Aspectual (re-)interpretation: Structural representation and processing

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1. Introduction

In this paper[1] I will address some questions arising from current investigations on the aspectual interpretation of utterances and, in particular, the aspectual reinterpretation involved in it. In order to illustrate the issue let me consider some assumptions and observations made in this field of semantic analysis. A general assumption that seems to be accepted by most researchers is Thesis 1.

> Thesis 1
> The computation of situation aspect[2] of an utterance, i.e. whether it refers to a dynamic or stative, a telic or an atelic, a durative or a punctual situation, etc. or, more specifically, to a state, a process, an event, a moment, a culmination or a situation of another kind is determined by a multiplicity of linguistic and contextual factors associated with the respective utterance.

In addition, to explain the aspectual properties of the result of verbal complementation Verkuyl (1972), Dowty (1979), and Krifka (1989, 1992) besides others have presented ideas that can be summarized as follows:

> Thesis 2
> Aspectual interpretations of the verb-complement complex of utterances can be essentially reduced to a combination of verbal aspect features with features contributed by nominal objects.

The assumption is particularly based on the observation that in languages like English or German for many verbs the situation type of the respective VP is determined dependently on whether the object NP has specific or unspecific cardinality. For example, in (1a), the combination of the verb *eat* with the bare plural NP *apples* can give rise to an interpretation in which the sentence refers to a process, i.e. a situation being durative and atelic. By contrast, in (1b), its combination with the singular NP *an apple* supports an event reading and, thus, an interpretation of the sentence such that it refers to a durative and telic situation.

(1)	a.	*Bill ate apples.*	unspecific	⇨ untelic:	process
	b.	*Bill ate apples.*	specific	⇨ telic:	event

A third assumption results from the observation that adverbial adjuncts can be combined with verbal heads, with which, in a strict sense, they are not compatible aspectually. The fact that often such sentences are nevertheless interpreted easily requires an explanation. For this purpose, Thesis 3 has been formulated by Moens and Steedman (1988).

> Thesis 3
> Aspectual interpretations of utterances can involve a reinterpretation that is triggered by mismatches in the aspectual specification of verbal heads and their adjuncts such as durative or time-span adverbials and is executed by coercion of situation type.

For illustrating, look at the sentences in (2). Because the durative adverbial *for ten minutes* is only applicable to predicates of states or processes the verb *jump* being originally a predicate of moments[3] is coerced into an iterative reading. As a result, sentence (2b) refers to a process constituted by an unspecific number of temporally connected moments of Jane's jumping.

(2)	a.	*Jane jumped.*	⇨ punctual:	moment
	b.	*Jane jumped for ten minutes.*	⇨ durative:	process

Another example is given by the sentences in (3). In (3b) the verbal head *won the race*, which is primarily a predicate of culminations[4] is coerced into an event reading by the time-span adverbial *in two hours*. In this manner, the sentence refers to an event that culminates in a situation of winning the race by Paul.

(3)	a.	*Paul won the race.*	⇨ punctual:	culmination
	b.	*Paul won the race <u>in two hours</u>.*	⇨ durative:	event

A number of conclusions are drawn from the latter type of observations. At present, most researchers that deal with aspectual reinterpretation and, thus, situation-type coercion take the following view:

> Conclusion 1
> Since aspectual coercion is basically a device to make expressions semantically compatible, a lot of specific operators have to be assumed for performing the required transformations of semantic representation.

In particular, in Pustejovsky (1991, 1995) and de Swart (1998) several mechanisms of aspectual coercion have been proposed to be associated with it. Going a step further, a conclusion that involves a fundamental change in methodology of semantic analysis is drawn by Jackendoff (1997).

> Conclusion 2
> As aspectual coercion can be considered a repair mechanism that introduces additional pieces of concrete content into semantic representations it supplies an argument against 'syntactically transparent semantic composition'.

Consequently, Jackendoff argues that we have no reason to further maintain the principle of strict semantic compositionality in its generality. Instead, it should be viewed as valid by default only and, therefore, substituted by a weaker assumption – the principle of 'en-

riched semantic composition'. According to Piñango, Zurif and Jackendoff (1999) and Piñango (this volume) there are also psycholinguistic findings of reaction-time effects that support such a conclusion. Essentially, their claim is that evidence of increased processing cost observed in cases of aspectual incompatibility between verbal heads and their adjuncts can be regarded as proving the existence of enriched semantic composition.

