

## Aspectual Coercion and Eventuality Structure\*

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### 1 Introduction

This paper is concerned with the reference of expressions to different sorts of eventuality<sup>1</sup> and its systematic shifting in interpretation. The point of departure is the fact that understanding an utterance often involves operations which adjust the aspect<sup>2</sup> of a verb or one of its projections to requirements of the context. Usually, such an adjustment is called *aspectual coercion*.

Often, aspectual coercion is required to prevent a mismatch between the aspect of a verbal expression and the aspectual constraint of its adverbial modifier. For illustrating, look at sentence (1).

- (1) #Fred played the sonata for one day.

Here # marks that (1) is acceptable not in its literal but only in a non-literal reading which arises from an impending aspectual conflict within the sentence. On the one hand, according to its usual meaning the verb phrase *play the sonata* denotes eventualities that are inherently bounded. On the other hand, the adverbial *for a day* indicates the duration of eventualities that do not have a natural end by themselves. Consequently, the VP does not satisfy the selection restriction of the durative adverbial and, hence, cannot be modified by it, unless the VP meaning undergoes a suitable adjustment by the adverbial meaning. The preferred possibility is that the modifier coerces *play the sonata* into an *iterative* interpretation, meaning now consecutively playing a particular sonata. As a result, the sentence is not understood as referring to a single playing of the sonata by Fred but to a sequence of eventualities of this kind, which has no inherent termination and lasts one day.

Another durative adverbial with which the VP *play the sonata* in its literal meaning is not compatible shows up in sentence (2).

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<sup>1</sup> The term *eventuality* introduced by Bach (1986) is understood here in the broadest sense, comprising events, processes, states, happenings, changes, episodes, etc.

<sup>2</sup> According to Smith (1991), we can distinguish between two kinds of aspect of expressions – *situation aspect* (traditionally called also *aktionsart*), which is related to the temporal constituency of the eventualities denoted by expressions, and *viewpoint aspect* (called also *grammatical aspect*), which is related to the temporal perspective from which the eventualities are presented by expressions. In the paper, I use the term *aspect* only in the first sense.

- (2) #Fred played the sonata for one minute.

For obvious reasons, an iterative interpretation is not appropriate here. According to our experiential knowledge, it is very implausible that any sonata can be completely played in such a short time. Therefore, the VP is coerced into a reading – I will call it *subtractive* interpretation – in which it denotes eventualities that are only part of playing a particular sonata. Accordingly, sentence (2) conveys that Fred was playing the sonata only for one minute and, therefore, without finishing it.

However, aspectual coercion needs not emerge from such a sentence-internal source. It may also be motivated by the aim to reconcile a sentence with world knowledge. For instance, in (3), the VP fulfills the selection restriction of the durative adverbial insofar as it literally denotes eventualities of playing a certain piano without an inherent termination.

- (3) #Fred played the piano for one year.

But the literal reading of the sentence is incompatible with our experiential knowledge about the physical abilities of human being and, therefore, odd. Due to the fact that nobody can play a piano for one year without pause *play the piano* is coerced into a *habitual* interpretation. Consequently, sentence (3) is taken as referring to Fred's one-year lasting practice or habit to play the piano at times.

Speaking generally, aspectual coercion is destined to avoid a conflict with linguistic or non-linguistic context by shifting the aspect and, thus, the meaning of a verbal expression. Importantly, the resulting meaning contains material over and above that which is immediately contributed by the expression by itself. For instance, in (1), the notion of iteration that is part of the understanding of *play the sonata* is not introduced via the original meaning of the VP but by means of enriching it with elements of world knowledge. Thus, unlike other operations on meaning, an adjustment of aspect is a syntactically and morphologically invisible operation, i.e. it does not have any counterpart in linguistic form.

At present, there are a number of proposals for explaining aspectual coercion. Moens and Steedman (1988) were the first to discuss the ubiquitous phenomenon as a topic of its own. In particular, they formulate a network of possible shiftings along with a characterization of the aspect of expressions involved. Further, Pulman (1997) offers a formal description that is based on Moens and Steedman's account and specifies it in many respects. Up to now, the most substantial contribution to the analysis of aspectual coercion, being part of a more general approach to contextual variation in meaning, is made by

Egg (2005). A great deal of actual research, however, suffers from several limitations or shortcomings. For example, Pustejovsky (1995), Jackendoff (1997), de Swart (1998) and Rothstein (2004) assume that aspectual coercion is always triggered by a mismatch between two expressions that have to be composed. Thus, the treatments are too restrictive since they preclude sentence-external sources of adjustment. Further, the authors claim that the aspectual conflict gives rise to insert a particular semantic operator which immediately resolves it, i.e. aspectual coercion is basically considered a semantic operation. Moreover, due to the insertion of additional material of meaning, some researchers explicitly draw the conclusion that the enrichments force to restrict or even to cancel the principle of semantic compositionality. For instance, according to Jackendoff (1997), syntactically transparent combination of meaning should be viewed merely as a default in a wider range of so-called enriched semantic composition.<sup>3</sup>

In Dölling (2003a, 2003b, 2005a), I argue for an approach which is basically in accordance with the strategy adopted by Pulman (1997) and Egg (2005). Most notably, supposing that linguistically determined meaning is strongly underspecified, adjustments of aspect are regarded as context-driven enrichments which are carried out in the course of interpretation and have no impact on semantic compositionality. But, with respect to the concrete content of coercion, my account differs from the proposals of the authors. More precisely, it is distinguished by two characteristics: First, the multitude of possible aspectual coercions that appear to be partly quite diverse emerge as instances of the same kind of formal structure. Second, their systematicity is predicated on relations that exist between the sorts of eventualities which are associated with the situation described by the respective sentence.

It is evident that the structure of eventualities underlying verbal meaning plays an essential role in determining the aspect of expressions and the way in which it can be contextually shifted. Properties of eventualities such as duration or dynamicity permit to classify the eventualities and, thus, the expressions denoting them. Moreover, general relations between eventualities indicate what kind of meaning arises if the aspect of an expression is coerced. Unfortunately, however, there are still many desiderata in analyzing eventuality structure in general and in its role as basis of aspectual coercion in particular. For this reason, leading questions of my paper are what the overall structure of eventualities is and how this structure is reflected in the meaning of verbal expressions.

The remaining paper is organized as follows: Chapter 2 gives some insights into the structure of eventualities and the way aspectual classification is based

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<sup>3</sup> For a detailed review and evaluation of the proposals made by Moens and Steedman, Pustejovsky, Pulman as well as de Swart see Egg (2005). Cf. also Dölling (2003a).

on it. In particular, two types of eventuality structure – sortal and intersortal structure – are distinguished. Taking the ontological distinctions expressed in natural language seriously, I advocate a classification of eventualities which is richer than commonly assumed and formulate a number of postulates linking them. Chapter 3 examines a sample of data and, at first, delivers a preliminary analysis of aspectual coercion. As a result, a multitude of operations are identified, which allow to shift the aspect and, with it, the meaning of expressions in order to meet the requirements of context. In view of the fact that the operations are similar in a way and, thus, give reason to generalization, then I present a two-stage approach that explains aspectual coercion by systematically integrating underspecified semantic structure of expressions with knowledge of eventuality structure and, thus, demonstrates it to be ultimately a pragmatic phenomenon.

## 2 A Survey of Eventuality Structure

### 2.1 Aspectuality and eventuality structure

Investigation into eventuality structure occupies an increasing realm of semantic research. One of the prominent phenomena that advance this development is aspectuality. According to Vendler (1957), aspectual classification characterizes verbs and their projections by tests that check the compatibility of the expressions with specific linguistic environments. Some of the most important properties of the four aspects – called *accomplishments*, *achievements*, *activities* and *statives*<sup>4</sup> – which verbal expressions are standardly divided into can be summarized as follows.

First, accomplishments like *write a poem*, *compose the sonata*, *run to the summit* or *drink a glass of beer* are compatible with time-span adverbials and the progressive in their literal meaning but with durative or time-point adverbials only on condition of non-literal interpretation.

- (4) (a) Rob wrote a poem in three hours.  
 (b) Rob was composing the sonata.  
 (c) #Rob run to the summit for thirty minutes.  
 (d) #Rob drunk a glass of beer at seven o'clock sharp.

Second, achievements like *win*, *arrive*, *die* or *reach the summit* are compatible with time-point adverbials in their literal meaning but with time-span

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<sup>4</sup> In order to draw a clear terminological distinction between the ontological and the linguistic point of view, I do not use *state* but *stative* for denoting the respective aspect.

adverbials, the progressive or durative adverbials only on condition of non-literal interpretation.

- (5) (a) #Ann arrived in three hours.
- (b) #Ann was reaching the summit.
- (c) #Ann won for thirty minutes.
- (d) Ann died at seven o'clock sharp.

Third, activities like *run*, *play the piano*, *write poems* or *drink beer* are compatible with the progressive and durative adverbials in their literal meaning but with time-span or time-point adverbials only on condition of non-literal interpretation.

- (6) (a) #Bob played the piano in three hours.
- (b) Bob was writing poems.
- (c) Bob drunk beer for thirty minutes.
- (d) #Bob run at seven o'clock sharp.

Fourth, stative verbs like *own*, *be silly*, *be drunk* or *be at the summit* are compatible with durative or time-point adverbials in their literal meaning but with time-span adverbials or the progressive only on condition of non-literal interpretation.

- (7) (a) #Sue owned the car in three hours.
- (b) #Sue was being silly.
- (c) Sue was at the summit for thirty minutes.
- (d) Sue was drunk at seven o'clock sharp.

There are several questions which the linguistic tests raise. In particular, more detailed investigation indicates that Vendler's classification is not fine-grained enough to cover all aspectual differences between verbal predicates. For this reason, researchers have continuously aimed at an improvement of this kind of differentiation as well as an clarification of the factors underlying it. Importantly, Dowty (1979) tried to capture aspectual distinctions by means of lexical decomposition within the framework of classical Montague semantics. But as Moens and Steedman (1988), Pustejovsky (1991), Krifka (1992), Egg (1995), Piñón (1995), Pulman (1997), Engelberg (2004) and others have demonstrated, the proposal is not satisfactory for giving a conclusive foundation to aspectuality in all. Most notably, Dowty does not really enter into an ontological commitment to eventualities and their structure.

Only after the introduction of the eventuality-based semantics in the eighties of the last century, initiated in particular by Parsons (1990) and originating from Davidson's (1967) idea to provide verbs with an event argument position, eventualities were acknowledged as entities in their own right and as revealing a structure of their own (cf. Maienborn 2010). In the meantime, researchers have developed various linguistically motivated accounts of the ontology<sup>5</sup> of eventualities, i.e. of what fundamental properties eventualities have, what basic sorts of them are there, and how these sorts are related to each other. Accordingly, at least three kinds of structure determining the domain of eventualities can be distinguished: the *mereological*, the *sortal*, and the *intersortal* structure. Each of them makes a contribution to the whole called *eventuality structure*.

Probably, the most influential consideration to the issue is to suppose that eventualities are internally structured in the sense that they have subeventualities, i.e. other eventualities as their parts. Following Link's (1983) crucial innovation to assume a specific mereological (or algebraic) structure on the domain of objects, Bach (1986) and, especially, Krifka (1992, 1998) have extended the approach to the domain of eventualities. For lack of space, however, I cannot go into this structure here. Rather, I will confine myself to outline the basic ideas of sortal and intersortal structure of eventualities and to mention some of the constraints that need to be imposed.

## 2.2 Sortal structure of eventualities

The sortal structure of eventualities is a hierarchy generated by the subsort relation between sets of eventualities. How many sorts of eventuality should be exactly distinguished is a matter of ongoing debate. However, all authors who try to improve aspectual classification by relating it to an ontological fundament separate eventualities into at least two subsorts: *events* in a broad sense – I will adopt the term *occurrence* for them – , which display dynamicity, and *states*, which do not. What both sorts of eventuality have in common, however, is that their members take a time longer than an instant.

While the former are generally taken to be particular spatio-temporal entities with participants, opinions differ over the precise ontological status of the latter. A point at issue is whether states should be actually treated as fully-fledged particulars or not.<sup>6</sup> Regardless of such differences, all researchers

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<sup>5</sup> It should be noted that the ontology interested in here results from projecting our common conceptual framework onto environmental input. Thus, by their nature the respective analyses are not primarily concerned with the way the world 'really' is but rather with the way human beings conceptualize it for the purpose of ordinary thinking and speaking.

