

Fabrizio Arosio

Tense,
Aspect
and
Temporal
Homogeneity

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Preface

This volume is a new revised edition of my PhD dissertation. All chapters have been completely re-edited and some paragraphs have been revised according to the comments I have received over the years. In particular, chapter 4, presenting an experimental study and its results supporting the theoretical proposal discussed in the original dissertation, has been completely revised with the addition of new results from new statistical analyses. I believe this will bring additional evidence to the temporal homogeneity account.

Abstract

This work investigates the semantics of tense and aspect in natural language sentences. Its goal is to develop a compositional, model-theoretic semantics for tense and temporal adverbs which is sensitive to aspectual distinction, with a clear syntax-semantics interface, with wide empirical coverage for some different languages. My analysis will be mainly concerned with tense and aspect in Romance languages. In the discussion, I will argue that, if we consider the distribution of durative adverbials and the aspectual contrasts across the different morphological tense forms, we discover that the homogeneity properties of the tense complement play a fundamental role in tense selection in Romance languages. In order to explain these facts, I will assume that tense forms depend on the temporal homogeneity of their complement in Romance languages. I will discuss some additional evidence to the hypothesis that the temporal homogeneity of the tense complement plays a role in tense selection in other domains such as habitual and generic meanings and state of result constructions. I will give an analysis of some facts from these domains. In order to develop the proposal in a model-theoretic framework, in chapter 1 I will discuss some of the accounts of tense and aspect and I will present a temporal architecture of tensed sentences which is sensitive to aspectual distinction and verb classes differences. In chapter 2, I will illustrate and formalize the *homogeneity* proposal. In chapter 3, I will explore a possible application of the proposal to English. Finally, in chapter 4, I will integrate the introspective linguistic facts we discussed in the previous chapters with data from an empirical study in order to confirm my initial hypothesis concerning tense forms and adverbs combinations in Italian.

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List of abbreviations

1sPASTimperf	third singular past imperfective verbal morphology
1sPASTperf	third singular past perfective verbal morphology
1sPRES	third singular present verbal morphology
3sPASTimperf	third singular past imperfective verbal morphology
3sPASTperf	third singular past perfective verbal morphology
3sPRES	third singular present verbal morphology
AspectP	Aspect Phrase
AdvP	Adverbial Phrase
FP	Functional Phrase
LF	Logical Form
NPI	Negative Polarity Item
PASTpart	Past Participle
SpecTP	Specifier of a Temporal Phrase
TP	Temporal Phrase
VP	Verbal Phrase

1. Tense, aspect and verb classes

In this chapter, I will discuss some accounts of tense, aspect and verb classes (Aktionsart) in order to provide a consistent and compositional architecture of the temporal system of the proposal I am making. I will argue that, in order to compositionally derive the temporal meaning of natural language sentences, we should consider the semantics of the main components in interaction with each other because the implicit semantic contribution of one component impacts on the explicit definition of the others. This idea is found in recent work by Stechow (2002), Musan (2001) and Kratzer (1998), who argue that we have to look at the entire architecture of the temporal interpretative mechanism in order to formally derive the correct truth conditions of a tensed sentence. I will argue that these proposals do not pay full attention to the role that the aspectual class of the predicate plays in temporal interpretation. In particular, I will argue that the distinction between state verbs and non-state verbs plays an important role in the truth conditions of a tensed sentence. I will claim that this distinction is not a purely semantic distinction but it is also concerned with the logical syntax and the argument structure of predicates. Following Herweg (1991) and Katz (2000), I will assume that state predicates denote properties of times, while event predicates denote properties of events. This distinction will be formalized in a temporal system analogous to the one proposed by Stechow (2002), Musan (2001) and Kratzer (1998), in which tense is a referential expression and aspectual operators are responsible for the aspectual meaning of a sentence. While arguing for a referential analysis of tense, I will discuss two alternative approaches. First, I will consider a Priorian approach, in which time is

represented in the metalanguage as a temporal index of evaluation and tenses are propositional operators; then I will discuss a quantificational approach, in which time is directly represented in the object language and tense is a propositional operator which existentially closes the temporal argument of a given sentence. Finally, I will discuss a referential approach, in which time is directly represented in the object language and tenses are temporal variables carrying presuppositions saturating the temporal argument of a predicate. I will discuss some of the problems of a tense logic account by considering the interaction between tenses, temporal adverbials and logical operators. I will argue that a Priorian approach that adequately copes with these problems has much of a referential approach since it introduces hidden indexical adverbials (see: Bennett & Partee (1972) and Cresswell (1973) proposals discussed in 1.1.1). I will show that even a quantificational approach, in which tense introduces existential quantification over times in the object language, cannot avoid some of the above difficulties. I will argue that a referential approach avoids most of the scope and adverbial interaction problems and I will discuss some implicit assumptions concerning the different temporal interpretations of predicates from different verb classes, which a quantificational approach also requires. I will point out that these implicit assumptions are required because in these proposals the contribution of tense is not defined by taking into consideration the explicit contribution of aspect and verb classes. This is the motivation for having aspectual projections in our temporal system. In the discussion about aspect, we will argue that an account of aspectual distinctions only based on event properties (Giorgi & Pianesi, 2001) is problematic and that an alternative analysis based on the notion of *point of view* is too general to capture an explicit contribution of aspect. Following the recent work of Klein (1994), Kratzer (1998), Musan, (2001) and von Stechow (2002), I will assume that aspectual distinctions are conveyed by *aspectual* operators located below tense in the syntactic structure of a tensed sentence. I will argue that aspectual operators play a crucial role in the derivation of the different temporal interpretations

conveyed by state sentences and non-state sentences; I will give an analysis of these differences. At the end of chapter 1, I will formalize the temporal architecture I will assume and I will account for some interesting English facts concerning these differences.

1.1 Tense

Natural language sentences show a systematic grammaticalization of temporal relations in many languages. In English, for example, tense morphemes marking verb inflections convey the information that the eventuality¹ described by the sentence is in the past or in the present with respect to the time at which the sentence is uttered. Intuitively, a present tense sentence like (1a) describes a situation as it is at the time at which the sentence is uttered, while a past tense sentence like (1b) describes a situation as it was at a time before the time at which the sentence is uttered, as represented in figure 1 and figure 2 below.

(1a) Arnim is in Konstanz

(1b) Graham was in Tübingen

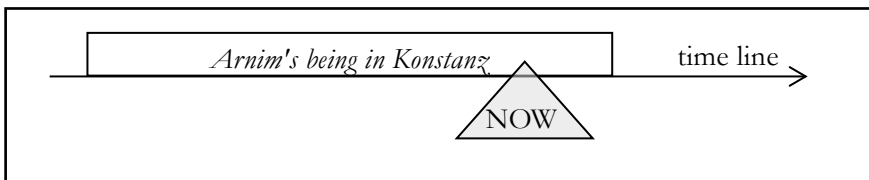


Figure 1: situation described by sentence (1a)

¹With the term eventuality I will generally refer to different types of situations (see Bach (1986)).

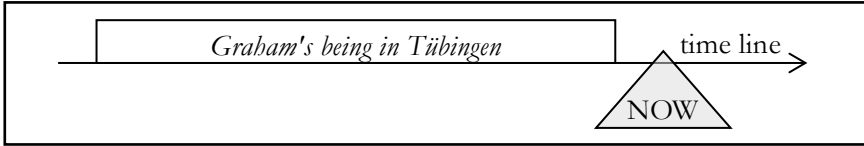


Figure 2: situation described by sentence (1b)

In (1a) and (1b), a difference in the tense inflection is responsible for the different temporal meanings conveyed by the two sentences.

1.1.1 Tense logic approaches

One of the most fruitful approaches to the study of tense in natural language is the tense logic approach, which makes use of formalisms developed by temporal logics (see Øhrstrøm and Hasle(1995)). According to modern tense logic, originally developed by the New Zealand philosopher Arthur Prior (1957, 1967) and further developed according to the laws of intensional logic (Carnap, 1947; Kripke 1959), the denotation of a formula is relativized to a time and tenses are sentential operators shifting the denotation of a formula into the past or into the future. The general idea is that, given a propositional language L , its tensed version is derived by adding to L the tense operators P and F by application of the following syntactic rule: if ϕ is a formula then $P\phi$ and $F\phi$ are formulae. A model for a tensed propositional language will include a structure T , representing the linearly ordered set of times, and a function v , assigning to each propositional letter of L its intension (in this case a function from times to truth values); a function of interpretation $|| \cdot ||$, which recursively gives the interpretation of a well-formed formula of L , will be relativized to the structure T , to the function v and to a time $i \in T$, as represented in (2).

- (2) If ϕ is a propositional letter, then $\|\phi\|^{T,v,i} = 1$ iff, $v(\phi)(i) = 1$ and in the usual way for the formulas derived by the application of the logical constants of L^2

Accordingly, the past and the future operators, which shift the truth condition of an untensed formula to a different temporal index, are defined as in (3) and (4).

- (3) If ϕ is a formula, then $\|P\phi\|^{T,v,i} = 1$ iff there is some $i' \in T$ such that $i' < i$ and $\|\phi\|^{T,v,i'} = 1$; $\|P\phi\|^{T,v,i} = 0$ otherwise
- (4) If ϕ is a formula, then $\|F\phi\|^{T,v,i} = 1$ iff there is some $i' \in T$ such that $i < i'$ and $\|\phi\|^{T,v,i'} = 1$; $\|F\phi\|^{T,v,i} = 0$ otherwise

The application of the tense logic semantics to the analysis of tense in natural language sentences has been realized in many different ways starting from the work of Montague (1974), Dowty (1979) and Kamp (1971). The basic idea is that the past tense morphology in a sentence like (5) is the spell-out of the Priorian temporal operator P that applies to the untensed sentence as represented in (6).

- (5) Graham lived in Tübingen
- (6) P [Graham live in Tübingen]

²In the original Priorian definition, T is an ordered set of instants of time. As Bennett and Partee (1972) showed this is a problem when we evaluate sentences such as "John built a house" since the building of a house takes more than an instant (we will ignore this problem at the moment and we will discuss it in the next sections). For the sake of the argumentation we will assume than in the definition in (2) sentences are evaluated with respect to times and with the term times we will refer to instant and intervals of time. Given a set of instants of time T , I is an interval of T iff $I \subset T$ and for every $t_1, t_3 \in I$ such that $t_1 \leq t_3$, if there is a t_2 such that $t_1 \leq t_2 \leq t_3$, then $t_2 \in I$.

In (6), the temporal operator P applies to the untensed sentence Graham live in Tübingen. According to the definition of the past operator given in (3), the truth conditions of (5) are represented in (7).

(7) $\| \| P[\text{Graham live in Tübingen}] \| \|^{T,v,i} = 1$ iff there is a time i' such that $i' < i$ and $\| \| \text{Graham live in Tübingen} \| \|^{T,v,i'} = 1$

Definition (7) says that the sentence Graham lived in Tübingen is true at a time i iff there is a time i' before i at which the untensed sentence Graham live in Tübingen is true.

Summing up, the tense logic approach is characterized as follows:

- sentences are evaluated with respect to a temporal index
- tense operators correspond to the tense morphemes
- present tense sentences are untensed
- tense is a sentential operator
- tense introduces existential quantification over times
- tense manipulates times in the meta-language
- tense introduces a new evaluation time, and the original one is lost

There are a number of problems with this approach. The first concerns the fact that, while evaluating a tensed sentence, we introduce a new evaluation time and the original one is lost. This is a problem when one tense is in the scope of another, as originally observed by Kamp (1971) in (8).

(8) A child was born who will become ruler of the world

A Priorian analysis can't capture the intended meaning of (8), given its associated LF reported in (9).

(9) P [a child be born [F who become ruler of the world]]

According to (9), the becoming ruler of the world event is in the future with respect to the past time introduced by the matrix past tense. This is not correct. In order to capture the right interpretation of (8), the embedded '[F who become ruler of the world]' has to be evaluated with respect to the speech time, and not to the new evaluation time introduced by the higher 'P'. The LF in (9) captures rather what sentence (10) says.

(10) A child was born who would become ruler of the world

As recently pointed out by Kusumoto (1999) (originally by Ladusaw (1977) and Dowty (1982)), we have the same problem when a past tense occurs in the scope of another past tense, as shown in (11) and (12).

(11) Hillary married a man who became the president of the US

(12) Who hired the person who wrote this article?
(originally by B. Partee)

According to the Priorian analysis, the events described in the matrix clause follow the events described in the embedded clause, but a 'forward-shifted' interpretation, namely an interpretation in which the events described in the matrix clause are before the events described in the embedded clauses, is also available to the two sentences.

Kamp (1971) proposes a two-dimensional system to solve these problems. In his system, sentences are evaluated with respect to two temporal indices: the first index is the Priorian evaluation time, which can be shifted by the temporal operators, the second index keeps track of the value that the first index has when the sentence is initially interpreted. Moreover, Kamp introduces an operator N which sets the value of the first index to the value of the second one. According to these assumptions, the semantics of tenses will be defined as in (13), (14) and (15).

- (13) $||P \alpha||^{T, \theta, t, t'}=1$ iff there is a time t'' such that $t'' < t$ and
 $||\alpha||^{T, \theta, t'', t'}=1$
- (14) $||F \alpha||^{T, \theta, t, t'}=1$ iff there is a time t'' such that $t'' > t$ and
 $||\alpha||^{T, \theta, t'', t'}=1$
- (15) $||N \alpha||^{T, \theta, t, t'}=1$ iff $||\alpha||^{T, \theta, t', t}=1$

According to these assumptions, the LF for (8) is represented in (16).

- (16) P [a child be born [N [F who become ruler of the world]]]

According to (16), the embedded future is now correctly evaluated with respect to the speech time since the operator N sets the evaluation time back to speech time before the embedded sentence is evaluated. The correct truth conditions for (11) and (12) are derived in the same way by the occurrence of the N operator above the embedded past operator.

However, a two-dimensional system is not powerful enough to capture the expressivity power of natural language, since in natural language we can have sentences that need to keep track of more than one time, as observed by Vlach (1973).³ Consider in fact the following example from Kusumoto (1999).⁴

- (17) The writer complained to a person who hired an editor who he was and still is working with

According to most natural interpretation of (17), the temporal order of the described eventualities is the one represented in figure 3 below.

³Vlach's (1973) original observation is that we cannot represent the correct truth conditions of the following sentences in Kamp's double index system:

(a) One day, all persons alive then would be dead.

⁴Kusumoto (1999): 18.

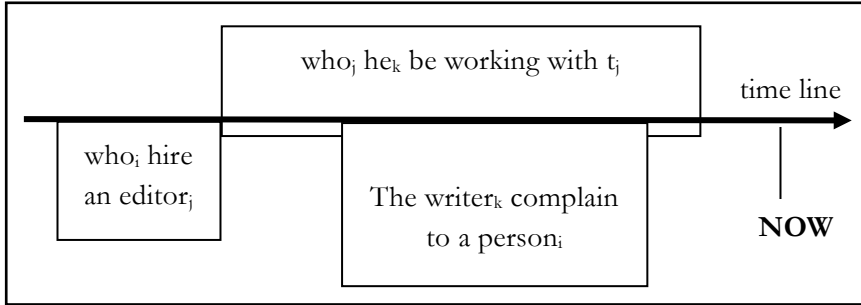


Figure 3: default temporal meaning described by sentence (17)

Ignoring the contribution of the progressive, which is not relevant to our discussion, according to a simple Priorian approach the LF of (17) is represented in (18).

- (18) P [The w. c. to a p. [P who h. an e. [P who he work with] & [he still work with]]]

These conditions do not capture the temporal order we represented in the picture above since a past working event is required to be before the time of the hiring. According to a two-dimensional system, one possible LF of (17) can be represented in (19).

- (19) P [The w. c. to a p. [P who h. an e. N [P who he be] and [he still be work with]]]

According to (19), the working past event is required to be before the speech time. However, this representation does capture what (17) says. In fact, according to what (17) says, the past operator in [P who be working with] should be evaluated with respect to the past time introduced by the main clause past operator, in a two dimensional system (this time is the evaluation time of the first intermediate clause). In order to cope with this problem, we need to introduce a third additional temporal index (the

evaluation time of the first intermediate clause), which should be recorded and remembered by the interpretative mechanism. Moreover, we need an additional operator analogous to N which sets the evaluation time of [P who be working with] to the third index. Thus, in order to account for (17), we need a three-dimensional system since we need to keep track of the intermediate evaluation time introduced by the first past tense operator. Since in natural language we have sentences requiring a potentially infinite number of intermediate evaluation times, in a Priorian approach we need Cresswell (1990) a potentially infinite-dimensional system, as originally observed by. This entails a problematic complexity of the interpretative mechanism.⁵

One alternative solution to this problem is to assume that the embedded tense in (8), (11) and (12) is not in the scope of the matrix tense but it has moved to a higher position by mean of a quantifier raising operation, in order to escape the influence of the matrix tense, as originally proposed by Ogihara (1989, 1996). This is shown in (20).

(20) [a man who became the president of the US]_i Hillary married t_i

As we can see, the past tense in the relative clause in (20), is no longer in the scope of the matrix past tense and it can be interpreted with respect to the speech time, and not with respect to the time introduced by the matrix tense.

However, even a raising account requires a number of assumptions, as pointed out by Kusumoto (1999). For instance, when considering sentences containing negative polarity items or sentences showing island effects, we have licensing problems. Consider the following sentence where the NPI “anybody” occurs in a past tensed relative clause.

⁵See Kusumoto (1999) for a detailed discussion. The original example from pointing out this problem is by Cresswell:

(a) There will be times such that all persons now alive will be happy at the first or miserable at the second”.

- (21) None of our sales people sold insurance to anybody who was on the plane⁶

When uttered after a plane crash, the meaning of (21) might require the being on the plane to be after the selling of the insurance. If the relative clause moves out of the scope of the matrix tense in order to derive this reading, the result is that the negative polarity “anybody” is no longer in the scope of the negative element, as shown below.

- (22) [anybody who was on the plane]_i None of our sales people sold insurance to t_i

In order to cope with this problem, we could assume that the relative clause moves above the matrix tense to a position which is below the subject of the matrix clause, as represented in figure 4 below.

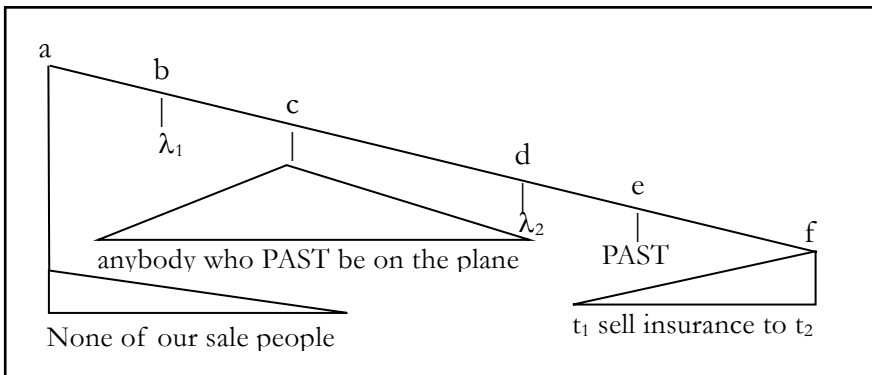


Figure 4: grammatical representation of sentence (21) according to a movement account

According to this representation, the negative polarity item “anybody” is in the scope of the subject of the main clause and the relative clause has

⁶Kusumoto (1999).

moved above the matrix tense to get a later than matrix interpretation. However, Kusumoto (1999) observes that this proposal does not work for sentences like (23).

(23) I tried not to hire anybody who put on a terrible performance⁷

In fact, if in (23) the relative clause moves above the matrix tense to derive a later than matrix interpretation, the negative polarity item “anybody” is no longer in the scope of the negative element (in this case the negation). This suggests that in a raising account, an ad hoc and complex process of reconstruction is required in order to account for the distribution of negative polarity items. Moreover, consider the following sentence with a wh-island.

(24) Katy asked whether every Kennedy brother at the party kissed most female astronauts who later landed on the moon⁸

As Kusumoto observes, the relative clause in (24) should move out of a wh-island in order to get a later than matrix clause interpretation. This would require that movement in temporal interpretation is not subject to island constraints. This is an additional problem.

Summing up, while discussing a Priorian analysis of tense, we argued that a multi-dimensional (potentially infinite) system that accounts for the interpretation of tense is problematic because it requires a complex interpretative mechanism. Moreover, we argued that movement in temporal interpretation should not be sensitive to some syntactic constraints in a raising account. In order to cope with some of these problems, Kusumoto (1999) proposed an analysis of tense in embedded contexts in which tenses are decomposed in a temporal variable, that is spelled out by the tense morpheme born by the verb, and a temporal

⁷Kusumoto (1999).

⁸Kusumoto (1999).

operator, that existentially closes the temporal variable by requiring the time denoted by this latter to be in a certain relation with the speech time. We will not discuss Kusumoto's proposal since it is mainly concerned with the interpretation of tense in embedded contexts and is not relevant to the aim of our discussion.

As Cresswell (1973) and Dowty (1982) pointed out, a Priorian analysis cannot account for the interaction of tense and temporal adverbials such as “yesterday” in sentences like (25).

(25) John left yesterday

A natural way to analyse the semantics of “yesterday” in a Priorian system is to define this adverbial as a sentential operator as in (26).

(26) $\| Y\phi \|_{T,u,i} = 1$ iff there is a time i' on the day before the day including i such that $\| \phi \|_{T,u,i'} = 1$

Given (26), two are the possible LFs of (25). These are reported in (27) and (28).

(27) P [Y [John leave]]

(28) Y [P [John leave]]

However, neither (27) or (28) represent what (25) means. Sentence (25) means that there is past time i at which John left and i is on the day before the day including the speech time, as represented in figure 5 below.

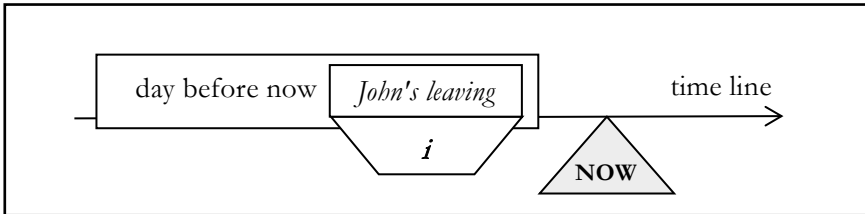


Figure 5: temporal meaning of sentence (25)

On the contrary, what (27) means is that there is a past time i for which there is another time j which is on the day before the day including i at which John left, as represented in the figure 6 below.

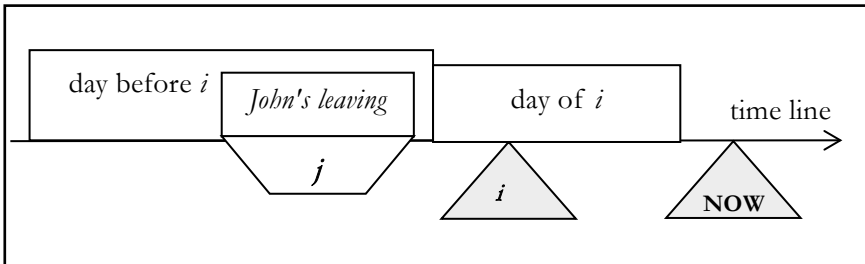


Figure 6: temporal meaning of sentence (25) according to (27)

This analysis doesn't account for the fact that John's leaving is on the day before the speech time. On the other hand, (28) says that there is a time i on the day before the day including the speech time for which there is a time j before it at which John left, as represented in figure 7 below.

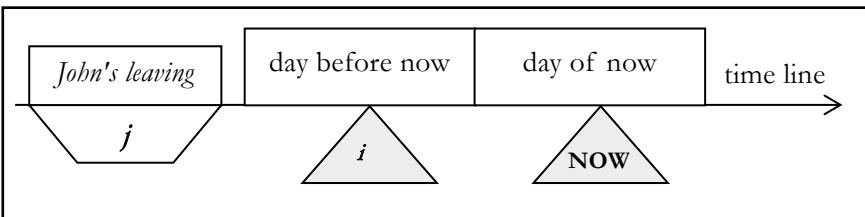


Figure 7: temporal meaning of sentence (25) according to (28)

In this case, John's leaving is only required to be in the past with respect to a time which is in yesterday. In order to cope with these problems (among others), Kamp (1971) proposes that, in a two-dimensional system, adverbials such as “yesterday” are not scope sensitive, but are indexical operators requiring their arguments to be true of a time which is on the day before the day including the context of utterance. As we have seen, in Kamp’s system sentences are evaluated with respect to two temporal indices: the first index is the Priorian evaluation time, which can be shifted by temporal operators, the second keeps track of the value that the first index has when we start to interpret the sentence. Given the definitions in (13), (14) and (15), the semantics of “yesterday” is defined as follows.

- (29) $\| Y\phi \| |_{T,u,i^*} = 1$ iff there is a i' included in the day before the day including i^* for which $\| \phi \| |_{T,u,i'} = 1$, where i^* stands for the context of utterance introduced in the semantic model as a distinguished interval

The LF and the truth conditions of (25) are therefore represented in (30).

- (30) $\| P[Y[\text{John leave}]] \| |_{T,u,i^*} = 1$ iff there is a $j < i$ such that $\| Y[\text{John leave}] \| |_{T,u,j,i^*} = 1$ and this is true iff there is an i' included in the day before the day including i^* such that $\| \text{John leave} \| |_{T,u,i',i^*} = 1$

As we can see from figure 8 below, (30) correctly represents the truth conditions of (25).

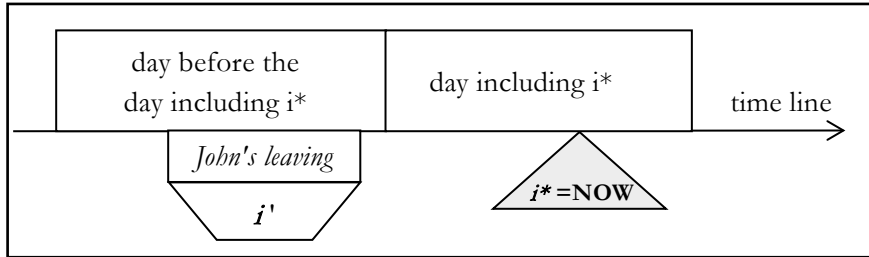


Figure 8: temporal meaning of sentence (25) according to (30)

However, in this proposal we need to stipulate that tense should always have scope over the adverbial in order to get the right results. This is an unnatural stipulation. Additionally, if we consider the semantic contribution of tense and of the adverbial in (30), we find a more serious problem: tense doesn't play any semantic role in determining the truth conditions of sentence (25). This was originally observed by. In fact, Bäuerle (1979) according to (30) the Y operator requires the embedded sentence to be true at a time before the speech time and the application of P is vacuous. This, as Bäuerle notes, implies that a sentence like (31), with its associate LF, has the same truth conditions of sentence (25).

(31) John will leave yesterday

LF: F [Y [John leave]]

In order to cope with these problems, Bennett and Partee (1972) propose that in sentences like (25) and (31), the contribution of tense is to be defined together with the contribution of the temporal adverbial. According to their proposal, this should be done in two steps. First, by restricting the class of temporal frame adverbials (like “yesterday”) which can combine with a certain tense by means of the two following grammaticality conditions in (32) and (33).

- (32) “John left α ” is grammatical only if there is a moment of time p such that if it is considered to be the present moment, α refers to an interval of time I such that there is a subinterval of I , I' , such that $I' < p$; where α is a frame adverbial such as “yesterday” or “tomorrow”
- (33) “John will leave α ” is grammatical only if there is a moment of time p such that if it is considered to be the present moment, α refers to an interval of time I such that there is a subinterval of I , I' , such that $I' > p$; where α is a frame adverbial such as “yesterday” or “tomorrow”

Second, by assuming the following truth conditions of a tensed sentence like (25).

- (34) “John left α ” is true at interval of time I if and only if I is a moment of time, α refers to an interval of time I' and there is a subinterval of I' , I'' , such that $I'' < I$ and John leaves α is true at I'' ; where α is a frame adverbial such as “yesterday” or “tomorrow”

However, as Bennett and Partee recognized in a postscript following their paper, the above definitions provide holistic truth conditions for past tensed sentences containing a temporal adverbial, without defining the internal part-whole semantic contribution of the tense and the temporal adverbial. Moreover, according to (32), (33) and (34), in the logical form of a tensed sentence there is always an adverbial which can be optionally spelled out. In other words, it is stipulated that a past tense sentence such as (35) contains a hidden context dependent temporal adverbial.

- (35) John left

This syncategorematic definition of tense finds an extreme position in Cresswell's (1973) proposal, where tense morphemes have no semantic content but only express a syntactic agreement between a temporal adverbial and the verb. As observed by Bäuerle (1979), in Cresswell's proposal it is however problematic to define the syntactic features of agreement relation between the verb and adverbials, especially in cases of adverbials which can occur with past, present and future morphologically inflected verbs, like "today".

The observations that we draw from the discussion about the combination of tenses and indexical frame adverbials like "yesterday" can be summarised as follows: in order to account for the interaction of tense and temporal adverbials like "yesterday", a Priorian approach should assume a scope order stipulation (or an equivalent index stipulation) or it should anchor the meaning of tense to the occurrence of an indexical (hidden) temporal adverbial indexically. If, on the one hand, we argued that a scope stipulation is unnatural, on the other hand, not much of a Priorian approach remains in an indexical anchoring account. In fact, the semantic features of an indexical approach are very similar to the features of a referential approach, since the semantic contribution of the Priorian tense is indexically determined or even made vacuous by a silent indexical temporal adverbial.

Interestingly, apart from the problems discussed above, a scope order stipulation doesn't help much if we consider the Priorian tense in interaction with negation, as shown in the early work of Partee (1973). Partee notes that neither (37) or (38) represents the correct LF for (36), when it is uttered in a car halfway down the turnpike.

(36) I didn't turn off the stove

(37) $\neg P(I \text{ turn off the stove})$

(38) $P\neg(I \text{ turn off the stove})$

According to the Priorian definition of tense, (37) says that there is no time in the past at which the speaker turned off the stove, while (38) says that there is some time in the past at which the speaker did not turn off the stove; this is not what sentence (36) means. As Partee observes, the sentence refers to a contextually salient interval at which the speaker did not turn off the stove. One way to cope with this problem within a Priorian approach is to contextually restrict the temporal domain on which the quantifier introduced by the tense range. This can be done by restricting it to a contextually salient set of times.⁹ The idea is that the set of times with respect to which (36) is to be evaluated is contextually restricted to the set of times included in a contextually salient interval which precedes the speaker's leaving. That is to say: in the contextually salient set of times, there is a time before the speech time at which the sentence is true.¹⁰

However, according to the original intuitions of Partee, examples like (36) not only show that the indication of the time for which a certain claim is made depends on the extra-linguistic context, but also that this dependency finds strict parallels in the pronominal domain. In fact, imagine a man who utters (39) while sitting alone with his head in his hands.

(39) She left me

Partee argues that the indication of the time at which the speaker did not turn off the stove in (36) and of the individual who left the speaker in (39) depends on the extra-linguistic context in the same way: by discussing some structural analogies between tenses and pronouns in anaphoric and binding contexts, Partee observes that a Priorian analysis of tense cannot be correct and that tenses behave more like pronouns.

⁹This is for instance recently assumed by Kusumoto (1999) in her system by adopting von Stechow's treatment of restrictions on quantifier domains.

¹⁰A parallel with the referential analysis of tense is important here. As we will see, the interval denoted by tense according to a referential analysis corresponds to the contextually restricted set of times with respect to which a tensed sentence is to be evaluated.