In my paper, I will examine the validity of these assumptions and observations. More specifically, I want to explore three problems:

- To what extent are Theses 2 and 3 correct?
- Can Conclusions 1 and 2 be drawn indeed?
- Must the psycholinguistic data be interpreted in the way sketched above?

The remainder of the paper is organized as follows. First, I give a preliminary structural analysis of cases of aspectual reinterpretation with adverbial adjunction and verbal complementation. Second, I present a framework within which aspectual (re-)interpretations turn out to be particular instances of a contextual enrichment of the semantic representations derived compositionally in a strict sense. Third, I discuss some data from reaction-time experiments and their implications for the understanding of aspectual (re-)interpretation.

2. Preliminary analysis of aspectual reinterpretation

2.1. Reinterpretation in adverbial adjunction

Let me begin with an analysis of sentence (4) where an achievement is combined with the durative adverbial *for weeks*.[5]

(4) *John broke a cup for weeks.*

Strictly speaking, the adverbial does not match with the verb-argument complex *break a cup* if the latter is used in its original meaning, i.e. the denotation of a property of culminations. Thus, we have to look for a suitable reinterpretation of this expression. Possibly, some recipients of the sentence believe that an imperfective

reading of (4) is the most adequate one. Under this assumption, it is viewed as referring to an unfinished process of breaking a cup by John. However, the problem is that such an interpretation of (4) is not compatible with the principles of conceptual ontology because stretching an atomic situation is conceptually impossible.

Rather, a possible solution of the problem seems to be to give the sentence in (4) an iterative reading. Then, it refers also to a process, however, now to a process of breaking successively a number of cups by John for weeks. More specifically, we could suppose that, in its iterative reading, sentence (4) has a meaning represented in (4'a) where p, c and o are variables of processes, culminations and objects, respectively, and AG, PAT and CONST are predicates denoting the relation 'the agent of', 'the patient of' and 'a constituent of', respectively:

(4') a. $\exists p\,[AG(john, p)\ \&\ \forall c\,[CONST(c, p) \rightarrow \exists o\,[CUP(o)\ \&\ BREAK(c)\ \&\ PAT(o, c)]]\ \&\ FOR\_WEEKS(p)]$

Such a reading could be based on a reinterpretation that is performed by a particular coercion operation on the original meaning of the verbal head. As shown in (4'b), an operator indicated by shift 1 is applied to the meaning of break a cup. In this manner, the predicate of culminations is shifted to a predicate of processes.

(4') b. *break a cup*: $\lambda c.\ \exists o\,[CUP(o)\ \&\ BREAK(c)\ \&\ PAT(o, c)]$

culmination

⇓ ***shift 1***: $\lambda P \lambda p.\ \forall c\,[CONST(c, p) \rightarrow P(c)]$

process

break a cup: $\lambda p.\ \forall c\,[CONST(c, p) \rightarrow \exists o\,[CUP(o)\ \&\ BREAK(c)\ \&\ PAT(o, c)]]$

What we have to presuppose then in conceptual ontology is that processes can be constituted by an unspecific number of temporally connected culminations of the same kind.[6] However, in the case of

an iterative reading of (4) we have a problem as well. Obviously, such an interpretation does not match our experience because no person can break cups for weeks without pause.

By contrast, it seems to be obvious that a habitual reading of (4) is empirically appropriate and, therefore, to be favored. Under this assumption, the sentence refers to a state of John which is realized by breaking a cup by John from time to time. Then, its meaning can be represented by (4''a) where s is a variable of states, and HOLD and REAL are predicates denoting the relation 'the holder of' and 'a realization of', respectively:

(4'') a. $\exists s\,[\mathrm{HOLD}(\mathrm{john}, s)\ \&\ \forall c\,[\mathrm{REAL}(c, s) \rightarrow \exists o\,[\mathrm{CUP}(o)\ \&\ \mathrm{BREAK}(c)\ \&\ \mathrm{PAT}(o, c)]]\ \&\ \mathrm{FOR\_WEEKS}(s)]$

As a precondition, *break a cup* has to be shifted by type coercion to a predicate of states.

(4'') b. *break a cup*: $\lambda c.\ \exists o\,[\mathrm{CUP}(o)\ \&\ \mathrm{BREAK}(c)\ \&\ \mathrm{PAT}(o, c)]$

culmination

⇓ ***shift 2***: $\lambda P \lambda s.\ \forall c\,[\mathrm{REAL}(c, s) \rightarrow P(c)]$

state

break a cup: $\lambda s.\ \forall c\,[\mathrm{REAL}(c, s) \rightarrow \exists o\,[\mathrm{CUP}(o)\ \&\ \mathrm{BREAK}(c)\ \&\ \mathrm{PAT}(o, c)]]$

Accordingly, in the conceptual ontology we have to make the assumption that habitual states can be realized by an unspecific number of temporally non-connected culminations of the same kind.