<sup>6</sup> For a discussion of some problems and a specific proposal to solve them, see Maienborn (2005) and Dölling (2005b).

agree that sentences describing states have the strict subinterval property (cf. e.g. Dowty 1979). That is, if a state description is true of a time interval, it is also true of all parts of the interval. Thus, an ontological assumption suggesting itself is that states hold at every instant during their time period. This property singles out states from all other eventualities. Moreover, it explains why sentences like (7d) are acceptable without restriction.

Most authors (see e.g. Mourelatos 1978, Bach 1986, Parsons 1990, Pustejovsky 1991, Piñón 1995, Pulman 1997, de Swart 1998, Rothstein 2004) divide occurrences, i.e. dynamic eventualities into two further sorts – *processes* and *events* (in the narrow sense). The division is seen in correlation with the aspectual separation of activities and accomplishments.

Intuitively, events are *telic* occurrences, i.e. movements towards a set terminal point – their *culmination*. For instance, in (8), it is not simply the case that the event referred to, i.e. the drinking of a glass of beer is finished.

- (8) John drank a glass of beer.

Instead, its inherent goal has been attained by consuming the whole glass of beer. By contrast, processes are *atelic* occurrences, i.e. such that do not determine an inherent termination of their moving but simply stop at some arbitrary temporal point. For instance, the process referred to by (9) is also brought to an end.

- (9) John drank beer.

But the course of drinking might well have continued, i.e. John might have drunk more and more beer.

The difference between the two sorts is the reason why, on the one hand, event predicates are compatible without difficulty with time-span adverbials (cf. (4a)), but normally not with durative adverbials (cf. (4c)) and, on the other hand, process predicates, in analogy to state predicates (cf. (7c) vs. (7a)), are compatible without difficulty with durative adverbials (cf. (6c)), but normally not with time-span adverbials (cf. (6a)).

There is an ongoing discussion on the question of whether an ontological distinction between events and processes is necessary or, more importantly, even admissible. As one and the same situation of drinking a glass of beer can be described as falling both in the extension of the VP *drink a glass of beer* and in that of the VP *drink beer*, Krifka (1992, 1998) argues that the differentiation in question is not a matter of ontology but only one of description. Therefore, the telic/atelic distinction should not be applied to

eventualities but to eventuality predicates. In the end, Krifka suggests that telicity and atelicity can be reconstructed in terms of mereology alone.

For my point of view, to say that mereological properties represent important features of verbal expressions is one thing; to say that they make it dispensable to separate events and processes is quite another.<sup>7</sup> By contrast, like Piñón (1995), I assume that a situation such as drinking a glass of beer can be conceptualized as two distinct eventualities, namely as one falling in the denotation of the event predicate *drink a glass of beer* and one falling in the denotation of the process predicate *drink beer*. As I will specify in the next section, if processes are viewed as being the ‘stuff’ events are made of, then the distinction between the two subsorts of occurrences is very natural.

Commonly (v.a. Dowty 1979, also e.g. Moens and Steedman 1988, Pustejovsky 1991, Piñón 1995, but not Vendler 1957), events are identified with changes of state, i.e. eventualities arising from a state and resulting in an opposite one. As noted by Egg (1995), however, a closer inspection shows that this assumption is not correct. Of course, VPs like *drink a glass of beer*, *run to the summit*, *write a poem* or *compose a sonata* are predicates of events that deserve to be called *changes*. So the event referred to by sentence (10) is a transition from a state of Sam’s not being at the summit to a state of his being at the summit and, thus, a change.

(10) Sam ran to the summit.

VPs like *run a mile*, *recite a poem* or *play a sonata*, being usually counted among accomplishments too, denote also properties of events. But, in moving to an inherent goal, the respective events do not involve any alternation of state and, therefore, do not bring about a new state.<sup>8</sup> For instance, no state has been replaced by its opposite state by running a mile by Sam.

(11) Sam ran a mile.

Accordingly, sentence (11) does not refer to a change, but still to an event. I will dub events that are no changes *episodes*.

As two subsorts of event – changes and episodes – have to be distinguished, the question arises whether the term *accomplishment* should be still used in the broad sense. Egg (1995, 2005) observes that the ontological difference is reflected in an aspectual one. While a VP like *run to the summit* is compatible

<sup>7</sup> Interestingly, although Filip (1999) and Rothstein (2004, 2008) basically adopt Krifka’s attitude towards the telic/atelic distinction, they distinguish also between events and processes.

<sup>8</sup> Here I understand the term *state* in the sense of what Parsons (1990) calls *target state*. It is important not to identify this kind of state with states which Parsons calls *resultant states*.



with the perfect in its literal meaning, an expression like *run a mile* is it only on condition of non-literal interpretation.

- (12) (a) Sam has run to the summit.  
(b) #Sam has run a mile.

Hence, it seems to be reasonable to restrict the class of accomplishments to predicates denoting properties of change. Following a proposal by Egg (1995), verbal expressions denoting properties of episodes can be called *intergressives*.

Another sort accepted by many authors is that of eventualities which occur in the denotations of achievements like *win* or *reach the summit*. Mostly, such eventualities are regarded as being telic and, at the same time, instantaneous (see e.g. Mourelatos 1978, Bach 1986, Pustejovsky 1991, Pulman 1997, de Swart 1998, Rothstein 2004, Egg 2005). In particular, a typical assumption is that they constitute a subsort of events, namely immediate changes of state. As a consequence, they are often considered to coincide with culminations (see e.g. Moens & Steedman 1988, Kamp & Reyle 1993). However, because events always require a time longer than an instant to move to their inherent goal the account cannot be adequate.<sup>9</sup>

Instead of that, I argue for a specific sort of eventualities that have no internal temporal structure. Thus, although located in time, they do not take any time, i.e. they are strictly instantaneous. Obviously, such eventualities must be separated from states as well as occurrences, which essentially have a duration. Following a proposal by Piñón (1997), I will call the former *boundaries* and the latter *happenings*. In the next section, the relation between the two sorts of eventuality will be characterized a little bit more.

It appears that most of Vendler's achievements denote properties of boundaries. So the sentence in (13) refers to the end point and, hence, a boundary of Sam's moving to a certain summit.

- (13) Sam reached the summit.

Accordingly, the VP *reach the summit* is a predicate applicable to this kind of boundary. In analogy, an expression like *leave the summit*, which occurs in (14), can be used to refer to the initial point of a moving away from a summit.

- (14) Sam left the summit.

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<sup>9</sup> In particular, I doubt that Rothstein (2004, 2008) is right in assuming that the eventualities in the denotation of achievements, being temporally not extended, consist of two temporally adjacent instants.

Thus, the VP denotes also a particular property of boundaries.<sup>10</sup> The feature of punctuality displayed by boundaries is responsible for, on the one hand, the problem-free compatibility of achievements with time-point adverbials (cf. (5d)) and, on the other hand, the merely restricted compatibility with time-span and durative adverbials as well as the progressive, as indicated by sentences (5a) – (5c).

Following Vendler (1957), in the past verbs like *sneeze*, *flash*, *cough*, *kick* or *jump* were often classified as achievements, too. But now, the assumption is common that they constitute a separate aspectual class – called *semelfactives* (cf. Smith 1991). At a first glance, semelfactives seem to have the same aspectual properties as achievements.

- (15) (a) #Mary sneezed in three hours.  
 (b) #Mary was coughing.  
 (c) #Mary jumped for thirty minutes.  
 (d) Mary kicked at seven o'clock sharp.

Later I will show that the two classes are different in regard to the aspect shifts they allow for.

Importantly, I assume that the denotations of semelfactives are made up by eventualities called *moments*. As they are premised to be durationless, moments constitute together with boundaries a sort of eventualities for which I will adopt the term *point*. Unlike boundaries, however, they are not intrinsically instantaneous but only conceptualized as being instantaneous for the purpose of ordinary thinking.<sup>11</sup> More precisely, moments can be traced back to eventualities which have an internal structure and, thereby, take time. For instance, for an actual sneezing to occur, several things have to happen at different instants. By their nature, the underlying eventualities are dynamic and even telic but do not involve alternations of state, i.e. they are particular episodes. Since under normal condition the temporal extension of such eventualities is more or less short and, therefore, marginal in comparison with that of most other everyday things, their duration remains out of consideration.

Finally, there are also some proposals to split up states into sorts. For instance, Moens & Steedman (1988) draw a distinction between consequent,

<sup>10</sup> Since achievements differ in that they are related to end or initial points, it is considerable to discriminate between two sorts of boundary – *right boundaries* and *left boundaries*. Moreover, in accordance with this idea of Piñón (1997), Heyde-Zybatow (2008) offers an analysis which makes an explicit distinction between *right boundary* and *left boundary achievements*.

<sup>11</sup> Moens and Steedman (1988) were the first noting the specific of this kind of eventuality. Cf. also Rothstein (2008).

progressive, lexical and habitual states. Here, I suggest a provisional division in two sorts: *episodic states*, which are autonomous or self-supporting in a way, and *habitual states*, which, roughly, represent a habit, disposition or ability ‘to do something’ and, in this sense, are nonautonomous.

For illustrating, look at the sentences in (16).

- (16) (a) John was drunk.  
(b) John used to drink.  
(c) John was a drinker.

While (16a) refers to an episodic state of John’s being drunk, (16b) and (16c) refer to the habitual state of John’s drinking alcohol regularly. Accordingly, I assume that the denotation of verbal expressions like *be drunk* is made up of members of the first sort and the denotation of expressions like *use to drink* or *be a drinker* is constituted by such of the second one. More linguistic data supporting the separation of habitual from episodic states will be presented later on.

To sum up, it seems appropriate to allow for a sortal structure of eventualities which is richer than commonly supposed. Particularly, further differentiations need to be made for characterizing properties of verbal predicates, which go beyond the traditional aspectual classification.

In figure 1, I illustrate the ontological taxonomy argued for in this section along with the most important features of some sorts of eventuality as well as a number of examples of verbal expressions that are predicable of eventualities of the respective sort.

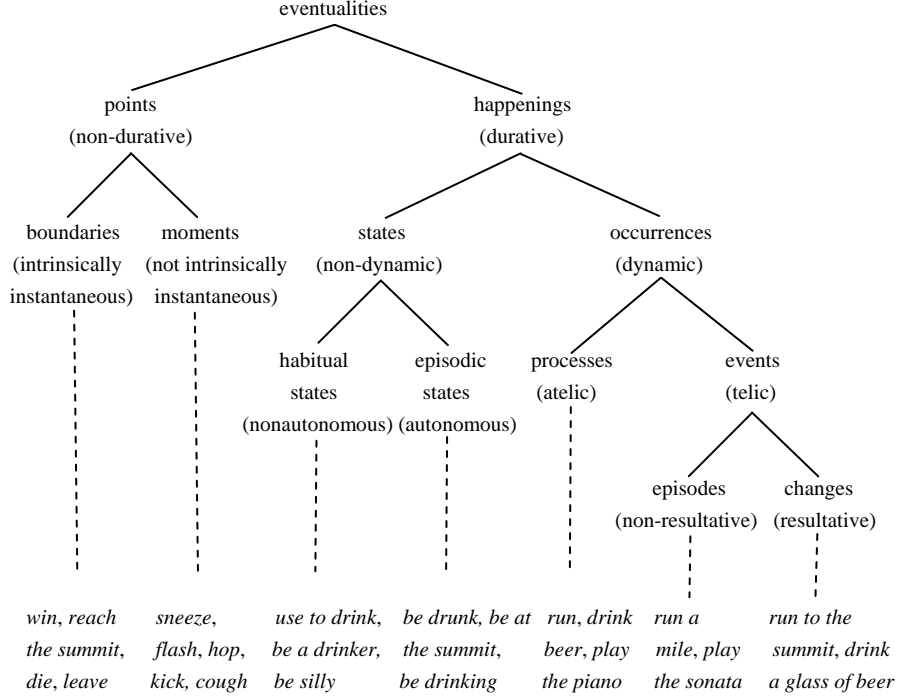


Figure 1

In accordance with the sortal structure, I assume twelve predicates which denote sorts of eventuality and, at the same time, indicate the corresponding aspects of verbal expression. Their interdependence is represented by the postulates in (17), where  $e$  is a variable of eventualities and  $:$  is the exclusive disjunction.