1.1.2 Referential approaches

Partee's observation has been developed by authors like Enç (1986), who argued that tenses are referential expressions denoting times. According to these analyses, tenses are referential expressions denoting times and verbs have an extra argument slot for tenses as represented in (40).

(40) $|| \text{to love} || := \lambda y \lambda x \lambda t [\text{love}(t)(x)(y)]$

According to this approach, tense bears an index, like all other referential expressions, and it fills the temporal argument slot of a verb as represented below in (41) and its LF.

(41) Mary loved John
 LF: $\text{love}(\text{PAST}_i)(\text{Mary})(\text{John})$

The general idea is that sentence (41) is true iff the ordered set $\langle ||\text{Mary}||, ||\text{John}||, ||\text{PAST}_i|| \rangle$ belongs to the set of ordered sets denoted by the predicate “to love”. According to the relation denoted by “to love”, sentence (41) is true iff Mary loves John at the time denoted by PAST_i . The time denoted by PAST_i should be a time before the speech time, according to what (41) says.

A straightforward semantics accounting for this fact has been given by Heim (1994) in her comments on Abusch's (1994) theory of tense. Heim observes that, just like a free instance of “she” can only refer to a female individual, a free instance of PAST_i must refer to a time before the time of the utterance. Heim argues that, since pronouns have been analyzed as individual variables and the contribution of gender has been treated as a presupposition restricting the denotation of these variables (Cooper, 1983; Heim, 1982), we should do the same for tenses and assume them to be temporal variables carrying presuppositions. The idea is that referring pronouns and tenses are free variables carrying an index whose value is

determined by a variable assignment depending on the physical and psychological circumstances (i.e. the context of utterance) that prevail when a LF is processed (see Heim and Kratzer, (1998)). Gender features on pronouns and temporal features on tenses are restrictions on the set of contexts of utterance which determine the assignments of the variable they are associated with (concerning the notion of presupposition see Stalnaker (1978), Lewis (1979) and Heim (1982)). If we consider sentence (42) and its associated simplified LF, we observe that pronouns are represented as verbal arguments bearing indices and carrying gender presuppositions.

(42) She left her
 LF: x_1^{FEM} left x_2^{FEM}

Sentence (42) is felicitously uttered in a context of utterance c if this context will determine an assignment for the indices 1 and 2 and if the individuals assigned to the indices are females. A context in which these individuals are not females is not *appropriate* for (42) (see Heim and Kratzer (1998)). According to Heim (1994), this analysis can be extended to tenses. Consider sentence (41), repeated below as (43).

(43) Mary loved John

According to the referential approach, its LF is represented in (44).

(44) love(John)(Mary)(PAST _{i})

Analogously to the case of individual pronouns, sentence (43) will be felicitously uttered in a context of utterance c if the time we refer by the use PAST _{i} in c is a time which is before the time of c and the sentence is true iff PAST _{i} denotes a time at which Mary loves John in that context. In Heim's proposal, the lexical entries for the past and the present tenses are therefore formally defined in the following way.

(45) $||\text{PAST}_i| |^{g_c, c} = g_c(i)$ when $g_c(i) < t_c$ undefined otherwise

(46) $||\text{PRES}_i| |^{g_c, c} = g_c(i)$ when $\neg g_c(i) < t_c$ undefined otherwise

Definition (45) says that the denotation of a temporal variable PAST_i is defined if the value that the assignment function g_c assigns to the index i is a time before t_c , the time of the context of utterance; if it is defined, it is equal to the value that the assignment function g_c assigns to the index i . Definition (46) says that the denotation of a temporal variable PRES_i is defined if the value that the assignment function g_c assigns to the index i is a time not before t_c ; if it is defined, it is equal to the value that the assignment function g_c assigns to the index i . Under these assumptions, the truth conditions for (43) are represented in (47).

(47) $||\text{love}(\text{John})(\text{Mary})(\text{PAST}_i)| |^{g_c, c} = 1$ iff *John* loves *Mary* at $g_c(i)$
when $g_c(i) < t_c$, undefined otherwise

According to the truth conditions given in (47), in the logical form of the verb there is an extra variable slot which is filled by tense and a sentence is true iff the eventuality described by the verb holds **at** the time denoted by the tense.

In this approach, we can account for the interaction of tense and temporal adverbials like “yesterday” we discussed in the previous section. A definition of “yesterday” in a referential approach is represented in (48).

(48) $\lambda P \lambda t \exists I (P(t) \ \& \ t \subseteq I \ \& \ I = \text{the day before the day including } t^*)$
where t^* is a distinguished variable denoting the speech time

As we can see from (48), “yesterday” is a temporal modifier: it modifies a temporal property by requiring the time for which a temporal property is true to be a time included in the day which is before the day including the

speech time. Given the definition in (48), the LF of the sentence (49) is represented in (50) and (51).

(49) Yesterday Mario was sick

(50) $PAST_i$ (Yesterday λt (be-sick(Mario)(t)))

(51) $\exists I$ (be-sick(Mario)($PAST_i$) & $PAST_i \subseteq I$ & $I =$ the day before the day of t^*)

Since tense is a referential expression denoting times, it is not subject to scope effects of temporal adverbials like “yesterday”; under this analysis, the semantic interaction of the tense and the adverbial follows straightforwardly in a compositional way. According to this analysis, a sentence like (52) is predicted to be ungrammatical if we assume the future morphology to be the spell out of a temporal variable whose denotation is defined for times which are not before the speech time; in this case, a time which is not before the speech time is required to be included in the day before the day of the speech time.

(52) ?? Yesterday Mario will be sick

Given these assumptions, we can consider the cases of multiple tense embedding discussed in the previous section.

In the previous section, we have argued that a Priorian analysis of tense cannot account for the interpretation of an embedded tense in sentences like (53).

(53) Hillary married a man who became the president of the US

In a referential approach, since tenses are not sentential operators having scope on each other, the interpretation of an embedded tense is not

problematic in these sentences, as shown by the LF of (53) represented in (54).

- (54) $PAST_i \lambda t [\text{marry}(-\text{a-man-who-become}(PAST_j)\text{-the-president-of-the US})(\text{Hillary})(t)]$

Since the embedded past tense bears a different index, it can be interpreted independently from the matrix past tense. In this case, since $PAST_j$ and $PAST_i$ denote different past times, the sentence is correctly predicted to be ambiguous between an interpretation in which the *wedding* and the *becoming-president* are both in the past and the *wedding* is after the *becoming-president* and an interpretation in which the *wedding* and the *becoming-president* are both in the past but the *wedding* is before the *becoming-president*.

Given the analysis above, we can consider the interaction of tense with negation we discussed by considering Partee's stove example. According to the referential approach, in the logical form of the verb there is an extra variable slot which is filled by tense and a sentence is true iff the eventuality described by the verb holds at the time denoted by the tense. Under this assumption, the LF of sentence (36) is represented in (55).

- (55) $|| \neg \text{turn-off}(\text{the-stove})(\text{I})(PAST_i) ||^{g_c, c} = 1$ it is false that the speaker turn-off the stove at $g_c(i)$ when $g_c(i) < t_c$, undefined otherwise

Ogihara (1989) (see also Kusumoto (1999)) observed that (55) does not represent the correct truth conditions of (36) in Partee's scenario. In fact, imagine the scenario in which the contextually relevant interval the speaker has in mind in his car while uttering (36) is a twenty-minute interval while he was getting ready to go out. This interval can't be the interval **at** which he didn't turn off the stove since the *turning off the stove* event is a punctual event which takes less than a few seconds. What (36) conveys in this scenario is rather that the speaker didn't turn off the stove **in** the

contextually relevant interval. Therefore, truth conditions for the interpretation of tense in a referential approach and the LF given in (55) are not correct for (36); the correct truth conditions of (36) are rather represented in (56), where the turning off of the stove is required to happen within the contextually relevant interval.

- (56) $|| \neg \text{turn-off}(\text{the-stove})(\text{I})(\text{PAST}_i) ||_{g^c, c} = 1$ it is false that the speaker turn off the stove **in** $g_c(i)$ when $g_c(i) < t_c$, undefined otherwise

However, the requirement that the turning off of the stove should happen within the contextually relevant interval, is not dependent on the context. In fact, imagine that in the same Mary asks me why I forgot to turn off the stove. In this context, I can answer Mary's question by uttering the sentence (57).

- (57) I was tired

In this case, the contextually relevant interval the speaker has in mind is still that twenty-minute interval before the house leaving. However, in this case "to be tired" is required to hold for the entire interval, and not for a subinterval within the interval. In this case, the truth conditions of (57) are represented in (58).

- (58) $|| \text{be tired}(\text{I})(\text{PAST}_i) ||_{g^c, c} = 1$ iff the speaker is tired **at** the time denoted by i .
(in our example i is the twenty-minute interval the speaker has in mind)

Given these facts, if we generalize of the contrasts between (36) and (57) we can assume that, under the simple past tense: (i) the truth conditions of sentences containing predicates like "to be tired" (*state predicates*) require

these predicates to be true of a whole salient interval introduced by the tense; (ii) the truth conditions sentences containing predicates like “to turn off the stove” (*event predicates*) require these predicates to be true of a time included in the relevant interval introduced by the tense.¹¹ One to account for these differences is to assume different verb classes select for different truth conditions. In a later paper, Partee (1984) proposes a new definition of tense along these lines and she argued that Reichenbachian *reference time*¹² plays a central role in the truth conditions of a tensed sentence; according to Partee, a tensed sentence is always interpreted with respect to a contextually given reference time; when the tense of the sentence is past, the reference time is required to be before the speech time. In order to derive the correct truth conditions for (36) and (57), Partee introduces an existential quantification into the lexical meaning of the tenseless verb and she argues that when the sentence describes a state or a process, this should hold at the current reference time, when it describes an event, this must occur within the reference time. According to this proposal, the lexical entries for “to be tired” and “to turn off” are represented in (59) and (60).

(59) $||\text{turn-off}|| (x)(y)(RT)=1 \text{ iff } \exists t(t \subseteq RT \ \& \ y \text{ turn-off } x \text{ in } t)$

(60) $||\text{be tired}|| (y)(RT) = 1 \text{ iff } \exists t(t=RT \ \& \ y \text{ is tired at } t)$

As pointed out by von Stechow (1999), a potential problem for this proposal is represented by sentences like (61).

(61) Mary was in London three times in December

According to what (61) says, the three occasions in which Mary was in London are included in a salient interval, which is in December. In this

¹¹Here is enough to know that *love* and *be-asleep* are stative predicates and that they behave differently from *turn-off-the-stove*. See section 1.3.

¹²See a later section for a definition of this notion.

case, Partee's proposal does not account for the meaning of (61) since the inclusion relation between the *being three times in London* and the *reference time* is not introduced by the lexical meaning of a verb. In the next paragraph, we will see that a development of Partee's proposal in an semantics framework does not solve the problem.

According to interval semantics (Bennett and Partee, 1972), sentences are evaluated with respect to intervals of time and not with respect to moments of time. The basic intuition behind this suggestion is that a sentence like "John baked a cake" can't be true with respect to moments of time because, if John baked a cake from 1 p.m. to 2 p.m., it is not true that John baked a cake at all moments of time between 1 p.m. and 2 p.m., assumed that the predicate "bake a cake" denotes the complete event of baking a cake. According to this fact, we can distinguish temporally homogeneous predicates from temporally non-homogeneous ones and assume that a temporal predicate is homogeneous when, if it is true of an interval, it is true of every subinterval of this interval, and, if it is false of an interval, it is false of every subinterval of this interval.

$$(62) \quad P \text{ is temporally homogeneous} :=_{\text{def}} P(t) \rightarrow \forall t'(t' \subseteq t \rightarrow P(t')) \ \& \\ \neg P(t) \rightarrow \forall t'(t' \subseteq t \rightarrow \neg P(t'))^{13}$$

According to the definition in (62), the temporal predicate "Mary be three times in London" is non-homogeneous since, if it is true of an interval that Mary was in London three times, it is not true of all the subintervals of this interval that Mary was in London three times; this because Mary is in London less than three times in some of the subintervals. Predicates like "Mary to build a house" are also non-homogeneous, as we have argued in

¹³The definition in (62) specifies that the divisibility of the predication should hold not only in the case of the *truth*, but also in the case of its *falsity*. Consider the predicate "John be sick". According to our definition, the predicate is homogeneous since: (i) if it is the case that "John be sick" is true of an interval, it is also the case that "John be sick" is true of every sub-interval of that interval; and (ii) if it is the case that "John be sick" is false of an interval, it is also the case that "John be sick" is false of every sub-interval of that interval.

above. Since the predicates “Mary to build a house” and “Mary be three times in London” are both non-homogeneous and in their truth conditions we find an inclusion relation, we could assume that the inclusion relation is associated with the interpretation of non-homogeneous temporal predicates. One problem for this proposal is the class of punctual predicates like “to turn off the stove”. Although the truth conditions of simple past sentences including these predicates require an inclusion relation, these predicates are temporally homogeneous, since they are true of points of time, which have no proper subparts by definition. Given this fact, an explanation of the contrast between (36) and (57) based on the temporal homogeneity of a predicate does not work.

Summing up, in our discussion we have seen that although the class of the verbs plays a crucial role in the temporal interpretation of a tensed sentence, these differences are not directly conveyed by the lexical meaning of the verb, and they are not dependent on the temporal homogeneity of temporal predicates. In the concluding part of this chapter, I will argue that these facts and the contrasts described in the above sections depend on the logical syntax of aspect modification and on the argument structure of different classes of predicates.¹⁴ Before this, I will briefly discuss a proposal arguing that the contrasts we discussed above can be accounted in quantificational approach by introducing a contextual restriction on domains.

1.1.3 Temporal domain restriction and referential approaches

Following the suggestion of Partee’s 1984 paper, Ogihara (1989, 1996) and Kusumoto (1999) have claimed that Partee’s stove example represents an

¹⁴The proposal is inspired by Partee’s work (1984) where it is assumed that there are two different classes of predicates behaving differently. I will assume that aspect is explicitly responsible for the contrasts we discussed above.

argument for a quantificational analysis of tense since the truth conditions for sentence (36) can be reformulated as (63).

- (63) There is no time in the contextually salient interval such as the speaker turns off the stove

According to these authors, tense is an operator introducing existential quantification over times in the object language. In these approaches, tense is assumed to denote a function from properties of times to properties of times as defined below

- (64) $PAST =_{\text{def}} \lambda P \exists t'[t' < \text{speech time} \ \& \ P(t')]$

- (65) $PRES =_{\text{def}} \lambda P \exists t'[t' \supseteq \text{speech time} \ \& \ P(t')]$

In order to account for Partee's stove example and derive the meaning that is intuitively represented in (63), we need to restrict the domain of quantification to a contextually salient set of times. According to Kusumoto, this can be done by following von Fintel's theory of restriction of quantifier domains (von Fintel, 1994). The idea is that a tense operator takes an extra argument which is a context-dependent function restricting the domain of the tense operator.

However, an analysis in the lines of Kusumoto, assuming a quantifier restriction for tense, ignores aspectual distinctions in the temporal meaning of tensed sentences and it does not consider the basic differences in the temporal interpretation of stative sentences and event sentences we discussed above. In the next section, I will argue that if we assume that aspectual distinctions are conveyed by aspectual operators localizing the described eventuality with respect to a time, Partee's puzzle follows straightforwardly in a referential analysis of tense. The general idea is that aspectual operators introduce the existential quantification that Partee builds in the lexical semantic of the verb and that the contrasts in the

temporal interpretation of state sentences and event sentences depend on the logical syntax of aspect modification and on the argument structure of different classes of predicates. Given these assumptions, our analysis will result compositionally explicit.

1.2 Aspect

While we find a general agreement about the basic nature of tense by recognizing that it relates the time at which a claim is made to the time for which the claim is made, the notion of Aspect is much more controversial. Traditionally, aspect concerns the temporal properties of the eventuality described by the sentence. Consider the contrast between the following Italian sentences.

(66) Ieri un orso dormiva nel parco [Imperfetto]

Lit: Yesterday a bear sleep-3sPASTimperf in-the park

Yesterday a bear was sleeping in the park

(67) Ieri un orso dormì nel parco [Passato Remoto]

Lit: Yesterday a bear sleep-3sPASTperf in-the park

Yesterday a bear slept in the park

According to what (66) says, *the sleeping* is going on at some time in the past yesterday and we don't know if it stopped in the past or if it is still going on at speech time; on the contrary, according to what (67) says, *the sleeping* is completed in the past. The contrast between the temporal interpretations of (66) and (67) is an aspectual contrast and the two temporal interpretations conveyed by (66) and (67) are called *imperfective* and *perfective* interpretations. In non-formal literature, these differences are often analyzed in terms of “different ways of viewing the internal temporal constituency of a situation” (Comrie, 1976). However, such an analysis does not offer an explicit definition of aspect, since it makes use of the

non explicit notion of *viewpoint*. Smith (1997) proposes a more explicit definition of this notion by assuming that every situation is characterized by its initial, internal and final temporal stage and by claiming that *viewpoint aspect* is a grammatical category conveying the information that the initial and final temporal stages of the situation described by the VP (verbal phrase) are included or not included in a relevant interval. However, it is difficult to give a model-theoretic representation of Smith's proposal since it lacks a formal topological description of the notion of temporal stages of a situation.

In their recent work, Giorgi and Pianesi (2001) propose an analysis of aspectual distinctions based on event boundaries, a notion which they define through some topological axioms and which is, therefore, more explicit than the one of temporal stage of a situation. According to Giorgi and Pianesi, the aspectual distinctions conveyed by (66) and (67) are to be analyzed in terms of properties of the events described by the sentences.¹⁵ According to their proposal, in the event domain, there are two kinds of events: topologically closed/terminated events and topologically non-closed/non-terminated events. Terminated events can be defined through a function *ter*, which assigns to an event its terminated counterpart as represented in (68).

- (68) $ter(e)$ = the terminated counterpart of e
 when e is terminated, $ter(e)=e$
 when e is non-terminated $ter(e)\neq e$

Moreover, a terminated event is defined by the following topological axiom.

¹⁵As we will see in the next paragraph, we can assume events to be primitive entities in the discourse domain and event sentences to describe event properties (Davidson, 1967).

$$(69) \quad \text{ter}(e) = b(\text{ter}(e)) + \text{int}(\text{ter}(e))$$

In (69), $\text{int}(\text{ter}(e))$ is the interior of $\text{ter}(e)$, i.e. the maximal part of e that is completely unbound, and $b(\text{ter}(e))$ is the boundary of $\text{ter}(e)$, i.e. the parts of $\text{ter}(e)$ which separate it from the rest of the eventive world. Given these assumptions, the difference in the aspectual meanings of (66) and (67) depends on the presence or on the absence of a terminative condition in their LF, as represented in the event semantics representations reported in (70) and (71).

$$(70) \quad \text{LF for (66): } \exists e(\alpha(e) \ \& \ \dots)$$

$$(71) \quad \text{LF for (67): } \exists e(\alpha(e) \ \& \ \dots \ t(e) \ \& \ \dots)$$

where t denotes the property of being a terminated event¹⁶

According to Giorgi and Pianesi, in Italian *perfective* sentences like (67), a morphological *perf* features hosted in an aspectual functional projection checks the presence of the $t(e)$ predicate in the VP. Since we do not find morphological oppositions in English, Giorgi and Pianesi assume that the *perf* feature, which checks for terminativity, is not hosted in an aspectual functional projection in this language, but it is added to the bare verbal form after it is extracted from the lexicon and before it is inserted in the derivation. As we can see from (66), in the LF of morphological imperfective sentences, the predicate t , requiring the described event to be terminated, is missing. This entails that Italian morphologically imperfective sentences can be used to describe both non-terminated events and terminated events. I will dispute this fact, especially in the light of the experimental results presented in chapter 4.

¹⁶Notice that (70) is compatible with both terminated and non-terminated events; this means that according to Giorgi and Pianesi both terminated and non-terminated events can be described by imperfective morphologically marked predicates.

Interestingly, Giorgi and Pianesi develop their theory of terminativity in order to characterize the notion of telicity from a morpho-syntactic perspective. The idea is that the presence or absence in the LF of an extra event variable for the right boundary of a terminated event distinguishes telic sentences from atelic ones. This is represented in the following principles:

- be t an event predicate such that $t(e) = 1$ iff e is a closed/terminated event,
- be rb a right boundary relation S.T. $rb(e, e') = 1$ iff e is the right boundary of e' ,

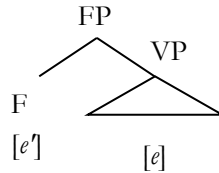
the LF of terminated telic and atelic predicates is represented as in (72) and (73).

(72) LF for terminated atelic sentences $\Rightarrow \exists e(\alpha(e) \& \dots \& t(e))$

(73) LF for terminated telic sentences $\Rightarrow \exists e \exists e'(\alpha(e) \& \dots \& rb(e, e'))$

According to Giorgi and Pianesi, the presence of the second event variable for the right boundary is realized by a zero morpheme in languages such as English and Italian. As represented in the grammatical representation (74), in the syntactic structure of a terminative sentence there is a head F that introduces an eventive variable which is interpreted as the boundary variable.

(74)



Following Higginbotham's (2000), Giorgi and Pianesi argue that the difference between (72) and (73) accounts for the distribution of *in x time* adverbials (for instance “in two days”) and *for x time* adverbials (for instance “for two days”) in tensed sentences. According to Giorgi and Pianesi, while *in x time* adverbials measure the time span between two events, *for x time* adverbials measure the temporal footprint of one event. Given Giorgi and Pianesi's analysis of telic sentences we have discussed above, the distribution of *for x time* adverbials and *in x time* adverbials follows in the following way. Consider the following English sentences and their associated LFs with the semantics of *for x time* adverbials and *in x time* adverbials as discussed by Giorgi and Pianesi.

(75) John ate an apple in two minutes

LF: $\exists \langle e_1, e_2 \rangle \exists x (\text{eat}(\langle e_1, e_2 \rangle) \ \& \ \theta_1(\langle e_1, e_2 \rangle, \text{John}) \ \& \ \theta_2(\langle e_1, e_2 \rangle, x) \ \& \ \text{apple}(x) \ \& \ \delta_{\text{INm}}(e_1, e_2) = 2)$

(where δ_{INm} is a function measuring the time span between two events)

(76) John ran for two minutes

LF: $\exists e \exists x (\text{run}(e) \ \& \ \theta_1(e, \text{John}) \ \& \ t(e) \ \& \ \delta_{\text{FORm}}(e) = 2).$

(where δ_{FORm} is a function measuring the temporal footprint of one event)

As we can see from (75), the *in x time* adverbial appears in a telic sentence; given that it denotes a function that measures the eventive span between two events¹⁷, it occurs in sentences where there are two event variables in a certain syntactic relation. As we can see, the LF of telic perfective predicates contains two event variables in the correct syntactic relation; for this reason, *in x time* adverbials combine with telic perfective predicates. On the contrary, the LF of atelic predicates contains only one event variable; for this reason, *in x time* adverbials do not combine with them. On the other hand, since *for x time* adverbials measure the temporal footprint of one event, they occur in atelic sentences but not in telic ones.

There are a number of problems with Giorgi and Pianesi's proposal. The first concerns the fact that Giorgi and Pianesi assume that durative temporal adverbials such as *in x time* adverbials and *for x time* adverbials measure the quantity of eventive stuff onto a temporal scale, namely, they assume that durative adverbials measure the length of events. A potential problem for this analysis is represented by the sentence below.

(77) John reached the top in two hours

According to what (77) says, the *reaching of the top* is not two hours long. The adverbial in (77) conveys the information that the event took place within a two-hour long interval. This means that the adverbial should measure the reference time, the time in which the event is included, and not the length of the event. This is an observation that goes back to Dowty's (1979) definitions of *in x time* and *for x time* adverbials. This argument is made clear if one considers the sentences below.

¹⁷It is not clear how we can formalize this idea since the *in x time* adverbial should take as argument a relation between two events and it should give the relation back by saying that the distance onto a temporal scale between the right bound event and the left bound of the associated activity is equal to a certain value indicated by the adverbial.

(78) A Champaign man was arrested twice in two days for two separate crimes

(79) Microsoft's network crashed three times in two weeks

In (78) and (79) the *in x time* adverbials do not measure the distance between an associated activity and a telos of a telic event but the length of the time in which the described events took place.¹⁸ This shows that *in x time* adverbials cannot measure the length of events.¹⁹ Moreover, in Giorgi and Pianesi's proposal, it is not clear which is the semantic difference between *x time* and *for x time* adverbials since the adverbials of both classes measure the length of terminated events, which all have a right bound. In the next chapter, I will argue that durative adverbials such that *in x time* and *for x time* measure the length of times as originally proposed in Dowty's (1979).

A second problem, strictly related to the first one, concerns the LF of achievement predicates such as "to reach the top". If we consider (77) again, we can observe that the *in x time* adverb measures the distance between an event, which is the preparation phase of *reaching the top*, and an

¹⁸If we try to analyze these sentences in Giorgi and Pianesi's proposal, we have to deal with an under-determinacy of the events domain. This is because the definition of "right boundary" requires to consider what separates a terminated event from the rest of the eventive world, and we do not understand what the rest of the eventive world is.

¹⁹ English *in x time* adverbials are actually ambiguous between two readings: (i) the durative reading which we are discussing now; (ii) and a second reading, meaning *after the time of the context* (see Schlenker (2001)). This reading doesn't measure the length of an event either, but rather the length of the time span between an origo and the beginning of an event. Giorgi and Pianesi's account doesn't capture this reading either. Sentence (a) is an example:

(a) I will call you in ten minutes

The sentence doesn't say that the *calling* event is ten minutes long. It rather says that the *calling* event will take place ten minutes after the speech time. In (a) the adverb here doesn't measure the eventive stuff. The ambiguity of „in x time“ is morphologically realised in a language such as Italian where the two meanings are conveyed by two different adverbials, as shown by the sentences below

(b) Gianni raggiunse la vetta in due ore

Gianni reached the top in two hours

(c) Ti telefonerò tra dieci minuti

I will call you in ten minutes

event which is the reaching of the top itself. This second event is a punctual change of state, which is the right boundary of the preparation activity. One problem with this analysis is the definition of the correct LF for telic sentences containing punctual predicates such as *to reach the top*. This LF cannot be analogous to the one we described in (76), since in this case we won't be able to explain why *in x time* adverbials but not *for x time* adverbials combine with such predicates; on the other hand, if we assume that it is analogous to the one we described in (75), which is derived by merging a functional projection providing the right bound event variable to the LF of the telic sentence, we do not understand which is the lexical entry of achievements predicates like "to reach the top". Since (77) describes a telic event, a functional projection F should lexicalize the right bound of the described terminated event. According to this analysis, the predicate "to reach the top" should, lexicalize the preparation phase of the change of state event, which is the reaching of the top. I think that this is problematic. On the other hand, if we assume these predicates to be inherently telic, i.e. they lexicalize a telos which is the right boundary of a contextually given possible associated activity, we drastically contradict the basic claim that the telic/atelic distinction is a morphosyntactic distinction concerning the way in which language represents terminated events; even if we do not take this general claim to be compulsory, we have to explain where the second event variable which lexicalizes the associated activity is coming from, given the presence of the *in x time* adverbials.²⁰

A third problem for Giorgi and Pianesi's proposal is that the analysis predicts that Imperfective sentences can convey terminative readings in free variation with perfective ones. In chapter 4, I will argue that this prediction is empirically incorrect.

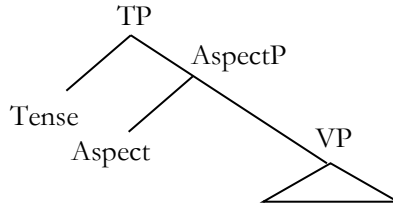
Finally, besides the fact that Giorgi and Pianesi proposal lacks an analysis of states sentences and of the interesting semantic contrasts we discussed with Partee's stove puzzle, there are some questions concerning

²⁰It cannot be lexicalized by F, since F lexicalizes the right bound of a terminated event.

how their proposal can be formally represented in model-theoretic semantics, given the genericity of some of its aspects. For instance, it is not clear how *t* compositionally is introduced; the proposal suggests that a functional projection introducing *t* modifies an event VP, but the formal details of how this takes place are unclear; specifically, it is not clear in which way *F* lexicalizes the second event variable in telic sentences and how the adverbial modification is derived. All these facts suggest that it is hard to analyze aspectual distinctions in terms of event boundaries or event stages without talking about times.

In the analyses of tense, we have discussed above, the contribution of aspect is not considered. I will argue that aspect interacts with tense and it has an impact on how an eventuality is localized in the flow of time. For this reason I will argue that in order to define the explicit contribution of these two grammatical categories, we have to look at the whole temporal architecture of a tensed sentence. This idea has been recently assumed in the work of Klein (1994), Kratzer (1998), Musan (2000) and Stechow (2002). According to this perspective, aspect concerns a temporal relation between two times, the time at which the eventuality described by the VP is going on and the time introduced by tense, namely between the Reichenbachian reference time and event time (Klein, 1994). The idea (Kratzer, 1998) is that aspectual distinctions are conveyed by means of aspectual operators which map properties of eventualities denoted by the VP onto properties of times and that tense provides the time that saturates the derived temporal property as shown in the grammatical representation in (80).

(80)



In Kratzer's (1998) analysis, where this idea is formally developed, the most common tenses are the past and the present tense and the most common aspectual operators are the *imperfective* and the *perfective* operators as defined below.²¹

(81) Perfective =: $||PFV|| = \lambda P \lambda t \exists ev (t \supseteq \tau(ev) \ \& \ P(ev))$
 [event time included in reference time]

(82) Imperfective =: $||IPV|| = \lambda P \lambda t \exists ev (\tau(ev) \supseteq t \ \& \ P(ev))$
 [reference time included in event time]
 (where τ is a function taking an eventuality and giving its temporal trace)

Kratzer's suggestion is that verb forms are the spell-out of tense/aspect combinations, as shown in the tables below, representing some of the English and Italian tense forms.

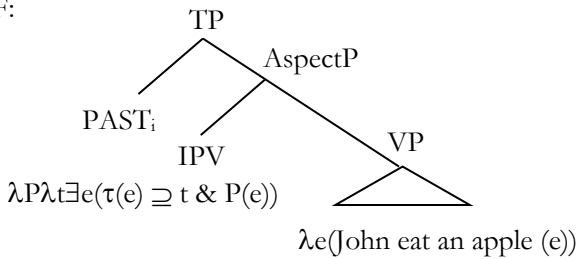
²¹I give a slightly modified definition from Kratzer's and I disregard the *Perfect* aspect which is described in Kratzer's paper but which is not relevant to our discussion. Moreover, the IPV operator, as defined above, only approximates the truth conditions for the English progressive, as observed in Dowty (1979). We will assume it for the sake of the discussion and we will give a better definition in chapter 3.

<i>English</i>	PRESENT	PAST
Imperfective	Present progressive	Past progressive
Perfective	Reporter's present	Simple past
<i>Italian</i>	PAST	
Imperfective	Imperfetto	
Perfective	Passato Remoto	

According to this proposal, if we assume Heim's semantics of tense given in (45) and (46), the LF of the English sentence (83) is represented below.

(83) John was eating an apple

LF:



According to the LF represented above, sentence (83) will be defined if $g_c(i) < \text{speech time}$ and it will be true iff $g_c(i)$ is a past time included in the temporal trace of *John eat an apple* event.²²

One question about the tense form classification we reported in the tables above concerns state predicates. As it is well known, state predicates do not appear in the progressive form (Vendler, 1957) as shown in (84).