Till now, I have only considered coercions resulting from an immediate aspectual conflict between verbal head and adverbial adjunct. Contrary to Thesis 3, however, there are also aspectual reinterpretations which are triggered by global factors. For illustrating, look at sentence (5).

(5) *Sue smoked for years.*

On the one hand, in (5), no mismatch of the aspectual properties of *smoke* and *for years* can be observed. On the other hand, it is obvious that the literal reading of (5) is, similar to (4'a), in contrast to experience because no person can smoke for years without a significant break. Therefore, against the background of our world knowledge, we have to perform a reinterpretation of the verb *smoke*. As a result, (5) receives a habitual reading in which Sue is the holder of a state that is realized by temporally non-connected processes of smoking.

(5') $\exists s$ [HOLD(sue, s) & $\forall p$ [REAL(p, s) $\rightarrow$ SMOKE(p)] & FOR_YEARS(s)]

In addition, there are also facts that force us to modify Thesis 2. To address these, let me turn to cases of aspectual interpretation of the verb-argument complex.

2.2. Aspectual reinterpretation in verbal complementation

Consider first sentence (6).

(6) *Mary broke five cups.*

Because *five cups* is an NP with a specific cardinality, the sentence refers to a telic situation. Sentence (6), however, can have a collective as well as a distributive reading. In its collective reading, it refers to a culmination and can be paraphrased as 'Mary broke five cups at once.' In this case, the meaning of (6) seems to emerge from a simple combination of the meanings of the verb and its object argument. It is represented in (6'a).[7]

(6') a $\exists c$ [AG(mary, c) & $\exists o$ [5_*CUP(o) & BREAK(c) & PAT(o, c)]]

Consider now the distributive reading of (6) where it can be understood as 'Mary broke successively five cups' and, thus, refers to an event. Obviously, sentence (6) can only receive a distributive reading if its interpretation involves also an aspectual reinterpretation of *break*.

(6'') a $\exists e\,[AG(mary, e)\ \&\ \exists o\,[5\_{*}CUP(o)\ \&\ \forall o'\,[^{AT}{<}\,(o', o) \rightarrow \exists c\,[CONST(c, e)\ \&\ BREAK(c)\ \&\ PAT(o', c)]]]]$

As is shown in (6''b), a particular coercion operation has to be performed in order to give the verbal expression a meaning on which the distributive reading of (6) is based.

(6'') b.

break: culmination	$\lambda o \lambda c.\ BREAK(c)\ \&\ PAT(o, c)$
⇓	***shift 3***: $\lambda R \lambda o \lambda e.\ \forall o'\,[^{AT}{<}\,(o', o) \rightarrow \exists c\,[CONST(c, e)\ \&\ R(o', c)]]$
event	
break:	$\lambda o \lambda e.\ \forall o'\,[^{AT}{<}\,(o', o) \rightarrow \exists c\,[CONST(c, e)\ \&\ BREAK(c)\ \&\ PAT(o', c)]]$

The distributive reading of a sentence does not only occur if the aspectual interpretation of a verb-argument complex is more than a simple combination of meaning units. To consider another instance of reinterpretation in verbal complementation look at sentence (7).

(7) *John broke cups.*

Since *break* is combined with a bare plural NP, the sentence refers to an atelic situation. In addition, we have to observe that (7) can have at least two readings. On the one hand, if the sentence is complemented by a durative adverbial like *for ten minutes* we can assume that it has an iterative reading and, therefore, refers to a process. On the other hand, if (7) is complemented by a durative adverbial like *for weeks* we can assume that it has a habitual reading and, therefore,

refers to a state. Notice, however, that in both cases *break* has to be reinterpreted.

Let us have a closer look at the habitual reading of (7):

(8) *John broke cups for weeks.*

It is obvious that against the background of our experience the sentence receives a habitual reading. Given this, (8) has a meaning that is represented by (8'a).

