = \{\langle g, h\rangle |\ \exists k : \langle g, k\rangle \in \sigma(\text{INFO}, w)\ \&\ \langle k, h\rangle \in [\![\phi]\!]^t_w\}\ \&\ A \neq \emptyset\}$$

Intuitively, the idea is to keep only the worlds such that their set of assignments is not empty after interpreting the formulas. As we shall see in what follows, updating with a sentence $\phi \wedge \psi$ amount to the same as updating with ϕ and updating with ψ in cases where ϕ and ψ has the same temporal index.

Definition 5 (Interpretation Relative to Worlds and Time)

As in Prior [56], sentence denotations are relative to a temporal index.[10] We will use the superscript $(^t)$ in $[\![\phi]\!]^t$ to say that the interpretation is relative to the temporal index t that corresponds to some interval in $\mathcal{T}$ and the subscript $(_w)$ in $[\![\phi]\!]_w$ to say that the interpretation is relative to $w \in \mathcal{W}$. We define the interpretation function $[\![\ ]\!]^t_{M,w} \subseteq G \times G$[11] as follows:

1. $[\![R\alpha_1 ... \alpha_n]\!]^t_w = \{\langle g, h\rangle |\ g = h\ \&\ \langle [\![\alpha_1]\!]_h ... [\![\alpha_n]\!]_h\rangle \in w(t)(R)\}$
2. $[\![\alpha_1 = \alpha_2]\!]_w = \{\langle g, h\rangle |\ g = h\ \&\ [\![\alpha_1]\!]_h = [\![\alpha_2]\!]_h\}$
3. $[\![\neg\phi]\!]^t_w = \{\langle g, h\rangle |\ g = h\ \&\ \neg\exists k : \langle h, k\rangle \in [\![\phi]\!]^t_w\}$
4. $[\![\phi \wedge \psi]\!]^t_w = \{\langle g, h\rangle |\ \exists k : \langle g, k\rangle \in [\![\phi]\!]^t_w\ \&\ \langle k, h\rangle \in [\![\psi]\!]^t_w\}$
5. $[\![\phi \vee \psi]\!]^t_w = \{\langle g, h\rangle |\ h = g\ \&\ \exists k : \langle g, k\rangle \in [\![\phi]\!]^t_w \vee [\![\psi]\!]^t_w\}$

[9] the superscript t should be thought as the time of utterance

[10] This would make it easy to extend DUQ with Priorian tense operators.

[11] I will usually drop the subscript $(_M)$ when this does not give rise to confusion

6. $[\![\phi \rightarrow \psi]\!]^t_w = \{\langle g,h\rangle |\ g = h\ \&\ \forall k : \langle h,k\rangle \in [\![\phi]\!]^t_w \Rightarrow \exists j : \langle k,j\rangle \in [\![\psi]\!]^t_w\}$
7. $[\![\exists x\phi]\!]^t_w = \{\langle g,h\rangle |\ \exists k : k[x]g\ \&\ \langle k,h\rangle \in [\![\phi]\!]^t_w\}$
8. $[\![\forall x\phi]\!]^t_w = \{\langle g,h\rangle |\ g = h\ \&\ \forall k : k[x]h \Rightarrow \exists j : \langle k,j\rangle \in [\![\phi]\!]^t_w\}$
9. $[\![\textsc{always}\phi]\!]_w = \{\langle g,h\rangle |\ g = h\ \&\ \langle g,h\rangle \in \bigwedge_{t\in\mathcal{T}} [\![\phi]\!]^t_w\}$
10. $[\![\textsc{sometimes}\phi]\!]_w = \{\langle g,h\rangle |\ g = h\ \&\ \langle g,h\rangle \in \bigvee_{t\in\mathcal{T}} [\![\phi]\!]^t_w\}$
11. $[\![\textsc{not-always}\phi]\!]_w = \{\langle g,h\rangle |\ g = h\ \&\ \langle g,h\rangle \in \bigvee_{t\in\mathcal{T}} [\![\neg\phi]\!]^t_w\}$
12. $[\![\textsc{never}\phi]\!]_w = \{\langle g,h\rangle |\ g = h\ \&\ \langle g,h\rangle \in \bigwedge_{t\in\mathcal{T}} [\![\neg\phi]\!]^t_w\}$