²²The IPV operator does not give us the complete truth conditions for the English progressive sentence; its correct definition will be given in chapter 3.

(84) * Peter is being asleep

Moreover, state predicates do not have a perfective interpretation under the past morphology, as observed by Smith (1997) and Klein (1994). In fact, according to the continuation in (85) Peter's sickness can hold at speech time even if it is described by a past tense sentence.

(85) Peter was sick (and he is sick)

On the contrary, event predicates have a perfective interpretation when occurring in past tensed sentences, as shown by the sentence (86) and the unavailability of a continuation requiring the drinking event to hold at speech time.

(86) Peter drank a beer (?? and he is still drinking one)

As noted by Katz (2000), these facts are not dependent on event telicity or event divisibility/cumulativeness (Krifka, 1989) since activity predicates, which are atelic and cumulative in the sense of Krifka, can appear in progressive constructions and behave like the telic predicate *Peter drink a beer*. Consider in fact the examples in (87) and (88).

(87) Peter was walking around aimlessly [progressive]

(88) Peter walked around aimlessly (?? and he still is) [simple past]

As we can see in (87) and (88), the predicate “to walk around aimlessly” can occur both in an imperfective progressive sentence and in a simple past sentence, but in this case a non-terminative interpretation is not available. In the following section, we will argue that aspectual differences between state and event predicates depend on the different argument structures of these two verb classes.

1.3 Verb classes

In the semantic literature, the term aspectual verb classes is used to refer to the Ryle-Kenny-Vendler verb classification which developed from the Aristotelian distinction between verbs of *kinesis* (movement) and verbs of *energeia* (actuality) (see Dowty (1979) for an overview of the history of this classification). Starting from the work of Vendler (1957), this verb classification has given particular attention to the temporal properties of the verbs it has been further investigated in a formal framework in Dowty's (1979) work on lexical decomposition. According to Vendler's analysis, verbs are to be classified in *states*, *activities*, *accomplishments* and *achievements*. According to this classification, a verb falls in one of these four categories on the basis of some tests, mostly concerned with temporal adverbials combination and the tense morphology of the verb. Examples of Vendler's classes are given in the table below (Dowty, 1979).

STATES	ACTIVITIES	ACCOMPLISHMENTS	ACHIEVEMENTS
Know	Run	Paint a picture	Recognize
Believe	Walk	Make a chair	Spot
Have	Swim	Deliver a sermon	Find
Desire	Push a chart	Draw a circle	Lose
Love	Drive a car	Push a cart	Reach

According to interval semantics, (Bennett and Partee, 1972), this classification can be explained by assuming that sentences are evaluated with respect to intervals of time²³, as we discussed in section 1.1.2. Assuming that sentences are evaluated with respect to intervals, Bennett

²³Intuitively, an interval I is to be considered as an ordered set of moments of time such that for any $t_1, t_3 \in I$, if t_2 is such $t_1 \leq t_2 \leq t_3$, then $t_2 \in I$ (see Bennet & Partee (1978): 11).

and Partee argue that we have to consider the truth conditions of a sentence at every subinterval of the interval at which the sentence is true, in order to account for the Vendlerian distinction.²⁴ This is represented in classification principles (89), (90) and (91).

- (89) If ϕ is a *state* or an *activity* sentence, then ϕ is true at an interval I just in case ϕ is true at all subintervals of I
- (90) If ϕ is an *accomplishment* sentence which is true at an interval I, then ϕ is false at all proper subintervals of I
- (91) If ϕ is an *achievement* sentence then if ϕ is true at I, there is no proper subintervals of I

One important cut between these four Vendlerian classes is the one between *stative* and *non-stative*, first made by Lakoff (1970). Unfortunately, the principle in (89), (90) and (91) do not capture this distinction which does not follow from the subinterval property. Dowty (1979) and Vlach (1993) argued that the condition in (89) should be modified for activity sentences, since the smallest interval at which an activity sentence is true can't be a momentary interval; according to the authors, the original formulation of (89) is correct for state sentences. In fact, an activity sentence like "Mary walked in the park" cannot be true for a momentary past interval simply because a walk takes at least two steps; on the contrary, a state sentence like "Mary was sick" can be true of a momentary interval, since, if someone is sick at some time, he is sick at every momentary subintervals of this time. In other words, while state sentences are fully and completely homogeneous, activities are homogeneous *down to a certain*

²⁴For the sake of the discussion, we assume the notion of "true at an interval" which, as we have seen in the previous paragraph, can be interpreted in many ways.

limit.²⁵ The notion of *down to a certain limit* can help us in distinguishing states from activities through the following reformulation of the condition (89).

- (92) If ϕ is an *activity* sentence, then ϕ is true at an interval I just in case ϕ is true at all subintervals of I down to a certain natural limit
- (93) If ϕ is a *state* or an *activity* sentence, then ϕ is true at an interval I just in case ϕ is true at all subintervals of I

Given this distinction, Taylor (1977) argued that state predicates do not appear in the progressive form since the progressive form is the spell-out of a sentential operator which takes a proposition that is true at an interval and returns a proposition that is true at all subintervals of that interval.²⁶ According to Taylor, the occurrence of a state predicate in the progressive form would violate a pragmatic Gricean principle since, being states homogeneous, the progressive form of a state predicate will be less informative than its basic form.

As Katz (1995) points out, this analysis is not entirely convincing for two reasons. First, it is not clear why the use of the progressive is less informative than the simple present for state sentences; moreover, Gricean principles should be able to be violated for pragmatic purposes but we never find progressive forms of state predicates used to derive pragmatic effects. Secondly, there are some activity predicates, such as *to sleep*, which intuitively do not show any natural limit to their homogeneity but do appear in the progressive form, as shown by sentence (94).

²⁵The notion of *down to a certain natural limit* is however vague. Vlach (1993) defines it as the *grain size* of a predicate. The *grain size* of a predicate is the smallest interval for which the predicate can be said to hold.

²⁶PROG ϕ is true at an interval I just in case there is an interval I' that properly includes I and ϕ is true at I' (Taylor, 1977).

(94) John is sleeping

This suggests that an account of the state/non-state distinction in terms of interval semantics is problematic. Moreover, a pure semantic account of the fact that state sentences do not appear in the progressive cannot be correct if we consider that the sentence (95) has the same meaning of sentence (94) and that the sentence (96) is ungrammatical.

(95) John is asleep

(96) *John is being asleep

According to some authors (Galton, 1984; Löbner, 1988; Herweg, 1991; Katz, 1995, 2000), this contrast is the sign of a deeper cut between state and non-state predicates and they propose that state and non-state predicates denote properties of entities from different ontological domains. In the next section, following some of the arguments of these authors, I will argue that the verb classes distinction, which is relevant for the explanation of the contrasts discussed above, is the one between state predicates and event predicates.

1.3.1 State predicates and event predicates

Davidson (1967) proposes that *action* sentences like (97) should be analyzed as sentences expressing an existential quantification over events.

(97) John buttered the toast

The idea is that sentence (97) says that there is a past event of *John's buttering the toast*. Davidson's motivations for assuming events in the basic ontology of natural language are mainly concerned with an analysis of adverbs

modification which is sensible to logical entailment.²⁷ As Davidson observes, there is an entailment relation from (c) to (a) between the sentences in (98).

- (98) a. Jones buttered the toast
 b. Jones buttered the toast with a knife
 c. Jones buttered the toast with a knife in the bathroom

Davidson argues that if we assume that the logical form of an action sentence contains an event variable which stands for the event described by the sentence, the entailment relations from (c) to (a) follow straightforwardly from the law of predicative logic, since these sentences express relations between individuals and events. According to Davidson's analysis, the sentences in (98) have a LF in which an event variable fills an extra argument slot of the verb and of the adverbs, as shown in their LFs represented in (99).

- (99) a. $\exists e[\text{butter}(\text{Jones}, \text{the toast}, e)]$
 b. $\exists e[\text{butter}(\text{Jones}, \text{the toast}, e) \ \& \ \text{With}(\text{a knife}, e)]$
 c. $\exists e[\text{butter}(\text{Jones}, \text{the toast}, e) \ \& \ \text{With}(\text{a knife}, e) \ \& \ \text{In}(\text{the bathroom}, e)]$

If we consider (99), we observe that the entailment relations follow from the rule of conjunction elimination. In his original proposal, Davidson points out that not all verbs have an underlying event argument. While *action* sentences do have one, *fact* sentences do not. According to Davidson, fact sentences are sentences describing states and their LF can be sketched for in the example (100) below.

²⁷See Thomason and Stalnaker (1973) for an alternative analysis and Parsons (1980; 1990) for a discussion about different approaches.

(100) John loves Mary
 LF: love(John, Mary)

In contrast to its original formulation, Davidson's proposal has been extended to state verbs as well as event verbs by assuming that the logical form of a state sentence contains a state variable which denotes the state described by the sentence, as represented in the example (101) below and its associated LF.

(101) John loves Mary
 LF: $\exists s$ [love(s)(John)(Mary)]

The development of this approach, which in the literature is called *neo-Davidsonian approach*, assumes that there are thematic roles predicates in the LF of a state sentence (Higginbotham, 1985; Parson, 1990).²⁸ Interestingly, this assumption provides the basis for an analysis of Vendler's verb classification as sketched below.

- Activity verbs are predicates of homogeneous events.
- Accomplishment verbs are predicates of non-homogeneous events.
- Achievement verbs are predicates of momentary events.
- State verbs are predicates of underlying states.

However, the original Davidsonian proposal has been assumed and further developed by some authors (Galton, 1984; Löbner, 1988; Herweg, 1991; Katz, 1995, 2000) who believe that the stative/non-stative distinction is based on the fact that while event verbs have an underlying event argument,

²⁸With the term *neo-Davidsonian* we usually refer to the semantic implementation of Davidson intuition. In its development, thematic role predicates are also introduced into the logical form of a sentence. In most of these proposals Davidson's intuition is extended to the analysis of state sentences as well. Following Katz (2000), I will refer here to those accounts that assume that all sentences have underlying Davidsonian arguments, in contrast to Davidson's original proposal.

state verbs do not. In my proposal, I will develop this intuition and I will assume that while state predicates denote properties of times, event predicates denote properties of events, as suggested by Herweg (1991) and more recently by Katz (2000). Therefore, in the basic ontology of natural language, I will include events and times.

Though there is not a clear cut argument for one approach or the another, Katz (2000) discussed some arguments for the original Davidsonian approach and claimed that in the neo-Davidsonian approach we should find some semantic parallels between state sentences and event sentences, given their analogous logical structure: if these parallels are not found, there is an evidence against the neo-Davidsonian account. Katz showed that these analogies are not found in many important domains such as anaphora, nominalization, perception verbs, and, more interestingly, in adverb modification. In fact, there are adverbs, like manner and instrumental adverbs, which appear with event verbs but not with state verbs, as shown in (102) and (103).

(102) Bill buttered the toast carefully

(103) ?? Bill owned the knife carefully

On the contrary, there are adverbs, such as modal adverbs, that appear with both event and state verbs, as shown in (104) and (105).

(104) Bill probably buttered the toast

(105) Bill probably owned the knife

Interestingly, we do not find adverbials which appear with state verbs but not with event verbs. This suggests that there is not a class of adverbs that only combine with state predicates. As Katz observed, on the neo-Davidsonian approach state adverbs might be expected. These adverbs

might denote properties of states, like state verbs do. On the contrary, if we follow the original Davidsonian proposal and we assume that state verbs denote properties of times, we predict there are not adverbs that only combine with state predicates. This follows from the fact that, if an adverb appears with a state verb it should be a temporal modifier or a propositional operator, and therefore it should also be able to appear with event sentence, once the verbal event variable is existentially closed and a temporal variable is introduced in its LF. Given these basic differences between state and event sentences, in the next section we will discuss and summarize some English facts concerning that state-event distinction and in section 1.5 we will formally analyze them.

1.4 Summing up some English facts we want to account for

As we have been discussing in the previous section, English state predicates do not appear in the progressive form while event predicates do, as shown in (106) and (107) (Kenny, 1963; Lakoff, 1965).

(106) ?? Peter is being asleep now

(107) Peter is running in the park now

Interestingly, event predicates are bad in the present tense (when not interpreted habitually²⁹) while state predicates are fine as shown in (108) and (109).

(108) Peter is asleep now

²⁹I will account for this fact in chapter 3.

(109) ?? Peter runs in the park now

Moreover, state predicates do not necessarily get a perfective interpretation under the simple past while event predicates do, as shown in (110) and (111) (Smith, 1997; Klein, 1994).

(110) Peter was sick (and he still is)

(111) Peter drank a beer (?? and he still is)

In fact, according to what (110) says, the state of *Peter being sick* is not required to be terminated in the past with respect to the speech time, as shown by the availability of the continuation in parenthesis; on the other hand, according to what (111) says, the event of *Peter drinking a beer* is required to be entirely terminated in the past, as shown by the ungrammaticality of the continuation of the event description in parenthesis. As observed by Katz, it is clear that the contrast between (110) and (111) does not depend on the telicity of the predicate “to drink a beer”. In fact, if we consider an activity sentence like (112), the described event of *Peter walking around aimlessly* is required to be entirely terminated before the speech time.

(112) Peter walked around aimlessly (?? and he still is)

Notice that the predicate in (112) is not a state predicate, since it combines with the progressive, as shown by the sentence (113).

(113) Peter was walking around aimlessly

In the next section, I will argue that the distributional facts observed in (106)-(113) are strictly associated and depend on both semantic distinctions and the logical syntax of predicates.

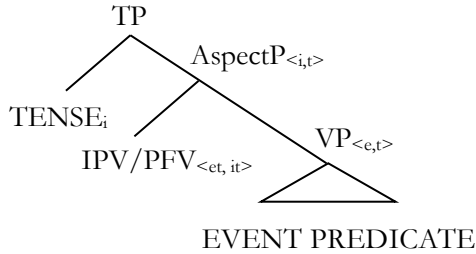
1.5 My proposal

To account for the above facts, I will assume that aspectual operators are responsible for the existential closure of the event variable of event predicates. Particularly, I will propose that aspectual operators denote functions from properties of events into properties of times and, therefore, that state sentences do not include aspectual operators. Given this assumption, the temporal architecture I am proposing is characterized by the following points:

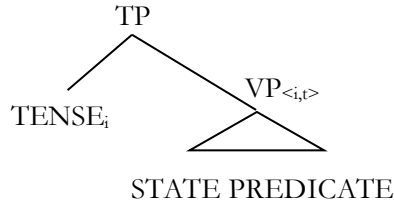
- Tenses are referential expressions, i.e. temporal variables carrying presuppositions.
- State predicates denote properties of times; the LF of state predicates has an extra argument slot for a temporal variable.
- Event predicates denote properties of events; the LF of event predicates has an extra argument slot for an event variable.
- Aspectual operators are functions from event properties to time properties; they locate an event with respect to a time; the two most common aspectual operators are PFV and IPV.
- The progressive is the spell out of the IPV aspectual operator.
- The PVF operator is a silent operator.
- Temporal adverbials are temporal modifiers, i.e. they denote functions from properties of times to properties of times.
- Event adverbials, such as manner adverbials, are event property modifiers, i.e. they denote functions from properties of events to properties of events.

Given these assumptions, while the temporal architecture of event sentences is the one represented in the grammatical structure (114), the temporal architecture of state sentences is the one represented in the grammatical structure (115).

(114) EVENT SENTENCES



(115) STATE SENTENCES



Given these assumptions, the contrasts in the temporal interpretation of event sentences and state sentences follow straightforwardly. Consider the state predicate “to be sick” and the event predicate “to butter the toast” and see the predictions that our proposal makes. The argument structure of the state predicate *be sick* and of the event predicate *butter the toast* will be the ones represented in (116) and (117).

(116) $\lambda x \lambda t(\text{be-sick}(x)(t))$

(117) $\lambda x \lambda e(\text{butter-the-toast}(e) \ \& \ \text{agent}(e, x))$

Once the two predicates combine with the subject of the sentence, we derive the two temporal properties represented in (118) and (119).

(118) $\lambda t(\text{be-sick}(\text{John})(t))$

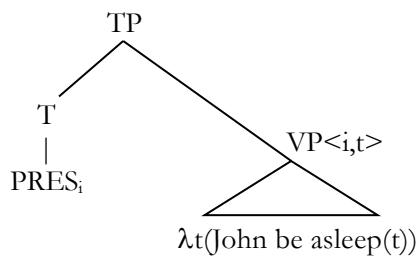
(119) $\lambda e(\text{butter-the-toast}(e) \ \& \ \text{agent}(e, \text{John}))$

Given the difference in the argument structure of the two predicates and the assumptions we have made so far, we can explain why state predicates do not appear in the progressive form while event predicates do, as shown in (106) and (107). Being the progressive form the spell out of the IPV operator with logical type $\langle et, it \rangle$, it cannot combine with a state predicate like “to be sick”, whose type is $\langle it, it \rangle$; on the contrary, the IPV operator can combine with an event predicate like “to butter the toast” whose logical type is $\langle et, it \rangle$. Its application to the event predicate will give the following temporal property.

(120) $\lambda t \exists e (t \subseteq \tau(e) \ \& \ \text{John-buttered-the-toast}(e))$

This is the property of being a time included in the temporal trace of the *John buttering the toast* event. According to the temporal architecture we are proposing, this temporal property is in turn saturated by the denotation of the temporal variable introduced by the tense, as represented in (121).

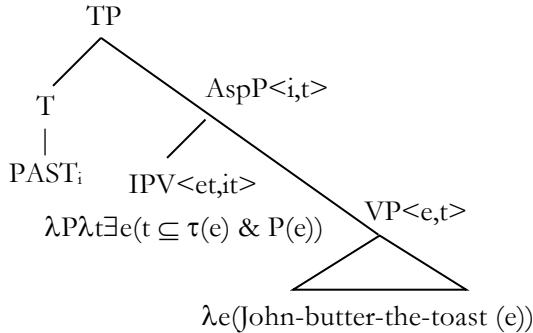
(121)



According to the temporal architecture we are proposing, we can explain why state predicates appear in the present tense while event predicates generally do not, as shown in (108) and (109). According to our proposal,

state predicates can directly combine with the tense, as shown by the LF of (108) represented in (122).

(122)



On the contrary, event predicates can combine with tense only via aspectual modification; in (122) there is no occurrence of the IPV operator, as it is morphologically evident by the lack of the progressive morphology; the PFV operator could in principle occur in (108) since it is morphologically silent. In this case, the sentence receives a special reading which is described as the *reports*' reading in the literature (see Kratzer (1998)). In our special case, this reading is difficult to derive given the presence of the adverbial “now” which requires the interval including the temporal trace of the *buttering* event to be equal to the speech time conceived as a point (now). It should be said that event predicates can appear in the present tense under a habitual reading as well. We will account for this fact in chapter 2 and chapter 3.

In our system, we can account for the important facts concerning the truth conditions of Partee's examples we discussed in the previous section. In fact, according to the proposal, the sentence “I didn't turn off the stove” is true when the *turn off the stove* event is included in a salient past interval introduced by the tense; on the contrary, the truth conditions

of the state sentence “I was tired” requires the state of the *speaker’s being tired* to hold at the whole salient past interval introduced by the tense. According to our analysis, in the specific case of Partee’s stove puzzle, the contextually relevant 20-minute interval is the interval denoted by the tense. Since state predicates denote time properties and they can combine directly with tense, the state predicate *be tired* will be true of the whole 20 minute interval; on the contrary, since event predicates combine with aspect before merging with tense, the PFV operator will require the temporal trace of the *I turn off the stove* event to be included in that 20 minutes interval (ignoring the role of negation). For the same reason, state sentences in the simple past do not describe events which are entirely terminated in the past, as shown in (110): the lack of the perfective operator in the LF of a state sentence in the simple past allows the state described by the sentence to hold at speech time. Event telic predicates, like “to drink a beer”, have a terminative reading under the simple past. This is because the PFV operator requires the temporal trace of a telic event to be included in the interval introduced by the tense. When a PFV operator combines with a telic event predicate *P*, it cannot combine with the temporal trace of a sub-event of *P* and produce a non-terminative reading of *P*: the sub-event of a telic event is not a telic event itself (see the arguments for interval semantics we discussed in section 1.1.2). However, the system predicts that simple past sentences containing activity event predicates like “to walk around aimlessly” (or “to sleep”) can have a non-terminative reading. This is because these predicates are homogeneous (down to a certain limit in some cases like “to run in the park”, for it takes at least two steps to perform a running). Given that an event predicate is homogeneous when, if it is true of an event it is true of every sub-event of this event, from the definition of the PFV operator it follows that the interval denoted by the tense can include the temporal trace of an event which is a sub-event of a homogeneous event of the same type. In this case, the past interval introduced by the tense can include the temporal trace of a *Peter walking around aimlessly* event which is a sub-event of a *Peter*

walking around aimlessly homogeneous bigger event. Thus, the fact that (88) have a terminative interpretation under the simple past verbal morphology does not follow semantically.

A similar account is found in Giorgi and Pianesi's proposal we discussed in the previous section, where a terminated event can be a sub-event of a bigger non-terminated event of the same type. This is also possible in a system assuming a neo-Davidsonian approach in the line of Parson's proposal (1980, 1989, 1990). In fact, in order to account for the fact that event predicates describe terminated event under the simple past, Parsons introduces an event predicate called *Cul*, which is true of an event and a time when that event culminates at that time, as shown in (123).

(123) $Cul(e, t) = 1$ iff the event e culminates at time t

By assuming (123), Parsons introduces the following semantic principle for the interpretation of simple past event sentences.

(124) If A is an event verb occurring in a simple non-progressive sentence, the logical form of the sentence contains *Cul*

The logical form of a sentence like (125) will be therefore the one represented in (126).

(125) John slept on the grass

(126) $\exists t \exists e (\text{sleep-on-the-grass}(e) \ \& \ \text{Theme}(e, \text{John}) \ \& \ Cul(e, t) \ \& \ t < \text{now})$

Given that the event predicate *sleep-on-the-grass* is homogeneous, the truth conditions reported in (126) won't rule out the possible continuation of (125) reported in (127).

(127) ... and he is still sleeping

Two are the ways in which we can cope with this problem in both a Kratzerian and a neo-Davidsonian approach. One possibility is to assume that the terminative reading of simple past activity sentences is the result of a pragmatic inference that assumes that the speaker is maximally informative and uses the simple past sentence for referring to the maximal interval for which the sentence is true. According to a different possibility, we can assume that event predicates are maximalized. In the system I am proposing, this second solution can be developed by assuming that the PFV operator is responsible for the maximalization of the event predicate as represented in (128).

$$(128) \text{ PFV} = \lambda P \lambda t \exists e (t \supseteq \tau(e) \ \& \ P(e) \ \& \ \neg \exists e' (e \subset e' \ \& \ P(e')))$$

In chapter 2 we will discuss this solution and some potential problems.³⁰

Interestingly, the system I am proposing can constraint adverbial modifications and it predicts why manner adverbials can appear in event sentences but not in state sentences, and why temporal adverbials can appear in both sentence types. Consider the definition of temporal adverbials like “yesterday” we assumed in the previous section reported in (129).

$$(129) \text{ Yesterday: } \lambda P \lambda t \exists I (P(t) \ \& \ t \subseteq I \ \& \ I = \text{the day before the day including } t^*)$$

(where t^* denotes the speech time)

According to (129), “yesterday” is a temporal modifier; it modifies a temporal property by saying that it is a property of a time which is in

³⁰There are cases in which the sentence is not perfectly interpreted. This happens when the predicate is a fine grain predicate such as the ones in the sentences below.

(i) He was shot while he slept

(ii) He was killed while he rode his motorbike

I found many similar sentences in the British National Corpus.

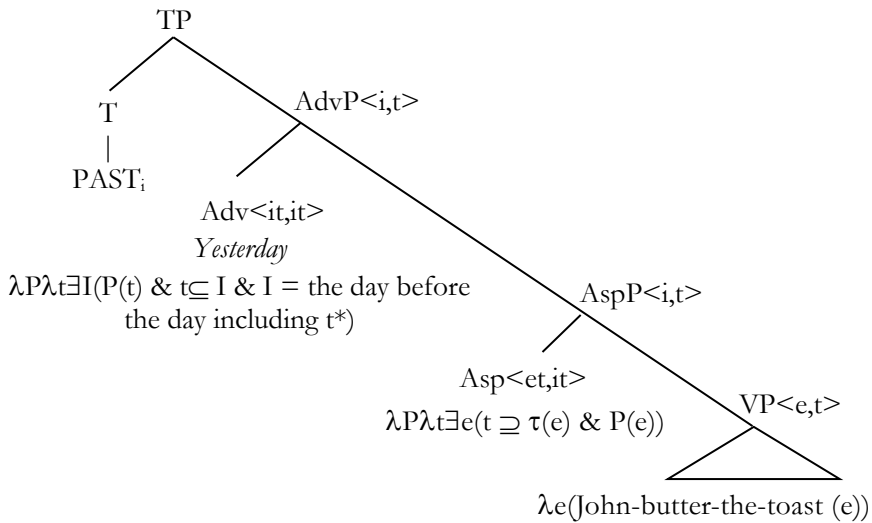
yesterday. On the contrary, manner adverbials like “carefully” are adverbials modifying an event predicate (or a relation between an event and an individual) and are merged within a verbal syntactic projection, as sketched in (130).

(130) Carefully: $\lambda R\lambda x\lambda e (R(x,e) \ \& \ \text{carefully}(x, e))$

We have previously discussed how “yesterday” modifies temporal predicates in state sentences like “John was sick yesterday”. In the case of event sentences like “John buttered the toast yesterday”, “yesterday” will be merged after the application of the aspectual operator as shown in the LF of (131) represented below.

(131) John buttered the toast yesterday

LF:



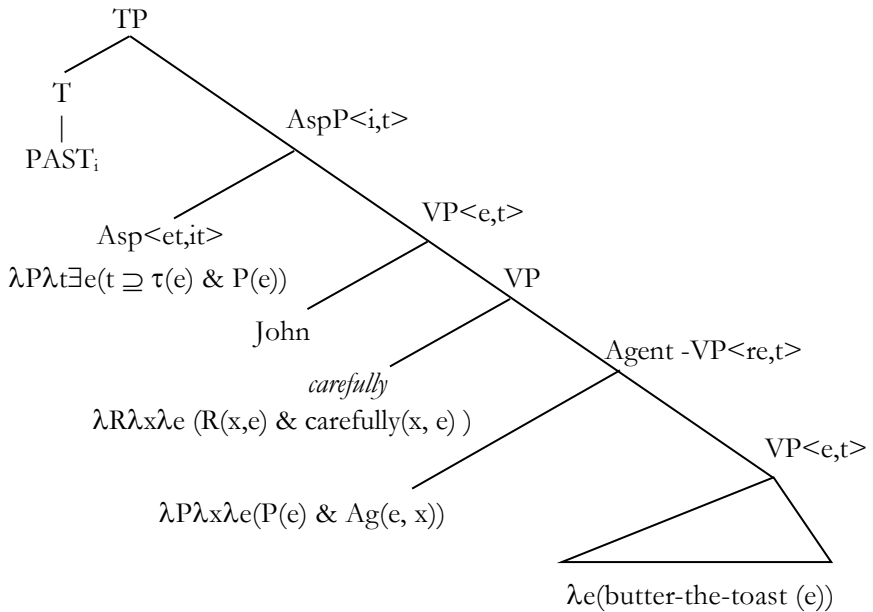
This explains why an adverb like “yesterday” can appear in both event and state sentences. On the other hand, a manner adverb like “carefully” cannot

appear in a state sentence as in (132) since there is not an event property (or an eventive relation) that can be modified. Manner adverbials like “carefully” can modify event predicates, as shown by (133) and its LF in which where we sketched the semantics of “carefully”.

(132) ?? John was sick carefully

(133) John buttered the toast carefully

LF:



This analysis predicts a linear ordering of the co-occurrence of adverbs like “yesterday” and “carefully”, as represented in the sentences (134), (135) and (136) below.

(134) Yesterday, John buttered the toast carefully

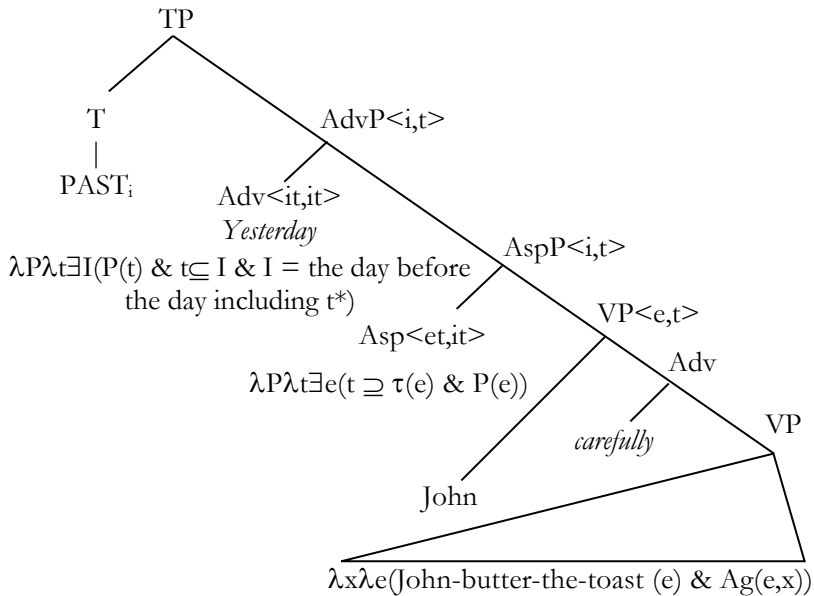
(135) John buttered the toast carefully yesterday

(136) *John buttered the toast yesterday carefully

Since temporal adverbials like “yesterday” are temporal modifiers occurring above the aspectual projection, they cannot occur in a position between the lexical verb and the manner adverbial. This explains why sentence (136) is ungrammatical. On the contrary, a temporal adverbial can be inserted in an event sentence once the aspectual projection has been merged. In this case the manner adverbial will be merged below the aspectual projection, shown by the LF of (134) represented in (137).

(137) Yesterday John buttered the toast carefully

LF:



1.6 Comments and conclusions

In this chapter, I argued that in order to describe how the temporal meaning of a sentence is derived, we have to analyse the main components of the temporal interpretative mechanism in interaction with each other. I argued that theories that consider these components in isolation stipulate implicit assumption to derive the correct truth conditions of a tensed sentence. I argued that a referential analysis of tense avoids some of the problems that a quantificational approach has. I discussed the difficulties of Giorgi and Pianesi analysis of aspectual distinctions based on event properties and I argued for an analysis of aspectual distinction *a la* Kratzer, where aspectual operators located below tense are responsible for aspectual contrasts. I proposed that aspectual operators play a crucial role in the derivation of the different temporal interpretations conveyed by event sentences and state sentences. In particular, I explained why state predicates do not occur in the progressive, why event predicates do not occur in the simple present tense, and why homogeneous event predicates like “to sleep” can have a non-terminative reading under the simple past. I argued that state sentences can have a non-terminative reading under the simple past because they lack aspectual operators.

Interestingly, in Italian and other Romance languages state sentences have a terminative reading when appearing in a past perfective morphological tense, as shown in the Italian sentences (138) and (139).

(138) Maria fu malata (?? e lo è ancora)

Lit: Maria be-3sPAST.perf sick (and she still is)

(139) Maria è stata malata (?? e lo è ancora)

Lit: Maria is been sick (and she still is)

These facts will be discussed in the next chapter.