(8') a. $\exists s$ [HOLD(john, s) & $\exists o$ [*CUP(o) & $\forall o'$ [$^{AT}<$ (o', o) $\rightarrow$ $\exists c$ [REAL(c, s) & BREAK(c) & PAT(o', c)]]] & FOR_WEEKS(s)]

To achieve the habitual reading of (8), the combination of the verb and the bare plural NP has to involve a reinterpretation of *break*. More specifically, its meaning has to be shifted by means of a coercion operator given in (8'b).

(8') b.

break: culmination	$\lambda o \lambda c$. BREAK(c) & PAT(o, c)
⇓	***shift 4***: $\lambda R \lambda o \lambda s$. $\forall o'$ [$^{AT}<$ (o', o) $\rightarrow$ $\exists c$ [REAL(c, s) & R(o', c)]]
state	
break:	$\lambda o \lambda s$. $\forall o'$ [$^{AT}<$ (o', o) $\rightarrow$ $\exists c$ [REAL(c, s) & BREAK(c) & PAT(o', c)]]

2.3. Essential results

To summarize the results achieved so far, I have demonstrated that, first, Thesis 2 has to be modified:

> Also aspectual interpretations of verb-argument complexes can involve reinterpretations and, thus, coercions.

Second, Thesis 3 has to be modified, too:

> Not every aspectual reinterpretation emerges from an immediate conflict between aspectual features of expressions combined.

3. Aspectual Reinterpretation as Contextual Enrichment

3.1 A new framework for understanding reinterpretation

In former papers,[8] I developed an approach which is called *multi-level model of interpretation* and can be considered a response to the difficulties observed before. Because of space limitations I cannot go into to much detail here, thus I shall restrict myself to the major aspects of the framework. The **basic principle** of my proposal can be characterized as follows:

> The interpretation of an utterance has to be generally regarded as a computational process that is divided into two stages:
> (i) compositional derivation of a conceptually underspecified semantic representation;
> (ii) contextual specification of this representation by pragmatic inferences making use of conceptual world knowledge.

With respect to the issue discussed here, the model follows a strategy where aspectual (re-)interpretation can be explained as a particular contextual fixation of parameters introduced by the obligatory structural enrichment in compositional derivation. For making such structural enrichments, two general operators of *SF inflection* are available. The first of them, ***met***, is an operator that is obligatorily

applied to each one-place predicate of first order and has structural similarity to ***shift 1*** and ***shift 2***, used above.

(9) ***met***: $\lambda P \lambda x.\ Q_n y\ [S_n\ (y, x)\ \ C_n\ P(y)]$,
where
Q_n is a parameter that can be fixed by $\exists$ or $\forall$,
S_n is a parameter that can be fixed by the predicate = or predicates of ontological relations like $^{AT}<$, REAL or CONST and
C_n is a parameter that can be fixed by & or $\rightarrow$.

The second one, ***var***, is an operator that is obligatorily applied to each two-place predicate of first order and has structural similarity to ***shift 3*** and ***shift 4***.

(10) ***var***: $\lambda R \lambda y \lambda x.\ Q_n^1 y'\ [S_n^1(y', y)\ \ C_n^1\ Q_n^2 x'\ [S_n^2(x', x)\ \ C_n^2\ \ R(y', x')]]$,
where
Q_n^1, Q_n^2, S_n^1, S_n^2, C_n^1 and C_n^2 are parameters in analogy to Q_n, S_n and C_n, respectively.

On this foundation, the following assumptions are made:

Assumption 1
At least three levels of meaning representation in the course of interpretation of an utterance *u* can be distinguished:

- The *propositional content* PC(*u*) represents the context-independent meaning of *u* and contains particular SF parameters. By fixing the parameters the meaning of *u* is contextually specified.
- The *conceptual content* CC(*u*) represents the fully specified meaning of *u* and emerges from interpreting SF(*u*) against general and situational world knowledge.
- The *parameter-fixed structure* PFS(*u*) is an intermediate result of the derivation of PC(*u*) and differs from SF(*u*) in so far that its SF parameters are substituted by specific

conceptual units.

Assumption 2
Two types of semantic form SF of an expression α can be distinguished

- The *basic semantic form* $SF_B(\alpha)$ is the SF directly connected to α.
- The *inflected semantic form* $SF_I(\alpha)$ results from $SF_B(\alpha)$ by introducing additional SF parameters by means of SF inflection obligatorily performed on expressions of the semantic type of α.

The intention now is to demonstrate how in my approach aspectual (re-)interpretations can be explained in accordance with the strict principle of semantic compositionality.

3.2. Reanalysis of some examples

For this purpose, look again at sentence (4) repeated here as (11).