Note that definitions 1-8 are exactly the same as in DPL (cf. [24]) but restricted to time and worlds. The definitions 9-12 define the adverbs of quantification (minus 'usually'). In these simple cases, the adverbs of quantification are not very interesting. Note that what is meant by $\bigwedge_{t\in\mathcal{T}} [\![\phi]\!]^t_w$ for instance, is the conjunction of ϕ under each temporal index. For example, in a model where $\mathcal{T} = \{t_1, t_2\}$ updating with $\textsc{always}\phi$ (i.e. $\mu(\textsc{info}, [\textsc{always}\phi])$) amounts to:

$$\{\langle w,A\rangle |\ A = \{\langle g,h\rangle |\ \exists k : \langle g,k\rangle \in \sigma(\textsc{info},w)\ \&\ \exists k' : \langle k,k'\rangle \in [\![\phi]\!]^{t_1}_w\ \&\ \langle k',h\rangle \in [\![\psi]\!]^{t_2}_w\}\ \&\ A \neq \emptyset\}$$

Note also that I will usually leave out the temporal index over formulas of the form '$\alpha = \alpha'$', '$\mathrm{Q}\phi$' as well as formulas containing WHEN. A quick look at the definitions should suffice to convince the reader that they are not necessary in those cases.

Now we shall turn on to a more complicated subject that is the interpretation of WHEN. In order to account for WHEN, we need to build cases. But first, we need to define *proto-cases*.

Definition 6 (Proto-ϕ-case)

A proto-ϕ-case in w (w.r.t. an information state INFO) is a pair $\langle\langle g,h\rangle, \langle t,t'\rangle\rangle$ such that[12]:

$$g = h \in \sigma(\textsc{info},w)\ \&\ \forall_{t\leq\ t''\leq\ t'}; \langle g,h\rangle \in [\![\phi]\!]^{t''}_w\ \&\ \langle g,h\rangle \notin [\![\phi]\!]^{pred(t)}_w\ \&\ \langle g,h\rangle \notin [\![\phi]\!]^{succ(t')}_w$$

where $pred(t)$ and $succ(t)$ are functions: $\mathcal{T} \rightarrow \mathcal{T}$ that take the predecessor and the successor of t as its value, respectively. They are both defined using the well-order on $\mathcal{T}$ as follows:

[12]Note that if the variable used in the when-conditionals was already used, we face some problems with this definition.

1. $pred(t) = t'$ iff $t' < t$ & $\neg\exists t''$; $t' < t'' < t$, if there is no such t', $pred(t)$ is undefined.

2. $succ(t) = t'$ iff $t < t'$ & $\neg\exists t''$; $t < t'' < t'$, if there is no such t' $succ(t)$ is undefined.

Intuitively, a proto-ϕ-case in w is a pair of assignments $\langle g, h\rangle$ coupled with a pair of time intervals $\langle t, t'\rangle$ such that $\langle g, h\rangle$ makes ϕ true in all time intervals between t and t' inclusively and such that $\langle g, h\rangle$ does not make ϕ true, just before t and just after t'. In other words, a proto-ϕ-case in w, is a pair composed of an assignment pair $\langle g, h\rangle$ and a time intervals pair $\langle t, t'\rangle$ such that under the assignment $\langle g, h\rangle$, ϕ 'starts' to be true at t and stop to be true right after t' (in w). For example, if John loves Mary only from t to t' inclusively in w, then the set of all proto-'John loves Mary'-case in w is the pair of all assignments ($\in \sigma(\text{INFO}, w)$) that makes it true (all of them in this situation) coupled with $\langle t, t'\rangle$.

A proto-'a man loves a woman'-case is similar. If there are only three individuals, 'John', 'Paul' and 'Mary' in $\mathcal{D}$ and if w is such that:

> 'John loves Mary' from t_1 to t_2 and, from t_4 to t_6 but doesn't love her at any other time, and 'Paul loves Mary' at t_3 only.

Then, the set of all proto-'a man loves a woman'-cases is the set consisting of the union of the following sets:

a. $\{\langle\langle g, h\rangle, \langle t_1, t_2\rangle\rangle |\ g = h \ \&\ g(x) = \mathbf{j} \ \&\ g(y) = \mathbf{m}\}$.
b. $\{\langle\langle g, h\rangle, \langle t_4, t_6\rangle\rangle |\ g = h \ \&\ g(x) = \mathbf{j} \ \&\ g(y) = \mathbf{m}\}$.
c. $\{\langle\langle g, h\rangle, \langle t_3, t_3\rangle\rangle |\ g = h \ \&\ g(x) = \mathbf{p} \ \&\ g(y) = \mathbf{m}\}$.