2. Tense and aspect in some Romance languages

In Romance languages, we find a rich system of verbal temporal inflections. For example, in French, Italian and Romanian (I will not discuss data from Romanian in my work) we find that different past forms are used to convey different temporal meanings. A brief chart of the tense forms for these languages is given below with an informal English morphological classification.³¹

ITALIAN	ROMANIAN	FRENCH	MORPHOLOGICAL CLASSIFICATION
Presente	Prezentul	Présent	Present
Passato	Perfectul	Passé	Past
Remoto	Simple	Simple	Perfective
Imperfetto	Imperfectul	Imparfait	Past Imperfective
Passato	Perfectul	Passé Composé	Present
Prossimo	Compus		Perfect
Trapassato	Mai Mult ca	Passé Antérieur	Pluperfect
Prossimo	Perfectul		

³¹In my work we will not discuss future tenses because it is complex and a matter of debate how to address the modal meanings of future tense sentences. For instance, Bonomi (1978) argues that when considering future tense sentences we should distinguish between the conditions for asserting a sentence from its truth conditions; given that we do not know the course of future contingent events, we do not have sufficient elements for making an assertion about them although there are in principle the truth conditions of a sentence describing them. According to Bonomi this would explain the epistemic use of future tenses. My proposal can be extended to future sentences independently from this problem by assuming the future tense to be a temporal variable whose denotation is only define for times which are after the speech time.

In the proposal made in chapter 1, the different morphological tense forms reported in the table above were analyzed in terms of different tense/aspect combinations (von Stechow, 2000; Kratzer, 1998). At the end of chapter 1, we argued that this analysis does not explain some important morphological and semantic contrasts we find in state sentences in Romance languages. In this chapter, we will discuss that these contrasts are related to semantic properties of tenses determining the distribution of durative temporal adverbials and tense selection in habitual sentences in Romance languages. In particular, we will see that *for x time* and *since x time* durative temporal adverbials have a complementary distribution across different verb forms in some Romance languages and we will observe that this distribution is different when the sentence is interpreted habitually. Moreover, we will discuss tense selection in habitual and generic sentences. In order to account for the described facts, I will propose a new analysis of the different tense forms listed in the table above. In particular, I will propose a new definition of tense according to which tense is sensitive to the temporal properties of its complement (a similar idea is found in de Swart (1998) where tenses are sensitive to the aspectual properties of their complements) and I will argue that the verbal forms listed in the table above are the morphological spell-out of two different tenses, associated with restrictions concerning the temporal homogeneity of their complements. In order to implement this idea, I will decompose the tense projection into a temporal variable, localizing the described eventuality in the flow of time, and an homogeneity condition on the interpretation of the tense complement. The idea is that tense combines with its complement and licenses it if it satisfies a temporal homogeneity condition: this means that the tense itself has some influence on the aspectual interpretation of a sentence. Given these assumptions, the problematic facts presented in chapter 1, the distributive facts and the semantic ambiguities I will discuss in this chapter will follow straightforwardly.

2.1 Italian and French facts

In Italian, durative *per-* and *da-*adverbials (*for x time* and *since x time* adverbials) are found in a complementary distribution in state sentences, as we can observe in the table below.

(140) *per*-adverbials

(a) ?? È buio per due ore

Lit: (It) is dark for 2 hours

PRESENTE

(b) ?? Era buio per due ore

Lit: (It) was dark for 2 hours

IMPERFETTO

(c) Fu buio per due ore

Lit: (It) was dark for 2 hours

PASSATO REMOTO

(d) È stato buio per due ore

Lit: (It) has been dark for 2 hours

PASSATO PROSSIMO

(e) Era stato buio per due ore

Lit: (It) had been dark for 2 hours

TRAPASSATO PROSSIMO

(141) *da*-adverbials

(a) È buio da due ore

Lit: (It) is dark since 2 hours

PRESENTE

(b) Era buio da due ore

Lit: (It) was dark since 2 hours

IMPERFETTO

(c) ?? Fu buio da due ore

Lit: (It) was dark since 2 hours

PASSATO REMOTO

(d) ?? È stato buio da due ore

Lit: (It) is been dark since 2 hours

PASSATO PROSSIMO

(e) ?? Era stato buio da due ore

Lit: (It) had been dark since 2 hours

TRAPASSATO PROSSIMO

As we can see from the sentences in (140), *per*-adverbials combine with the *Passato Remoto*, the *Passato Prossimo* and the *Trapassato Prossimo* but not with the *Presente* and the *Imperfetto*. On the other hand, *da*-adverbials combine with the *Presente* and the *Imperfetto* but do not with the *Passato Remoto*, the *Passato Prossimo* and the *Trapassato Prossimo* as we see in the sentences in (141).³² French³³ patterns with Italian in the distribution, as we can see from the table below.

(142) *pendant*-adverbials

(a) ?? La fenêtre est sale pendant
deux jours

Lit: The window is dirty for
2 days

PRÉSENTÉ

(b) ?? La fenêtre était sale pendant
deux jours

Lit: The window was dirty for 2
days

IMPARFAIT

(c) La fenêtre fut sale pendant deux
jours

Lit: The window was dirty for 2
days

PASSÉ SIMPLE

(143) *depuis*-adverbials

(a) La fenêtre est sale depuis
deux jours

Lit: The window is dirty since
2 days

PRÉSENTÉ

(b) La fenêtre était sale depuis deux
jours

Lit: The window was dirty since 2
days

IMPARFAIT

(c) ?? La fenêtre fut sale depuis
deux jours

Lit: The window was dirty since 2
days

PASSÉ SIMPLE

³²(141a-b) are fine under a habitual interpretation in an appropriate context. As we will see later, this is predicted by the proposal I am making.

³³Romanian as well. The only difference is that in Romanian bare durative adverbials belong to the *per/pendant* class while the prepositional *pentru*-adverbials (*for*-adverbials) are result state modifiers.

(d) La fenêtre a été sale pendant longtemps Lit: The window has been dirty for 2 days PASSÉ COMPOSÉ	(d) ?? La fenêtre a été sale depuis deux jours Lit: The window has been dirty since 2 days PASSÉ COMPOSÉ
(e) La fenêtre avait été sale pendant longtemps Lit: The window had been dirty for 2 days PASSE ANTÉRIEUR	(e) ?? La fenêtre avait été sale depuis deux jours Lit: The window had been dirty since 2 days PASSE ANTÉRIEUR

Like in Italian, *pendant*-adverbials combine with the *Passé Simple*, the *Passé Composé* and the *Passé Antérieur* but not with the *Présent* and the *Imparfait*, as you can see from the sentences in (142). On the other hand, *depuis*-adverbials combine with the *Présent* and the *Imparfait* but not with *Passé Simple*, the *Passé Composé* and the *Passé Antérieur*, as shown in the sentences in (143). I will call these two classes of adverbials durative *for*-adverbials and durative *since*-adverbials.³⁴

Another interesting fact we want to account for is that ongoing and habitual meanings are generally conveyed by the use of a morphological imperfective tense in Romance languages, while specific terminative readings are conveyed by the use of a morphological perfective tense, as shown by the sentences below.

(144) Alle tre Carlo <u>correva</u> nel parco	[Imperfetto]
Lit: At three Carlo ran-3sPASTimperf in the park	

³⁴For the sake of the discussion, let us assume that *per/pendant*-adverbials correspond to the English durative *for*-adverbials, while *da/depuis*-adverbials do not have a counterpart in English; they rather correspond to the German *seit*-duration-adverbials described by Musan (2001).

(i) *At three o'clock Carlo was running in the park*

(ii) *At three o'clock, Carlo used to run in the park*

(145) Alle tre Carlo corre nel parco [Presente]

Lit: At three Carlo runs-3sPRES in the park

(i) *At three o'clock Carlo is running in the park*

(ii) *At three o'clock Carlo runs in the park*

(146) Ieri Carlo corse nel parco [Passato Remoto]

Lit: Yesterday Carlo ran-3sPASTperf in the park

Yesterday Carlo ran in the park

As we can observe, while the imperfective (144) and (145) have both an ongoing interpretation, as represented by the (i) English sentences, and an habitual interpretation, as represented by the (ii) English sentences, the perfective (146) only have a terminative interpretation. Interestingly, under a habitual interpretation, *for*-adverbials combine with morphological imperfective tenses, as shown by the sentences below.

(147) Il venerdì Carlo correva nel parco per due ore [Imperfetto]

Lit: The friday Carlo ran-3sPASTimperf in the park for two hours

On Friday Carlo used to run in the park for two hours

(148) Il venerdì Carlo corre nel parco per due ore [Presente]

Lit: The Friday Carlo runs-3sPRES in the park for two hours

Fridays Carlo runs in the park for two hours

Interestingly, when a *for*-adverbial measures the time span of the habit, habitual meanings are conveyed by the use of a morphological perfective tense, as shown by the Italian sentences below.

(149) Leo ha preso il te` alle cinque per venti anni [Passato Prossimo]
 Lit: Leo have-3sPRES take-PASTpart tea at five for twenty years
Leo used to have tea at 5 o'clock for twenty years

(150) Leo prese il te` alle cinque per venti anni [Passato Remoto]
 Lit: Leo take-3sPASTperf tea at five for twenty years
Leo used to have tea at 5 o'clock for twenty years

When a durative adverbial measures the time span for which an habit holds in the past, a past imperfective tense is bad, as we can see in the following sentences.

(151) ?? Leo prendeva il te` alle cinque per venti anni [Imperfetto]
 Lit: Leo take-3sPASTimperf tea at five for twenty years

(152) ?? Leo prende il te` alle cinque per venti anni [Presente]
 Lit: Leo take-3sPRES tea at five for twenty years

My proposal in short

In order to account for these facts (and some others to be presented in our discussion), I will assume that:

- *since*-adverbials combine with temporal predicates to give temporally homogeneous predicates;
- *for*-adverbials combine with temporal predicate to give temporally non-homogeneous predicate;
- present and past imperfective tenses require their complements to be temporally homogeneous;
- past perfective tenses require their complements to be temporally non-homogeneous.

These assumptions will explain the adverbial distribution in sentences (140)-(143) from (a) to (c). I will moreover assume that:

- the perfect morphology in (140)-(143) in the sentences from (d) to (e), is the spell-out of a semantic tense combining with a temporally non-homogeneous predicate.

This explains the distribution in sentences (141)-(144), (d)-(e). Finally, we will observe that:

- habits are temporally homogeneous.

This will explain the fact that habitual readings are conveyed by the use of the present or by the use of past imperfective tenses; when they undergo *for*-adverb modification, habits are denoted by non-homogeneous temporal properties; this will explain the occurrence of the perfective morphology in the habitual sentences under specific *for*-adverb modification.

2.2 Italian and French tenses

In order to develop the analysis sketched above, I will propose that the temporal system of Italian and French (and some other Romance languages, for instance, Romanian) has two lexical entries in its inventory of tenses: a tense selecting for temporally homogeneous predicates and a tense selecting for temporally non-homogeneous predicates. The insight is that, in these languages, present and the past imperfective forms are two forms of one tense selecting for temporally homogeneous predicates, while the past perfective, the present perfect and the pluperfect forms are forms of a tense selecting for temporally non-homogeneous predicates. This classification goes back to an observation by the Latin grammarian Varro (116 B. C.-27 B. C.), who argues in *De Lingua Latina*, IX, 48 that we should assume a basic division of the Latin tense forms into two stems, *Infectum*

and *Perfectum*. According to Varro, while the Latin *present* and *past-imperfective* verbal forms (like *lego* (I read-present)) and *legebam* (I read-past.imperfective) are *Inflecta* forms and are “analogous to one another”, the Latin past-perfective forms (like *legi* (I read-past.perfective)) are *Perfecta* forms and are in opposition to the former ones (see Oldsjö (2001) for a further discussion about Latin tense forms).³⁵

I will define the class of temporally homogeneous predicates as the class of those predicates having the sub-interval property, i.e. they are divisible as we discussed in the previous section; the class of temporally non-homogeneous predicates as the class of those predicates not having the sub-interval property (Bennett and Partee, 1972).

Given a temporal property P of type $\langle i, t \rangle$,

(153) P is temporally homogeneous if:

$$\forall i [P(i) \rightarrow \forall i' [i' \subset i \rightarrow P(i')]] \ \& \ \forall i [\neg P(i) \rightarrow \forall i' [i' \subset i \rightarrow \neg P(i')]]$$

(154) P is temporally non-homogeneous if

$$\forall i [P(i) \rightarrow \neg \forall i' [i' \subset i \rightarrow P(i')]] \ \& \ \forall i [\neg P(i) \rightarrow \neg \forall i' [i' \subset i \rightarrow \neg P(i')]]$$

where i and i' are intervals.

Definition (153) is different from the definition of temporal homogeneity we gave in chapter 1; the homogeneity definition given in chapter 1 is closer to the definition we find in Bennett & Partee (1972).³⁶ In (153), there is a

³⁵Vide: M. Terenti Varronis, (Varro), De Lingua Latina, LVI-LVIII, Liber IX.

³⁶ Bennett and Partee (1972) definition was the following.

A verb phrase α is a subinterval verb phrase iff α is main verb of a sentence β such that if $||\beta|| \models^{T,u,i}$ then, for every $j \subseteq i$, $||\beta|| \models^{T,u,j}$, where j and i are intervals.

According to this definition, “live” is a subinterval verb phrase. In fact,

if $||\text{Carlo live } || \models^{T,u,i} = 1$ then for every $j \subseteq i$, $||\text{Carlo live } || \models^{T,u,j} = 1$

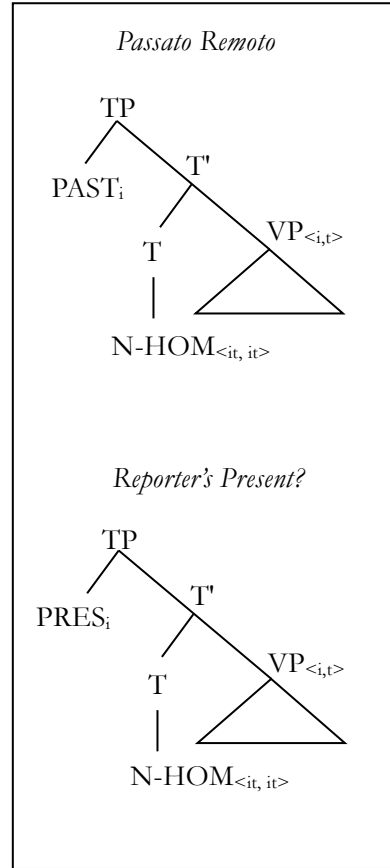
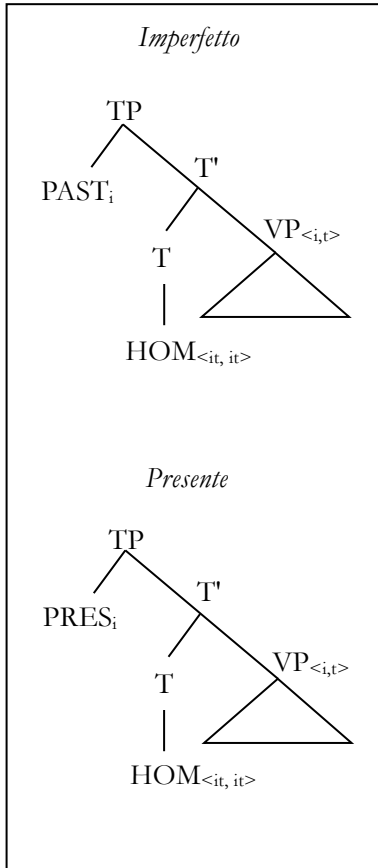
second conjunct in the definition of homogeneity. This second condition says that a temporal predicate is temporally homogeneous if, when false of a temporal interval is also false of every sub-interval of that interval. This follows from our intuition concerning the falsity of a state predicate. Consider the temporal predicate “Mary be sick”. According to our intuitions, if it false that Mary is sick at a temporal interval, let’s say from 2 p.m. to 4 p.m. today, it is also false that Mary is sick at every sub-interval of that interval.

2.2.1 Tense architecture

In order to develop a tense architecture appropriate for the proposal I am making, I assume that Italian and French tenses are to be decomposed into an *homogeneity condition*, which distinguishes the Infectum from the Perfectum, and a *temporal variable*, which distinguishes the past from present (and the future). I will assume that the homogeneity condition is located in the head of the tense projection whose specifier position is filled by a temporal variable as represented in the trees below (I follow the Italian classification just for simplicity).

I. TEMPORA INFECTA

II. TEMPORA PERFECTA



According to this classification, we find two classes of tenses: the class of the Tempora Infecta, whose tense head HOM requires the tense complement to be temporally homogeneous; the class of the Tempora Perfecta, whose tense head N-HOM requires the tense complement to be temporally non-homogeneous. The *Perfect* constructions (*Passato Prossimo* and *Piuccheperfeito*) do not appear in the tables I and II even though they fall

in the classification above. This is because, depending on the aspectual class of the predicate they combine with, these forms are semantically ambiguous between the spell out of a Tempus Infectum and the spell out of a Tempus Perfectum. They will be discussed in section 2.4.

2.2.2 Homogeneity conditions and temporal variables

According to the tense architecture described in section 2.2.1, the head of the tense projection is a *predicate restriction*, namely, a partial identity function from predicates of times to predicates of times, *presupposing* its complement to be temporally homogeneous or temporally non-homogeneous. The lexical entries of our tenses will be therefore the following.

(155) HOM =: $\lambda P\lambda t(P(t))$: P is temporally homogeneous

(156) N-HOM =: $\lambda P\lambda t(P(t))$: P is temporally non-homogeneous

As you can see from the tense architecture described in section 2.2.1, the predicate restriction associated with the Tempora Infecta is HOM, the one associated with the Tempora Perfecta is N-HOM; in the case of the Tempora Infecta, the predicate restriction HOM takes a predicate of times as argument and returns it if this latter is temporally homogeneous; in the case of the Tempora Perfecta, N-HOM takes a predicate of times as its argument and returns it, if this is temporally non-homogeneous. The denotation of the application of the predicate restriction to its complement is represented in (157) and (158).

(157) $\| \text{HOM}(P) \|^{g,c} = \{t \in \| P \|^{g,c} : P \text{ is temporally homogeneous}\};$
undefined otherwise

(158) $\| \text{N-HOM}(P) \|^{g,c} = \{t \in \| P \|^{g,c} : P \text{ is temporally non-homogeneous}\};$ undefined otherwise

As we will discuss later, the temporal predicate restrictions of tense have an impact on the aspectual interpretation of a sentence. Once the tense head combines with a temporal predicate, the derived property of times is saturated by the denotation of the temporal pronoun occupying the specifier of the tense position as shown in the tables I and II.

In my proposal, I will assume Heim's (1994) straightforward analysis of tense discussed in chapter 1 in order to define the semantic contribution of the temporal variable occupying the specifier of the tense position as represented in tables I and II. I report these definitions in (159) and (160) below.

(159) $||PAST_i||^{g,c} = g(i)$ when $g(i) < t_c$, undefined otherwise

(160) $||PRES_i||^{g,c} = g(i)$ when $\neg g(i) < t_c$, undefined otherwise

According to (159), the denotation of $PAST_i$ is defined if the value that the assignment function g assigns to the index i is a time before t_c , the time of the context of utterance; if it is defined, it is equal to the value that the assignment function g assigns to the index i . According to (160), the denotation $PRES_i$ is defined if the value that the assignment function g assigns to the index i is a time that is not before t_c ; if it is defined, it is equal to the value that the assignment function g assigns to the index i . We can now discuss how my proposal works and accounts for the facts described in the previous section. Consider the Imperfetto sentence (161).

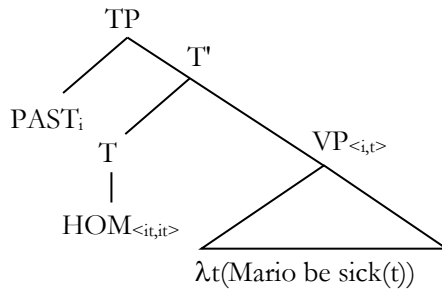
(161) Mario era malato
Lit: Mario be-3sPASTimperf sick

The derivation of its LF will start from the state predicate *Mario be sick*. As I argued in chapter 1, the logical form of a state predicate has an explicit argument position for a temporal variable as represented in (162).

(162) $\lambda t(\text{Mario be sick}(t))$

The state predicate is merged with the tense head and the derived temporal predicate is successively merged with the temporal pronoun $PAST_i$, as represented in the LF in (163).

(163) $PAST_i (\text{HOM}(\lambda t(\text{Mario be sick}(t))))$



Given the definedness restriction introduced by the temporal variable and by the predicate restriction HOM, (163) is defined if (164) and (165) are defined.

(164) $||PAST_i||^{g,c}$

(165) $||\text{HOM}(\lambda t(\text{Mario be sick}(t)))||^{g,c}$

That is, if $g(i) < t_c$, and if $\lambda t(\text{Mario-be-sick}(t))$ is homogeneous, which is the case, since state predicates denote homogeneous properties of times. In this case:

(166) $||PAST_i (\text{HOM}(\lambda t(\text{Mario be sick}(t))))||^{g,c} = 1$ iff the time denoted by $PAST_i$ is a past time at which Mario is sick.

2.2.3 Durative *for*- and *sinceD*-adverbials

Contrary to Giorgi and Pianesi's (2001) analysis discussed in chapter 1, in my proposal I will assume that durative *for*- and *sinceD*-adverbials are temporal modifiers, namely functions from time properties to time properties. Intuitively, while *for*-adverbials combine with a temporal predicate by requiring it to be true of an interval of a certain length (Dowty, 1979), *sinceD*-adverbials introduce an *extended now* interval³⁷ by combining with a temporal predicate and requiring the derived predicate of times to abut an interval of a certain length (for which the original temporal predicate is true) (Musan, 2000; von Stechow, 2002). The interesting property of these adverbs is that while *for*-adverbials quantize and make non-homogeneous the temporal predicates they modify, *sinceD*-adverbials make them homogeneous.

2.2.3.1 *For*-adverbials

For-adverbials turn all temporal predicates into quantized temporal predicates and, therefore, they make them non-homogeneous. I will assume that *for*-adverbials introduce universal quantification over times and measure a time interval as we see in the definition (167) (Dowty, 1979).

(167) For x time := $\lambda P \lambda t (\delta_{\text{TIME}}(t) = x \ \& \ \forall t' (t' \subseteq t \rightarrow P(t'))$
 where δ is function measuring the length of an interval onto a temporal scale.

The definition in (167) says that a *for*-adverbial combines with a temporal predicate P and the derived predicate is a predicate of a time t which is x long (δ_{TIME} is a function measuring the length of an interval) and for which, for every subinterval t' of t , P is true of t' . Intuitively, the adverb says that the predicate P is true of a x -long interval and of every subinterval of this

³⁷Dowty (1979) and McCoard (1978).

interval. These adverbs quantize the temporal predicate they modify; namely, they give a temporal predicate which, if true of an interval, is false of every proper subinterval of that interval.³⁸

(168) P is temporally quantized iff $\forall i[P(i) \rightarrow \forall j [j \subset i \rightarrow \neg P(j)]]$
 where i and j are intervals

Notice that being quantized is different from being non-homogeneous given the different scope of negation in (154) and in (168). In fact, given a temporal predicate P , $\text{Quantized}(P) \rightarrow \text{NON-HOM}(P)$. Consider in fact the LF of the time predicate *John be sick for two days*, as represented in (169).

(169) $\lambda t(\delta_{\text{DAY}}(t) = 2 \ \& \ \text{John be sick}(t) \ \& \ \forall t'(t' \subset t \rightarrow \text{John be sick}(t'))$

As shown in figure 9 below, if (169) is true of an interval i , it is false of every proper subinterval j of i , trivially because j cannot be two days long if it is properly included in i .

³⁸Andrea Bonomi (personal communication) objected that not every *for*-adverbial quantizes the temporal property it modifies as in the case of "per meno di due ore" (*for less than two hours*). I think that Bonomi's observation is not correct and that we have to make clear what this adverb says. In fact, if you consider the following contrast it is clear that the adverb requires the maximality of the temporal property it modifies, as we can see from the (a) and (b) examples.

(a) Leo è stato malato per meno di due giorni ... ?? ed è ancora malato
Leo has been sick for less than two days ... ?? and he still is

(b) Leo è stato malato per due giorni... ed è ancora malato
Leo has been sick for two days ... and he still is

Thus, "to be sick for less than two days" intuitively means *to be maximally sick for less than two days*. The right definition of "for less than x time" will be therefore represented in (c).

(c) $\lambda P \lambda t[(\delta_{\text{DAY}}(t) \subset x \ \& \ P(t) \ \& \ \neg \exists t'(t' \subset t \ \& \ P(t')) \ \& \ \forall t''(t'' \subset t \rightarrow P(t''))]$

This temporal modifier quantizes the temporal property it modifies.

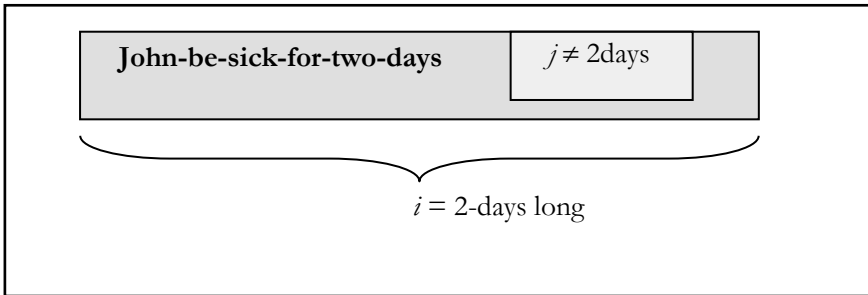


Figure 9: temporal meaning conveyed by (169)

This shows that *for*-adverbials quantize the temporal property they modify.

2.2.3.2 *SinceD*-adverbials

SinceD-adverbials turn all temporal predicates into homogeneous temporal predicates. As proposed by von Stechow (2002), these adverbials introduce an extended-now interval. In (170) I will assume a slightly modified version of von Stechow's definition of German durative *seit*-adverbials, which is more appropriate for Italian and French.

$$(170) \text{ since } x \text{ time} := \lambda P \lambda t \exists I (t \text{ abuts } I \ \& \ P(I \cup t) \ \& \ \delta_{\text{TIME}}(I) = x)$$

The definition in (170) says that a *sinceD*-adverbial combines with a temporal predicate and the derived predicate is true of a time t abutting an interval I , which is x -time long ("t abuts I" means that the right bound of I is the left bound of t), for which the original predicate P is true of the set union of I and t . Intuitively, a *sinceD*-adverbial combines with a temporal property and returns a property of times abutting an x -long interval for which the original predicate is true. Consider now the Italian temporal predicate in (172) derived by the application of the *da*-adverbial in (171) to the state predicate $\lambda t(\text{Mario be sick}(t))$.

(171) *da due giorni* (*since two days*):= $\lambda P \lambda t \exists I (t \text{ abuts } I \ \& \ P(I \cup t) \ \& \ \delta_{\text{DAY}}(I) = 2)$

(172) $\lambda t \exists I (t \text{ abuts } I \ \& \ \text{Mario-be-sick}(I \cup t) \ \& \ \delta_{\text{DAY}}(I) = 2)$

The temporal predicate in (172) denotes a set of times i abutting a 2-day long interval I for which Mario is sick at i plus I , as shown by figure 10 below.

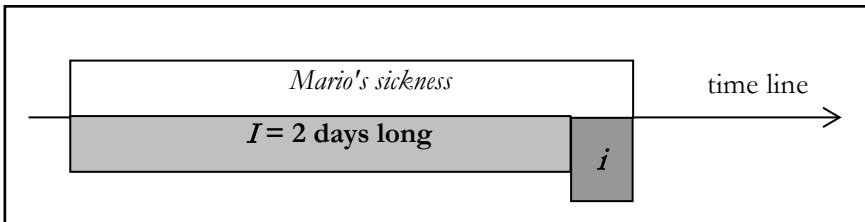


Figure 10: temporal meaning conveyed by (172)

The *homogenizing* nature of *sinceD*-adverbials is easy to understand. Consider in fact figure 11 below.

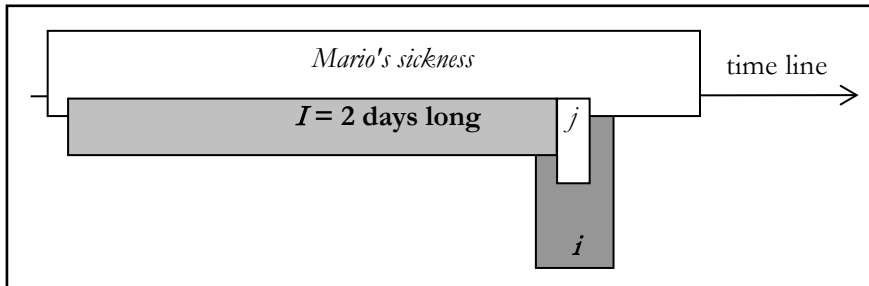


Figure 11: example of the *homogenizing* nature of *sinceD*-adverbials

If (172) is true of the interval i , it should be true of every subinterval j of i . Since the duration *two days* is relative to the time I introduced by existential quantification and not to i , and I abuts j , $I \cup j$ will always be included in I

$\cup i$. Therefore, if Mario is sick at $I \cup i$, he is sick at $I \cup j$; this shows that the derived predicate is homogeneous.³⁹

³⁹In this case there is an empirical question about whether the measuring function δ should apply to $(I \cup t)$ and not only to I , namely if the x -long interval should include the reference time introduced by the tense. If this is the case we have a potential problem while combining a since-D adverbial with a Tempus Infectum, since in this case the temporal property derived via since-D modification is no more temporally homogeneous. This is an empirical question. Sentences like the following can shed some light on the problem.

- (a) Oggi Leo è malato da tre giorni
Today Leo be-3sPASTimperf sick since three days

According to what (a) means, at the speech time included in today Leo is entering his fourth day of sickness, i.e. there is a three-day-long interval abutting now at which he is sick, and he is still sick now. Though the empirical intuitions about these facts can (hardly) be disputed, I think that this is only a potential problem for my proposal. There are some other facts suggesting that since-D adverbials deliver homogeneous properties of times. Here are some of these facts concerning an important property of the reference time abutting the interval I in meaning of these adverbials.