(11) *John broke a cup for weeks.*

At first, in (11'a) where θ is a parameter for thematic relations like AG, HOLD, etc., I show what semantic form SF is derived for (11).

(11') a. SF(11):
$\exists$x [θ(john, x) &
Q_1y [S_1(y, x) C_1 (by ***met***)
$\exists$z [CUP(z) &
Q_1^1z' [S_1^1(z', z) C_1^1 Q_1^2y' [S_1^2(y', y) C_1^2 (by ***var***)
BREAK(y') & PAT(z', y')]]]] & FOR_WEEKS(x)]

In addition, in (11'b) and (11'c), relevant parts of the compositional derivation of SF(11) are given. In particular, you can observe what role the operators of SF inflection have to play.

(11') b. SF_B(*break*): $\lambda y \lambda x$. BREAK(x) & PAT(y, x)

⇓ ***var***: $\lambda R \lambda z \lambda y$. Q_1^1 z' [S_1^1(z', z) C_1^1 Q_1^2y' [S_1^2(y', y) C_1^2 R(z', y')]]

SF_I(*break*): $\lambda z \lambda y$. Q_1^1 z' [S_1^1(z', z) C_1^1 Q_1^2y' [S_1^2(y', y) C_1^2 BREAK(y') & PAT(z', y')]]

c. SF_B(*break a cup*): λy. $\exists$z [1_CUP(z) & Q_1^1 z' [S_1^1(z', z) C_1^1 Q_1^2y' [S_1^2(y', y) C_1^2 BREAK(y') & PAT(z', y')]]]

⇓ ***met***: $\lambda P \lambda x$. Q_1y [S_1(y, x) C_1 P(y)]

SF_I(*break a cup*): λx. Q_1y [S_1(y, x) C_1 $\exists$z [1_CUP(z) & Q_1^1 z' [S_1^1(z', z) C_1^1 Q_1^2y' [S_1^2(y', y) C_1^2 BREAK(y') & PAT(z', y')]]]]

Second, in (11''a) and (11''b), the parameter-fixed structures PFS representing the iterative and the habitual reading, respectively, are given. Notice that both structures are derived by contextual specification of SF(11) against conceptual world knowledge. More specifically, (11''a) and (11''b) result from (11'a) by fixing SF parameters by concrete conceptual units.

(11'') a. PFS(11^{iter}): (= 4'a)

$\exists$p [AG(john, p) &
$\forall$c [CONST(c, p) $\rightarrow$
$\exists$o [CUP(o) &
...
BREAK(c) & PAT(o, c)]] & FOR_WEEKS(p)]

(11'') b. PFS(11^{habit}): (= 4''a)
∃s [HOLD(john, s) &
∀c [REAL(c, s) →
∃o [CUP(o) &
…
BREAK(c) & PAT(o, c)]] & FOR_WEEKS(s)]

Let me remind you of the fact that for empirical reasons the iterative reading of (11), i.e. PFS(11^{iter}) is not acceptable.

As a further example, I want to reanalyze sentence (8) repeated as (12).

(12) *John broke cups for weeks.*

(12') SF(12):
∃x [θ(john, x) &
Q_1y [S_1(y, x) C_1 (by ***met***)
∃z [*CUP(z) &
Q_1^1 z' [S_1^1(z', z) C_1^1 Q_1^2y' [S_1^2(y', y) C_1^2 (by ***var***)
BREAK(y') & PAT(z', y')]]]] & FOR_WEEKS(x)]

(12'') a. PFS(12^{iter}):
∃p [AG(john, p) &
…
∃o [*CUP(o) &
∀o' [$^{AT}<$ (o', o) → ∃c [CONST(c, p) &
BREAK(c) & PAT(o', c)]]]] & FOR_WEEKS(p)]

(12'') b. PFS(12^{habit}): (= 8'a)
∃s [HOLD(john, s) &
…
∃o [*CUP(o) &
∀o' [$^{AT}<$ (o', o) → ∃c [REAL(c, s) &
BREAK(c) & PAT(o, c)]]]] & FOR_WEEKS(s)]

Again the iterative reading of (12), i.e. PFS(12^{iter}) has to be ruled out because it is not compatible with our experience.

3.3 Essential results

To sum up my approach to the issue in question here, I have shown the following. Firstly, Conclusion 1 has to be refused:

- Aspectual reinterpretation cannot be simply identified with a concrete semantic operation to make expressions compatible.