- (17) (a)  $\forall e [\text{EVENTUALITY}(e) \leftrightarrow \text{POINT}(e) : \text{HAPPENING}(e)]$   
 (b)  $\forall e [\text{POINT}(e) \leftrightarrow \text{BOUNDARY}(e) : \text{MOMENT}(e)]$   
 (c)  $\forall e [\text{HAPPENING}(e) \leftrightarrow \text{STATE}(e) : \text{OCCURRENCE}(e)]$   
 (d)  $\forall e [\text{STATE}(e) \leftrightarrow \text{HABITUAL\_STATE}(e) : \text{EPISODIC\_STATE}(e)]$   
 (e)  $\forall e [\text{OCCURRENCE}(e) \leftrightarrow \text{PROCESS}(e) : \text{EVENT}(e)]$   
 (f)  $\forall e [\text{EVENT}(e) \leftrightarrow \text{EPISODE}(e) : \text{CHANGE}(e)]$

Needless to say, further predicates discriminating between sorts of eventuality are imaginable.

## 2.3 Intersortal structure of eventualities

Unlike the hierarchical structure considered before, the intersortal structure imposed on the domain of eventualities is formed by various general relations which connect members of different sorts. There are several proposals to explore the intersortal relations, and many of the approaches offered differ from each other in a basic manner. As not any of them can be discussed in detail here, I restrict myself to a few points which are important for my purpose.

According to Piñón (1997), all (finite) happenings have two boundaries – their beginning and their ending. I assume that the two relations *the beginning of* and *the ending of*, which are represented by the predicates BEG and END, respectively, are characterized by the following postulates:

- (18) (a)  $\forall e [\text{HAPPENING}(e) \rightarrow \exists e' \exists e'' [\text{BEG}(e', e) \wedge \text{END}(e'', e)]]$   
 (b)  $\forall e \forall e' [\text{BEG}(e, e') \vee \text{END}(e, e') \rightarrow \text{BOUNDARY}(e) \wedge \text{HAPPENING}(e')]$   
 (c)  $\forall e [\text{BOUNDARY}(e) \rightarrow \exists e' [\text{BEG}(e, e') \vee \text{END}(e, e')]]$

In addition, beginnings and endings differ as follows: If a boundary is the beginning (ending) of a happening, then the happening stretches temporally to the right (left). Thus, for instance, if Paul begins (ends) to move, then he moves for a while immediately thereafter (before).

Further, Moens and Steedman (1988) as well as Kamp and Reyle (1993) suggest that an event is complex in the sense that it is composed of a preparatory process and a culmination.<sup>12</sup> Therefore, to borrow a term from Moens and Steedman, events are often viewed as culminated processes. By contrast, elaborating on an idea by Bach (1986), Piñón (1995) argues that the event and the process it is made of – its *substratum* – are spatio-temporally superposed though not identical. While the event has the same boundaries as the process, the former differs from the latter in that the ending is inherent in it. Thus, the end point can be viewed as the culmination which the event aspires to.

Building on these observations, I suppose the postulates in (19) and (20), where SUBST and CULM are predicates of the substratum relation and the culmination relation, respectively.

- (19) (a)  $\forall e [\text{EVENT}(e) \rightarrow \exists e' [\text{SUBST}(e', e)]]$   
 (b)  $\forall e \forall e' [\text{SUBST}(e, e') \rightarrow \text{PROCESS}(e) \wedge \text{EVENT}(e') \wedge \exists e'' [\text{BEG}(e'', e) \wedge \text{BEG}(e'', e')] \wedge \exists e''' [\text{END}(e'', e) \wedge \text{END}(e'', e')]]$

<sup>12</sup> As opposed to it, Pulman (1997) claims that events are made up of processes and states. For my point of view, this assumption is not justifiable.

- (20) (a)  $\forall e [\text{EVENT}(e) \rightarrow \exists e' [\text{CULM}(e', e)]]$   
 (b)  $\forall e \forall e' [\text{CULM}(e, e') \rightarrow \text{EVENT}(e') \wedge \text{END}(e, e')]$

Moreover, processes being the substratum of an event have proper parts which are processes of the same kind and, therefore, contribute to the constitution of the event. The postulates in (21) determine that the event can be viewed as the *completion* – denoted by the relation predicate COMPL – of the respective processes.<sup>13</sup>

- (21) (a)  $\forall e [\text{EVENT}(e) \rightarrow \exists e' [\text{COMPL}(e, e')]]$   
 (b)  $\forall e \forall e' [\text{COMPL}(e, e') \rightarrow \text{EVENT}(e) \wedge \text{PROCESS}(e') \wedge \exists e'' [\text{SUBST}(e'', e) \wedge e' < e'']]$

Next, taking into account that not all events, but only changes create a poststate, I assume the following postulates, where RES is a predicate standing for the relation *the result of* between states and changes.

- (22) (a)  $\forall e [\text{CHANGE}(e) \rightarrow \exists e' [\text{RES}(e', e)]]$   
 (b)  $\forall e \forall e' [\text{RES}(e, e') \rightarrow \text{STATE}(e) \wedge \text{CHANGE}(e') \wedge \exists e'' [\text{BEG}(e'', e) \wedge \text{END}(e'', e')]]$

Accordingly, if Paul moves to the summit, then there is a state of Paul's being at the summit, which is the result of the motion event. The ending of Paul's moving to the summit is at the same time the beginning of the state. In addition, changes fulfill the following condition: The ending of a change is at the same time the ending of the state that is complementary to the state resulting from the change. For instance, if Paul ends moving to the summit, then the state in which he is not at the summit ends too.

Turning now to moments, I assume that they are in relationship with episodes which have a more or less short temporal extension and, therefore, can serve as the basis for a moment. As explained in the last section, for the purpose of ordinary thinking the respective episodes are conceptually reduced to moments, i.e. eventualities that are presumed to have no duration. The postulates in (23), where RED denotes the relation *the reduction of* between moments and episodes, reflect this circumstance.

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<sup>13</sup> It is obvious that the concept of events as process completion, supposed in (21), is too simple and, hence, must be improved. In particular, considering the intensional character of the issue, a distinction between possible and real events has to be drawn.

- (23) (a)  $\forall e [\text{MOMENT}(e) \rightarrow \exists e' [\text{RED}(e, e')]]$   
 (b)  $\forall e \forall e' [\text{RED}(e, e') \rightarrow \text{MOMENT}(e) \wedge \text{EPISODE}(e')]$

For instance, a moment of sneezing by Mary has to be decoded as the reduction of an episode in which Mary does things like open the mouth, breathe in, close the eyes and breathe out.

The most perspicuous conception of processes is that they are built up from events (cf. e.g. Parsons 1990, Piñón 1995, Rothstein 2004). In accordance with it, I assume that processes are constituted by an unspecific number of temporally adjacent events. Using CONST and TEMP\_ADJ for the relations *constituent of* and *temporally adjacent to*, respectively, I postulate that for each process there are at least two temporally adjacent events that are constituents of it.

- (24) (a)  $\forall e [\text{PROC}(e) \rightarrow \exists e' \exists e'' [\text{CONST}(e', e) \wedge \text{CONST}(e'', e) \wedge \text{TEMP\_ADJ}(e', e'')]]$   
 (b)  $\forall e \forall e' [\text{CONST}(e, e') \rightarrow \text{EVENT}(e) \wedge \text{PROCESS}(e')]$

For example, a process of drinking beer is a sequence of events in which a specific quantity of beer is drunk. Thus, if John drank a glass of beer from 19.00 to 20.00 and he drank a glass of beer again from 20.00 to 21.00, then he drank beer from 19.00 to 21.00.

Finally, I adopt the position that a habitual state is an eventuality which has to be realized by means of an unspecific number of temporally not adjacent occurrences of certain kind. For my purpose, it will suffice to assume the postulates in (25), where REAL is the predicate of *realization* between occurrences and habitual states.

- (25) (a)  $\forall e [\text{HABITUAL\_STATE}(e) \rightarrow \exists e' \exists e'' [\text{REAL}(e', e) \wedge \text{REAL}(e'', e) \wedge \neg \text{TEMP\_ADJ}(e', e'')]]$   
 (b)  $\forall e \forall e' [\text{REAL}(e, e') \rightarrow \text{OCCURRENCE}(e) \wedge \text{HABITUAL\_STATE}(e')]$

As indicated, a habitual state requires the existence of at least two occurrences that are realizations of it. For instance, a state such that John has the habit to drink beer exists only due to it that there are several processes of drinking of beer by John, which take place within a sufficiently large interval.

In figure 2, I give a concluding overview of the general relations between members of different sorts of eventuality.

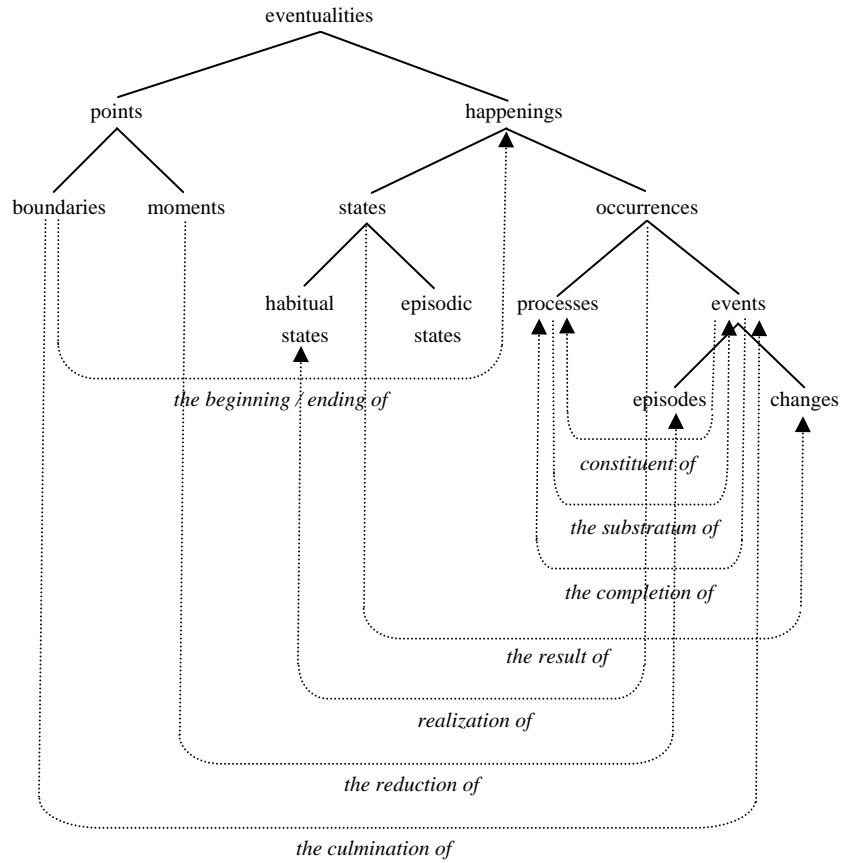


Figure 2

To be sure, my survey of the ontology of eventualities is provisional in many respects and, hence, needs a good deal of specification. With it, however, I dispose of a sufficient basis to address the way in which eventuality structure is systematically reflected in aspectual coercion.



### 3 A System of Aspectual Coercion

#### 3.1 Coercion by durative adverbials

Before examining several kinds of aspectual coercion in more detail, a few comments are in order with respect to the general mode of representation of meaning. I adopt a neo-Davidsonian format of verbal meaning, which is particularly developed by Parsons (1990), Krifka (1992) and Kratzer (1996). On this view, verbs are separated from their thematic arguments and uniformly treated as predicates ranging over eventualities. The arguments are introduced via predicates such as AG (*the agent of*), TH (*the theme of*), HD (*the holder of*), etc., which denote relations between eventualities and their participants. Further, I assume that the inherent aspect of a verbal expression is lexically determined if the expression is a verb, and it is determined by aspectual composition if the expression is one of the projections of a verb.<sup>14</sup> Thus, for instance, the verb *play* is a predicate of processes and the VPs *play the piano* and *play the sonata*, resulting from the combination of *play* with the NPs *the piano* and *the sonata*, respectively, are a predicate of processes and a predicate of episodes, respectively. For the sake of simplicity, I assume that verbal expressions are aspectually classified on the basis of sortal restrictions like (26).