- (b) ??Ogni volta che Maria corse nel parco per un'ora Leo dormiva da due ore
Every time that Mary run-3sPASTperf in the park for one hours, Leo sleep-3sPASTimperf since two hours
- (c) ??Ogni volta che Maria corse nel parco per un'ora Leo stava dormendo da due ore
Every time that Mary run-3sPASTperf in the park for one hours, Leo be-3sPASTimperf sleeping since two hours
- (d) Ogni volta che Maria corse nel parco per un'ora Leo dormiva
Every time that Mary run-3sPASTperf in the park for two hours, Leo sleep-3sPASTimperf
- (e) Ogni volta che Maria corse nel parco per un'ora Leo stava dormendo
Every time that Mary run-3sPASTperf in the park for two hours, Leo be-3sPASTimperf sleeping
- (f) Ogni volta che Maria entrò Leo dormiva da due ore
Every time that Mary come-3sPASTperf in, Leo sleep-3sPASTimperf since two hours
- (g) Ogni volta che Maria entrò Leo stava dormendo da due ore
Every time that Mary come-3sPASTperf in, Leo be-3sPASTimperf sleeping since two hours

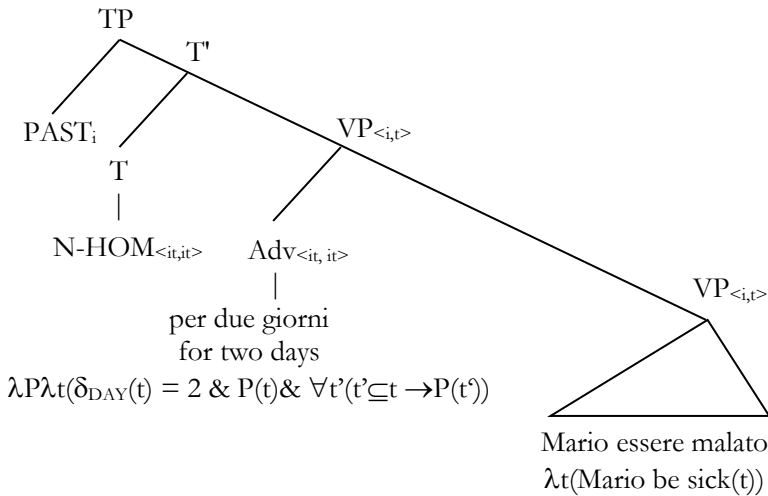
According to their relevant meanings, the temporal variables introduced by the tenses are bound by universal quantification in these sentences, their LF being something like: $\forall i[P(\text{PAST}_i) \rightarrow Q(\text{PAST})]$. The contrast between (b)-(c), and (d)-(e) shows that when the reference time introduced by the tense in the embedded clause has some length (as required by the *for-one-hour* adverbial modification) the since-D adverbial in the embedded clause is bad. On the other hand, when the reference time is a point (as the case in (f) and (g) where the embedded clause describes a punctual event) the since-D adverbial modification is good. This shows that a since-D adverbial requires that the

2.2.4 Tense and durative adverbials

While the quantizing nature of *for*-adverbials explains why they do not combine with a Tempus Infectum but they combine with a Tempus Perfectum, the homogenizing nature of *since*-adverbials explains why they combine with a Tempus Infectum but not with a Tempus Perfectum. Consider the following Italian sentences where a *for*-adverbial combines with the Passato Remoto but not with the Imperfetto and their associated LFs.

- (173) Mario fu malato per due giorni [Passato Remoto]
 Lit: Mario be-3sPASTperf sick for two days

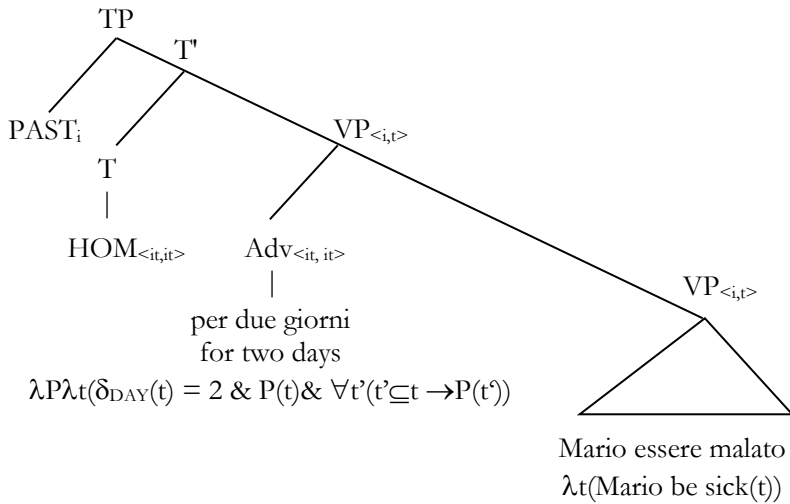
LF:



reference time abutting the interval I should be a point of time. If this is correct, since-D adverbial modification gives homogeneous properties of times since the property of a point is vacuously homogeneous, having a point of time no proper subparts by definition.

- (174) ?? Mario era malato per due giorni [Imperfetto]
 Lit: Mario be-3sPASTimperf sick for two days

LF:



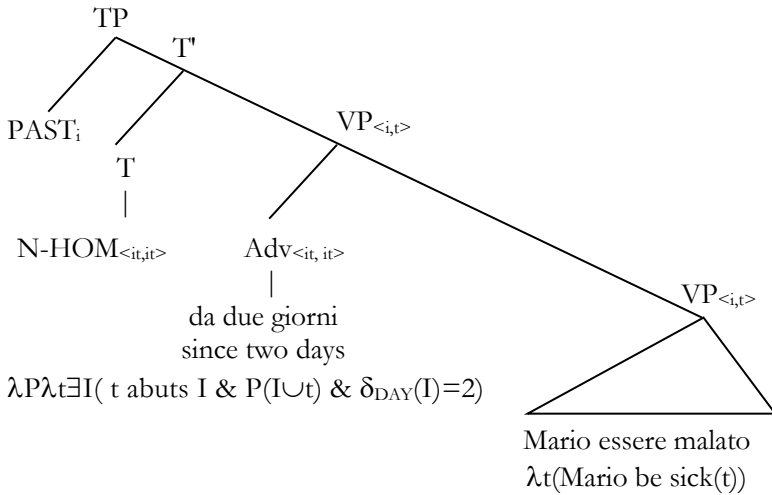
In both (173) and (174) we start the derivation of the LFs from the state predicate $\lambda t(\text{Mario-be-sick}(t))$ and we derive the non-homogeneous temporal predicate $\lambda t(\delta_{DAY}(t) = 2 \ \& \ \text{Mario-be-sick}(t) \ \& \ \forall t'(t' \subseteq t \rightarrow \text{Mario-be-sick}(t'))$ by *for*-modification. In (173), this temporal predicate is merged with the tense head N-HOM and is applied to the temporal variable $PAST_i$. The definedness conditions for the derived sentence require the denotation of $PAST_i$ to be a past time and $\lambda t(\delta_{DAY}(t) = 2 \ \& \ \text{Mario be sick}(t) \ \& \ \forall t'(t' \subseteq t \rightarrow \text{Mario be sick}(t'))$ to be non-homogeneous, which is the case. Therefore, if $PAST_i$ refers to a time before the time of the context of utterance, the sentence is felicitous and it is true if and only if $PAST_i$ denotes a time

which is two days long and is characterized by Mario's sickness. On the contrary, in (174) the presupposition associated with HOM cannot be met, because $\lambda t(\delta_{\text{DAY}}(t) = 2 \ \& \ \text{Mario be sick}(t) \ \& \ \forall t'(t' \subseteq t \rightarrow \text{Mario be sick}(t'))$ is temporally non-homogeneous. The presupposition failure of (174) is the cause of its ungrammaticality.

On the other hand, the homogeneous nature of a temporal predicate derived by *since*-modification allows it to combine with the Imperfetto in Italian; for the same reasons it does not combine with the Passato Remoto.

- (175) ?? Mario fu malato da due giorni [Passato Remoto]
 Lit: Mario be-3sPASTperf sick since two days

LF:



As we see from its LF, sentence (175) undergoes a presuppositional failure, since the non-homogeneity presupposition associated with the N-HOM head cannot be met by the temporal property $\lambda t\exists I(t \text{ abuts } I \ \& \ \text{Mario-be-sick}(I \cup t) \ \& \ \delta_{\text{DAY}}(I) = 2)$, which is homogeneous. Such a temporal property

combines with a *Tempus Infectum*, since it meets the homogeneity presupposition carried by the HOM head.⁴⁰

However, state predicates combine with the *Passato Remoto* without any overt *for*-adverbial modification, as shown by the sentence below.

- (176) Mario fu malato [Passato Remoto]
Lit: Mario be-3sPASTperf sick

Interestingly, sentence (176) is ambiguous between a terminative and an inchoative reading. According to its inchoative reading, whose analysis will be given in section 2.3, sentence (176) says that Mario became sick in the past. According to its terminative reading, sentence (176) describes *Mario's sickness* which is entirely terminated in the past. I assume that this second reading is derived by the application of a covert operator which maximalizes the time for which the described state is true, in order to meet the non-homogeneity presupposition associated with the *Passato Remoto*.⁴¹ The maximalizing operator is defined in (177).

- (177) MAX:= $\lambda P \lambda t (P(t) \ \& \ \neg \exists t' (t \subseteq t' \ \& \ P(t'))$

The maximalizing operator maximalizes, and thus quantizes, the temporally homogeneous state predicate. As we said, a quantize predicate is non-homogeneous. The application of MAX to the state predicate “Mario be sick” will give the following LF for (176).

⁴⁰In my proposal it is implicitly assumed that adverbials cannot have scope above the homogeneity restriction, namely that we cannot have something like PAST[IN x TIME[HOM[VP]]]; in order to avoid this unwelcome LF I have to postulate the following rule saying that tenses cannot be decomposed in the logical syntax: || PAST+HOM ||^{g_c} = $\lambda P. \text{HOM}(P). \lambda t. t < t_c. P(t) = 1$.

⁴¹Alternatively, we can assume the terminative reading to be derived by a pragmatic inference assuming the speaker to be maximally informative and to use the *Passato Remoto* for the maximal interval for which a temporal predicate is true. This will predict the terminative inferred meaning can canceled in particular circumstances.

- (178) $PAST_i(N-HOM(\lambda t(Mario-be-sick(t) \& \neg \exists t'(t \subseteq t' \& Mario-be-sick(t')))))$

According to (178), the application of the MAX operator correctly gives that *Mario's sickness* is terminated in the past. On the one hand the application of the MAX operator gives the same quantizing effect as the application of *for* adverbials, but on the other hand, this latter is different from the former since it does not entail terminativity. In fact, nothing prevents *Mario's sickness* to hold up to the speech time given the LF associated with (173). At first glance, this would seem to be an unwelcome prediction since in Italian we usually understand Passato Remoto sentences to describe events which are no more going on at the present. However, if we have a brief look at data available in the net we do find sentences which requires the *for*-modified states not to be necessarily terminated before the speech time, like (179).

- (179) La cupola del Brunelleschi fu per lungo tempo, ed è ancora, il simbolo visivo dell'intera città
 Lit: The cupola from Brunelleschi was for long time, and it is still, the symbol visual of-the whole city

I explain the fact that we understand the eventuality as terminated in the past as an effect of pragmatic factors associated with *for*-adverbials: since *for*-adverbials are upward entailing (*John was sick for three days* entails *John was sick for two days*), in order to be maximally informative, the length indicated by the *for*-adverbial should be the length of the maximal interval for which the predicate is true. This explains why we intend that *Mario's sickness* is terminated in the past while processing the temporal meaning conveyed by (173).

2.3 Homogeneity and event predicates

Until now, I have discussed state predicates which I have assumed to denote properties of times. In chapter 1, I have argued for a basic distinction between state predicates and event predicates and I assumed that while a state predicate has an explicit argument for times, an event predicate has an explicit argument for events, as shown again in the examples below.

STATE PREDICATE:

(180) || to love || := $\lambda y \lambda x \lambda t (\text{love}(t)(x)(y))$

EVENT PREDICATE:

(181) || to sleep || := $\lambda x \lambda e (\text{sleep}(e)(x))$

Since a state predicate like the one in (180) denotes a property of times and belongs to the logical type $\langle i, t \rangle$, it can be modified by a durative temporal adverbial or saturated by tense; on the contrary, since an event predicate like the one in (181) denotes a property of events and belongs to the type $\langle e, t \rangle$, it needs to be type shifted to combine with a temporal adverbial or tense. As I argued in chapter 1, implicit aspectual operators are responsible for the type shifting of event predicates by localizing the described event with respect to a time. Following Kratzer's and von Stechow's definitions of aspect, we assumed that the common Romance aspectual operators are the inclusion operator, and its converse. Let us discuss them again in order to clearly understand how they are connected with the temporal homogeneity proposal I am making. The inclusion operator, which is called the *Perfective* operator since it is responsible for the perfective reading of an event sentence, localizes the described event within a time: it takes a property of events and it returns a property of times including the

temporal trace of the event. The *Imperfective* operator, on the contrary, is responsible for the imperfective reading of an event sentence, and it localizes the described event as surrounding a time: this operator takes a property of events and it returns a property of times properly included in the temporal trace of the event. The definitions we gave for the aspectual operators are reported below (where τ is a function taking an event and giving its temporal trace⁴²).

$$(182) \text{ Perfective} =: ||\text{PFV}|| = \lambda P \lambda t \exists e (t \supseteq \tau(e) \ \& \ P(e))$$

$$(183) \text{ Imperfective} =: ||\text{IPV}|| = \lambda P \lambda t \exists e (\tau(e) \supset t \ \& \ P(e))$$

According to (183), a temporal property formed via the IPV operator will always be homogeneous, as shown by figure 12 below.

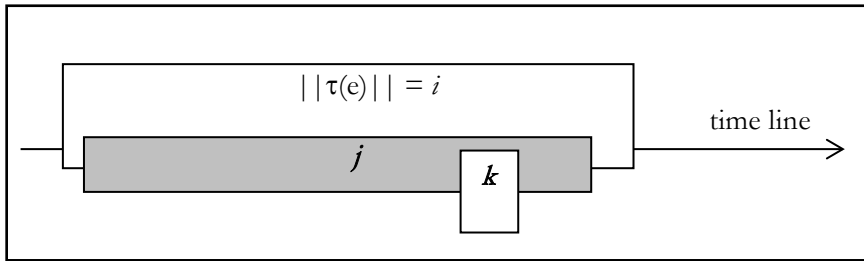


Figure 12: example of the *homogenizing* nature of the IPV operator

This is because, if j is included in the temporal trace of e , every subinterval k of j will be included in it; therefore, we expect a temporal property formed via the IPV operator to combine with a Tempus Infectum. On the other hand, according to (182), a temporal property formed via the PFV operator will always be non-homogeneous, as shown by figure 13 below.

⁴²In (184) we do not consider the modal aspect of the Imperfective aspect discussed in Bonomi (1999) since it clearly goes beyond the purpose of the present chapter. It will be discussed in chapter 3.

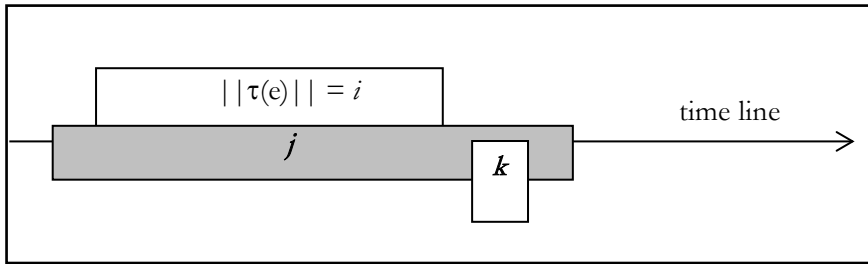
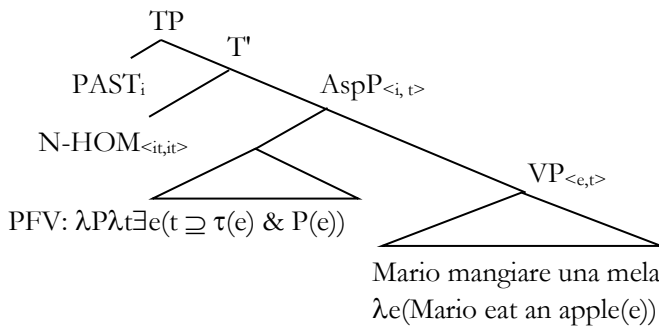


Figure 13: example of the *dis-homogenizing* nature of the PFV operator

As we can see, if j includes the temporal trace of e , it is not the case that every subinterval k of j will include the temporal trace of e ; therefore, we expect a temporal property derived via the PFV operator to combine with a Tempus Perfectum. Now, consider the following Passato Remoto event sentence and its associated LF.

- (184) Mario mangiò una mela [Passato Remoto]
 Lit: Mario eat-3sPASTperf an apple

LF:



The temporal predicate derived by the application of the PFV operator meets the non-homogeneity condition associated with the N-HOM head. This explains why event sentences have terminative interpretations under

the Passato Remoto, as shown by the bad continuation of the sentence below.

- (185) Mario mangiò una mela, ?? e la sta ancora mangiando
 Lit: Mario eat-3sPASTperf an apple, ?? and it he-is still eating

The Passato Prossimo (perfect) (and the Trapassato Prossimo (pluperfect)), which will be discussed in Section 2.4, behave analogously, as shown by the sentence below and its bad continuation.

- (186) Mario ha mangiato una mela, ?? e la sta ancora mangiando
 Lit: Mario has eaten an apple, ?? and it he-is still eating

Going back to state predicates, in section 2.2.4 I have mentioned that they are ambiguous between a terminative and an inchoative interpretation when they combine with a past perfective tense in Romance languages. Consider again the following Italian sentence where the state predicate *be dark* combines with a past perfective tense.

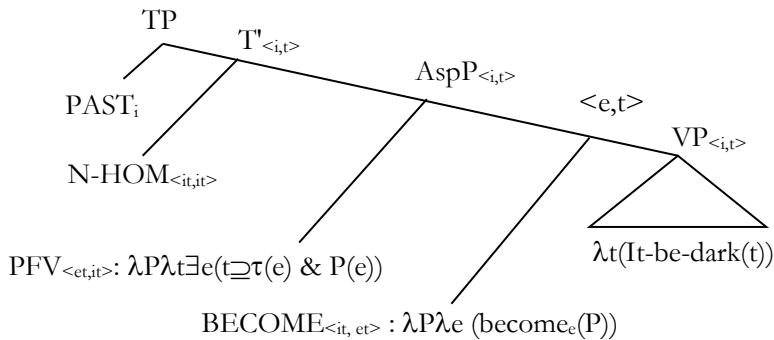
- (187) Fu buio [Passato Remoto]
 Lit: (It) be-3sPASTperf dark

Sentence (187) is ambiguous. It can be used to convey that there is some past terminated darkness state or that it became dark in the past. In section 2.2.4 we argued that the terminative reading is derived via a maximalization of the state predicate in order to meet the non-homogeneity condition associated with the past perfective tense. In order to account for the inchoative reading, I propose a similar explanation. In order to meet the non-homogeneity condition associated with the past perfective tense, I assume the inchoative reading to be derived by the application of the covert *achievementizing* operator defined in (188).

- (188) BECOME =: $\lambda P\lambda e$ (become_e(P))
 the event e is a becoming with result P, where P is a state⁴³

As shown by the LF of (187) represented in (189) below, the temporal predicate derived via the *become* operator is, in turn, perfectivized and selected by the past perfective tense.

- (189) PAST_i (N-HOM ($\lambda t\exists e(t \supseteq \tau(e) \ \& \ \text{become}(\text{It-be-dark}))$))



Under its inchoative reading, sentence (187) is true if and only if $g(i)$ is a past time including the time of a becoming dark event. Interestingly, the analysis predicts that the result state can hold up to speech time since the embedded state of result is not temporally constrained, as shown by the sentence below (Bertinetto, 2001).

- (190) La sua squadra preferita aveva perso. Gianni ne ebbe un forte mal di pancia che ancora non gli è passato

⁴³ A formal definition for "became" will be given in 2.4.

His preferred team had lost. Because of this, Gianni got a belly ache, which is still hurting him

2.3.1 Event predicates and *for*-adverbials

It is a known fact that *for*-adverbials combine with atelic predicates but not with telic ones. Given Dowty's definition of *for*-adverbials, the explanation of this fact runs as follow in the system I am proposing. Given that *for*-adverbials are temporal modifiers and they introduce universal quantification over subintervals, they combine with state predicates which denote homogeneous properties of times. As we have seen, the temporal property derived by the application of a *for*-adverbial is quantized and it meets the non-homogeneity presupposition associated with a Tempus Perfectum. Event predicates denote properties of events and they cannot combine directly with a temporal modifier such as a *for*-adverbial. They must be type shifted into a time predicate by the application of the aspectual operators before they can combine with a tense or with a temporal modifier. According to the definition given in (182), the PFV operator requires $t \supseteq \tau(e)$, namely, that the temporal trace of the event is either properly included or equal to the time t . According to these conditions, when the temporal property is derived via the proper-inclusion relation, it is non-homogeneous, and it does not meet the universal quantification associated with *for*-adverbials. Thus, it does not combine with a *for*-adverbial. When the relation associated with PFV is the identity relation, the homogeneity nature of the derived temporal property depends on the homogeneity nature of the event predicate that the PFV operator modifies; thus, a temporal property derived via the identity relation combines with a *for*-adverbial depending on the homogeneity nature of the modified event property. When the event predicate is telic, like *build a house* (see the discussion about telic predicates and interval semantics in chapter 1), it is non-divisible (i.e. non-homogeneous). In this case, a subinterval of the temporal trace of the event for which this predicate is true is not the

temporal trace of an event of the same type. In this case, the temporal property derived via the PFV operator under the identity relation will be non-homogeneous. For this reason, the temporal property derived via the identity relation from a telic event predicate does not combine with a *for*-adverbial; this is because the derived temporal property does not meet the universal quantification introduced by this adverbial.⁴⁴ When the event predicate is atelic like *to sleep* (and thus divisible, down to a certain point), the temporal property derived via the PFV operator under the identity relation will be homogeneous; therefore, a temporal property derived via the identity relation from an atelic event predicate combines with a *for*-adverbial; this because it meets the universal quantification introduced by the adverbial.⁴⁵ This explains why activity predicates such as *to sleep* combine with a *for*-adverbial but telic predicates such as *to build a house* do not under PFV. More generally, this explains the distribution of *for*-adverbials across the different Vendlerian verb classes under PFV.

Let us consider IPV modification now. According to the definition of IPV given in (183), every event predicate can combine with a *for*-adverbial under IPV. This happens because IPV requires that $t \subset \tau(e)$. According to this condition, the temporal property derived via IPV is the property of *being a time properly included in the temporal trace of an event*. This temporal property is homogeneous and it meets the universal quantification introduced by a *for*-adverbial. This shows that every event predicate can in principle combine with a *for*-adverbial via IPV under a Tempus Perfectum. This prediction is borne out by the following Italian facts.

⁴⁴Actually, in the case of achievement predicates the explanation runs differently. In fact, the temporal trace of an achievement predicate, which denotes a punctual event, is the property of a point of time. This property is vacuously homogeneous and it satisfy the conditional associated with the universal quantification introduced by *for*-adverbials. The reason why a temporal property derived via the identity relation from an achievement predicate does not combine with a *for*-adverbial is that the temporal trace of an achievement event does not have sensible length to be measured by *for*-adverbials.

⁴⁵This does not work anymore if we assume that PFV maximalizes the event properties it modifies as stipulated in the redefinition of the PFV operator we gave in chapter 1 while discussing the terminative interpretation of event sentences in the simple past.

(191) Tullio disegnò il suo ritratto per circa dieci minuti; poi dovette smettere

Lit: Tullio drew his portrait for circa ten minutes; then he had to stop (Bertinetto, 1991)

In this case, the *for*-adverbial modifies a subinterval of the temporal trace of *Tullio's drawing his portrait* event. "Tullio draw his portrait" is an accomplishment predicate and the event denoted by (191) is not completed, as shown by its continuation. Notice that in (191) the tense morphology is past perfective though the semantic aspect occurring in its LF is IPV; to make this point clear, we can consider its LF represented in (192).⁴⁶

(192) [PAST [N-HOM [for 10 minutes [IPV[Tullio draw his portrait]]]]]

This fact shows that the tense morphology is not depending on the aspectual operator. As we have seen in (192), a Tempus Perfectum can combine with a temporal property derived via the IPV aspectual operator, if this property is made non-homogeneous by *for*-adverbial modification. It is the presence of the adverbial, that quantizes the temporal predicate derived via IPV, that requires a Tempus Perfectum. One important question concerning these facts is why a sentence like (192) sounds unnatural when uttered without an appropriate context or without a relevant continuation like the one in (192). I will assume that this is explained by pragmatic factors associated with the meaning of *for*-adverbials. As we have seen before, since *for*-adverbials are upward entailing (*John ran in the park for five minutes* entails *John ran in the park for four minutes*), in order to be maximally informative, the length indicated by the *for*-adverbial should be the length of the maximal interval for which the predicate is true. Under IPV, this last

⁴⁶IPV is here required by the semantics of the temporal adverbial which introduces universal quantification over subintervals; The prediction is important here since the analogous English example is ungrammatical: *"*Tullio drew his portrait for ten minutes; then he had to stop"*.

condition is not met. For this reason, a sentence like (192) sounds unnatural when uttered without an appropriate context. However, pragmatic principles can be violated, and this can happen in appropriate contexts, like the one in (192).

2.4 The Perfect in some Romance languages

As we have seen in (140) and (141), the presence of the Perfect changes the distribution of the durative adverbials under the same tense morphology (borne by the auxiliary verb). In recent work, von Stechow (2002) argued that the Present Perfect morphology in the (d) sentence in (140) is a variant of the past perfective inflection in Romance languages and he suggested that the same temporal meaning can be spelled out by the past perfective or by the Present Perfect in languages such as Italian (see also Hornstein (1990)). While, on the one hand, this proposal correctly predicts the adverbial distribution in the (d) sentences in (140) and (141), on the other hand, it does not seem entirely appropriate if one considers the contrast below.

(193) *Maria sposerà un uomo che ha vissuto a NY*

Lit: Maria marry-3sFUT a man who have-3sPRES lived in NY

Maria will marry a man who has lived in NY

(194) *Maria sposerà un uomo che visse a NY*

Lit: Maria marry-3sFUT a man who live-3sPASTperf in NY

*Maria will marry a man who lived in NY*⁴⁷

Sentence (193) is temporally ambiguous. It can mean: (i) that Mary will marry a man in the future with respect to the speech time and that this man lives in NY in the past with respect to the speech time; or (ii) that Mary

⁴⁷Actually, this is not a good translation for the Italian (197) since the English sentence is ambiguous between the (198) and (199) readings (see Abusch (1996)).

will marry a man in the future with respect to the speech time and that this man lives in NY in the past with respect to the future *marrying* event (thus his living in NY may be in the future with respect to the speech time), as represented by in figure 14 and figure 15 below.

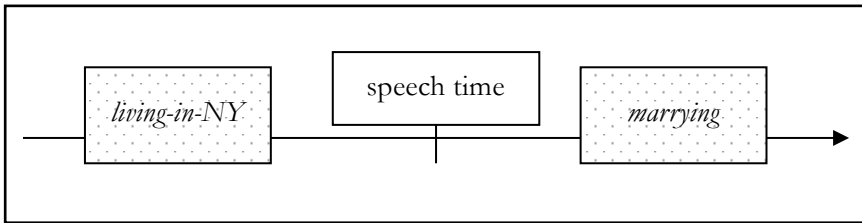


Figure 14: Representation of the temporal meaning (i) of sentence (193)

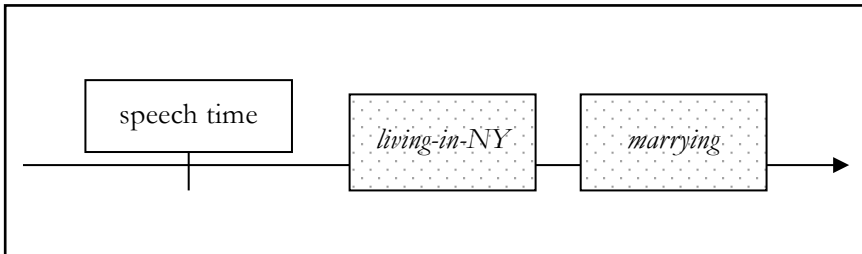


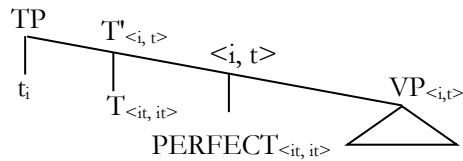
Figure 15: Representation of the temporal meaning (ii) of sentence (193)

On the contrary, sentence (194) is not temporally ambiguous. According to what (194) says, the *living-in-NY* can only be in the past with respect to the speech time, i.e., (194) can only have the temporal interpretation (i). If we consider the Past Perfective and the Present Perfect morphology to be free spell-out variants of one and the same tense while conveying this meaning, we have to stipulate that the Present Perfect is semantically ambiguous in order to account for the ambiguity of (193). In other words, we have to assume that, under the reading (i), the Present Perfect is the spell-out of something different. One way of address this problem and to avoid the ambiguity is to assume that the perfect morphology in (193) is the spell-

out of a Priorian (Prior, 1957) *temporal operator* in the scope of the present tense as represented in (195) and (196).

(195) PERFECT:= $\lambda P\lambda t\exists t'[t' < t \ \& \ P(t')]$: P is temporally non-homogeneous

(196)



The definition in (195) says that the perfect takes a time predicate as its argument and returns a predicate of the times which are after a time at which the original temporal predicate holds, and it presupposes this latter to be temporally non-homogeneous. As observed by von Stechow (2002), the Perfect as defined in (195) can be seen as an object language representation of the truth conditions of the Priorian past operator, since it introduces an existential quantification over times preceding the time denoted by tense. By introducing existential quantification, the Perfect turns all the predicates it modifies into temporally homogeneous predicates. In fact, consider the temporal property reported in (197) that has been derived by Perfect modification from the temporally quantized predicate “Mario essere malato da tre giorni” (*Mario be sick for two days*).

(197) $\lambda t\exists t' [t' < t \ \& \ \text{Mario be sick for two days } (t')]$

As shown by figure 16 below, if (197) is true of an interval i , it is true of every subinterval j of i , trivially because an interval which is before another interval is before every subinterval of that interval.

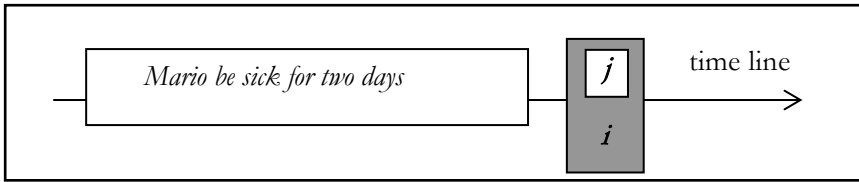
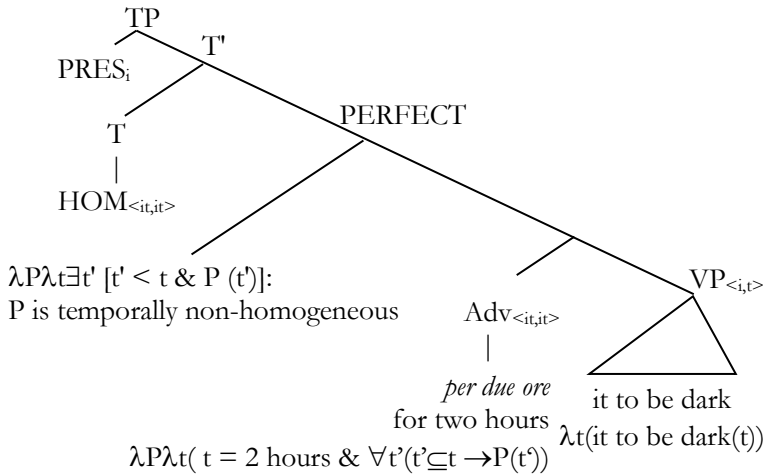


Figure 16: example of the *homogenizing* nature of the Perfect

According to this proposal, the LF associated with the (d) sentence in (141) is represented in (198).