And obvious problem here is that it might well be that various assignment pairs $\langle g, g\rangle$ and $\langle h, h\rangle$ do not differ in the value they assign to the variables in ϕ. In other words, it can happen that, in the last example for instance, the pairs $\langle g, g\rangle$ and $\langle h, h\rangle$ do not differ from the value they assign to x and y but differ from the value they assign to z, for example. The problem is that in such a case, $\langle\langle g, g\rangle, \langle t_1, t_2\rangle\rangle$ and $\langle\langle h, h\rangle, \langle t_1, t_2\rangle\rangle$ are two different proto-ϕ-cases. But intuitively, they shouldn't be two different ϕ**-cases**.

Definition 6 (ϕ-case)

In order to define ϕ-cases, we first need to define an equivalence relation $\equiv_{\phi_w}$ on the set of all proto-ϕ-cases in w as follows:

$$\langle\langle g, g\rangle, \langle t_i, t_j\rangle\rangle \equiv_{\phi_w} \langle\langle h, h\rangle, \langle t_{i'}, t_{j'}\rangle\rangle$$

if and only:

1. for all variables $x_1, ..., x_n$ occurring in ϕ, $g \upharpoonright \{x_1, ..., x_n\} = h \upharpoonright \{x_1, ..., x_n\}$

2. $\langle t_i, t_j\rangle = \langle t_{i'}, t_{j'}\rangle$

In other words, two proto-ϕ-cases are equivalent if and only if the restriction of g to $\{x_1, ..., x_n\}$ is identical to the restriction of h to $\{x_1, ..., x_n\}$ i.e. for all variables occurring in ϕ, g and h have the same value.

Then $\equiv_{\phi_w}$ is an equivalence relation on the set of proto-ϕ-cases in w.

A ϕ-case in w is then defined to be an $\equiv_\phi$-equivalence class, i.e., a set

$$[\langle\langle g, g\rangle, \langle t_i, t_j\rangle\rangle]_{\equiv_\phi} := \{\langle X, Y\rangle \,:\, \langle X, Y\rangle \equiv_\phi \langle\langle g, g\rangle, \langle t_i, t_j\rangle\rangle\}.$$

This gives us exactly all the different ϕ-cases in w. Now, we want to make a distinction between the ϕ-cases involving the same topical subjects[13]. For instance, we want to distinguish the cases where 'John loves Mary' (given that there is more than one) from the cases where 'Paul loves Mary' in the 'a man loves a woman'-case (if 'man' is topical).

Definition 7 (Topical ϕ-case)

Now let d be an element of the set of individuals $\mathcal{D}$. Define a subset of the set of ϕ-cases as follows.

$$\phi[d] := \{[\langle\langle g, g\rangle, \langle t_i, t_j\rangle\rangle]_{\equiv_\phi} \,:\, g(x) = d\}.$$

Thus, intuitively, $\phi[d]$ is the set of ϕ-cases in w which agree on the variable x occurring in ϕ. Thus, if, as in our example, 'man' is topical and the variable 'introduced' by 'a man' is x, the subset defined as above corresponds to the ϕ-cases with respect to a particular individual. In other words, we get a subset of the ϕ-cases involving John, another involving Paul, and so on.

For all $\phi[d]$, we define a set $\phi[d]^\psi$ as follows:

$$\phi[d]^\psi := \{X |\ X \in \phi[d]\ \&\ \exists x \in X;\ \exists t^*;\ t \leq t^* \leq t'\ \&\ g = h\ \&\ \langle g, h\rangle \in [\![\psi]\!]^{t^*}\}$$

where the $x \in X$ is, of course, of the form $\langle\langle g, h\rangle, \langle t, t'\rangle\rangle$.[14]

[13] see section 6.4.1 (An Hypothesis)

[14] Here the $\exists t^*$ is arbitrary. In the basic language of DUQ, we cannot make some important distinctions. For instance, consider the following sentences:

(i) a. When John makes a phone call, he lights a cigarette just before.
b. When John drinks beer, he is happy.