- (26) (a)  $\forall e [\text{sneeze}(e) \rightarrow \text{MOMENT}(e)]$   
 (b)  $\forall e [\text{win}(e) \rightarrow \text{BOUNDARY}(e)]$   
 (c)  $\forall e [\text{win}(e) \wedge \text{TH}(\text{the\_game}, e) \rightarrow \text{BOUNDARY}(e)]$   
 (d)  $\forall e [\text{play}(e) \wedge \text{TH}(\text{the\_piano}, e) \rightarrow \text{PROCESS}(e)]$   
 (e)  $\forall e [\text{play}(e) \wedge \text{TH}(\text{the\_sonata}, e) \rightarrow \text{EPISODE}(e)]$   
 (f)  $\forall e [\text{run}(e) \rightarrow \text{PROCESS}(e)]$   
 (g)  $\forall e [\text{run}(e) \wedge \text{to}(e, \text{the\_summit}) \rightarrow \text{CHANGE}(e)]$   
 (h)  $\forall e [\text{reach}(e) \wedge \text{TH}(\text{the\_summit}, e) \rightarrow \text{BOUNDARY}(e)]$   
 (i)  $\forall e [\text{be\_at\_the\_summit}(e) \rightarrow \text{STATE}(e)]$

In addition, the fact that some adverbial modifiers can be only combined with verbal expressions of a certain aspect is also captured by sortal restrictions. For instance, as the application of durative adverbials like *for one day* is restricted to predicates of states or processes, the following postulate is supposed:

- (27)  $\forall e \forall t [\text{for}(e, t) \rightarrow \text{TIME\_INTERVALL}(t) \wedge (\text{STATE}(e) \vee \text{PROCESS}(e))]$

<sup>14</sup> Aspectual composition basically obeys the principles formulated in Krifka's mereological theory (cf. Krifka 1992, 1998). Some adaptations of the theory, which are necessary in order to meet the conditions of the approach pursued here, remain the task of future work.

Taking into account the points mentioned and ignoring the contribution of tense and other factors being irrelevant in this connection, I argue that the meaning of a sentence like (28) can be identified with a structure like (28').

(28) Fred played the piano for one day.

(28')  $\exists e [\text{AG}(\text{fred}, e) \wedge \text{play}(e) \wedge \text{TH}(\text{the\_piano}, e) \wedge \text{for}(e, \text{1\_day})]$

According to (28'), the sentence conveys that Fred is the agent and a certain piano is the theme of a process which is a playing and lasts one day.

Let me start my preliminary analysis of aspectual coercion with a closer look at sentence (1), repeated here as (29), where the selection restriction of the modifier *for one day* calls for an aspectual coercion of the VP *play the sonata*.

(29) #Fred played the sonata for one day.

As pointed out at the very beginning, the sentence is not interpreted as referring to a single but to consecutive playing of one and the same sonata. Now, after some features of eventuality structure have been explored, it appears that, more precisely, (29) refers to a one-day lasting process that consists of at least two temporally adjacent events of playing the sonata by Fred. In a somewhat simplified form, I represent the meaning of the sentence by the structure in (29'), where the formula behind the colon is a restriction of the  $\forall$ -quantifier.

(29')  $\exists e [\text{AG}(\text{fred}, e) \wedge \forall e': \text{CONST}(e', e) [\text{play}(e') \wedge \text{TH}(\text{the\_sonata}, e')] \wedge \text{for}(e, \text{1\_day})]$

According to (29'), Fred is the agent of a process  $e$  and each event  $e'$  being a constituent of  $e$  is a playing which the respective sonata participates in as theme. The core of this process-related interpretation is that the VP is coerced from a predicate of events into a predicate of processes that are constituted by this kind of event. I illustrate the operation of *iterative coercion* ( $\text{EVENT} \Rightarrow \text{PROCESS}$ ) in (30).

(30) play the sonata:  $\lambda e. \text{play}(e) \wedge \text{TH}(\text{the\_sonata}, e)$

$\lambda P \lambda e. \forall e': \text{CONST}(e', e) [P(e')]$ 
*iterative coercion*

play the sonata:  $\lambda e. \forall e': \text{CONST}(e', e) [\text{play}(e') \wedge \text{TH}(\text{the\_sonata}, e')]$

Sentence (2), repeated as (31), is likewise interpreted in a process-related manner. However, as previously argued with respect of experiential knowledge, this interpretation does not result in an iterative but a subtractive reading.

(31) #Fred played the sonata for one minute.

(31')  $\exists e [AG(\mathbf{fred}, e) \wedge \exists e': COMPL(e', e) [\mathbf{play}(e') \wedge TH(\mathbf{the\_sonata}, e')] \wedge \mathbf{for}(e, \mathbf{1\_minute})]$

As (31') shows, Fred is again the agent of a process. But now, unlike sentence (29), the one-minute lasting process is characterized as an eventuality that can be completed to an event of playing the sonata.<sup>15</sup> This interpretation supposes that *play the sonata* is changed by *subtractive coercion* (EVENT  $\Rightarrow$  PROCESS) from a predicate of events to a predicate of processes, the completion of which is such an event.

(32) play the sonata:  $\lambda e. \mathbf{play}(e) \wedge TH(\mathbf{the\_sonata}, e)$

$\lambda P \lambda e. \exists e': COMPL(e', e) [P(e')]$       *subtractive coercion*  
 $\swarrow$   
 play the sonata:  $\lambda e. \exists e': COMPL(e', e) [\mathbf{play}(e') \wedge TH(\mathbf{the\_sonata}, e')]$

Consider next sentence (33).

(33) #Fred played the sonata for one year.

On the basis of experience, we know that human beings are unable to play a sonata in permanent repetition for one year. For this reason, contrary to sentence (29), the interpretation of (33) cannot work in terms of ordinary iteration. Instead, the sentence has to receive a habitual and, with it, state-related reading.

(33')  $\exists e [HD(\mathbf{fred}, e) \wedge \forall e': REAL(e', e) [\mathbf{play}(e') \wedge TH(\mathbf{the\_sonata}, e')] \wedge \mathbf{for}(e, \mathbf{1\_year})]$

Hence, the sentence refers to a one-year lasting state of Fred, which is realized by his playing a particular sonata from time to time. More precisely, Fred is

<sup>15</sup> As noted in connection with the postulates in (21), the concept of process completion needs some improvement. In order to avoid the imperfective paradox, provisionally, I use the  $\exists$ -quantifier in a formula  $\exists e': COMPL(e', e) [\dots e' \dots e' \dots]$  without existential commitment, i.e. only in the sense of 'for a possible ...'. As a consequence, using  $\exists$  in the respective context does not presuppose the event at issue to exist in the actual world. For an elaborated approach to a problem of similar kind see Piñón (2008).

the holder of a habitual state  $e$  such that each occurrence  $e'$  being a realization of  $e$  is a playing of the respective sonata and  $e$  lasts one year.

As demonstrated in (34), this reading is based on a habitual coercion (OCCURRENCE  $\Rightarrow$  HABITUAL\_STATE) by means of which the VP is shifted from a predicate of occurrences to a predicate of habitual states.

$$\begin{array}{l}
 (34) \text{ play the sonata: } \lambda e. \text{play}(e) \wedge \text{TH}(\text{the\_sonata}, e) \\
 \quad \swarrow \lambda P \lambda e. \forall e': \text{REAL}(e', e) [P(e')] \quad \text{habitual coercion} \\
 \text{play the sonata: } \lambda e. \forall e': \text{REAL}(e', e) [\text{play}(e') \wedge \text{TH}(\text{the\_sonata}, e')]
 \end{array}$$

Summing up, there are three kinds of aspectual coercion which episode predicates like *play the sonata* can be subject to under the influence of durative adverbials. Which of them is chosen for fitting the aspect of verbal expression is dependent on the concrete content of the adverbial modifier and on our experiential knowledge about typical duration of the kind of eventualities involved.

It is evident that the same is true of change predicates like *run to the summit*. Thus, sentences comprising such a verbal predicate in conjunction with a durative adverbial can have an iterative or a subtractive and, hence, in each case process-related reading or a habitual, state-related reading. Importantly, however, for a sentence like (35) a change-related reading is also possible.

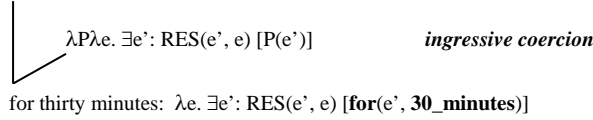
(35) #Rob ran to the summit for thirty minutes.

The sentence can have an interpretation on which the adverbial specifies the duration of the state brought about by the running event. Thus, (35) conveys that Rob ran to the summit and the resulting state of his being at the summit lasted thirty minutes.

(35')  $\exists e [\text{AG}(\text{rob}, e) \wedge \text{run}(e) \wedge \text{to}(e, \text{the\_summit}) \wedge \exists e': \text{RES}(e', e) [\text{for}(e', \text{30\_minutes})]]$

Unlike the examples concerned with so far, this understanding requires the durative adverbial *for thirty minutes* to be shifted in its meaning in order to meet the condition of the VP. In (36), the new kind of transfer operation underlying the structure in (35') is represented.

- (36) for thirty minutes:  $\lambda e. \text{for}(e, \text{30\_minutes})$



The derivation shows that the adverbial undergoes an *ingressive coercion* (STATE  $\Rightarrow$  CHANGE) by means of which it is shifted from a predicate of states to a predicate of changes resulting in such a state.<sup>16</sup>

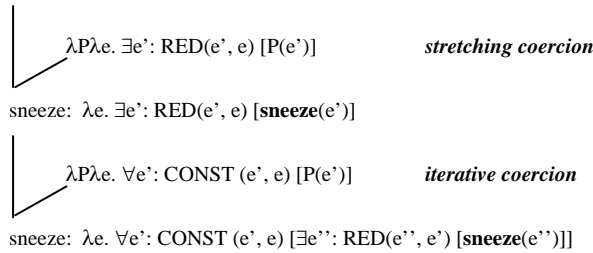
Sentences containing a moment predicate as *sneeze* in combination with a durative adverbial also call for an iterative, subtractive or habitual coercion. However, since moments are eventualities which arise from an episode by ignoring its internal structure, initially another aspectual shift is demanded.

For instance, we observe a clear preference for interpreting sentence (37) iteratively.

- (37) #Liz sneezed for one hour.

But the sentence must not be understood as simply referring to repeated moments of sneezing by Liz. Such a treatment would ignore that a process can be only constituted by events. Rather, the moments of sneezing must be firstly ‘stretched’ to the corresponding episodes, i.e. they are traced back to the eventualities the reduction of which they are. More precisely, before the verb can be subject to an *iterative coercion* (EVENT  $\Rightarrow$  PROCESS), it requires to undergo a *stretching coercion* (MOMENT  $\Rightarrow$  EPISODE).

- (38) sneeze:  $\lambda e. \text{sneeze}(e)$



Since in derivation (38) two aspectual coercions are combined sentence (37) has the more complex meaning represented in (37').

<sup>16</sup> Obviously, interpretations such as (35') suggest that the traditional concept of aspectual coercion should be extended. Not only verbal expressions but also adverbial modifiers can be subject to a meaning shift in order to avoid an aspectual mismatch.

(37')  $\exists e [\text{TH}(\text{liz}, e) \wedge \forall e': \text{CONST}(e', e) [\exists e'': \text{RED}(e'', e') [\text{sneeze}(e'')]] \wedge \text{for}(e, \text{1\_hour})]$

Here, Liz is the theme of a one-hour lasting process  $e$  such that for each event  $e'$  being a constituent of  $e$  there is a moment of sneezing  $e''$  which is a reduction of  $e'$ .

In a similar way, sentence (39) and (40) are only acceptable on a reading where the moment predicate *sneeze* is at first changed to an episode predicate (*stretching coercion*) and then to a process predicate (*subtractive coercion*) or a state predicate (*habitual coercion*), respectively.

(39) #Liz sneezed for one second.

(39')  $\exists e [\text{TH}(\text{liz}, e) \wedge \exists e': \text{COMPL}(e', e) [\exists e'': \text{RED}(e'', e') [\text{sneeze}(e'')]] \wedge \text{for}(e, \text{1\_second})]$

(40) #Liz sneezed for one month.