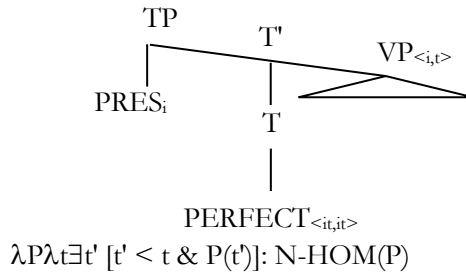
(198)



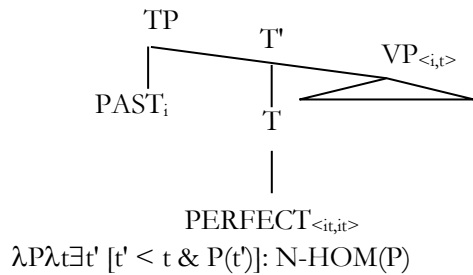
In this analysis, the difference between the Present Perfect and the Pluperfect will depend on whether we find a past or a present temporal pronoun in the Spec-TP position. The ungrammaticality of the Italian sentences (d) and (e) in (141) and the French sentences (d) and (e) in (143) follows from the non-homogeneity presupposition we associated with the Perfect in (195). Since the Perfect presupposes its complement to be non-homogeneous, it cannot combine with a temporal predicate derived via a

since-adverbial; this non-homogeneity presupposition is moreover responsible for the fact that eventualities described under the Perfect have a terminative interpretation in Italian.

Italian/French Present Perfect



Italian/French Pluperfect



One problem for this proposal is that a durative temporal adverbial should always occur in the scope of the perfect. This is an unnatural stipulation and I think it is a sign that our description of the perfect is not yet entirely correct. In our analysis, we have described the perfect as a temporal operator in the scope of the tense (this is the standard analysis for perfect constructions in English). I think that the scope stipulation is an indication

that this analysis cannot be correct. A way of avoiding this problem is to assume that the perfect is a special predicate restriction as defined in (156), namely a special tense head selecting for temporally non-homogeneous predicates, whose specifier position is filled by a past or a present time variable as represented in the logical forms below.

Given that in section 2.2.4 we assumed that tenses cannot be decomposed in the logical syntax, we will derive the correct scope order in which temporal adverbials are always in the scope of the perfect.

This analysis accounts for what has been called the *inclusive meaning* (Bertinetto, 1986) of the Italian present perfect illustrated by the sentence below.⁴⁸

- (199) Finora ho abitato a Torino (Bertinetto, 1986)
Lit: Until-now have-1sPRES lived in Torino

According to what (199) says, there is a past interval, which ends now, at which the speaker lives in Torino. I will assume this temporal meaning to be derived as a result of the interaction of the temporal information conveyed by the use of the *finora* (until now) adverbial occurring in the scope of the perfect and of a pragmatic inference concerning state predicates such as *to live*. Given the definition of Romance *untilNOW*-adverbials represented in (200), the correct LF for (199) is represented in (201).

- (200) $\text{untilNOW}(\text{finora}) := \lambda P \lambda t (P(t) \ \& \ t \text{ abuts NOW})$

- (201) $\exists t' [t' < \text{PRES}; \ \& \ (\text{I-live-in-Torino}(t') \ \& \ t' \text{ abuts NOW})]$

Notice that *untilNOW*-adverbials, as defined in (200) makes the temporal predicate it modifies non-homogeneous: this is because, if the temporal

⁴⁸And given the analogies between French and Italian, of the French *inclusive meaning* too.

property derived via the untilNOW modification is true of an interval, this interval should abut the speech time; clearly, it is not true that every sub-interval of this interval abuts the speech time. The temporal predicate *Io abitare finora a Torino* (I to live until-now in Torino) is therefore non-homogeneous and meets the non-homogeneity presuppositions associated with the perfect. Because of its *dis-homogeneizing* nature, these adverbs do not combine with a Tempus Infectum, as shown by the ungrammaticality of the sentences (202) and (203).

(202) ?? Finora abito a Torino

Lit: Until-now live-1sPRES in Torino

(203) ?? Fino ad allora abitavo a Torino

Lit: Until to then live-1sPASTimperf in Torino

As in the case of *for*-adverbials, these adverbs do not maximalize the temporal predicate they modify. The embedded temporal predicate, in our case *Io abitare a Torino* (I to live in Torino), is therefore free to hold of an interval that is bigger than the one introduced by the perfect; this means that the embedded temporal predicate can extend up to the speech time. In fact, (199) can be truly uttered in a situation in which the speaker is living in Torino at the speech time. The LF (201) is therefore compatible with both a situation in which the speaker does live in Torino at the speech time and with one in which it is not true that he lives in Torino at the speech time. This second reading associated with (199) is more marginal. The explanation for this fact is a pragmatic one. *To live in Torino* is not a situation that you can change with a punctual event. So, if you have been living in Torino just before now, I will infer that you still live in Torino right now and that you will still live in Torino just after now. This is what makes the second reading of (199) pragmatically less accessible. That the *including now* effect is a pragmatic effect depending on the verb meaning is additionally suggested by the sentence (204), uttered in the following situation: I went

out for a beer with my friends and I left my children at home with the babysitter. I came back, and when I entered the room, the children started crying. The babysitter utters (204).

(204) Finora sono stati bravissimi

Lit: Until-now they have been very quiet

Be quiet is a state that one can change in a snapshot; according to my experience, a child can suddenly start crying or doing funny things. The reading in which the described event is not holding at the speech time is pragmatically more accessible in this case. The sentence means that there is a past interval which abuts now, at which the children were quiet. Notice that it is the presence of the adverbial that is responsible for the *including now* interpretation of sentence (204). Consider sentence (205).

(205) Ho abitato a Torino

I have lived in Torino

As Bertinetto (1986) observes, when the adverb is not occurring, as in (205), the sentence means that there is a past time at which the speaker lived in Torino. This is the case because in order to meet the non-homogeneity presuppositions associated with the perfect, the temporal predicate is maximalized. If the predicate is maximalized, it cannot hold of an interval which is bigger than the interval introduced by the perfect. Since we find a non-homogeneity presupposition associated with the Italian Passato Remoto (and French passé simple) we expect temporal property derived via the *untilNOW*-adverbial modification to combine with this tense as well. This is borne out by facts.

(206) Giuro, fino ad allora fui una madre esemplare.

Lit: I swear, until to then be-1sPAST^{perf} a mother ideal.

Summing up, the adverb in (199) requires the interval introduced by the perfect to abut the speech time, and the including now interpretation is dependent on pragmatic factors concerning the verb meaning. Given that an *abutting* relation is a limit case of a *preceding* relation (preceding is entailed by abutting and it is therefore less informative), (199) is more informative than (205), due to the presence of the adverbial, and the described abutting relation is a special case of preceding. This suggests that there is no *extended-now* meaning of the perfect in Italian (and French) (see McCoard (1978)). Namely, the perfect does not introduce an interval whose right boundary is the speech time (or a generic referent time). In fact, in some Romance languages, the extended now meaning is conveyed by the use of the Tempora Infecta combined with a *sinceD*-adverbial, and not by the perfect as in English, as shown by the English sentence (207).

(207) I have lived in Torino for two years

The extended-now reading of (207), i.e. the reading for which there is a two-year-long interval abutting now at which the speaker lives in Torino, is conveyed by the use of the present tense plus the durative *da due anni* (since two years) adverbial in Italian, as shown in (208).

(208) Vivo a Torino da due anni

Lit: (I) live-1sPRES in Torino since two years

I have lived in Torino for two years

However, durative *sinceD*-adverbials combine with the Perfect. Actually, they do when the predicate is a change of state predicate, as shown in the Italian (209) and French (210).

(209) Il Parco Disney Studios ha aperto i cancelli da sei ore

Lit: The Park Disney Studios has opened the gates since six hours

(210) Le Disney parc a ouvert le portail depuis 6 heures

Lit: The Park Disney has opened the gate since six hours

Sentences (209) and (210) says that the Disney Park opened its gates, and that the gates have been open for six hours (up to the speech time); in these sentences, the adverbial modifies the state brought about by the completion of the opening event and it says that this state holds for a six-hour-long interval abutting the speech time. In order to represent the correct truth conditions of these sentences, I argue that in Italian (and in French) the perfect morphology is ambiguous between the spell-out of a special Tempus Perfectum, as defined above, and the spell-out of a state of result construction. The perfect morphology in (209) and (210) is the spell-out of a state of result construction: it introduces a state of result brought about by the completion of a telic event which can be modified by temporal adverbials or saturated by tense. That the Italian perfect constructions are ambiguous between these two meanings is clear if we consider the contrast between sentence (211) and sentence (212).

(211) Alle tre, il Parco Disney Studios ha aperto i cancelli da 6 ore

Lit: At three o'clock, the Park Disney Studios has opened the gates since six hours

(212) Alle tre, il Parco Disney Studios ha aperto i cancelli per sei ore

Lit: At three o'clock, the Park Disney Studios has opened the gates for six hours

In (211) and (212), *since*- and *for*-adverbials⁴⁹ modify the result state brought about by the completion of the opening event but, interestingly, in (212) the adverb *alle tre* (at three o'clock) localizes the opening event, while in (211) it localizes the right bound of the result state (the being open

⁴⁹See Piñón (1999) and von Stechow (2000) for a discussion about result state modification and *for*-adverbials.

of the gates). This is an indication of the fact that the perfect conveys two different meanings in the two sentences: in (212) it localizes the *at-three-o'clock opening* event in the past with respect to speech time, in (211) it introduces the state of *being open of the gates*.

We might argue that these facts could be explained by assuming that the perfect morphology in (211) and (212) is the spell-out of a temporal operator introducing a post state, in our example the post state of the opening event. Notice that a post state of an event is a forever holding state, in our example, the forever holding state of the opening event having culminated (the post state is called *resultant state* by Parsons (1990)). According to this alternative analysis, a post state is what is modified by the *sinceD*-adverbial. Interestingly, if we consider the unavailability of the continuation of (209) represented in (213) we realize that this alternative explanation cannot be correct.

(213) ?? Il Parco Disney Studios ha aperto i cancelli da sei ore ma la
polizia li ha chiusi un'ora fa

Lit: The Park Disney Studios has opened the gates since six hours,
but the police has closed them one hour ago

Sentence (213) shows that a *sinceD*-adverbial in (209), (211) and (213) does not modify the post state of the opening event but rather its result state, since the gates should be open at speech time according to what the sentence says.

In order to account for these facts, it has been recently argued that there are two classes of telic predicates, those that have an accessible result state, for instance “to open the gates”, and those that do not, for instance “to send a letter” (Kratzer, 2000; von Stechow, 2002). According to these proposals, only the former should occur in perfect of result constructions. This analysis seems correct for the Italian result construction. Consider in fact the Italian sentence (214).

(214) Mario ha spedito il suo articolo da una settimana

Lit: Mario has sent his paper since one week

According to von Stechow and Kratzer sentence (214) does not convey a result state meaning. However, we have seen that *sinceD*-adverbials modify result states in Italian; therefore the predicate “spedire un articolo” (*to send a paper*) should give us an accessible result state when appearing under the perfect. On the other hand, it is clear that if we say that both “spedire un articolo” (*to send a paper*) and “aprire i cancelli” (*to open the gates*) have an accessible result state, we have to say why *for*-adverbials can modify the former but not the latter, as shown by the contrast between sentences (215) and (216).

(215) ?? Mario ha spedito il suo articolo per una settimana

Lit: Mario has sent his paper for one week

(216) Il Parco Disney Studios ha aperto i cancelli per sei ore

Lit: The Park Disney Studios has opened the gates for six hours

In order to explain this fact, I will assume that *for*-adverbials presuppose the result state they modify to be reversible. In order to formulate the correct meaning and account for the contrast between (215) and (216), we need to introduce a *modal* dimension of the temporal interpretation of a predicate. We will only sketch the definition without entering in a theoretical discussion about modality and possible world semantics (see Heim and Kratzer (1998)). According to this proposal, we can sketch the following intuitive definition of state reversibility: for every contingent property denoted by a state predicate and actual time t for which the property is true, there is a time after t for which the property is possibly not true. In order to make clear what the definition says we have to define what “contingent” and “possibly not true” mean. Since these are modal predicates we need to relativize the definition of state reversibility to a set

of possible worlds and we have to give an accessibility relation among them. We can assume that possible worlds have a common past and we can assume a circumstantial accessibility relation for the future as represented in (217) and formulate a state reversibility condition as represented in (218).

(217) $w \text{ Ri } w'$ iff w and w' are identical until time i and w' is accessible in w at i given the relevant facts

(218) S is a reversible state iff $\forall t(S(t) \rightarrow \exists t'(t < t' \ \& \ \Diamond \neg S(t'))$

Definition (218). says that a state S is reversible iff for every time t for which the state is true there is a time t' after t such that it is possible that S is false at t' .⁵⁰ The reversibility presupposition associated with *for*-adverbials prevents these adverbials from combining with non-reversible result states like *being dead*, or *being sent*.

However, in order to give an analysis of (209) and (210), we have to formulate a definition of *change of state predicates* which offers the correct result when occurring in result state constructions. In more recent work, Kratzer (2000) and von Stechow (2002) have proposed two alternative but similar definitions of accomplishment predicates sensitive to result state modification. While in Kratzer's analysis, transformative predicates denote relations between *events* and *individual states* having a certain property, in von Stechow's, they denote relations between *events* and *properties of states* (in order to account for the different meanings of adverbs modifying causative verbs (see also von Stechow (2000)). Both Kratzer and von Stechow assume then that special operators called *aktionsart choosers* convert a relation into an event predicate or into a state of result predicate. Given that in my system I have assumed that states are not primitive entities and I argued that state predicates denote property of times, if we follow Kratzer's proposal we have a logical inconsistency because in this approach

⁵⁰This is a first approximation.

transformative predicates denote a causative relation between events and times having a certain property, as represented in (219) which represents the transformative predicate “to open”.

(219) to open := $\lambda x \lambda e \lambda t \lambda t' (\text{CAUSE}(e, t) \ \& \ \text{open}(x)(t'))$

Since the only way of integrating this approach in the system I am proposing is to assume Lewis's idea that times are event slices of a world, I will not follow Kratzer's proposal which will require further discussions and assumptions. If we follow von Stechow's proposal and we reformulate his definition of transformative verbs in temporal terms, we obtain the following definition of “to open” which fits more easily into the proposal I am making, without addressing any ontological question about the nature of time.

(220) to open := $\lambda x \lambda y \lambda e \lambda P (\text{CAUSE}(e, P) \ \& \ \text{Become}(e, P) \ \& \ \text{Agent}(e, y) \ \& \ P = \text{open } x)$, where P is a state

However, (220) does not give us the desired results when we apply to it the *aktionsart choosers* described in (222) and (223) below and we derive the truth condition of the “CAUSE” proposition. This is because, according to (220), transformative verbs denote causal relations between events and sets of times. An alternative possible way of representing transformative predicates in the system I am proposing, is to assume them to denote complex relations between an event and a time, which abuts the temporal trace of the event, whose result state holds at that time; this is represented in (221).⁵¹

⁵¹The definition does not follow von Stechow's idea that transformative verbs denote a relation between an event and a property of a state, i.e. something propositional, but it is more Kratzer's, since it assumes these verbs to denote relations between events and individual times. Von Stechow argues correctly that we need the property and not the individual state in order to account for the restitutive readings of result state sentences modified by expressions like *again/wieder/di nuovo*. In order to account for these facts we have to assume von Stechow's original formulation of transformative verbs where

(221) to open:= $\lambda x \lambda y \lambda e \lambda t (t > \tau(e) \ \& \ \text{CAUSE}(e, \text{open}(x)(t)) \ \& \ \text{Agent}(e,y))$

Extending Kratzer's and von Stechow's proposals to the our analysis, the relation in (221) is converted into an event predicate or into a result state predicate by the application of the following *aktionsart choosers*, which I defined in according to the temporal framework of my proposal.

AKTIONSPORT CHOOSERS:

(222) RESULT:= $\lambda R \lambda t \exists e (R(e,t))$ FIRST TRY

(223) EVENT := $\lambda R \lambda e \exists t (R(e,t))$

According to (223), the eventive aktionsart chooser closes the temporal variable t and gives us a property of events, which can, in turn, enter the derivation of the LF of an eventive sentence. On the other hand, according to (222), the RESULT aktionsart chooser closes the event variable e and gives us a property of times which are in a complex relation with e . The result state predicate derived by applying (222) to (221) is represented in (224).

(224) $\lambda t \exists e (t > \tau(e) \ \& \ \text{CAUSE}(e, \text{the-gates-be-open}(t)) \ \& \ \text{Agent}(e, \text{The-P-D-Studios}))$

Unfortunately, (224) does not represent the desired result since it does not meet the homogeneity restriction associated with the Tempora Infecta. (224) is non-homogenous. In this case, the non-homogeneity depends on the " $t > \tau(e)$ " condition. In fact, as we can see from figure 17, it is not true

the first argument of CAUSE is an event and the second a temporally specified proposition, namely a set of possible worlds.

that every subinterval k of an interval j abutting the temporal trace of e abuts the temporal trace of e .

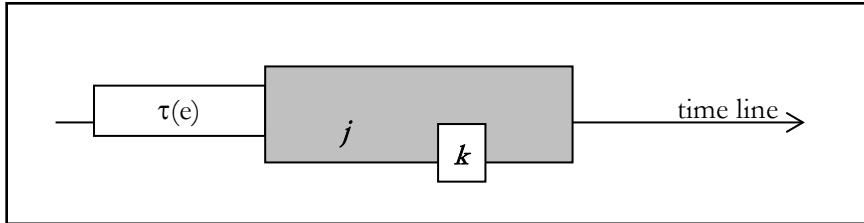


Figure 17: non-homogeneity associated to the “ $t > \tau(e)$ ” condition

The presence of this condition would prevent a result state predicate from combining with a Tempus Infectum. In order to cope with this problem, I assume that the correct definition of the result operator is the one represented in (225).

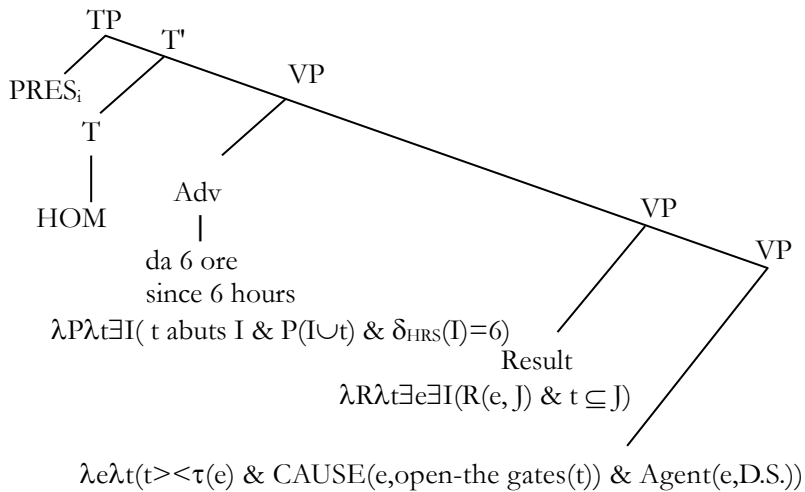
$$(225) \text{ RESULT} := \lambda R \lambda t \exists e \exists I (R(e, I) \ \& \ t \subseteq I) \quad \text{REVISED}$$

According to (225), the result operator is a stativizer and its application to (221) gives the correct definition of the result state predicate in (226).

$$(226) \lambda t \exists e \exists I (I > \tau(e) \ \& \ \text{CAUSE}(e, \text{the-gates-be-open}(I)) \ \& \ \text{Agent}(e, \text{The-P-D-Studios}) \ \& \ t \subseteq I)$$

The temporal property in (226) is homogeneous and meets the homogeneity condition associated by a *da*-adverbial and the presuppositions introduced by the predicate restrictions associated with the Tempora Infecta. The correct LF for (209) is represented in (227).

(227) $\exists I(\text{PRES}_i \text{ abuts } I \ \& \ \exists e \exists J (J > \tau(e) \ \& \ \text{CAUSE}(e, \text{the-gates-be-open}(J)) \ \& \ \text{Agent}(e, \text{The-P-D-Studios}) \ \& \ (I \cup \text{PRES}_i) \subseteq J \ \& \ \delta_{\text{HRS}}(I)=6)$



Given the LF in (227), there is one more thing to be explained. According to what (209) says, the 6-hours long interval introduced by the *sinceD*-adverbial is understood as left abutting the temporal trace of the opening event and right abutting the speech time. This does not follow from the application of the *sinceD*-adverbial. I argue that the left abutting effect is a pragmatic inference. Since *sinceD*-adverbials sentences are upward entailing (“Mario e` malato da due ore” (*Mario has been sick for two hours*) entails “Mario e` malato da un'ora” (*Mario has been sick for one hour*)), in order to be maximally informative, the length indicated by the *sinceD*-adverbial should be the length of the maximal interval for which we have evidence that the predicate is true. This explains the left abutting effect of *sinceD*-adverbial modification of result state predicates. Under such an analysis the Romance Perfect morphology is ambiguous between the spell-out of a

special tense selecting for temporally homogeneous predicates and the spell-out and of the result state construction.

2.5 Tense selection and habitual meanings

In section 2.1 we discussed some facts concerning habitual meanings and tense selection. In this section I will discuss an account for these facts in the system I am proposing.⁵² Let me summarize these facts. In Romance languages, ongoing-eventive meanings and habitual meanings are generally conveyed by the use of the same tense morphology, as shown by the Italian sentences below.

- (228) Gianni lavora in giardino
 Lit: Gianni work-3sPRES in the garden
 (i) *John is working in the garden* [ongoing reading]
 (ii) *John works in the garden* [habitual reading]
- (229) Gianni lavorava in giardino
 Lit: Gianni work-3sPASTimperf in the garden
 (i) *John was working in the garden* [ongoing reading]
 (ii) *John used to work in the garden* [habitual reading]

As we observed in section 2.1, while a sentence with past imperfective verb morphology is ambiguous between an ongoing and a habitual interpretation, a sentence with past perfective verb morphology is generally not, as shown by sentence (230).

⁵²The habitual interpretation is often seen as a subtype of the imperfective interpretation (Comrie, 1976; Bertinetto, 1986).

(230) Gianni lavorò in giardino

Lit: Gianni work-3sPASTperf in the garden

John worked in the garden

[terminative reading]

In order to account for these facts, Bonomi (1997)⁵³ proposed that different aspectual verb forms are associated with different structures of quantification in Italian and that these differences are responsible for the aspectual contrasts we among (228), (229) and (230). According to Bonomi, while the imperfective morphology is the spell-out of an imperfective operator introducing universal quantification over times, which is responsible for both a progressive and a habitual reading of an event sentence, the perfective morphology is the spell-out of a perfective operator introducing existential quantification over times, which is responsible for the terminative reading of an event sentence. In order to understand the main idea of Bonomi's proposal, we will discuss some of its features in the following section.

Bonomi's work is mainly concerned with *when*-constructions like the ones represented in (231) and (232).

(231) Quando aveva mal di testa Gianni lavorava in giardino

Lit: When he have-3sPASTimperf headache Gianni work-3sPASTimperf in garden

(i) *Whenever he had a headache, Gianni used to work in the garden*

(ii) *When he had a headache, Gianni was working in the garden*

(232) Quando ebbe mal di testa Gianni lavorò in giardino

Lit: When he have-3sPASTperf headache Gianni work-3sPASTperf in garden

When he had a headache, Gianni worked in the garden

⁵³See also Bonomi (1995) and Bonomi's (in progress).

Sentence (231) is ambiguous between a progressive and a habitual reading, as we can see from the possible translations reported in (i) and (ii). Sentence (232) is not ambiguous; it only has an eventive perfective reading. In order to explain these facts, Bonomi proposes that sentence (231) and (232) are to be analyzed as structures of quantification in which the material of the temporal adjunct clause fills the quantifier restriction and the material of the main clause fills its nuclear scope. In order to formally develop this intuition, Bonomi assumes⁵⁴ that, in Italian *when*-sentences, the temporal subordinating conjunction *quando* (*when*) denotes a function taking two properties of eventualities, for instance A and B, and giving a relation between a property of eventualities e satisfying A and a set of properties of eventualities C, such that every eventuality e' satisfying C satisfies also B and temporally coincides with e . The formal definition for *quando* is represented in (233).

$$(233) \text{ quando}[A,B] = \lambda e \lambda C [A(e) \ \& \ \forall e'[C(e') \leftrightarrow B(e') \ \& \ e' \text{ temp. Coincides with } e]]$$

In order to derive the desired LFs for (231) and (232), Bonomi argues that we first apply the *quando*-operator to the eventualities properties denoted by the matrix VP and embedded VP, represented in (234) and (235).

$$(234) \lambda e(\text{He-have-headache}(e))$$

$$(235) \lambda e(\text{Mario-work-in-the-garden}(e))$$

The application of this operation produces a relation between a property of eventualities satisfying (234) and a set of properties of eventualities satisfying (235), as represented in (236).

⁵⁴I give a slightly different formalization of Bonomi's proposal than he does.

(236) $\lambda e \lambda C$ [He_i-have-headache (e) & $\forall e'$ [C(e') \leftrightarrow Mario_i-work-in-the-garden (e') & e' temp. coincides with e]]

Successively, the relation in (236) is saturated by the application of *aspectual* operators that are responsible for the different structure of quantification associated with (231) and (232). The definitions of the aspectual operators are represented in (237) and (238), where *Cont* is the phonetically empty predicate of *being contextually relevant*.

(237) IPF = $\lambda R \lambda i \forall e[e \subseteq i \& \text{Cont}(e) \& \exists C[R(e, C)]] \rightarrow \exists C[R(e, C) \& \exists e' C(e')]$

(238) PF = $\lambda R \lambda i \exists e[e \subseteq i \& \exists C[R(e, C) \& \exists e' C(e')]]$

The application of (237) and (238) to (236) will produce the temporal predicates reported in (239) and (240).

(239) IPF(236) = $\lambda i \forall e[e \subseteq i \& \text{Cont}(e) \& \exists C[\text{He}_i\text{-have-headache}(e) \& \forall e'[C(e') \leftrightarrow \text{Mario}_i\text{-work-in-the-garden}(e') \& e' \text{ temp. coincides with } e]] \rightarrow \exists C[\text{He}_i\text{-have-headache}(e) \& \forall e'[C(e') \leftrightarrow \text{Mario}_i\text{-work-in-the-garden}(e') \& e' \text{ temp. coincides with } e \& \exists e' C(e')]]]$

(240) PF(236) = $\lambda i \exists e[e \subseteq i \& \exists C[\text{He}_i\text{-have-headache}(e) \& \forall e'[C(e') \leftrightarrow \text{Mario}_i\text{-work-in-the-garden}(e') \& e' \text{ temp. coincides with } e] \& \exists e' C(e')]]]$

These predicates are respectively logically equivalent to the predicates reported in (241) and (242).

(241) IPF(236) = $\lambda i \forall e[e \subseteq i \& \text{Cont}(e) \& \text{He}_i\text{-have-headache}(e) \rightarrow \exists e'[\text{Mario}_i\text{-work-in-the-garden}(e') \& e' \text{ temp. coincides with } e]]]$

- (242) $PF(236) = \lambda i \exists e [e \subseteq i \ \& \ [He_i\text{-have-headache}(e) \ \& \ \exists e' [Mario_i\text{-work-in-the-garden}(e') \ \& \ e' \text{ temp. coincides with } e]]]$

These predicated are in turn selected by the tense in order to derive the following LFs for (231) and (232), where t^* is the distinguished temporal variable denoting the speech time.

- (243) $PAST(IPF(236)) = \exists i \forall e [i < t^* \ \& \ e \subseteq i \ \& \ Cont(e) \ \& \ He_i\text{-have-headache}(e) \ \rightarrow \ \exists e' [Mario_i\text{-work-in-the-garden}(e') \ \& \ e' \text{ temp. coincides with } e]]]$

- (244) $PAST(PF(236)) = \exists i \exists e [i < t^* \ \& \ e \subseteq i \ \& \ [He_i\text{-have-headache}(e) \ \& \ \exists e' [Mario_i\text{-work-in-the-garden}(e') \ \& \ e' \text{ temp. coincides with } e]]]$

According to what (243) says, there is a past interval i such that for every relevant event e included in i of *Mario having a headache*, there is an event e' of *Mario working in the garden* which temporally coincides with e . On the other hand, according to what (244) says, there is a past interval i such that there is an event e included in i of *Mario having a headache* and there is an event e' of *Mario working in the garden* which temporally coincides with e . Bonomi argues that the imperfective morphology in (231) and the perfective morphology in (232) are the spell out of the two phonetically silent different operators selected through an unspecified agreement mechanism. However, if the past imperfective morphology in (231) is the spell out of the presence of the IPF operator, it is not clear what is spelled out in simple sentences like (229), where the same morphology does not occur in a temporal adjunct clause (thus no complex relation to be selected by the IPF operator). One way to account for this fact is to assume that in simple matrix clauses we find silent restrictions and covert *when* operators and that in simple matrix clauses the aspectual morphology is the spell out of the aspectual IPV operator defined in (237). Clearly, an analogous assumption should be made for perfective sentences in which the

perfective morphology is the spell out of the PF operator. defined in (238). One problem for this analysis is the complexity of the LF of simple sentences and the stipulation of silent operators and logical structures. However, while discussing the ambiguity of sentences like (245), Bonomi's proposes an alternative analysis in order to cope with this problem.

- (245) Quando giocava a golf, Leo guadagnava molto
 Lit: When he play-3sPASTimperf at golf, Leo earn-3sPASTimperf
 much

As Bonomi observes, sentence (245) is ambiguous between two readings. According to one reading, sentence (245) means that:

- in the past, every relevant event of *Leo's playing golf* temporally coincides with an event of *Leo's making money*.

According to a second reading, sentence (245) means that:

- in the past Leo used to make a lot of money (as a lawyer for instance) and used to play golf.

As Bonomi notices, while the principles represented in (233) and (237) account for the first reading, they cannot account for the second one. According to the second reading, the two habits of *Leo's playing golf* events and *Leo's making money* overlap in the past. In order to account for these facts, Bonomi modifies his proposal in the following way. He assumes that a covert operator shifts an event predicate and its logical type into an expression which has the correct type for being modified by the IPF operator and that the *when* operator applies to the temporal properties derived via aspectual operator after type shifting. The definition of the covert shifting operator “ \uparrow ” is represented in (246).

$$(246) \quad || \uparrow || = \lambda P \lambda i \lambda C \forall e' [C(e') \leftrightarrow P(e') \ \& \ i \text{ temp. coincides with } e']$$

The application of the shifting operator to the event predicates $\lambda e(\text{Leo-make-money}(e))$ and $\lambda e(\text{Leo-play-golf}(e))$ will produce the following two predicates.

$$(247) \quad \lambda i \lambda C \forall e [C(e) \leftrightarrow \text{Leo-make-money}(e) \ \& \ i \text{ temp. coincides with } e]$$

$$(248) \quad \lambda i \lambda C \forall e [C(e) \leftrightarrow \text{Leo-play-golf}(e) \ \& \ i \text{ temp. coincides with } e]$$

In order to derive the correct LF for (245), the IPF is applied to the properties represented in (247) and (248). The results of the IPF application is represented in (249) and (250).

$$(249) \quad \lambda i \forall i' [i' \subseteq i \ \& \ \text{Cont}(i') \rightarrow \exists e' (\text{Leo-make-money}(e') \ \& \ i \text{ temp. coincides with } e')]$$

$$(250) \quad \lambda i \forall i' [i' \subseteq i \ \& \ \text{Cont}(i') \rightarrow \exists e' (\text{Leo-play-golf}(e') \ \& \ i \text{ temp. coincides with } e')]$$

The temporal properties in (249) and (250) will be selected by the *when* operator as in (251) in order to derive the relation between a time property and a set of time properties represented in (252).

$$(251) \quad \text{when} [(249), (250)]$$

$$(252) \quad \lambda i \lambda C [\forall i' [i' \subseteq i \ \& \ \text{Cont}(i') \rightarrow \exists e (\text{Leo-play-golf}(e) \ \& \ i' \text{ temp. coincides with } e)] \ \& \ \forall i' [C(i') \leftrightarrow \forall i'' [i'' \subseteq i' \ \& \ \text{Cont}(i'') \rightarrow \exists e (\text{Leo-make-money}(e) \ \& \ i'' \text{ temp. coincides with } e)]] \ \& \ i \text{ temp. coincides with } i']]$$

According to (252), we the two habits overlap in the interval i . At this point, Bonomi applies the tense rule (assuming that the logical type mismatch between (252) and the tense operator can be accommodated).