In order to account for (i-a), DUQ needs to add the operator 'before'. This is not complicated and it is there that it should play a role, in taking the predecessor of t instead of an arbitrary t^* between t and t'. For (i-b), it is more complicated. The definition, as we shall see, won't rule out worlds where John drinks a beer for one hour, say, and he's happy for one minute in this hour.

Definition 8 (Double Quantification Hypothesis and Restrictions)

In section 6.4.1, I have made the hypothesis that there are always two quantifications involved in when-conditionals. In the present setting, when-conditionals are interpreted as something like the following:

$$\mathbf{G}(\phi[d])(\{\phi[d]|\ \mathbf{G'}(\phi[d], \phi[d]^{\psi}) = 1\})$$

1. If no QADVERBS occurs in the *when*-sentence φ or USUALLY is the QADVERBS occurring in φ then: $\mathbf{G} = \mathbf{G'} =$ MOST
2. If a Q $\in$ QADVERBS occurs in the consequent of φ then: $\mathbf{G} =$ MOST and $\mathbf{G'} =$ Q*
3. If a Q $\in$ QADVERBS occurs in the first position of φ[15] then: $\mathbf{G} = \mathbf{G'} =$ Q*

where Q* is the Generalized quantifier associated with Q defined in Definition 9.

Definition 9 (Q-adverbs)[16]

ALL (ALWAYS):	(A)(B)=1	iff A $\subseteq$ B
NOT ALL (NOT ALWAYS):	(A)(B)=1	iff A - B $\neq \emptyset$
SOME (SOMETIMES):	(A)(B)=1	iff A $\cap$ B $\neq \emptyset$
MOST (USUALLY):	(A)(B)=1	iff $\lvert$A $\cap$ B$\rvert$ > $\lvert$A - B$\rvert$

Definition 10 (Update - 'When')

Updating INFO with ϕ (where ϕ is a when-conditional) is defined as:

$$\mu(\text{INFO}, \phi) := \{\langle w, A\rangle|\ \mathbf{G}(\phi[d])(\{\phi[d]|\ \mathbf{G'}(\phi[d], \phi[d]^{\psi}) = 1\}) =\ 1 \text{ in } w\}$$

where **G**, **G'** are subject to the clauses defined in Definition 8-9. Also note that $\phi[d]$ has been defined with respect to w.

Here the system faces a genuine problem. The question is what to do with the set of assignment pairs A of w. The problem is that in certain cases, when updating with a sentence χ, the interpretation χ should stay in the scope of the when-clause as in:

[15] i.e. φ is of the form "Usually, when..., ..."

[16] Interestingly enough, the Q-adverbs satisfy almost the same constraints on admissible interpretation of natural language as determiners i.e.:
Conservativity: Q$(A)(B) \Leftrightarrow$ Q$(A)(A \cap B)$
Quantity: For all $A, B \subseteq U$ and all permutations m of U: Q$(A)(B) \Leftrightarrow$ Q$m[A]\ m[B]$
Extension: for all $A, B \subseteq U$, if Q$_U(A)(B)$ and $U \subseteq U'$ then Q$_{U'}(A)(B)$
Note that from the perspective of adding 'cases' as the time goes (i.e. gradual change), one should replace 'extension' by van Benthem 'plus' ([64], p. 32. See also [63], p.170.):
If $a = |A - B|$ and $b = |A \cap B|$ then
If $(a, b) \in$ Q, then $(a + 1, b) \in$ Q or $(a, b + 1) \in$ Q
If $(a, b) \notin$ Q, then $(a + 1, b) \notin$ Q or $(a, b + 1) \notin$ Q

(6) When a man loves a woman, he usually kisses he. And he buys her flowers.

as opposed to sentences like:

(7) When a man loves a woman, he usually kisses he. Oh, I think the house is on fire.