(40')  $\exists e [\text{HD}(\text{liz}, e) \wedge \forall e': \text{REAL}(e', e) [\exists e'': \text{RED}(e'', e') [\text{sneeze}(e'')]] \wedge \text{for}(e, \text{1\_month})]$

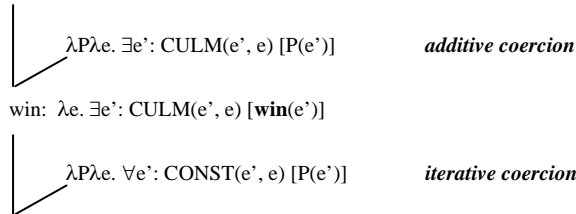
To assign a meaning to sentences where a boundary predicate is coerced by a durative adverbial is a little more complicated. Because boundaries are intrinsically instantaneous, no stretching is possible for a verb like *win*. Instead, we have to take into account that the boundaries forming the denotation of it are culminations of corresponding events. For this reason, I propose that the meaning of sentence (41) can be identified with the structure given in (41').

(41) #Chris won for three hours.

(41')  $\exists e [\text{AG}(\text{chris}, e) \wedge \forall e': \text{CONST}(e', e) [\exists e'': \text{CULM}(e'', e') [\text{win}(e'')]] \wedge \text{for}(e, \text{3\_hours})]$

Thus, Chris is the agent of a three-hours lasting process  $e$  such that for each event  $e'$  being a constituent of  $e$  there is a winning  $e''$  which is the culmination of  $e'$ . As a precondition, *win* must undergo a twofold aspectual shift: first, a new operation, namely an *additive coercion* ( $\text{BOUNDARY} \Rightarrow \text{EVENT}$ ) and, second, an *iterative coercion* ( $\text{EVENT} \Rightarrow \text{PROCESS}$ ).

(42) win:  $\lambda e. \text{win}(e)$



win:  $\lambda e. \forall e': \text{CONST}(e', e) [\exists e'': \text{CULM}(e'', e') [\text{win}(e'')]]$

Analogous to (41), the interpretation of sentence (43) involves two shifting operations. At first, the verb is likewise subject to an *additive coercion* ( $\text{BOUNDARY} \Rightarrow \text{EVENT}$ ). After this, however, a *habitual coercion* ( $\text{OCCURRENCE} \Rightarrow \text{HABITUAL\_STATE}$ ) has to take place.

(43) #Chris won for three months.

(43')  $\exists e [\text{HD}(\text{chris}, e) \wedge \forall e': \text{REAL}(e', e) [\exists e'': \text{CULM}(e'', e') [\text{win}(e'')]] \wedge \text{for}(e, \text{3\_months})]$

Consequently, (43) refers to a habitual state of Chris, which is realized by events that culminate in a winning and lasts three months.

As opposed to (41) and (43), a sentence like (44) has no reading.

(44) \*Chris won for three seconds.

For interpreting the sentence, also two shifting operations – this time, an additive and a subtractive coercion – would be needed. But this means that, firstly, boundaries would have to be ‘supplemented’ to events which, subsequently, would have to be ‘cut down’ on processes. It seems that such a combination of operations is odd for pragmatic reasons.<sup>17</sup>

### 3.2 Coercion by time-span adverbials

Let me now turn to the analysis of sentences where the VP is coerced by a time-span adverbial. Basis of this kind of aspectual coercion is the sortal restriction given by the postulate in (45).

(45)  $\forall e \forall t [\text{in}(e, t) \rightarrow \text{TIME\_INTERVALL}(t) \wedge \text{EVENT}(e)]$

As indicated, time-span adverbials can only be applied to predicates of events, i.e. episodes or changes.

To begin with, consider sentence (46) that again contains the VP *sneeze* which is originally a moment predicate.

<sup>17</sup> In contrast, a sentence as #Chris left for three seconds has an interpretation according to which Chris left and this leaving was the beginning of a three-seconds lasting state of his being away. Probably, this is explained by the fact that, unlike *win*, the boundary predicate *leave* does not denote culminations of change. In any case, analogous to sentence (35) in its change-related reading (35'), not the verb but the adverbial modifier has to be coerced here.

(46) #Liz sneezed in two seconds.

A possible reading of the sentence is that Liz was the theme of an episode such that its reduction is a moment of sneezing and the time intervall during which it takes place is two seconds.<sup>18</sup>

(46')  $\exists e [\text{TH}(\text{liz}, e) \wedge \exists e': \text{RED}(e', e') [\text{sneeze}(e')] \wedge \text{in}(e, \text{2\_seconds})]$

Clearly, to obtain the meaning represented in (46'), the verb *sneeze* must be subject to a **stretching coercion** ( $\text{MOMENT} \Rightarrow \text{EPISODE}$ ).

Also achievements which appear in conjunction with a time-span adverbial are available for aspectual coercion. For instance, sentence (47) can be interpreted as meaning that Sam was the agent or the theme of an event which within ten minutes culminated by his reaching the summit.

(47) #Sam reached the summit in ten minutes.

(47')  $\exists e [\text{AG/TH}(\text{sam}, e) \wedge \exists e': \text{CULM}(e', e) [\text{reach}(e') \wedge \text{TH}(\text{the\_summit}, e')] \wedge \text{in}(e, \text{10\_minutes})]$

This interpretation supposes that the VP *reach the summit* is transformed by **additive coercion** from a boundary predicate into an event predicate.

Another operation of aspectual coercion can be performed if a time-span adverbial occurs in combination with a stative VP. I suggest that a sentence as (48) has a possible reading on which it does not refer to a state but to a change.

(48) #Sam was at the summit in ten minutes.

(48')  $\exists e [\text{AG/TH}(\text{sam}, e) \wedge \exists e': \text{RES}(e', e) [\text{be\_at\_the\_summit}(e')] \wedge \text{in}(e, \text{10\_minutes})]$

According to (48'), Sam is characterized as the agent or the theme of a change that takes ten minutes and results in his being at the summit. As a precondition, the VP *be at the summit* must be shifted by **ingressive coercion** – which has been carried out already in case of sentence (35) although there at the adverbial – from a predicate of states to a predicate of changes.

<sup>18</sup> It should be noted that the kinds of sentence discussed in this section generally have a further reading which is often more salient. On this interpretation, a time-span adverbial measures a contextually determined intervall at the end of which the respective eventuality takes place. Thus, while the VP is used in its literal meaning, the *in*-adverbial is understood as being synonym with the corresponding *after*-adverbial. If it is placed in front of the sentence, only this interpretation is available.



Interestingly, the kinds of coercion concerned with are not confined to modification by time-span adverbials. In particular, some manner adverbs, among them *quickly*, *slowly*, *suddenly* and *gradually*, can also trigger a shift of aspect. For instance, the VPs occurring in sentence (49a) and (49b) are compatible with *quickly* on condition that they are subject to an *additive* or an *ingressive coercion*, respectively.

- (49) (a) #Sam quickly reached the summit.  
 (b) #Sam quickly was at the summit.

Accordingly, analogous to (47) and (48), the sentences are interpreted as meaning that Sam participated in a quick event that culminated by his reaching the summit or resulted in his being there, respectively.<sup>19</sup>

Finally, look at sentence (50) where *run* being originally a process predicate occurs in combination with a time-span adverbial. A possible understanding is that the sentence describes how long it took for Julia to do a complete run.

- (50) #Julia ran in ten minutes.

Such an interpretation is justified only in contexts from which a suitable culmination can be drawn – in (50), for instance, by way of identifying a certain running distance. Given this assumption, the meaning of the sentence can be represented as follows:

- (50')  $\exists e [AG(julia, e) \wedge \exists e': SUBST(e', e) [run(e')] \wedge in(e, 10\_minutes)]$

Here, Julia is the agent of a ten-minutes lasting event, the substratum of which is a process of running. Obviously, a new kind of aspectual coercion is necessary in order to adapt the aspect of *run*.

- (51)  $run: \lambda e. \mathbf{run}(e)$

$$\begin{array}{l} \downarrow \\ \lambda P \lambda e. \exists e': SUBST(e', e) [P(e')] \quad \text{completive coercion} \\ \uparrow \\ run: \lambda e. \exists e': SUBST(e', e) [\mathbf{run}(e')] \end{array}$$

<sup>19</sup> Sentences as (49a) and (49b) can likewise have an interpretation on which the VP is used in its literal meaning. Then, their reading is that a short periode of time elapses before the respective boundary or state is in existence.

As indicated by (51), the VP is shifted by **completive coercion** (PROCESS  $\Rightarrow$  EVENT) from a process predicate to an event predicate.

Finally, it has also to be taken into account that temporal adverbials often occur together. For instance, in sentence (52), at first the VP *win the game* combines with the time-span adverbial *in five minutes*, and then the VP *win the game in five minutes* combines with the durative adverbial *for five months*.

(52) #Mary won the game in five minutes for five months.

(52')  $\exists e [\text{HD}(\text{mary}, e) \wedge \forall e': \text{REAL}(e', e) [\exists e'': \text{CULM}(e'', e') [\text{win}(e'') \wedge \text{TH}(\text{the\_game}, e'')]]$   
 $\wedge \text{in}(e', 5\_minutes)] \wedge \text{for}(e, 5\_months)]$

It follows that the interpretation of (52) involves two shifting operations: First, *win the game* is transformed by **additive coercion** from a boundary predicate into an event predicate and, second, *win the game in five minutes* is transformed by **habitual coercion** from an occurrence predicate into a predicate of habitual states.

### 3.3 Coercion by time-point adverbials

According to the postulate in (53), time-point adverbials like *at seven o'clock sharp* are restricted to predicates of boundaries, moments or states.

(53)  $\forall e, t [\text{at}(e, t) \rightarrow \text{TIME\_POINT}(t) \wedge (\text{POINT}(e) \vee \text{STATE}(e))]$

Thus, to meet the aspectual constraint of this kind of adverbial modifier, a VP denoting actually a property of occurrences, i.e. processes or events, has to be coerced.

For instance, look at sentence (54) and (55).

(54) #Julia ran at seven o'clock sharp.

(55) #Julia ran to the summit at seven o'clock sharp.

The sentences are most naturally interpreted as referring to a boundary that is the beginning of a process of Julia's running and a boundary that is the beginning of an event of her running to a certain summit, respectively. Correspondingly, I assume that the meaning of (54) and (55) can be identified with the structure in (54') and in (55'), respectively, where  $\text{BEG}^{-1}$  – read as *is begun by* – is the inverse relation of  $\text{BEG}$ .

(54')  $\exists e [\text{TH}(\text{julia}, e) \wedge \exists e': \text{BEG}^{-1}(e', e) [\text{run}(e')] \wedge \text{at}(e, 7\_o'clock)]$

(55')  $\exists e [\text{TH}(\text{julia}, e) \wedge \exists e': \text{BEG}^{-1}(e', e) [\text{run}(e') \wedge \text{to}(\text{the\_summit}, e')] \wedge \text{at}(e, 7\_o'clock)]$

As a precondition, the two VPs must undergo a new kind of aspectual coercion – an *inchoative coercion* (OCCURRENCE  $\Rightarrow$  BOUNDARY) – which shifts a predicate of occurrences to a predicate of boundaries which are the beginning of such an occurrence. In (56), the operation underlying the boundary-related interpretation of (54) is represented.

(56) run:  $\lambda e. \mathbf{run}(e)$

$$\begin{array}{l} \lambda P \lambda e. \exists e': \text{BEG}^{-1}(e', e) [P(e')] \\ \swarrow \\ \text{run: } \lambda e. \exists e': \text{BEG}^{-1}(e', e) [\mathbf{run}(e')] \end{array} \quad \textit{inchoative coercion}$$

Something analogous is true for the interpretation of sentence (55).

### 3.4 Coercion by the progressive

Till now, I have examined aspectual coercions by temporal modifiers. As demonstrated, this kind of operation is an implicit, contextually governed transition that comes into play whenever there is an impending conflict between the aspect of the VP and the aspectual constraint of the temporal adverbial. In addition, however, there are also aspectual operations which are explicitly encoded in language and, therefore, syntactically or morphologically visible. This section extends my examination, first, to such explicit transitions and, second, to aspectual coercions which have often to be performed in order to make the former possible in the first place.