The type shifting solution proposed by Bonomi account for (228), (229) and (230) without assuming silent *when*-clause operators. For instance, in order to derive the LF for (229), the application of the shifting operator to the event predicate $\lambda e(\text{Mario-work-in-the-garden}(e))$ will give us the predicate represented in (253).

(253) $\lambda i \lambda C \forall e [C(e) \leftrightarrow \text{Mario-work-in-the-garden}(e) \ \& \ i \text{ temp. coincides with } e]$

The predicate can in turn, be modified by the IPF operator to derive the predicate reported in (254) (assuming that i , e and t type variables belong to the same logical type).

(254) $\lambda i \forall i' [\dot{i} \sqsubseteq i \ \& \text{Cont}(i') \rightarrow \exists e' (\text{M.-work-in-the-g.}(e') \ \& \ i \text{ temp. coincides with } e']$

The application of tense to (254) will gives the truth conditions for the habitual sentence (236).

The original and interesting point of Bonomi's proposal is a unified account for both the progressive and the habitual reading of sentences like (229) and (231). According to Bonomi, these readings are derived from the same LF as formulated by the *IPF Unifying Principle* reported below.

IPF UNIFYING PRINCIPLE:

The progressive reading of the imperfective and the habitual reading originate from the *same* logical form, based on universal quantification over eventualities.

Consider again (229) and its LF, as repeated here, to see how the IPF Unifying Principle is to be understood.

(255) Gianni lavorava in giardino

Lit: Gianni work-3sPASTimperf in the garden

(i) *Gianni was working in the garden*

(ii) *Gianni used to work in the garden*

LF: $\exists i \forall j [i < t^* \ \& \ j \subseteq i \ \& \ \text{Cont}(j) \rightarrow \exists e' (\text{G.-work-in-g}(e') \ \& \ i \text{ t.c.w. } e']$

According to Bonomi, pragmatic factors will determine when (255) has a progressive reading instead of a habitual one. When i is considered as one of the intervals mentioned in the restrictor (namely i'), the progressive reading is available, because what (255) says is that the whole interval i itself is occupied by an event of Gianni's working in the garden; in other words such an event is going on at i . To be noticed is that the context plays a crucial role in determining whether i itself is relevant.⁵⁵

Apart from minor problems concerning type coherence (events properties and temporal properties are assumed to belong to the same logical type) there are some facts making Bonomi's proposal not entirely consistent.⁵⁶ The first concerns the role of the contextual restriction predicate *Cont* and the events characterizing every contextually salient interval j in the LF of sentences like (255). In the case in which there is exactly one contextually relevant interval j properly included in i , the LF in (255) does not represent the truth conditions of the habitual reading; in order to represent the habitual reading we need to assume that there is a sufficient large number of actual events happening in i and that these events distribute uniformly throughout i (we need a partition of i). The LF in (255) does not guarantee these conditions.

⁵⁵I freely quoted from Bonomi (in progress).

⁵⁶Additionally, there is the not convincing fact that Bonomi's analysis requires a very complex analysis of simple present tense matrix sentences.

A second problem concerns the empirical predictions of Bonomi's proposal. In Bonomi's analysis, the Imperfetto morphology is the *sign* of the presence of the IPF operator which is responsible for both the progressive and the habitual readings. However, habitual readings are always conveyed by morphological perfective sentences when a durative *for* adverbial measures the time span of the habit in Italian. Consider in fact the examples discussed at the beginning of this chapter reported in below.

(256) Leo prendeva il te` alle cinque [Imperfetto]
Lit: Leo take-3sPASTimperf tea at five

(257) ?? Leo prendeva il te` alle cinque per venti anni [Imperfetto]
Lit: Leo take-3sPASTimperf tea at five for twenty years

(258) Leo ha preso il te` alle cinque per venti anni [Passato Prossimo]
Lit: Leo have-3sPRES take-PASTpart tea at five for twenty years

(259) Leo prese il te` alle cinque per venti anni [Passato Remoto]
Lit: Leo take-3sPASTperf tea at five for twenty years

As we can observe from these contrasts, when a durative adverbial measures the time span of the habit, habitual interpretations are conveyed by the use of the Passato Remoto (Past Perfective) or the Passato Prossimo (Present Perfect) and the Imperfetto (Past Imperfective) is bad. These important facts are a problem for Bonomi's proposal, and they have always been disregarded in the literature about habituality and aspect in Italian, since in all these analyses the imperfect morphology is assumed to be the spell-out of a semantic operator responsible for the habitual reading. (see for example Bertinetto (1986) and Lenci & Bertinetto (2000)). The data in (256)-(259) show that this view is not empirically correct.

As we observed, it is however not true that *for*-adverbials never combine with the Tempora Infecta (present and past imperfective). In fact,

they combine when the sentence have a habitual interpretation, as shown in the examples we discussed before reported below.

(260) Il venerdì Carlo correva nel parco per due ore [Imperfetto]
 Lit: The Friday Carlo ran-3sPASTImperf in the park for two hours
Fridays Carlo used to run in the park for two hours

(261) Il venerdì Carlo corre nel parco per due ore [Presente]
 Lit: Fridays Carlo runs-3sPRES in the park for two hours
Fridays Carlo runs in the park for two hours

These facts follow straightforwardly from an integration of Scheiner's (2002) analysis of habitual sentences in the system I am proposing. According to Scheiner, who develops an intuition found in von Stechow and Paslawska (2000), habitual meanings are derived by means of a covert extensional habitual operator which stativizes its complement.⁵⁷ Her definition of the habitual operator is reported in (262).

(262) HAB:= $\lambda Q\lambda P\lambda I\exists J[I\subseteq J] \& (Q(P))(J)$
 where I and J are intervals and Q a quantifier

According to (262), HAB denotes a relation between a set of quantifiers, a set of temporal properties and a set of times such that these times are included in the interval including the many-quantifier defined times of which the temporal property is true. An example of quantifier is given (263).

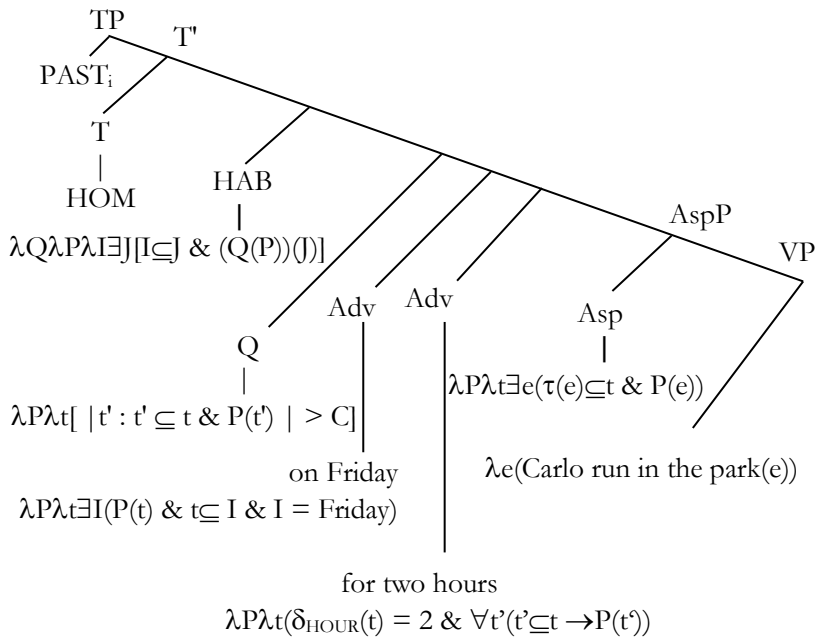
⁵⁷ That this operator should be an extensional operator, contrary to what Lenci & Bertinetto claim, is easy to understand. For (260) to be true there should be a habit of Carlo's which is based on actual *Friday Carlo's running in the park* past events. If Carlo had never run in the park on Friday in the actual world, (260) would have been false. This distinguishes habitual sentences from generic or dispositional ones. Consider, for instance, the dispositional sentence "John sells used cars". This sentence can be true even if John never sold a used car in his life.

(263) $\exists\text{-many} := \lambda P\lambda t[|t' : t' \subseteq t \ \& \ P(t') \ | > C]$

where C is a context dependent number of t' for which P(t') is true

Let us discuss how Scheiner's proposal can be developed in order to account for the habitual meaning of (260). According to the temporal architecture I am assuming, the LF for (260) is represented in (264).

(264) $\exists t[\text{PAST}_i \subseteq t \ \& \ [|t' : t' \subseteq t \ \& \ \exists I(\exists e(\delta_{\text{HOUR}}(t') = 2 \ \& \ \forall t'' (t'' \subseteq t' \rightarrow t'' \subseteq \tau(e) \ \& \ \text{Carlo run in the park}(e)) \ \& \ t' \subseteq I \ \& \ I = \text{Friday}) \ | > C]]]$



The formula in (264) says that a contextually given past time is included in a time at which Carlo has the habit of *running for two hours on Friday*. The LF for (261) will be analogous with the difference that the temporal pronoun in SpecTP is PRES_i. As you can see from (262), and (264), the habitual operator gives an homogeneous temporal property: if it is true that last year Carlo had the habit of running in the park on Fridays, it is true he had this habit in every month of last year, in every week of last year, in every day, and so on. This explains why habitual readings are generally conveyed by the use of a Tempus Infectum, which requires its complement to be homogeneous. This also explains while *for*-adverbials combine with the Tempora Infecta under a habitual reading: the habitual operator homogenizes the non-homogeneous temporal property derived by *for*-adverbials modification.

As we saw in (257), (258) and (259), when a durative adverbial measures the time span at which the habit holds in the past, habitual interpretations are conveyed by the use of the Passato Remoto (Past Perfective) or the Passato Prossimo (Present Perfect) and the Imperfetto (Past Imperfective) is bad. These facts follow straightforwardly from our analysis. According to what these sentences say, the adverbial does not measure the time of each *Leo's having tea at five* event; this is pragmatically ruled out by the fact that a *tea drinking* events usually do not take 20 years. The adverb rather measures the whole interval at which Leo had the habit of *having tea at five*. In order to derive this reading, the durative adverbial has scope over the habitual operator. In this case, the derived temporal property, i.e. the property of being a twenty-year long interval at which Leo has the habit of having the tea at five, is quantized and therefore it cannot combine with a Tempus Infectum, but it does with a Tempus Perfectum.

When the interval at which the habit holds is modified by *since*-adverbials, the derived temporal predicate combines with a Tempus Infectum and not with a Tempus Perfectum as shown by the sentences (265) and (266).

(265) Leo prendeva il te`alle cinque da venti anni [Imperfetto]
 Lit: Leo take-3sPASTimperf tea at five since twenty years

(266) ??Leo prese il te`alle cinque da venti anni [Passato Remoto]
 Lit: Leo take-3sPASTperf tea at five since twenty years

To sum up, it is incorrect to assume that the Italian Imperfetto is the spell out of a habitual operator. The Italian Imperfetto is on the contrary the spell out of a tense selecting for a homogeneous complement. The property of being a time at which a habit holds is homogeneous, if not modified by a quantizing adverbial; therefore, it combines with a Tempus Infectum but not with a Perfectum. When the habit is modified by a quantizing adverbial such as *for twenty years*, the pattern of acceptability changes.

These observations can be extended to generic sentences. In the literature about Italian (see for instance Lenci and Bertinetto (2000)) it is claimed that generic meanings are always conveyed by the use of the Presente or the Imperfetto. This is not correct if we consider the generic sentences like (267).

(267) Il Neanderthale è stato vegetariano per 30.000 anni. Poi è diventato onnivoro
The Neanderthaler has been a vegetarian for 30.000 years. Then he became an omnivore

In (267) we find a generic meaning conveyed under a perfective morphology. According to the proposal I am making, the tense morphology in (267) is dependent on the occurrence of the *for-adverbial* which quantizes the generic temporal proposition to be true of a 30.000 years long interval.

2.6 Conclusions

In this chapter, I have argued that *temporal homogeneity* plays a fundamental role in the selection of tense in Romance languages. I proposed a tense decomposition in which tense is sensitive to the temporal homogeneity of its complement. This accounts for the fact that while temporal adverbials which homogenize the temporal property they modify combine with the morphological imperfective tenses (Tempora Infecta), temporal adverbials which quantize the temporal property they modify combine with the morphological perfective tenses (Tempora Perfecta). We have seen that this decomposition explains the fact that perfective readings of event predicates are usually conveyed by the use of a Tempus Perfectum, while imperfective readings by the use of a Tempus Infectum; usually, but not always. In fact, when a temporal adverbial intervenes above the aspectual projection the pattern of combination changes. This follows from the fact that, in my proposal, the tense morphology is not the spell-out of the combination of a tense and of an aspectual operator but rather the spell-out of semantic tenses which have some influence in the aspectual interpretation of a sentence. Moreover, we have seen that habitual interpretations are conveyed by the use of a Tempus Infectum or of a Tempus Perfectum depending on whether the habit is or is not quantized by a durative temporal adverbial. I have argued that this also accounts for tense selection in generic sentences. I have proposed an analysis of the Perfect in Romance languages which assumes that perfect constructions are ambiguous between a past/Priorian reading and a result state one depending on the class of the predicate occurring in the VP. We have seen how temporal homogeneity plays an important role in Perfect constructions. In the next chapter, I will explore a possible cross-linguistic extension of the homogeneity proposal by looking at English temporal phenomena.

3. Cross-linguistic comparison

In this chapter, we will briefly explore a cross-linguistic generalization of the homogeneity proposal by looking at some of the English facts discussed in chapter 1. The discussion will be mainly focused on habitual and ongoing interpretations. Concerning the latter, we will discuss some of the analysis of progressive English sentences and we will explain why progressive constructions are not used cross-linguistically to convey habitual meanings but present tense sentences are. The discussion will suggest a redefinition of the Romance IPV operator. Moreover, we will discuss the factors that make present tense sentences ambiguous between a habitual and an ongoing reading in Romance languages but not in English.

3.1 English facts

In chapter 1, we discussed that event predicates are generally bad when appearing in the present tense, unless the sentence is interpreted habitually or, more marginally, when it is interpreted with a strongly marked *reading of reports*. Consider the following present tense event sentence.

(268) At five o'clock, Peter drinks a beer

Sentence (268) is generally interpreted as saying that Peter has the habit of drinking a beer at five o'clock. According to its more marginal *reading of reports*, sentence (268) has also a perfective/terminative interpretation and it means that there is an event of *Peter drinking a beer* which is accomplished

right now, five o'clock. If on the one hand, sentence (268) can also have a perfective/terminative interpretation, although more marginal, on the other hand, it cannot have an imperfective/ongoing interpretation; namely it cannot be used to convey a present ongoing event of *Peter drinking a beer*. In order to convey an ongoing reading, the sentence should appear in the progressive tense, as shown by the sentence below.

(269) At five o'clock, Peter is drinking a beer

In this chapter, I will argue that these facts might follow by the analysis of tense and aspect in Romance languages we discussed in the previous chapters.

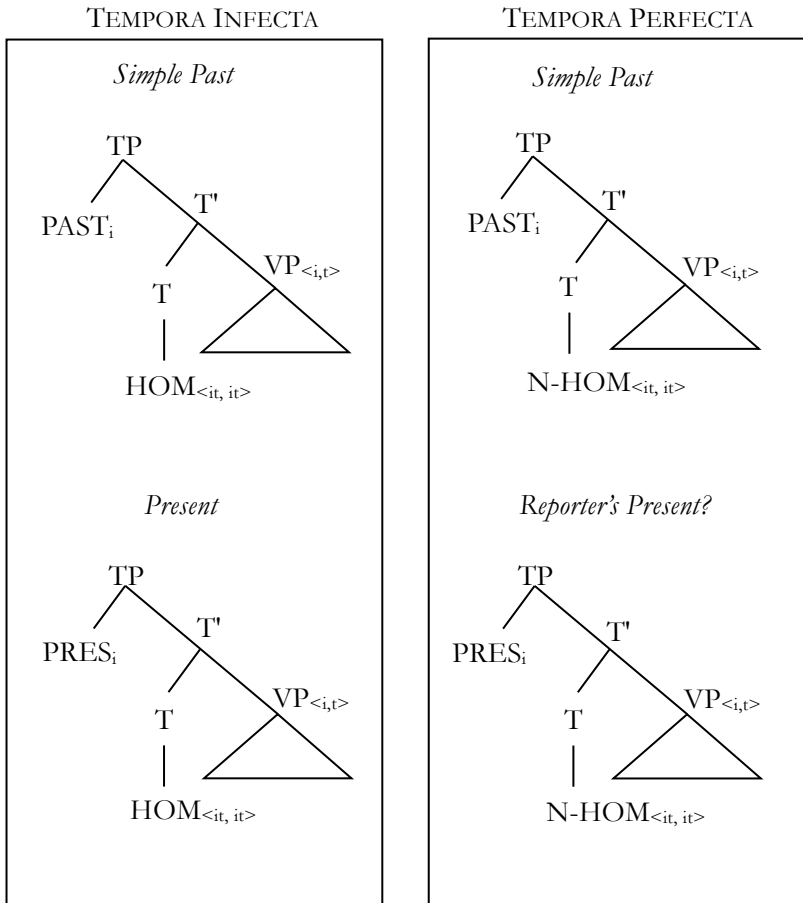
The proposal in short

In order to account for the facts above, I will assume that:

- The tense architecture of English is analogous to the one of the Romance languages.
- English has two lexical entries in its inventory of tenses: a Tempus Perfectum combining with temporally non-homogeneous predicates and a Tempus Infectum combining with a temporally homogeneous predicate.
- English progressive forms are the morphological spell-out of a *modalized* IPV_{<et,it>} aspectual operator and we find no covert IPV operator in English.

3.2 Tense and aspect in English

Given the assumptions above, the English tense architecture will be analogous to the Romance one, as represented below.



According to this classification, while the English present tense is a Tempus Infectum combining with a temporally homogeneous predicate, the reporter's present is a Tempus Perfectum combining with a temporally non-homogeneous predicate, like in Romance languages. Given this assumptions, the English facts in (268) and (269) will be explained in the following way: since the present tense selects for homogeneous predicates and the IPV operator is morphologically overt while the PVF operator is covert in English, event predicates in the present tense morphology will be

interpreted habitually, according to the analysis we gave in section 2.5 (or in the more marginal *reading of reports*). That event predicates in the present tense cannot have an ongoing interpretation is explained by the fact that the IPV operator is responsible for the ongoing reading of event predicates and the IPV operator is always spelled out by the progressive morphology. In chapter 2, we defined IPV as an extensional operator from properties of events into properties of times included in the temporal trace of the particular event. At this point, if we want a unified treatment of ongoing reading of event predicates for both Romance languages and English, we have to compare the meaning of English progressive forms to ongoing interpretations conveyed by Romance Tempora Infecta. This will be done in the next section. Concerning the past tenses, the simple past morphology is ambiguous between being the spell-out of a Tempus Infectum and of a Tempus Perfectum, according to the classification given above. This entails that an event predicate will combine with perfectum past when it has a terminative interpretation, while it will combine with the infectum past when it has an ongoing interpretation, which also requires the presence of the progressive morphology in English.

3.2.1 Progressive forms

It is well known that in the literature about the formal description of the English progressive starting from the work of Scott (1970) and Montague (1970), we find two different positions concerning the fact whether the progressive has a modal meaning (Dowty, 1979; Landman, 1992; Bonomi, 1992, 1997) or not (Bennett & Partee, 1972; Taylor, 1977; Parsons, 1994). We will not go into the details of this debate. I will only sketch it in order to motivate my belief that the intensional approach is the correct one and to get to an explicit definition of the IPV operator which fits coherently into our system.

According to the original Scott and Montague's truth conditions, the progressive sentence (270) is true at the instant t iff there is an open interval i including t such that (271) is true at every instant of i .

(270) Peter is building a house

(271) $\exists x(\text{house}(x) \ \& \ \text{Peter build}(x))$

As is well known, this analysis entails the entailment relation reported in (272).

(272) Peter is building a house \rightarrow Peter built a house

This is the case because, if i is an open interval including t such that (271) is true at every instant of i , there is a t' included in i such that t' is $t' < t$ and (271) is true at t' . According to our intuitions (272) should not be valid, since, if Peter is building a house right now, it is not true now that he has already built this house. In order to avoid this problem, Bennet & Partee (1972) propose that in the truth conditions of progressive sentences the untensed part of the sentence is to be evaluated with respect to a big interval containing the original evaluation time. According to this analysis, the progressive form is the spell-out of a propositional operator as defined in (273).

(273) $\text{PROG}\alpha$ is true at the interval i iff i is a moment and there is an interval i' such that $i' \supseteq i$ and i is neither the final subinterval nor the initial subinterval of i' and α is true at i'

Given the definition in (273), sentence (270) will be associated with the LF represented in (274) and it will be true at i iff there is an interval I including i at which (275) is true.

(274) $\text{PROG}\exists x(\text{house}(x) \ \& \ \text{Peter build}(x))$

(275) $\exists x(\text{house}(x) \ \& \ \text{Peter build}(x))$

According to these truth conditions, (272) is not valid. However, this analysis makes a false prediction, as the authors recognize in a later postscript to their paper. The problem is the following; given the definition of PROG in (274), the sentence “Peter is building a house” entails “Peter will have built a house”. This is because: (a) “Peter is building a house” is true now iff there is a interval *I* including now at which “Peter build a house” is true; (b) if there is an interval *I* including now at which “Peter build a house” is true, then there is a time *t* after now at which “Peter built a house” is true, since this interval *I* will be before that future time *t*, as shown in figure 18 below.

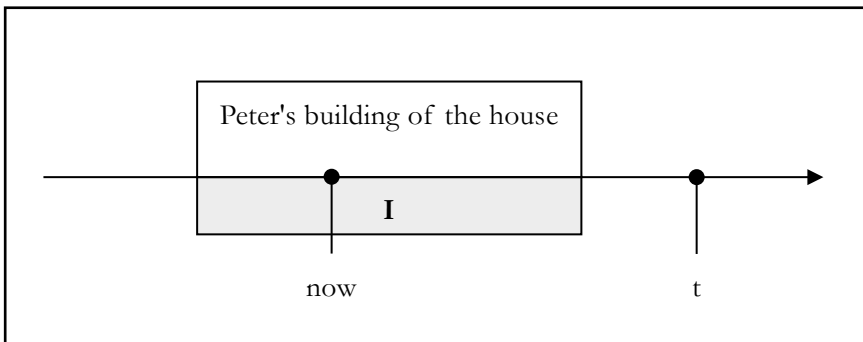


Figure 18: wrong prediction with the extentional analysis of the progressive

As Dowty (1979) observes, there are cases in which the larger interval does not exist in the actual world, as shown by the sentence below.

(276) John was building a house when he died

If (276) is true now, there will never be a interval *I* containing now at which John accomplished the building of his house. This is because John will

never manage to build his house according to what (276) says. According to Dowty, this fact suggests that we need an intensional account for the progressive, i.e. a theory in which the ongoing event is completed not necessarily in the actual world but rather in a set of possible worlds having certain properties. Dowty proposes the following definition for the progressive.

(277) $\text{PROG}\alpha$ is true at the interval I in a world w iff there is an interval I' such that $I \subset I'$ and I is not a final subinterval of I' and α is true at I' in every w' such that w' is an *inertia world* of w at I

Following a suggestion from Lewis, Dowty defines the set of the *inertia worlds* of w at I as the “set of worlds which are exactly like the given world w up to I and in which the future course of events after this time I develops in ways most compatible with the past course of events”.⁵⁸ In other words, the *inertia worlds* are worlds in which after I nothing unexpected or contrary to the *normal course of events* happens. Given the definition in (277), “Peter is building a house” does not entail “Peter will have built a house”, since “Peter is building a house” is true now iff “Peter build a house” is true at a bigger interval containing now in every inertia worlds and the actual world does not necessarily belong to this set of worlds. Consider in fact sentence (276). A world in which Peter dies while building his house is a world in which something unexpected happens; this world does not belong to the set of the inertia worlds in which *Peter's building a house* is completed.

Parsons (1989, 1990) argues that there is a problem concerned with the reference to a completed event that we find in every intensional analysis of the progressive. The argument that Parsons brings to his point is the following. In Dowty's proposal, sentence (278) has the LF represented in (279).

⁵⁸Free quoting Dowty (1979), p. 148.

(278) Peter was building a house

(279) PAST PROG [Peter build a house]

According to Dowty's definition, in every inertia world there is a completed *house building* event, that is to say, in every inertia world there is a finished house built by Peter. As Parsons says, this can be represented as in (280), where the existential quantifier has scope under the progressive operator.

(280) PAST PROG $\exists x$ [x is a house & Peter build x]

A condition for (278) to be true is that in every inertia world there is a house which is brought about by the completion of *Peter's building a house* event. According to Parsons, this is a problem since, in this case, (278) will have the same truth conditions of sentence (281).

(281) Peter was building a house that he would finish

This is the case because, being the progressive operator a propositional operator, the relative clause is in the scope of the progressive in (281), as shown in (282).

(282) PAST PROG [Peter build a house [FUT[that he finish]]]

However, (282) says something different from (278). According to what (282) says, Peter finished his house in the actual world. For Parsons, this is a sign that an intensional account of the progressive in which we make reference to completed events is wrong. In order to cope with this problem, Parsons proposes an analysis of the progressive in terms of properties of underlying eventualities.

As we have seen in section 1.3.1, Parsons (1989, 1990) proposes a neo-Davidsonian analysis in which state predicates have underlying state

variables and event predicates have underlying event variables as in the LFs of state and event sentences represented below.

(283) John loves Mary state sentence
 LF: $\exists s[\text{love}(s) \ \& \ \text{Subj}(s, \text{Mary}) \ \& \ \text{Theme}(s, \text{John})]$

(284) Peter buttered the toast event sentence
 LF: $\exists e \exists x[\text{butter}(e) \ \& \ \text{Agent}(e, \text{Peter}) \ \& \ \text{Theme}(e, x) \ \& \ \text{Toast}(x)]$

The idea is that event sentences express existential quantification over events while state sentences over states. According to Parsons, one distinction between events and states is that the former can culminate while the latter cannot. Culmination is explained by Parsons in the following way: “if Mary builds a bookcase, then there is a period of time during which the building is going on -the development portion- and then (if she finishes) there is a time at which the bookcase finally gets built, the time of culmination”. According to Parsons not every event has a culmination: “if Mary begins building a bookcase but is struck by lightning when she has finished three quarters of the work, then there is an event which is a building, that has her for a subject, that has a bookcase (a unfinished one) as object, and that never culminates”. Accomplishments, achievements and processes⁵⁹ (Vendler's activities) can culminate, while states cannot: there is no culmination point of a state, a state holds or it does not. Parsons introduces two predicates *Cul* and *Hold* defined as follows.

(285) $Cul(e, t) = 1$ iff the event e culminates at time t

(286) $Hold(e, t) = 1$ iff the eventuality e holds at time t

⁵⁹According to Parsons:

P is a predicate of processes iff $P(e) \rightarrow \exists e'(e' \subset e \ \& \ P(e'))$ and e' culminates).

The idea is that a process such as *Mary's running* is composed by some culminating *Mary's running* sub-events.

In (286) “the eventuality e holds at time t ” means that e is either a state or e is an event which is in progress (in its development portion). Successively, Parsons introduces three semantic principles which can be formulated as follows:

- If A is an event verb occurring in a simple non-progressive sentence, the logical form of the sentence contains *Cul*.
- If A is a state verb occurring in a simple non-progressive sentence, the logical form of the sentence will contain *hold*.
- If A is an event verb then “be A -ing” is to be treated semantically as a state verb, i.e. the logical form of the sentence in which “be A -ing” occurs will contain *hold*.

Given these assumptions, in Parson’s system the LF of the simple past event sentence (287) is represented in (288).

(287) Peter built a house

(288) $\exists t \exists e \exists x [t < \text{now} \ \& \ \text{build}(e) \ \& \ \text{Agent}(e, \text{Peter}) \ \& \ \text{Theme}(e, x) \ \& \ \text{house}(x) \ \& \ \text{cul}(e, t)]$

Given Parsons’ assumptions, one observation about the truth conditions of a simple past event sentence is that accomplishment predicates in the simple past describe punctual events, like achievement predicates. This is the case because the predicate $Cul(e, t)$ is true of a point, not of an interval. However if $Cul(e, t)$ is true of a point, the sentences (289) and (290) should be perfectly grammatical and natural.

(289) ?At five, Peter built a house
= At five, Peter finished building a house

- (290) ?At five, Peter flew to Boston
 = At 5, Peter terminated his flight to Boston

However, these sentences are unnatural and they do not have the readings derived in Parsons' system. According to what (289) and (290) say, the adverb does not locate the time of the culmination but rather the time of the entire event. This is a problem for Parsons' analysis of simple past event sentences.

Moreover, according to the semantic principle (iii), the LF of the progressive past sentence (278) is the one represented in (291).

- (291) $\exists t \exists e \exists x [t < \text{now} \ \& \text{build}(e) \ \& \text{Agent}(e, \text{Peter}) \ \& \ \text{Theme}(e, x) \ \& \ \text{house}(x) \ \& \ \text{hold}(e, t)]$

According to semantic principle (iii), the predicate "be building a house" in (278) is classified as a state and therefore it will require the introduction of the *Hold* predicate in the LF of the sentence. Under this analysis, (278) and (281) do not have the same truth conditions; in fact, in the truth conditions of (278) we do not refer to an event which is completed in the set of inertia worlds but rather we refer to an event which is ongoing in the actual world. On the other hand, (281) says that this event, which was going on at some time in the past, is completed at a later time in the actual world. As Parsons points out, this treatment of the progressive solves the problem of the imperfective paradox since, to say that an event holds at a time is not to say that it culminates at that time.⁶⁰

However, Parsons' criticism to the reference to a completed event in a modal analysis of the progressive is problematic if we consider examples like (292) and (293), discussed by Landman (1992) and more recently by Bonomi and Zucchi (2001) (originally from Kwart, p.c.).

⁶⁰We won't discuss the details of Parsons' proposal since they are not relevant to our discussion.

(292) Mary was killing a Roman soldier before she got killed

(293) Mary was wiping out the Roman army before she got killed

Imagine a situation according to which Mary is a person of moderate physical capacities, that she is fighting against the Roman army and that she manages to kill a couple of soldiers before she gets killed. Sentence (292) is true while (293) is false in this situation. But, as Bonomi and Zucchi (2001) observe, this does not follow in Parsons' analysis. Consider the two (simplified) LF (294) and (295) respectively associated with the two matrix sentences in (292) and (293).