Secondly, Conclusion 2 has to be refused, too:

- Aspectual reinterpretation gives no reason to question the general validity of the principle of 'syntactically transparent' semantic compositionality.

4. Processing correlates of aspectual reinterpretation

4.1 Some data from reaction-time experiments

Finally, against the background of the argumentation presented above, I want to discuss psycholinguistic data seemingly reflecting different degrees of processing cost to be associated with the structures in questions. In Todorova, Straub, Badecker and Frank (2000), the authors report, consistently with the findings by Piñango, Zurif

and Jackendoff (1999), experimental results, which suggest the following:

> Observation 1:
> Significant reaction-time effects indicating higher processing costs can be observed at or shortly after the moment of introducing a durative adverbial that is combined with a verb-argument complex related to single culminations.

To illustrate this consider the following example:

(13) *Although John broke a cup for weeks, Mary wasn't angry.*
↑
reaction time effect

In contrast, the authors come to the following conclusion (Observation 2) after having tested sentences like (14), which contain a plural noun instead.

> Observation 2:
> No significant reaction-time effects indicating higher processing costs can be observed at or shortly after introduction a bare plural object NP that is combined with a verb related to single culminations.

(14) *Although John broke cups for weeks, Mary wasn't angry.*
↑
no reaction time effect

From these findings, a serious problem arises. Given that in both types of combination an aspectual reinterpretation is performed, as I have argued above, what reasons for such different reaction-time effects are there?

4.2. Interpretation of the data

Regarding the proposal suggested by Todorova et al. (2000), I shall argue for the following: Firstly, I suggest that the results do not exclude a view where the combination of the verb and the bare plural object NP does involve a reinterpretation, albeit one without measurable processing effects. Secondly, contrary to the assumption made in Piñango, Zurif and Jackendoff (1999) and Piñango (this volume), it is uncertain whether the processing effects can be viewed as resulting from a specific coercion operation performed to resolve an aspectual conflict between the verbal head and its adjunct. Instead, an interpretation of the results is conceivable such that they have their origin elsewhere. More generally, in my view, the essential result can be formulated as follows: Psycholinguistic findings of reaction-time effects in cases of aspectual reinterpretation are compatible with a two-level model of interpretation, in which the principle of strict semantic compositionality is entirely maintained.

5. Summary

Let me summarize the main points of my paper.

Firstly, several assumptions and observations related to aspectual interpretation of utterances have been examined. It has been suggested that some of them must be modified or refused.

Secondly, not only aspectual interpretations of verb-adjunct but also of verb-argument complexes can call for a reinterpretation of material involved.

Thirdly, aspectual reinterpretations cannot be explained as simply emerging from an immediate aspectual conflict between expressions and as being performed by a specific semantic coercion operation.

Fourth, it has been argued for a multi-level model of interpretation where aspectual reinterpretations can be identified with particular contextual enrichments of underspecified semantic representations.

Finally, aspectual (re-)interpretation is an interesting candidate for psycholinguistic inquiry. For now, however, the results from ex-

periments do not allow to make a definite decision between competing theoretical approaches.

Notes

1. For comments and discussion, I would like to thank Markus Egg, Stefan Engelberg, Wilhelm Geuder, Ingolf Max, and Chris Piñón.
2. Cf. Smith (1991) where situation aspect ('Aktionsart') is separated from viewpoint aspect which is related to the question of looking at a situation from the 'inside', as imperfective or from the 'outside', as perfective. In the paper, I use expressions like *aspect* or *aspectual* only in the first sense.
3. In accordance with Moens and Steedman (1988), I consider moments situations which differ from processes in exposing a temporal extension which is negligible and, in this way, punctual or instantaneous.
4. Unlike moments, culminations are temporally atomic, i.e. punctual in a real sense. Such situations can be considered being telic insofar as they form the end of an event. For an understanding of culminations as a subkind of borders, i.e. situations bordering events, processes, or states cf. Piñón (1997).
5. In what follows, I restrict my considerations to cases of adjunction by durative adverbials. For a formal analysis of occurrences of aspectual reinterpretation triggered by time-span adverbials, manner adverbials or other kinds of adverbial see Dölling (2003).
6. Cf. Piñón (1996).
7. For the properties of the plural operator * see Link (1983) and Krifka (1989).
8. See Dölling (1997, 2001, 2003). Cf. also Egg (2000), Egg & Striegnitz (this volume), Maienborn (2000), Wiese (this volume).

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