One of the aspectual shifts having a counterpart in linguistic form is the progressive in English. Parsons (1990) observes that progressive sentences refer to a particular kind of state: For every event that is ever in progress, there is an uniquely associated state, the ‘in-progress’ state of the event, which holds as long as the event is in progress. In the literature, there is a dispute about the question of what eventualities can have such a progressive state. While Parsons (1990) supposes that event predicates can be subject of the progressive operator, authors like Moens and Steedman (1988) or Pulman (1997) suggest that it is only applicable to process predicates. Following the proposal by de Swart (1998) and Egg (2005), I argue that the domain of the progressive operator is constituted by the predicates of occurrences, i.e. events or processes. It helps to explain why sentences like (4b) as well as (6b) are acceptable without restriction, but sentences like (5b), (7b) or (15b) not. Additionally, for the sake of simplicity, I assume that progressive states can be subsumed under episodic states.

Consequently, the progressive operator **PROG** (OCCURRENCE  $\Rightarrow$  EPISODIC\_STATE), which has the linguistic marker *be -ing*, is regarded as a tool for shifting occurrence predicates into predicates of episodic states. It can be identified with the structure in (57a), where IN\_PROG denotes the relation *the being in progress of* which meets the postulate in (57b).<sup>20</sup>

- (57) (a)  $\lambda P \lambda e. \exists e': \text{IN\_PROG}(e, e') [P(e')]$   
 (b)  $\forall e e' [\text{IN\_PROG}(e, e') \rightarrow \text{EPISODIC\_STATE}(e) \wedge \text{OCCURRENCE}(e')]$

For illustrating, consider sentence (58) and (59).

- (58) Julia was running.  
 (59) Julia was running to the summit.

Since *run* and *run to the summit* are predicates of processes and events, respectively, **PROG** is immediately applicable to them. Therefore, the meaning of the progressive of *run* can be derived as follows:

- (60)  $\text{run}: \lambda e. \mathbf{run}(e)$   
 $\swarrow$   
 be -ing:  $\lambda P \lambda e. \exists e': \text{IN\_PROG}(e, e') [P(e')]$       **PROG**  
 $\searrow$   
 be running:  $\lambda e. \exists e': \text{IN\_PROG}(e, e') [\mathbf{run}(e')]$

Accordingly, the meaning of (58) is represented as in (58').

- (58')  $\exists e [\text{HD}(\mathbf{julia}, e) \wedge \exists e': \text{IN\_PROG}(e, e') [\mathbf{run}(e')]]$

As indicated, Julia is the holder of a state that is the being in progress of a process of running. Analogous is true for sentence (59).

By contrast, sentence (61) requires an aspectual coercion because the verb is originally a moment predicate.

- (61) #Liz was sneezing.

<sup>20</sup> As pointed out by Dowty (1979) and many others, the progressive operator actually requires an intensional analysis. Accordingly, the progressive picks out a stage of the occurrence which, if it does not continue in the actual world, has a reasonable chance of continuing in some other possible world which resembles the actual world in certain ways. This intensionality is not taken into account here. In order to avoid the imperfective paradox, again provisionally, I use the  $\exists$ -quantifier in **PROG** without existential commitment (cf. footnote 15).

The sentence means most naturally either that Liz is in an in-progress state of single sneezing (cf. (61a)) or that Liz is in an in-progress state of iterative sneezing (cf. (61b)).

- (61) (a) #Liz was sneezing (for one second).  
 (b) #Liz was sneezing (for one hour).

It appears that the interpretation of (61) fails unless *sneeze* is changed to an episode predicate by *stretching coercion* (MOMENT  $\Rightarrow$  EPISODE) or to a process predicate by, firstly, *stretching coercion* and, subsequently, *iterative coercion* (EVENT  $\Rightarrow$  PROCESS). As a result, the two readings of (61) are represented as follows:

- (61') (a)  $\exists e [\text{HD}(\text{liz}, e) \wedge \exists e': \text{IN\_PROG}(e, e') [\exists e'': \text{RED}(e'', e') [\text{sneeze}(e'')]]]$   
 (b)  $\exists e [\text{HD}(\text{liz}, e) \wedge \exists e': \text{IN\_PROG}(e, e') [\forall e'': \text{CONST}(e'', e') [\exists e''': \text{RED}(e''', e'') [\text{sneeze}(e''')]]]]]$

In a similar way, sentence (62) can be interpreted as meaning that Chris is in an in-progress state of single winning or that Chris is in an in-progress state of iterative winning.

- (62) #Chris was winning.  
 (62') (a)  $\exists e [\text{HD}(\text{chris}, e) \wedge \exists e': \text{IN\_PROG}(e, e') [\exists e'': \text{CULM}(e'', e') [\text{win}(e'')]]]$   
 (b)  $\exists e [\text{HD}(\text{chris}, e) \wedge \exists e': \text{IN\_PROG}(e, e') [\forall e'': \text{CONST}(e'', e') [\exists e''': \text{CULM}(e''', e'') [\text{win}(e''')]]]]]$

Accordingly, in order to satisfy the sortal restriction of the progressive, the interpretation of (62) calls for one of two possible transitions of *win*: its only *additive coercion* (BOUNDARY  $\Rightarrow$  EVENT) or its *additive coercion* and subsequent *iterative coercion* (EVENT  $\Rightarrow$  PROCESS).

It is well-known that the progressive does not normally combine with stative verbal expressions. At the same time, however, there is also a certain tendency to accept such a combination for expressions of habitual states in appropriate contexts. For instance, special assumptions are required to make sense of sentence (63).

- (63) #Paul was being clever (in selling the car).

I assume that stative expressions like *be clever* have to be shifted to occurrence predicates before the progressive operator can be applied. The new operation of *agentive coercion* (HABITUAL\_STATE  $\Rightarrow$  OCCURRENCE), which is

required here, is illustrated in (64), where  $\text{REAL}^{-1}$  – read as *is realized by* – is the inverse relation of  $\text{REAL}$ .

$$\begin{array}{lcl}
 (64) \text{ be clever: } \lambda e. \mathbf{be\_clever}(e) & & \\
 \begin{array}{l} \downarrow \\ \lambda P \lambda e. \exists e': \text{REAL}^{-1}(e', e) [P(e')] \end{array} & \text{agentive coercion} & \\
 \text{be clever: } \lambda e. \exists e': \text{REAL}^{-1}(e', e) [\mathbf{be\_clever}(e')] & & 
 \end{array}$$

Accordingly, the meaning of (63) can be identified with the structure given in (63').

$$(63') \exists e [\text{HD}(\mathbf{eve}, e) \wedge \exists e': \text{IN\_PROG}(e, e') [\exists e'': \text{REAL}^{-1}(e'', e') [\mathbf{be\_clever}(e'')]]]$$

Sentence (63) refers to a state of Eve, which is the being in progress of an occurrence that realizes her habitual state of being clever.

### 3.5 A two-stage approach: Aspectual coercion as pragmatic enrichment

To take stock, I have distinguished a multitude of operations for transforming the aspect and, thus, the meaning of expressions denoting properties of eventualities. My analysis until now is summarized in figure 3. The picture indicates a network of aspects and possible transitions between them.

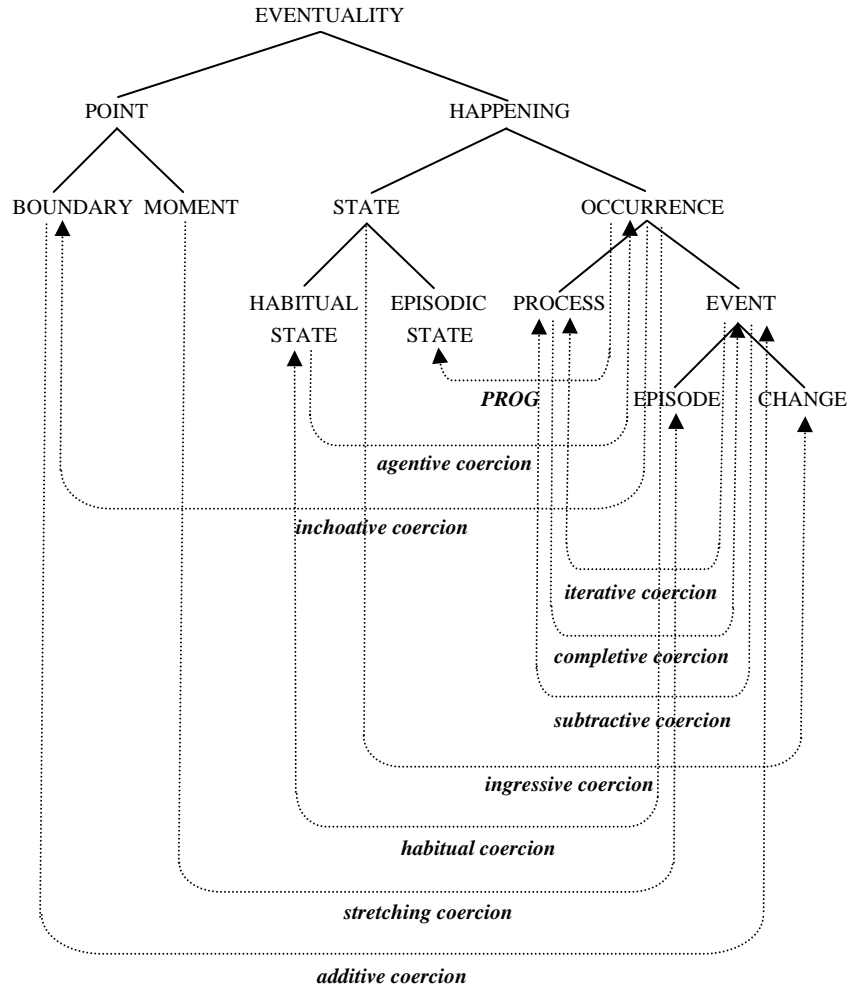


Figure 3

In (65), all kinds of aspectual coercion that have been subject of consideration in the last four sections, along with the operators that underlie them, are listed.<sup>21</sup>

(65) (a) *iterative coercion* (EVENT  $\Rightarrow$  PROCESS):

<sup>21</sup> As demonstrated in Dölling (1995, 1997), in the domain of object-denoting expressions there is an analogous network of sortal predicates and possible transitions between them.

- $\lambda P \lambda e. \forall e': \text{CONST}(e', e) [P(e')]$
- (b) **subtractive coercion** (EVENT  $\Rightarrow$  PROCESS):  
 $\lambda P \lambda e. \exists e': \text{COMPL}(e', e) [P(e')]$
- (c) **completive coercion** (PROCESS  $\Rightarrow$  EVENT):  
 $\lambda P \lambda e. \exists e': \text{SUBST}(e', e) [P(e')]$
- (d) **inchoative coercion** (OCCURRENCE  $\Rightarrow$  BOUNDARY):  
 $\lambda P \lambda e. \exists e': \text{BEG}^{-1}(e', e) [P(e')]$
- (e) **habitual coercion** (OCCURRENCE  $\Rightarrow$  HABITUAL\_STATE):  
 $\lambda P \lambda e. \forall e': \text{REAL}(e', e) [P(e')]$
- (f) **agentive coercion** (HABITUAL\_STATE  $\Rightarrow$  OCCURRENCE):  
 $\lambda P \lambda e. \exists e': \text{REAL}^{-1}(e', e) [P(e')]$
- (g) **additive coercion** (BOUNDARY  $\Rightarrow$  EVENT):  
 $\lambda P \lambda e. \exists e': \text{CULM}(e', e) [P(e')]$
- (h) **stretching coercion** (MOMENT  $\Rightarrow$  EPISODE):  
 $\lambda P \lambda e. \exists e': \text{RED}(e', e) [P(e')]$
- (i) **ingressive coercion** (STATE  $\Rightarrow$  CHANGE):  
 $\lambda P \lambda e. \exists e': \text{RES}(e', e) [P(e')]$

In this section, I will offer an approach that focusses on the systematicity of the operators of aspectual coercion and their application.