(294) $\exists t \exists e [t < \text{now} \ \& \ \text{Mary-kill-a-Roman-soldier}(e) \ \& \ \text{hold}(e, t)]$

(295) $\exists t \exists e' [t < \text{now} \ \& \ \text{Mary-wipe-out-the-Roman-army}(e') \ \& \ \text{hold}(e', t)]$

According to the described situation, (294) should not entail (295), i.e., the formula “hold(e, t)” should not entail “hold(e', t)”. Since in Parsons' system a progressive sentence is true if the described event is not completed, (295) cannot be false only because Mary gets killed before wiping out the Roman army in our scenario. Therefore, given Parsons' analysis, we do not understand why (293) should be false in the described scenario. The reference to a completed *Mary's wiping out the Roman army* event seems in this case necessary for falsifying (293). Bonomi and Zucchi observe that this problem is completely obscured in Parsons' analysis since we do not find an explicit truth condition for the formula “hold(e', t)”; in order to cope with the problem above, an explicit definition of the *hold* predicate needs a *modal* reference to a complete event.⁶¹

⁶¹The same problem affects Giorgi and Pianesi (2001) recent analysis of Italian imperfective sentences. According to this analysis the LF associated with an Italian imperfective event sentence contains an event variable which can denote non-terminated events under an ongoing reading. But non-terminated events are underspecified events: the event *Mary's killing a Roman soldier* in our scenario is a non-

There are some additional problems for Parsons' analysis of the progressive as pointed out by Landman (1992). The most salient concerns creation verbs. As you can see in (280), the truth of (278) commits us to the existence of an actual house, since (280) entails (296).

(296) $\exists x[\text{house}(x)]$

This means that if Peter is building a house now, then there is now an actual house which is caused by *Peter's building* event holding now. This seems intuitively wrong, as observed by Landman (1992). If Peter is building a house and he has built only its foundations, we do not say that there is already an actual house. Parsons is aware of this problem and interestingly he claims that the inference from (280) to (296) is valid since (280) does commit us with the existence of an actual house, but with the existence of an *incomplete* actual house. Therefore, if Peter is building a house and he has built only its foundations we are allowed to say that that there is an incomplete actual house. However, Parsons' replay does not seem convincing since, as Landman observes, he discusses cases where the objects are typically created in stages. In these cases, we do not find complete objects in the creation stages, but we find incomplete objects. This proposal is in fact problematic in cases in which objects are not created in stages, cases in which the object comes into existence *in a flash* at the end of a creation process. Landman discusses this example for illustrating them.

terminated event of *Mary's wiping out the Roman army*. The prediction of Giorgi and Pianesi proposal in our scenario is that sentence (i) entails sentence (ii).

- (i) Maria uccideva un soldato romano
Lit: Maria killed-PASTimperf a soldier Roman
Mary was killing a Roman soldier
- (ii) Maria annientava le legioni romane
Lit: Maria wiped- PASTimperf the army Roman
Mary was wiping out the Roman army

(297) God was creating a unicorn when he changed his mind

Imagine that God was about to bring a unicorn into existence by uttering the magic formula and that he changed his mind while doing it. As Landman observes, (297) is true in this scenario. However, in this case, the truth of the progressive sentence does not commit us to the existence of an actual unicorn, neither to the existence of an incomplete one. A modal characterization of the progressive is therefore required if we want to cope with these problems (for further argumentation for a modal approach to the progressive see also Bonomi (1997) and Asher (1992)).

In order to give a definition of the IPV operator which is sensible to the facts we have discussed so far, I will assume Landman's analysis of the progressive. According to Landman, we have to modify Dowty's notion of *normality*, which plays a crucial role in the truth conditions of progressive, if we want to account for examples like the following, which is true in a scenario discussed by Vlach (1981). Consider sentence (298) uttered in the scenario described below.

(298) Mary was crossing the street when the truck hit her

SCENARIO: Mary is walking to the other side of the street and she does not realize that a truck is coming towards her direction. If nothing unexpected happens, the truck will hit her; it would be a miracle for her to escape.

Dowty's truth conditions of the progressive predict that (298) is false in the described scenario, since the inertia worlds are worlds in which nothing unexpected happens; if *Mary's crossing* and the *truck coming* events follow their natural course, we will have a collision and Mary will never complete her crossing in the set of the inertia worlds.⁶² In order to cope with this

⁶²Hinrichs (1983) gives a slightly different but clearer presentation of Vlach's observations.

(i) Mary was crossing the street when the truck hit her

problem, Landman proposes that while considering the natural continuation of an event stage “we have to abstract away from facts about the world that are external to that stage”.⁶³ According to Landman, event stages of an event e are parts of e which are big enough and share enough with e so that we can call them a less developed version of e . For Landman, *Being a stage of an event* is therefore different from *being a part of an event* since “we cannot say that when an event stops in a world, there is no bigger event of which it is part in this world, but we can say that there is no bigger event in the world of which it is a stage”. Going back to (298), we have to look at Mary's crossing “solely on the basis of what is internal, inherent to that stage”.⁶⁴ What is relevant here is whether the stage of Mary's crossing “is the process of which it is normally reasonably within Mary's capacity that she will complete it”.⁶⁵ This is the reason why (298) is true. Analogously, the fact that (293) is false in its described scenario is explained by the same reasons. If Mary is a person of moderate physical capacities, she doesn't have a chance of wiping out the Roman army. In other words, there is no reasonable chance on the basis of what is internal to the stage of *Mary's wiping out* (the killing of a couple of soldiers) that it will continue and complete. In order to develop this intuition, Landman assumes the progressive to convey a relation between an event e and an event type V , as give in (299), where *the continuation branch of e in w* (henceforth $C(e, w)$) is a set of pairs of events and worlds.⁶⁶

Take the instant t at which Mary is hit by the truck in the actual world. If (i) is true at t , Mary crosses the street at an interval I including t in every inertia world. But at t the inertia worlds are exactly like the actual world; therefore if Mary is hit by the truck at t in the actual world, she is hit by the truck at t in every inertia world. Therefore (i) should be false according to Dowty's truth conditions.

⁶³Landman (1992): p.25.

⁶⁴Landman (1992): p.25.

⁶⁵Landman (1992): p.25.

⁶⁶"The *continuation branch* for e in w is the smallest set of pairs of events and worlds such that:

1. For every event f in w such that e is a stage of f , $\langle f, w \rangle \in C(e, w)$; the continuation stretch of e in w ;

- (299) $\text{PROG}(e, V)$ is true in a world w iff in some world in the continuation branch of e in w some event realizes the event type V

The intuition behind the requirement of a continuation branch e in w is that you follow the development of e in the actual world w ; if e stops in w , then we follow it in the closest world w' where it does not stop, if w' is a reasonable option for e in w .⁶⁷

Given the definition in (299), we can implement Landman's analysis in our system. As I argued before, I will assume the progressive to be an aspectual operator taking an event predicate as argument, introducing a relation between an event and an event predicate in Landman's style, and giving a temporal predicate as value, as defined in (300).

- (300) $\text{IPV}_{\text{PROG}} := \lambda P \lambda t \exists e [t \subset \tau(e) \ \& \ \exists w' \exists e' [\langle e', w' \rangle \in \text{continuation branch of } \langle e, w^* \rangle \ \& \ P(e')]]$

By integrating Landman's proposal in our system, the LF of sentence (301) is represented in (302).

2. if the continuation stretch of e in w stops in w , it has a maximal element f and f stops in w . Consider the closest world v where f does not stop:
 - if v is not in $R(e, w)$, the continuation branch stops.
 - if v is in $R(e, w)$, then $\langle f, v \rangle \in C(e, w)$. In this case we re-apply the construction:

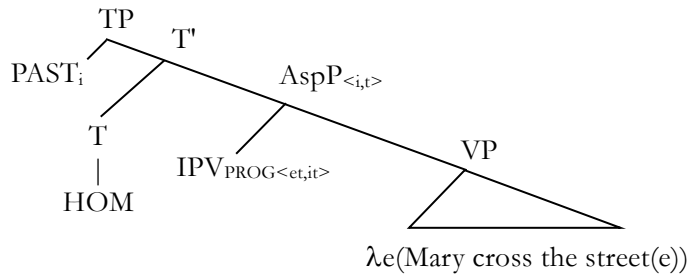
3. for every g in v such that f is a stage of g , $\langle g, v \rangle \in C(e, w)$, the continuation stretch of e in v .

4. if the continuation stretch of e in v stops, we look at the closest world z where its maximal element g does not stop:
 - if z is not in $R(e, w)$, the continuation branch stops.
 - if z is in $R(e, w)$, then $\langle g, z \rangle \in C(e, w)$ and we continue as above" (Landman, 1992: p. 26).

⁶⁷It is important to notice that Landman's proposal presents some of the difficulties we encountered while discussing Giorgi and Pianesi proposal. Consider in fact sentence (298) again. Perhaps a particular event e' is a stage of a crossing the street event, but how do we know? Intuitively, we know that only if we know Mary's intention.

(301) Mary was crossing the street

(302)



3.2.2 Going back to Romance languages

In chapter 2, we assumed that ongoing readings of event predicates are derived by the covert occurrence of the IPV aspectual operator in Romance languages. We defined this operator as a simple extensional operator as in (303).

(303) $||IPV|| = \lambda P \lambda t \exists e (\tau(e) \supset t \ \& \ P(e))$

If we consider sentence (304) in the light of the analysis of English progressive sentences, we realize that this definition is not entirely correct.

(304) Mario faceva una torta
 Lit: Mario make-3sPASTimperf a cake
Mario was baking a cake

According to the analysis of IPF we gave in chapter 2, sentence (304) is true iff there is a past interval which is included in the temporal trace of the Mario baking a cake event. These truth conditions are derived according to (303), but notice that the definition refers to actual events and to their actual temporal traces. In this case, it is implicitly assumed that there will always be a bigger actual interval containing the temporal trace of the actual event; in other words, the assumption of (303) leads us to the same problem we encountered in Partee and Bennett's analysis of the English progressive, since, according to (303), (304) entails sentence (305).

(305) Mario avrà fatto una torta
Mario will have baked a cake

Sentence (305) says that there is a time in the future at which Mario will have baked the cake. This inference is not correct if we consider a sentence analogous to the English ones we have discussed so far like (306).

(306) Mario; morì a mezzanotte, mentre (pro;) faceva una torta
Mario died at midnight, while he was baking a cake

According to what (306) says, Mario did not complete his cake; notice that this is the same phenomenon we found while discussing the English progressive sentences. These facts show that a simple extensional analysis of ongoing readings of event predicates conveyed by the use of the Imperfetto (Past Imperfective) is not enough.

Interestingly, the temporal meaning expressed by (304) is conveyed in free variation by a progressive construction in Italian, as shown by sentence (307).

(307) Mario stava facendo una torta
 Lit: Mario was-3sPASTimperf making a cake
Mario was baking a cake

In order to account for these facts, I will assume that the ongoing readings associated with (304) and (307) are conveyed by means of the same semantic IPV_{PROG} operator that we assumed to be responsible for ongoing readings of event predicates in English. In order to explain the morphological variation between (304) and (307), I will assume that while in (307) the IPV_{PROG} operator is morphologically realized by the progressive construction, as in English, it occurs covertly in (304). It is important to notice that while the progressive construction is the spell-out of the IPV_{PROG} operator in (307), the imperfective morphology bared by the verb in (304) is not. This morphology is the spell out of a PAST-HOM tense as we argued in chapter 2. In sentence (307) the auxiliary “stava” (*was*) occurs in the past imperfective morphology, which we assume to be the spell out of a PAST-HOM tense (*Tempus Infectum*). The occurrence of an infectum morphology on the auxiliaries of progressive construction is expected according to the definition of the IPV_{PROG} operator we gave in (300), since the application of IPV_{PROG} gives temporal properties which are homogeneous. For the same reason, the auxiliary of progressive constructions can never have a perfectum morphology. This prediction is borne out by the following Italian facts.

- (308) Maria sta attraversando la strada
Lit: Mary be-3sPRES crossing the street
- (309) Maria stava attraversando la strada
Lit: Mary be-3sPASTimperf crossing the street
- (310) * Maria stette attraversando la strada
Lit: Mary be-3sPASTperf crossing the street

As we can see from the sentences above, the progressive sentences are fine when the auxiliary morphology is Presente or Imperfetto, namely the spell-

out of a Tempus Infectum, but are bad when it is a Tempus Perfectum.⁶⁸ One problematic prediction of this proposal is that sentences like (311) should be grammatical in Italian, which is not actually the case according to Italian speakers' intuitions. However, the unacceptability of (311) might depend on the marginal use of past perfective progressive constructions which are almost disappeared.

- (311) * Maria stette attraversando la strada per due minuti
 Lit: Mary be-3sPASTperf crossing the street for two minutes

⁶⁸As we have seen, present habits are conveyed by the use of the present tense in English. Given the proposed English tense architecture and its analogies to the Romance system, we would expect past habits to be conveyed by the use of the simple past tense in English (being the morphological English simple past ambiguous between the spell-out of a Tempus Perfectum and of a Tempus Infectum). Actually this is not the case; past habits are not usually conveyed by the use of the simple past but by the use of the "used to" construction, as shown by the sentence below

- (i) John used to go to church on Sundays

On the contrary, the following simple past sentence

- (ii) John went to church on Sunday

has only an eventive perfective interpretation. We could assume that pragmatic restrictions are responsible for this fact. Namely we could assume the sentence

- (iii) John ate at noon

to be actually ambiguous between (a) that there is a past event of *John eating at noon* and (b) that *John had the habit of eating at noon* and then we could say that English morphologizes the HAB operator by the "used to" construction in simple past sentences to get pragmatically rid of this ambiguity. This strategy would not be necessary in Romance languages where we find two distinct morphological realizations for the PAST-Infectum and the PAST-Perfectum tenses. One could dispute that such a stipulation would be in contrast with Romance language data since present tense sentences with event predicates are ambiguous between a present ongoing and a present habitual interpretation and we do not find "use to" constructions conveying these latter. One possible answer to this objection could be that English wants to get rid of the Perfectum-Infectum ambiguity and not of the habitual-ongoing ambiguity that arises under the very same Infectum tense in Romance languages. The assumption of the overt realization of the IPV_{PROG} operator in English would find here further evidence.

3.3 Conclusions

In this chapter, we have seen how we can extend the homogeneity account to English. In order to do so, we have assumed that the English simple past morphology is ambiguous between the spell-out of a *Tempus Infectum* and of a *Tempus Perfectum*. We proposed how progressive constructions are to be integrated in the homogeneity proposal by discussing some of the accounts of English progressive and we extended the results to Romance languages.

4. Experimental study

The linguistic data discussed in my work mostly come from introspection and from the broad literature about tense and aspect (which includes introspective data, mostly). The main motivation for using this kind of data was to provide linguistic contrasts as minimal as possible to our theoretical investigation in order to make clear and describe the linguistic phenomena we wanted to explain. These data, though extremely important for theoretical investigation, are required to be further confirmed by data from other sources, such as corpora and experimental investigations. In this chapter, I will describe a pilot study and an experimental study I conducted in order to bring independent empirical evidence to the theoretical proposal I have made.

In these studies, I investigated the adverbial distribution facts discussed in my work. This was done by measuring acceptability judgments and reaction times in a group of adult Italian monolingual speakers. In these studies, I investigated the acceptability judgments of Italian state sentences containing a durative temporal adverbial as reported in the four conditions (a-d) below. State predicates were chosen in order to neutralize the effect of lexical aspect (*aktionsart*), that we saw to be relevant to the temporal interpretation of a sentence. This allowed us to investigate the acceptability of combinations of tenses and durative adverbial as predicted by the proposal I made.

- (a) Passato Remoto sentences containing a “per x time” adverbial (henceforth RP)
- (b) Passato Remoto sentences containing a “da x time” adverbial (henceforth RD)
- (c) Imperfetto sentences containing a “per x time” adverbial (henceforth IP)

- (d) Imperfetto sentences containing a “da x time” adverbial (henceforth ID)

4.1 A pilot study with questionnaires.

In this pilot study, 14 Italian monolingual speakers were asked to judge 12 sentences as acceptable or non-acceptable. Sentences contained a state predicate and a durative temporal adverbial as represented in conditions (1a-d). We administered three sentences for condition. Sentences were presented together with 15 filler sentences in a paper and pencil questionnaire in random order. Fillers included eight grammatical sentences and seven ungrammatical sentences. Ungrammatical sentences included sentences with a semantic or a syntactic violation (for instance, “?? Yesterday Mario will run a race” or “* Maria are sleeping” respectively). Participants read the sentences in the questionnaire and gave an acceptability judgment. Below, a sample page from the questionnaire.

<input type="checkbox"/>	ACCETTABILE	<input type="checkbox"/>	NON-ACCETTABILE
<p>IL FIUME ADDA ERA SPORCO DA VENTI</p>			

Sample page of the questionnaire

The results of this pilot study are represented in the histogram in figure 19 below. As we can see, while the acceptability rate of RP sentences was 95,23%, the acceptability rate of RD sentences was 7,14%; moreover, the acceptability rate of ID sentences was 97,26%, and the acceptability rate of IP sentences was 11,9%.

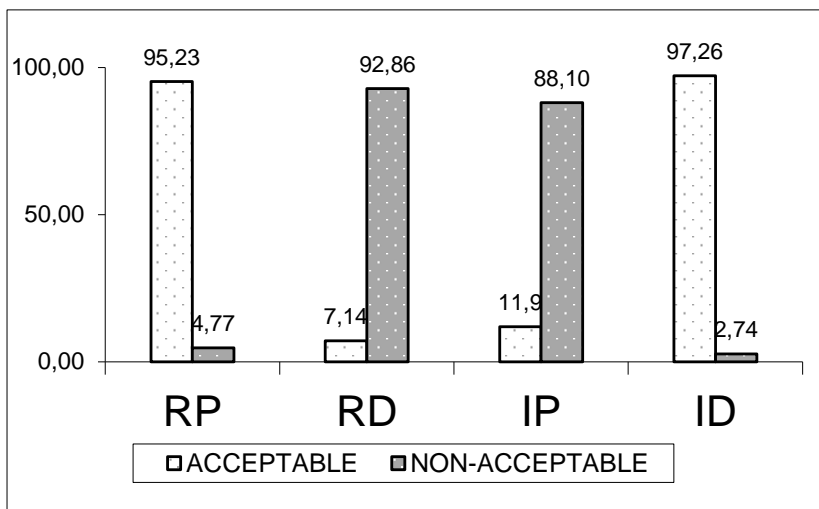


Figure 19: acceptability percentages at the judgment task

The data from this pilot study confirm the prediction of the theoretical proposal discussed in my work.

Though the results confirmed our hypothesis, we found some unexpected answers, especially in the IP condition, as we can see from the histogram in figure 1 (acceptability rate for Imperfetto sentences with *per x time* adverbials is 11,9%). This result might depend either on a marginal acceptability of *per x time* in Imperfetto sentences or on the small number of participants and items for condition. In order to examine these hypotheses, I investigated acceptability judgments of sentences in the four conditions described above in a study with a larger number of items and

participants. In this study, I measured participants' reaction times of their judgments.

4.2 Experimental study

In the second study, participants had to judge the acceptability of 20 sentences containing a durative temporal adverbial. Sentences were presented either in the Imperfetto or in the Passato Remoto in the four conditions described in (a-d). Since in the pilot study we found a few unexpected responses, in the second experiment we measured acceptability answers and response times. We measured response times of acceptability judgments since different acceptability response times in the different conditions might reflect different processing and comprehension strategies.

4.2.1 Method

Participants: Twenty adult monolingual speakers of Italian were recruited in the Milan metropolitan area (Italy). The mean age of the subjects was 28,9 years (range = 22;5 – 30;00).

4.2.2 Design

Items included 20 state sentences in four conditions where we manipulated the tense (Imperfetto vs Passato Remoto) and the durative temporal adverbial (“per x time” vs “da x time”) in a 2X2 design (5 items for condition), analogously to the design of the pilot study. Moreover, participants were administered 30 filler sentences including 14 grammatical sentences and 16 ungrammatical sentences analogously to the pilot study. A complete list of the sentences is reported in the appendix A.

4.2.3 Procedure

The study was conducted at the language processing lab of the Psychology Department of the Università degli Studi di Milano-Bicocca. The *Matlab* program with the *Psychtoolbox* library, running on a Toshiba computer, presented the 50 written sentences on the PC screen. Sentences were presented randomly. Subjects were required to read the sentences on the screen and to judge them as acceptable or non-acceptable by pressing the “F” and the “J” keys of the PC keyboard; keys were colored with different colors in order to facilitate the task. Judgment times measured intervals from the sentence onset to the subject’s key press.

4.2.4 Results

As we can observe from table 1 and figure 20 below, the results of the pilot study are confirmed. As we can see, participants consistently accept RP and ID sentences and reject RD and IP sentences. Interestingly, acceptability rates for RD and IP sentences were equally small. This suggests that the differences we found in the pilot study presumably depend on the experimental design and procedure. In fact, in the pilot study, where we used a paper and pencil questionnaire, we had a smaller number of items for condition and a smaller number of participants.

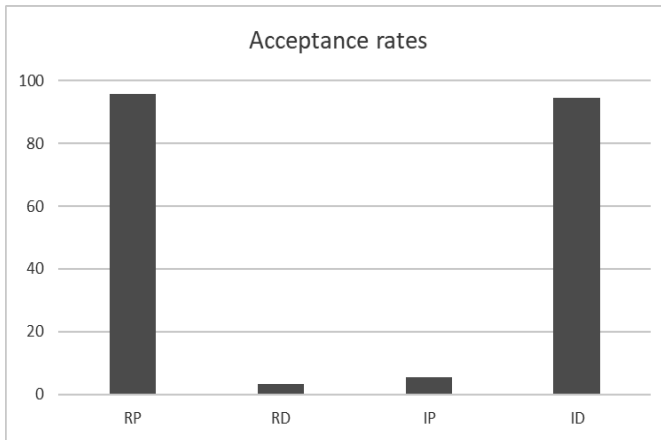


Figure 20: percentages of acceptability for study 2

	RP	RD	IP	ID
Mean	95.74	3.19	5.43	94.50
SD	20.29	17.67	22.79	22.91

Table 1. Percentages and standard deviations of acceptability for study 2.

These differences are confirmed by a statistical analysis in mixed models with item and subject as random factors, condition as predictor and acceptability judgment (accepted = 1, rejected = 0) as dependent variable. Since acceptability judgment has a binomial distribution, we performed a logistic regression analysis (Baayen, 2008, 2015). A comparison between the model including the fixed effect of condition and the null model revealed that condition significantly improved the goodness of the fit of the model ($p = <.001$). As we can see from the coefficients of the statistical analysis reported in table 2, acceptability rates of RP sentences are different from acceptability rates of RD and IP sentences; no differences were found between RP sentences and ID sentences,

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	3.3400	0.5998	5.569	<.005
RP-RD	-6.9844	0.9432	-7.405	<.005
RP-IP	-6.4191	0.8635	-7.434	<.005
RP-ID	-0.2778	0.6948	-0.400	0.689
RD-IP	0.5653	0.7523	0.752	0.452
RD-ID	6.7066	0.9119	7.355	<.005
IP-ID	6.1413	0.8292	7.406	<.005

Reaction times for judgements of experiment 2 also confirm the prediction of the theoretical investigation. As we can see from figure 21 and table 2, reaction times for judgments are similar across different condition with no significant difference, as revealed by ANOVA in mixed models with items and subject as random factors and conditions as a predictor.

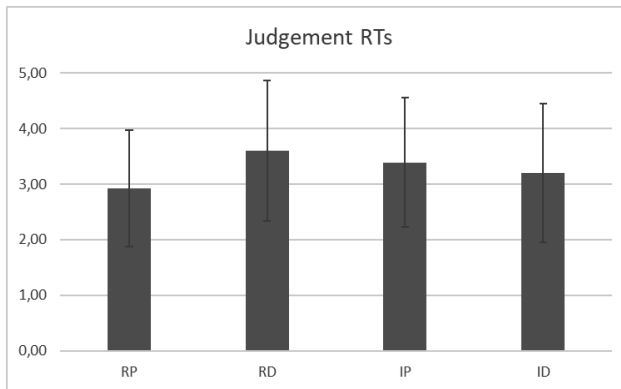


Figure 21. Judgment reaction times (in seconds) in study 2.

	RP	RD	IP	ID
mean	2.92	3.60	3.39	3.20
SD	1.04	1.26	1.17	1.25

Table 2. Means of reaction times (in seconds) and standard deviations in study 2.

In order to further investigate reaction times of acceptability judgments across conditions, we performed a statistical analysis on reaction times of accepted sentences (judged as acceptable by participants). Reaction times were analyzed as before in LMMs in R. A comparison between the model including the fixed effect of condition and the null model revealed that condition significantly improved the goodness of the fit of the model ($p = <.001$). Consequently, we run a Mixed Model ANOVA on the reaction times with Condition as a fixed effect and Subject and Item as random effects; we run pairwise comparisons on conditions. As we can see from the coefficients reported in table 3, reaction times in RP condition are different from reaction times in the RD condition, reaction times in RP condition are different from reaction times in the IP condition, reaction times in RP condition are different from reaction times in the ID condition, reaction times in RD condition are different from reaction times in the IP condition, reaction times in RD condition are different from reaction times in the ID condition and reaction times in IP condition are different from reaction times in the ID condition.

	Estimate	Std. Error	t value	Pr(> t)
RP - RD	-80.778	29.956	-2.697	0.0312
RP - IP	-83.511	23.452	-3.561	0.0020
RP - ID	-8.611	7.697	-1.119	0.6461
RD - IP	-2.733	37.276	-0.073	0.9998
RD - ID	72.167	29.979	2.407	0.0662
IP - ID	74.900	23.481	3.190	0.0072

Table 3. Coefficient of analysis of reaction times in different conditions in study 2.

4.3 Discussion

The results from the empirical study confirm the predictions of the theoretical investigation. While RP and ID sentences are consistently

accepted, RD and IP sentences are rejected. However, RD and IP sentences are occasionally accepted. When this happens, the judgment times for these sentences are longer than judgment times of RP and ID sentences. Since the acceptability of IP and RD sentences requires extra time costs, we argue that when IP and RD sentences are accepted additional linguistic operations are performed in order to resolve an homogeneity clash found in IP and RD sentences. Given the temporal architecture of these sentences, two are the possible solutions of the homogeneity clash: listeners can *accommodate* the presuppositions associated with the tense or drop it and reinterpret the sentence according to the homogeneity of the temporal predicate. In the first case, listeners can accommodate the presupposition by assuming “per x time” modified temporal properties to be homogeneous and “da x time” modified temporal properties to be non-homogeneous. This is rather implausible. Consider in fact sentence (312).

(312) ?? Mario era malato per due giorni

Lit: Mario be-3sPASTimperf sick for two days

In order to accommodate the homogeneity presuppositions associated with the tense, the temporal property *Mario-be-sick-for-two-days* is assumed to be homogeneous, that is, we require that every subinterval of the interval introduced by tense is two-days-long. This is implausible.

According to the second solution, listeners can drop the presupposition associated with tense and reinterpret it according to the homogeneity property of the temporal predicate. According to this proposal, when listeners accept a sentence with a presupposition clash as (312), they drop the homogeneity presupposition associated with the Imperfetto and they reinterpret the tense according to the non-homogeneity property of the tense complement. Since the tense complement denotes a non-homogeneous temporal property ($\lambda t(\text{Mario-be-sick-for-two-days}(t))$), the tense is reinterpreted as a Tempus Perfectum, a tense selecting for temporally non-homogeneous predicates.

5. Conclusions

In my work I have claimed that temporal homogeneity plays a fundamental role in conveying the temporal meaning of natural language sentences. I discussed durative adverbial modification, habitual and generic meanings in Italian and French and I have argued that the temporal homogeneity of a temporal property determines tense selection in these languages. Moreover, I have argued that perfect constructions are ambiguous in these languages and that their different meanings have different homogeneity features which are relevant for adverbial modification. While discussing the data motivating my proposal, I investigated whether it can be extended to other languages such as English.

In order to formalize my proposal, I distinguished state predicates from event predicates (Herweg, 1991; Katz, 2000) and I assumed that tense is a grammatical projection localizing states and events in the flow of time. By developing a proposal by Klein (1994), von Stechow (2002), Musan (2001) and Kratzer (1998), I have assumed that aspect is a grammatical projection responsible for the aspectual meaning of event sentences.

Given this temporal architecture, I proposed a new analysis of the different tense forms of Italian and French. In particular, I proposed an analysis in which tense is sensitive to the temporal properties of its complement and I argued that the verbal forms of these are the morphological spell-out of two different tenses, associated with restrictions concerning the temporal homogeneity of their complements. In order to implement this idea, I decomposed the tense projection into a temporal variable, localizing the described eventuality in the flow of time, and a homogeneity condition on the interpretation of the tense complement. The idea is that tense combines with its complement and licenses it if it satisfies a condition of temporal homogeneity: this means

that the tense itself has some influence on the aspectual interpretation of a sentence. Given these assumptions, the linguistic distributive facts and the semantic ambiguities discussed in my work follow straightforwardly. Results from two experimental studies brought empirical evidence to my proposal and confirmed the linguistic distributive facts that motivated it.

Appendix

	Sentence	Condition
1	Picasso abitò a Parigi per nove anni	RP
2	La casa puzzò di muffa per due giorni	
3	Il capo si sentì male per tre giorni	
4	Lo studente rimase in piedi per tre ore	
5	Eva ebbe la febbre per venti giorni	
1	Lo studente era malato da due giorni	ID
2	La segretaria lo amava da dieci anni	
3	Marcello aveva un cane da dieci anni	
4	I fidanzati si conoscevano da tre mesi	
5	Carla Serra era incinta da tre mesi	
1	A Natale Eva visse a Roma da due anni	RD
2	Il campo profumò di menta da due giorni	
3	Il fiume Adda fu sporco da venti anni	
4	Il locale fu pieno di gente da due ore	
5	Il vagabondo ebbe fame da due giorni	
1	Ferrara era grasso per venti anni	IP
2	Carlo possedeva un bar per tre anni	
3	Il commesso era scortese per due ore	
4	Lele aveva paura del buio per due anni	
5	Nel 1980 il Niger era in pace per due anni	
1	Giovanni ebbe i capelli ricci e neri	FILL_U
2	Domani Francesca era nata a Firenze	
3	Ieri Alessandra indossa una bella gonna	
4	Ieri sera Manzoni studierà a Milano	
5	Nel 1474 Colombo partiranno il Brasile	

6	Mio nonno era bravissimo un falegname		
7	Nel gennaio 1941 la Francia era guerra		
8	La bomba è esplosa sino a notte fonda		
9	Il poeta sul palco sta rimanendo seduto		
10	Leo va a trovare sua nonna due volte		
11	Marta comincia a possedere una casa		
12	Tutti dicono quel quadro di Tiziano		
13	Le credevano suo marito fedele		
14	Esclusivamente Maria va al cinema		
15	Oggi vidi mia sorella in stazione		
1	Galileo Galilei morì solo e in miseria		FILL_G
2	Antonio sta comprando una nuova auto		
3	Edo e Rita non si parlano mai		
4	Giotto fu a Milano intorno al 1335-1336		
5	La casa di Virgilio era bassa e larga		
6	Platone scrisse dei dialoghi filosofici		
7	A mio padre piacevano i romanzi gialli		
8	La disfatta di Caporetto fu cruenta		
9	E' il mio flauto che ho perso sul treno		
10	La sua foto del presidente è ovunque		
11	Elena ha finito di soffrire per lui		
12	Il concerto è a scopo di beneficenza		
13	I migliori sono i giocatori stranieri		
14	Lo sport mantiene il fisico sano		
15	Gianni ha scritto più che letto		

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Tense, Aspect and Temporal Homogeneity

By considering the distribution of aspectual meanings and durative temporal adverbials across different verb forms, we discover that temporal homogeneity plays a fundamental role in tense selection in Romance languages. This volume discusses the meaning of temporal verb forms in Romance languages and it proposes a compositional, model-theoretic semantics of tense, aspect and durative temporal adverbials where temporal homogeneity is a key factor for the temporal interpretation of a sentence. In order to bring additional evidence to the temporal homogeneity account, the volume presents results from an empirical study with Italian.