The easy way out is to force the update of the kind of (6) to be an update of the form WHEN$\phi, (\psi \wedge \chi)$ where χ is the update. This would give us the correct results, but, of course, there is more to say on this. It is, however, the *ad hoc* solution I will adopt here. This leads to the (complete) definition of Update:

Definition 10 (Update)

- For all φ such that 'WHEN' does not occur in ϕ and such that φ is not (or shouldn't be) in the scope of 'WHEN':

$$\mu(\text{INFO}, \varphi) := \{\langle w, A\rangle |\ A = \{\langle g, h\rangle |\ \exists k : \langle g, k\rangle \in \sigma(\text{INFO}, w)\ \&\ \langle k, h\rangle \in [\![\varphi]\!]^t_w\}\ \&\ A \neq \emptyset\}$$

- For all φ (of the form "whenϕ, ψ") such that φ is a WHEN-conditional:

$$\begin{gathered}\mu(\text{INFO}, \varphi) := \{\langle w, A\rangle |\ \mathbf{G}(\phi[d])(\{\phi[d] |\ \mathbf{G'}(\phi[d], \phi[d]^\psi) = 1\}) = \ 1 \text{ in } w\ \& \\ A = \{\langle g, h\rangle |\ \exists x; \langle x, y\rangle \text{ is a proto} - \phi - \text{case}_w\ \&\ x = \langle g, h\rangle\}\ \& \\ \text{there are at least 2 } \phi - \text{cases}_w\}\end{gathered}$$

In words, updating and INFO with a when-conditional amounts to eliminate the worlds where the when-conditionals is not true (either because the relation with the QADVERBS does not hold or there are less than two ϕ-cases). The definition ensures that the variables introduce by the when-clause are still introduced for further updates and it is thus a minimal change for the set of assignment pairs with respect to a given w. In other words, updating with a when-conditionals do not 'really' influence the set of assignment pairs A.

7.4 Conclusion

DUQ faces many problems as we have already seen. First, it is not clear at all, how an update with a formula that should be interpreted in the scope of a when-conditionals should go. Moreover, a lot of cases have been left undefined. In that sense, DUQ can only be a rough approximation. However, I believe that it provides a framework to pursue researches on 'when' as the system is transparent with respect to 'cases'. No difference, however, are made here between 'states' and 'events'. I shall now briefly present some possible extensions of DUQ.

World Assumptions

I have argued in this thesis that the SLP/ILP distinction is a matter of world knowledge. One can easily model this in a framework like DUQ. It suffices to define a subset of W by adding some rules. For instance, it is easily done to extend the language of DUQ by adding '$\Box$' to the formal language and using it to express 'it is a law that...', as in Veltman's [67] (p.6ff.). This would enable us to explain why the some when-conditionals are 'odds': because there are some general laws that are assumed to hold and that make the re-iteration of certain eventualities impossible. In other words, adding to the system a formula expressing "It is a law that everyone dies only once" would lead the information state to the absurd states after any update of the form 'When John dies, he does it consciously'.

Priorian Tense Logic

To extend DUQ with Priorian Tense operators is also straightforward in most cases since DUQ already makes use of temporal indexes. One could define the semantics of the past and present tenses as follows, where t is a temporal index and $<$ is an ordering relation:

(8) Where ϕ is a tenseless sentence,

a. $[\![\text{Past } \phi]\!]^t = 1$ iff there is a time t' such that $t' < t$ and $[\![\phi]\!]^{t'} = 1$
b. $[\![\text{Fut } \phi]\!]^t = 1$ iff there is a time t' such that $t' > t$ and $[\![\phi]\!]^{t'} = 1$
c. $[\![\text{Pres } \phi]\!]^t = 1$ iff $[\![\phi]\!]^t = 1$
d. $[\![\phi]\!]^t = 1$ iff ϕ is true at t.

However, it is not clear how 'when'-conditionals behave with respect to tense. For instance, future when-conditionals do not semantically behave as with the 'two' other tenses. For a present or past when-conditional, it is natural to assume that, if the when-conditional is true, then the protasis was true in at least two different non overlapping time intervals. However, this is not the case with future when-conditionals. For instance, it seems that a sentence like "From now on, when I will go to the library, I will bring an umbrella." can be vacuously true if the proposition expressed by the protasis never occurs. This is a delicate matter and I have nothing to offer for this now.

'When', 'Before', 'After' and Locations

Finally, it would be possible to add operators like the 'topic time *when*', *before* and *after*. However, in order to do that, one has to put more structure on $\mathcal{T}$ and this is also unclear how it should go. In principle it is possible, but the system would get way more complicated. For instance, one would have to make sure that if a formula is true at a given hour of a day, the formula is also true in the interval corresponding with that day. Where it gets complex is that we need to account for the fact that when we quantify over cases i.e. when we use Q-adverbs, we quantify on a certain scale. For instance, a sentence like (9) can be interpreted on a minute-scale for an interval of a given ten minutes:

(9) When the light flashes, I hear a sound.