Researchers like Pustejovsky (1995), Jackendoff (1997), de Swart (1998) or Rothstein (2004) assume that coercion operators are inserted into the meaning structure when it is required by the process of semantic composition. More precisely, the insertion is triggered by an actual mismatch between the aspect of verbal expressions and the aspectual constraint of their modifier. In the absence of such a conflict no coercion operator appears. Further, the authors formulate rules that check the input conditions for temporal adverbials or explicit aspectual operators like the progressive, and that introduce a (more or less) special coercion operator to be applied to the verbal expression if the aspectual constraints are not met.

But this kind of approach has at least two shortcomings. First, it disregards that aspectual coercion needs not emerge from a sentence-internal source. In particular, as already exemplified by means of sentence (3), the requirement of adjustment may also result from a conflict with stereotypical experience. Second, it leaves out of consideration that to prevent an aspectual conflict does not always mean that the verbal expression has to be coerced. For instance, as we have observed above, a sentence like (35) also provides the opportunity to adjust the adverbial modifier. Therefore, in each case, we have to decide which of the involved expressions is subject to coercion and which of the possible coercion operators is used. Such decisions, however, require additional information to be taken into account. Consequently, both types of example



show that an appropriate coercion operator cannot be inserted unless extra-linguistic knowledge is consulted.

By contrast, my final account of aspectual coercion is not only more general but also fully compatible with the principle of semantic compositionality.<sup>22</sup> It rests on the basic assumption that only a part of an utterance meaning is linguistically determined. This strongly underspecified meaning is represented by a structure which I call *Semantic Form* (SF). Because SFs model the context-independent meaning of expressions they are composed strictly compositionally. At the same time, SFs comprise parameters, i.e. free variables, which indicate where particular constants of the respective type are to be inserted into the linguistically determined meaning. This instantiation of parameters and, thereby, specification of meaning by taking recourse to world knowledge is the task of pragmatics. It is carried out in terms of pragmatic inferences, for instance, abductive ones (cf. e.g. Hobbs et al. 1993, Dölling 1997). When the SF parameters are instantiated, a *Parameter-Fixed Structure* (PFS) for the meaning of expression arises. In sum, this two-stage approach considers that grasping the full meaning of an utterance always includes pragmatic enrichments of its SF in the course of interpretation.

As noted previously, I pursue a strategy that is largely analogous to that by Pulman (1997) and Egg (2005). Both authors suppose that semantic structure of expressions does not contain any coercion operator. Instead, they propose that semantic construction introduces particular gaps or blanks which buffer potential aspectual conflicts and into which relevant operators (or a combination of them) can be inserted if required. Thus, anticipating possible aspectual coercions, the positions are 'prophylactically' included into semantic structure. If any aspectual incompatibility impedes the respective position is filled; if not it is deleted. Due to the fact that Pulman and Egg distinguish between underspecified semantics of coercion and its potential instantiation, I agree with their basic idea. In respect to the restrictions they impose on instantiation, however, I object that the proposals are too coarse-grained.

In order to clarify this, let me take a closer look at the list given in (65). It is obvious that operators of aspectual coercion change only the aspect of expressions, but not their logical (or semantic) type. Accordingly, each operator denotes a mapping from properties of eventualities of a certain sort onto properties of eventualities of some other sort. More precisely, properties  $P$  are mapped onto properties  $\lambda e. Qe'$ :  $R(e', e) [P(e')]$  where some quantifier  $Q$  ranging over  $e'$  has as its restriction an intersortal relation  $R$  between  $e'$  and  $e$ , and its scope is the proposition that  $e'$  is  $P$ .

<sup>22</sup> To what follows, see Dölling (2003a, 2003b, 2005a, 2007) for further discussion. Cf. also Dölling (1995, 1997) for my proposals to handle systematic shifts of nominal predicates in a similar manner.

Since all operators in (65) have the same formal structure, my proposal is to represent them by a template called *coerce*.<sup>23</sup>

$$(66) \quad \lambda P \lambda e. Q e': R(e', e) [P(e')]$$

I regard *coerce* as an abstract coercion operator which under definite conditions is introduced into SF composition.<sup>24</sup> The symbols  $Q$  and  $R$  are parameters that can be instantiated by quantifiers like  $\exists$  or  $\forall$  and general relations between eventualities like  $=$ , CONST, COMPL, SUBST or REAL, respectively. As mentioned above, this fixation of the parameters is left to the interpretation of SF dependently from context. As a consequence, *coerce* leaves room for different specifications at PFS. In particular, on demand it can be specified to one of the concrete coercion operators in (65).

For illustrating the use of *coerce*, consider the VP *play the sonata*. Before in semantic construction it may be combined with others expressions the operator *coerce* has to be applied to its SF first.

$$(67) \quad \text{play the sonata: } \lambda e. \text{play}(e) \wedge \text{TH}(\text{the\_sonata}, e)$$

$$\begin{array}{l} \swarrow \\ \text{coerce: } \lambda P \lambda e. Q e': R(e', e) [P(e')] \\ \searrow \\ \text{play the sonata: } \lambda e. Q e': R(e', e) [\text{play}(e') \wedge \text{TH}(\text{the\_sonata}, e')] \end{array}$$

The SF arising from this operation is more complex and, in particular, contains the parameters  $Q$  and  $R$ . If in the course of interpretation values are assigned to them we obtain a PFS that represents one of the possible readings of the VP. For instance, an universal instantiation of  $Q$  and a fixation of  $R$  as the relation CONST specifies *coerce* to the operator of *iterative coercion*. Correspondingly, *play the sonata* receives an iterative interpretation and, therefore, denotes a property of processes.

$$(68) \quad \lambda e. \forall e': \text{CONST}(e', e) [\text{play}(e') \wedge \text{TH}(\text{the\_sonata}, e')]$$

In case no aspectual coercion is needed, a default fixation of *coerce* is available, namely, existential instantiation of  $Q$  and regarding  $R$  as the identity

<sup>23</sup> The term *coerce* is borrowed from Pulman (1997). In former papers, I designated templates of similar kind *sort*, *met*, *infl* or *var*. Cf. also Nunberg (1995) for his assumption of two general operators of predicate transfer.

<sup>24</sup> I suppose that each SF being a one-place predicate of eventualities is subject to an application of *coerce* (cf. Dölling 1997, 2003a, 2003b).

relation. As the logical relation in (69) shows, this interpretation is equivalent to removing the operator.

$$(69) \quad \lambda e. \exists e': e' = e [\mathbf{play}(e') \wedge \mathbf{TH}(\mathbf{the\_sonata}, e')] \\ \equiv \lambda e. \mathbf{play}(e) \wedge \mathbf{TH}(\mathbf{the\_sonata}, e')$$

Accordingly, the VP is used in its default and, thus, literal meaning, i.e. it is a predicate of episodes.

After this general characterization, I will sketch how the two above-mentioned problem cases are handled in my approach. First, a sentence like (3), repeated here as (70), has an SF which can be identified with the highly simplified structure in (70').

$$(70) \quad \# \text{Fred played the piano for one year.} \\ (70') \quad \exists e [\mathbf{AG}(\mathbf{fred}, e) \wedge Q e': R(e', e) [\mathbf{play}(e') \wedge \mathbf{TH}(\mathbf{the\_piano}, e')] \wedge \mathbf{for}(e, \mathbf{1\_year})]$$

Taking into account our experiential knowledge about typical duration of playing a piano without break, from the SF in (70') we can derive the PFS in (70<sup>+</sup>), representing the habitual reading of (70).

$$(70^+) \quad \exists e [\mathbf{AG}(\mathbf{fred}, e) \wedge \forall e': \mathbf{REAL}(e', e) [\mathbf{play}(e') \wedge \mathbf{TH}(\mathbf{the\_piano}, e')] \wedge \mathbf{for}(e, \mathbf{1\_year})]$$

Here, the parameters  $Q$  and  $R$  are instantiated by  $\forall$  and  $\mathbf{REAL}$ , respectively.

Second, a sentence like (35) or even like (71) needs some more considerations.

$$(71) \quad \# \text{Rob ran to the summit for some time.}$$

In (71), coercion is due to the restricted aspectual compatibility of the VP *run to the summit* and the durative adverbial *for some time*. A closer look at *run to the summit for some time* reveals that it has at least four possible interpretations, namely an iterative, a subtractive and a habitual reading as well as a reading on which the adverbial specifies the duration of the poststate. Accordingly, to derive these readings demands that the SFs of both the VP and the adverbial are subject of *coerce*. After the two applications of the operator, we obtain the SFs in (72).

$$(72) \quad (a) \quad \lambda e. Q_1 e': R_1(e', e) [\mathbf{run}(e') \wedge \mathbf{to}(e', \mathbf{the\_summit})] \\ (b) \quad \lambda e. Q_2 e': R_2(e', e) [\mathbf{for}(e', \mathbf{some\_time})]$$

Modifying the VP by the adverbial then yields the more complex SF for *run to the summit for some time* in (73).

$$(73) \quad \lambda e. Q_1 e': R_1(e', e) [\text{run}(e') \wedge \text{to}(e', \text{the\_summit})] \wedge Q_2 e': R_2(e', e) [\text{for}(e'', \text{some\_time})]$$

From this SF we can now derive the PFSs for the four readings.

- (73') (a)  $\lambda e. \forall e': \text{CONST}(e', e) [\text{run}(e') \wedge \text{to}(e', \text{the\_summit})] \wedge \text{for}(e, \text{some\_time})$   
 (b)  $\lambda e. \exists e': \text{COMPL}(e', e) [\text{run}(e') \wedge \text{to}(e', \text{the\_summit})] \wedge \text{for}(e, \text{some\_time})$   
 (c)  $\lambda e. \exists e': \text{REAL}(e', e) [\text{run}(e') \wedge \text{to}(e', \text{the\_summit})] \wedge \text{for}(e, \text{some\_time})$   
 (d)  $\lambda e. \text{run}(e) \wedge \text{to}(e, \text{the\_summit}) \wedge \exists e': \text{RES}(e', e) [\text{for}(e', \text{some\_time})]$

For instance, the PFS for the iterative reading of (73), which is given in (73'a), emerges again by universal instantiation of  $Q_1$  and interpretation of  $R_1$  as **CONST**, while the second instance of *coerce* gets default fixation. In contrast to that, the PFS for the poststate reading is (73'd). Here, the first instance of *coerce* gets default fixation,  $Q_2$  is interpreted existentially, and  $R_2$ , as **RES**.

Till now, it has been remained unconsidered that coercion can be iterated. An examination of sentences like (37), (39), (40), (41) or (43) shows that this kind of aspectual adjustment could be explained as resulting on the basis of a twofold application of *coerce*. However, the procedure would raise the question of how the repeated use of the operator can be restricted to at most twice. Therefore, I suggest that an improvement or, more precisely, a generalization of *coerce* is necessary.

The new abstract operator *coerce\** given in (74) is derived by functional composition of two instances of *coerce*. Its more complex character is accounted for by the embedding of a second restricted quantifier in the scope of the first one.

$$(74) \quad \lambda P \lambda e. Q^1 e': R^1(e', e) [Q^2 e'': R^2(e'', e') [P(e'')]]$$

Possible concrete coercion operators, which at PFS arise from *coerce\** by instantiating its parameters  $Q^1$ ,  $Q^2$ ,  $R^1$  and  $R^2$  appropriately, are listed in (75).

- (75) (a) **iterative-stretching coercion** (MOMENT  $\Rightarrow$  PROCESS):  
 $\lambda P \lambda e. \forall e': \text{CONST}(e', e) [\exists e'': \text{RED}(e'', e') [P(e'')]]$   
 (b) **subtractive-stretching coercion** (MOMENT  $\Rightarrow$  PROCESS):  
 $\lambda P \lambda e. \exists e': \text{COMPL}(e', e) [\exists e'': \text{RED}(e'', e') [P(e'')]]$   
 (c) **habitual-stretching coercion** (MOMENT  $\Rightarrow$  HABITUAL\_STATE):  
 $\lambda P \lambda e. \forall e': \text{REAL}(e', e) [\exists e'': \text{RED}(e'', e') [P(e'')]]$

- (d) *iterative-additive coercion* (BOUNDARY  $\Rightarrow$  PROCESS):  
 $\lambda P \lambda e. \forall e': \text{CONST}(e', e) [\exists e'': \text{CULM}(e'', e') [P(e'')]]$
- (e) *habitual-additive coercion* (BOUNDARY  $\Rightarrow$  HABITUAL\_STATE):  
 $\lambda P \lambda e. \forall e': \text{REAL}(e', e) [\exists e'': \text{CULM}(e'', e') [P(e'')]]$

For instance, applying *coerce\** to the SF of *sneeze* delivers the structure in (76).

$$(76) \lambda e. Q^1 e': R^1(e', e) [Q^2 e'': R^2(e'', e') [\text{sneeze}(e'')]]$$

From this SF the PFSs for the several readings of *sneeze* can be derived. As an example, the meaning of *sneeze* being part of a VP like *sneeze for one hour* (cf. sentence (37)) is the result of its *iterative-stretching coercion*. Accordingly, we obtain the PFS in (77).

$$(77) \lambda e. \forall e': \text{CONST}(e', e) [\exists e'': \text{RED}(e'', e') [\text{sneeze}(e'')]]$$

Here,  $Q^1$  has been instantiated as the quantifier  $\forall$ ,  $R^1$  as the relation CONST,  $Q^2$  as the quantifier  $\exists$ , and  $R^2$  as the relation RED.