However, sentences like (10) can take a scale of years:

(10) When I go to Mexico, I usually eats a lot of corn.

A final extension that would be viable is to introduce 'locations'. One could thus define $\mathcal{W}$ to be a set of total functions w_i with the set of time intervals $\mathcal{T} \times \mathcal{L}$ as its domain and with $\mathcal{I}$ as its range, where $\mathcal{L}$ would be a set of ordered spatial locations. This would allow to account for multiple cases such has:

(11) a. John is drunk in the car.
b. In Montréal, I am very popular.

The problems one would get are similar to extending DUQ with 'before' and 'after'. Moreover, it is not clear what kind of structures should have $\mathcal{L}$[17]

To conclude, I have sketched a way that makes it possible to account for 'cases' of when-conditionals directly in the models i.e. without using a Davidsonian argument. The system sketched here is incomplete. But I hope to have convince the reader that this kind of analysis is valuable for further investigations. And this, for at least two different reasons. First, it is more transparent: one sees exactly what is needed and how it could work. Second, the logical translation are closer to natural languages than previous account. In other words, if one believes that logical translation serves practical purposes only and that, in principle it can be discarded, DUQ is the kind of framework one should work with.

[17]For details and difficulties that one could face using locations, see [9]

8 Conclusion

We have seen that there is no "fundamental cognitive division of the world", roughly corresponding to temporary vs. permanent properties, that is reflected in the lexicon by some type of marking SLPs and ILPs. The grammar is not sensitive to the temporariness effects that occur in the process of interpretation of sentences: what has been called the SLP/ILP distinction is a matter of world knowledge and do not correspond to a type of contrasts but rather a collection of different ones.

Locative modifiers and predicative adjuncts, as opposed to *when*-conditionals, need not be iterable. We have seen that from both these constructions it follows that a certain eventuality holds at the moment where the eventuality denoted by the VP does. For instance, "John played the piano injured" is true only if 'the time interval in which he played the piano is included in (is a part of) a time interval in which he is injured'. Likewise, 'John was drunk in the yard' is true only if 'the time interval in which he was drunk is included in (is a part of) a time interval in which he is in the yard' or 'the time interval in which he is in the yard is included in (is a part of) a time interval in which he is drunk.' In other words, the time interval in which one holds must at least overlap with a time interval in which the other does.

Similarly, we have seen that there-sentences and direct perception sentences convey the meaning that the eventuality is holding at the precise moment. For instance, that a sentence like "there was a man drunk in the park" should be interpreted as "At some specific time interval, a man was in the park and he was drunk at this very moment." Direct perception reports behave in a related manner with respect to the contrast at hand: from "I saw John drunk", it follows that John was drunk at the precise moment where I saw him. And,finally, we saw that the SLP/ILP distinction is not operating in the interpretation of bare plurals.

In the second part of the thesis, I have focused on when-conditionals and we have seen that they (as well as temporal and frequency adverbials) need the eventuality denoted by the protasis of the sentence to be iterable. This is due to the meaning of 'when' (when interpreted as 'when-conditional' i.e. the Norwegian 'når'). As I have argued at length, no predicates are 'iterable' or not by virtue of their meaning alone: this is again a matter of world knowledge. We have seen some interesting aspects of when-conditional constructions, most of them being, however, only briefly stated and in need of further research.

Finally, I have proposed a minimal account for when-conditionals in a dynamic framework close to Groenendijk and Stokhof's Dynamic Predicate Logic and Veltman's Update Semantics, the idea being to use DPL in a framework able to model world knowledge and thus, as I have argued, accounting for the 'oddness' of when-constructions by modeling world knowledge.

Compared to the approaches of Carlson, Kratzer and Chierchia, the account advocated here is more parsimonious with respect to the lexicon, the grammar and the ontology but is, however, minimal in multiple respects. The dynamic setting that has been presented

here is not meant to be the final chapter of the when-conditional story. Most of the problems related to what has been called the 'proportion problem' are left unexplained. However, the system is transparent in that it doesn't make use of Davidsonian arguments and, thus, that the 'cases' have to be built in the models. It is that sense, that the account proposed here is not complete but is a step forward in the understanding of '*when*'.

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