It is easy to demonstrate that the concrete coercion operators observed previously are also possible specifications of *coerce\**. That is, any kind of adjustment treated with *coerce* so far can be viewed as being actually based on the more general operator. Moreover, my assumption is that there is no aspectual coercion which is not performed by means of *coerce\**.

Finally, it should be noted that during the last ten years a lot of work in psycho- and neurolinguistics was devoted to aspectual coercion (see e.g. Piñango et al. 2006, Pykkänen and McElree 2006, Pickering et al. 2006, Bott 2008, Brennan and Pykkänen 2008, Pykkänen 2008).<sup>25</sup> But up to the present, only a very small subset of kinds of coercion were subject of experiments. The investigations concentrated primarily on iterative readings, and the shifting operations most often experimentally tested were adjustments of semelfactives like *sneeze* or *jump*. Psycholinguistic research yielded mixed findings on the question whether aspectual coercion is cognitively demanding or not: while some studies found sentences such as (78) to take longer to read than sentences involving no aspectual mismatch (e.g. Piñango et al. 2006, Brennan and Pykkänen 2008), others failed to find any such processing consequences (e.g. Pickering et al. 2006).

$$(78) \# \text{For ten minutes, Susan jumped.}$$

<sup>25</sup> For a general review see, in particular, Pickering et al. (2006), Pykkänen and McElree (2006) and Pykkänen (2008).

Thus, it seems to be delivered no definite judgment on the basis of current experimental results.

Importantly, however, the magnetoencephalography (MEG) studies by Brennan and Pylkkänen (2008) provide some empirical evidence that the two-stage approach pursued in this paper could be on the right track. In searching for neural correlates of the processing cost elicited by aspectual mismatch resolution in sentences like (78), the authors identified two distinct effects, an earlier right-lateral frontal, anterior temporal and posterior temporal/cerebellar effect at 340–380 ms after verb onset, and a later anterior midline effect at 440–460 ms. They suggest that of the representational hypotheses currently in the literature, the data are most consistent with the assumption of a pragmatic realization of iterative coercion, which is argued for in Dölling (2003a, 2003b). Whereas the first effect can be interpreted as reflecting an detection of anomaly of the sentence in its default, literal reading, the second one can be associated with a meaning shift of the verb.

## 4 Conclusion

The aim of this paper has been explaining systematicity of aspectual coercion. For this purpose, I have addressed the question of how the aspect of expressions and its contextually determined shifting are based on eventuality structure. In the first part of my account, some assumptions standardly made about aspectual classes and their correlation to sorts of eventuality have been examined. As has been demonstrated, there is a lot of indications that the domain of eventualities referred to by expressions is more structured than commonly supposed. More precisely, I have argued for a richer differentiation of eventualities into sorts and a number of general relations between members of them. In the second part, a multitude of operations for systematically transforming the aspect of expressions have been analyzed. Crucially, it has appeared that the different kinds of aspectual coercion have basically the same structure. In particular, shifting an expression from the one sortal predicate to another one always involves a reference to a general relation that exists between eventualities of the respective sorts. Taking this into consideration, I have proposed an approach to aspectual coercion, which makes a distinction between two stages of calculation of meaning. Whereas in the first stage an abstract, underspecified coercion operator is mandatorily inserted in semantic composition, in the second one if required an aspectual coercion can be realized by pragmatically enriching it.

## References

- Bach, Emmon (1986): The Algebra of Events. *Linguistics and Philosophy* 9: 5-16.
- Bott, Oliver (2008): Doing It Again and Again May Be Difficult, But It Depends on What You Are Doing. In: N. Abner and J. Bishop (eds.): *Proceedings of the 27th West Coast Conference on Formal Linguistics*. Somerville, MA, 63-71.
- Brennan, Jonathan and Liina Pylkkänen (2008): Processing Events: Behavioral and Neuromagnetic Correlates of Aspectual Coercion. *Brain & Language* 106: 132-143.
- Davidson, Donald (1967): The Logical Form of Action Sentences. In: N. Rescher (ed.): *The Logic of Decision and Action*, Pittsburgh: University of Pittsburgh Press, 81-95.
- de Swart, Henriëtte (1998): Aspect Shift and Coercion. *Natural Language and Linguistic Theory* 16: 347-385.
- Dölling, Johannes (1995): Ontological Domains, Semantic Sorts and Systematic Ambiguity. *International Journal of Human-Computer Studies* 43, 785-807.
- Dölling, Johannes (1997): Semantic Form and Abductive Fixation of Parameters. In: Rob van der Sandt, Reinhard Blutner and Manfred Bierwisch (eds.): *From Underspecification to Interpretation*. Working Papers of the Institute for Logic and Linguistics. IBM Deutschland, Heidelberg, 113-139.
- Dölling, Johannes (2003a): Flexibility in Adverbial Modification: Reinterpretation as Contextual Enrichment. In: E. Lang, C. Maienborn and C. Fabricius-Hansen (eds.): *Modifying Adjuncts*. Berlin, New York: Mouton de Gruyter, 511-552.
- Dölling, Johannes (2003b): Aspectual (Re-)Interpretation: Structural Representation and Processing. In: H. Härtl and H. Tappe (eds.): *Mediating between Concepts and Grammar*. Berlin, New York: Mouton de Gruyter, 303-322.
- Dölling, Johannes (2005a): Semantische Form und pragmatische Anreicherung: Situationsausdrücke in der Äußerungsinterpretation. *Zeitschrift für Sprachwissenschaft* 24: 159-225.
- Dölling, Johannes (2005b): Copula Sentences and Entailment Relations. *Theoretical Linguistics* 31: 317-329.
- Dölling, Johannes und Tatjana Heyde-Zybatow (2007): Verb Meaning: How much Semantics is in the Lexicon? In: Andreas Späth (ed.): *Interface and Interface Conditions*. Berlin, New York: Mouton de Gruyter, 33-75.
- Dowty, David (1979): *Word Meaning and Montague Grammar. The Semantics of verbs and Times in generative Semantics and in Montagues's PTQ*. Dordrecht: Kluwer.
- Egg, Markus (1995): The Intergressive as a New Category of Verbal Aktionsart. *Journal of Semantics* 12: 311-356.

- Egg, Markus (2005): *Flexible Semantics for Reinterpretation Phenomena*. Stanford: CSLI Publications.
- Engelberg, Stefan (2004): Lexical Event Structures for Verb Semantics. *Journal of Language and Linguistics* 3, 62-108.
- Filip, Hana (1999): Aspect, Eventuality Types and Nominal Reference. New York: Garland Publishing.
- Heyde-Zybatow, Tatjana (2008): What Kind of Events Do Achievements Describe? In: A. Steube (ed.): *The Discourse Potential of Underspecified Structures*. Berlin: de Gruyter, 109-144.
- Hobbs, Jerry, Mark Stickel, Douglas Appelt, and Paul Martin (1993): Interpretation as abduction. *Artificial Intelligence* 63: 69-142.
- Jackendoff, Ray (1997): *The Architecture of Language Faculty*. Cambridge: MIT Press.
- Kamp, Hans and Uwe Reyle (1993): *From Discourse to Logic. Introduction to Modeltheoretic Semantics of Natural Language*. Dordrecht: Kluwer.
- Kratzer, Angelika (1996): Severing the External Argument from its Verb. In: J. Rooryck and L. Zaring (eds.): *Phrase Structure and the Lexicon*. Dordrecht: Kluwer, 109-137.
- Krifka, Manfred (1992): Thematic Relations as Links between Nominal Reference and Temporal Constitution. In: I. A. Sag & A. Szabolcsi (eds): *Lexical Matters*. Stanford: CSLI Publications, 29-53.
- Krifka, Manfred (1998): The Origins of Telicity. In: S. Rothstein (ed.): *Events and Grammar*. Dordrecht: Kluwer, 197-235.
- Link, Godehard (1983): The Logical Analysis of Plurals and Massterms: A Lattice-theoretical Approach. In: R. Bäuerle, Ch. Schwarze and A. von Stechow (eds.): *Meaning, Use and Interpretation of Language*. Berlin, New York: de Gruyter, 303 - 323.
- Maienborn, Claudia (2005): On the Limits of Davidsonian Approach: The Case of Copula. *Theoretical Linguistics* 31: 275-316.
- Maienborn, Claudia (2010): Event Semantics. In: C. Maienborn, K. von Heusinger and P. Portner (eds.): *Semantics. An international Handbook of Natural Language Meaning; Volume 1*. Berlin, New York: Mouton de Gruyter.
- Moens, Marc and Mark Steedman (1988): Temporal Ontology and Temporal Reference. *Computational Linguistics* 14: 15-28.
- Mourelatos, Alexander P.D. (1978): Events, Processes, and States. *Linguistics and Philosophy* 2: 415-434.
- Nunberg, Geoffrey (1995): Transfers of Meaning. *Journal of Semantics* 12: 109-132.
- Parsons, Terence (1990): *Events in the Semantics of English: A Study in Subatomic Semantics*. Cambridge: MIT Press.



- Pickering, Martin J., Brian McElree, Steven Frisson, Lillian Chen, and Matthew J. Traxler (2006): Underspecification and Aspectual Coercion. *Discourse Processes* 42: 131–155.
- Piñango, Maria, M., Rashad Winnick, Aaron Ullah, and Edgar Zurif (2006): Time-course of Semantic Composition: The Case of Aspectual Coercion. *Journal of Psycholinguistic Research* 35: 233–244.
- Piñón, Christopher (1995): *An Ontology for Event Semantics*. UMI, Ann Arbor.
- Piñón, Christopher (1997): Achievements in an Event Semantics. In: A. Lawson and E. Cho (eds.): *Proceedings of SALT VII*. Cornell University, Ithaca, 273–296.
- Piñón, Christopher (2008): Verbs of Creation. In: J. Dölling, T. Heyde-Zybatow and M. Schäfer (eds.): *Event Structures in Linguistic Form and Interpretation*. Berlin, New York: Mouton de Gruyter, 493–521.
- Pulman, Stephen (1997): Aspectual Shift as Type Coercion. *Transactions of the Philological Society* 95: 279–317.
- Pustejovsky, James (1991): The Syntax of Event Structure. *Cognition* 41: 47–81.
- Pustejovsky, James (1995): *The Generative Lexicon*. Cambridge: MIT Press.
- Pykkänen, Liina (2008): Mismatching Meanings in Brain and Behavior. *Language and Linguistics Compass* 2/4: 712–738.
- Pykkänen, Liina and Brian McElree (2006): The Syntax-Semantics Interface: On-line Composition of Sentence Meaning. In: M. J. Traxler and M. A. Gernsbacher (eds.): *Handbook of Psycholinguistics*. New York: Elsevier, 537–577.
- Rothstein, Susan (2004): *Structuring Events: A Study in the Semantics of Lexical Aspect*. Malden: Blackwell Publishing.
- Rothstein, Susan (2008): Two Puzzles for a Theory of Lexical Aspect: Semelfactives and Degree Achievements. In: J. Dölling, T. Heyde-Zybatow and M. Schäfer (eds.): *Event Structures in Linguistic Form and Interpretation*. Berlin, New York: Mouton de Gruyter, 175–197.
- Smith, Carlota (1991): *The Parameter of Aspect*. Dordrecht: Kluwer.
- Vendler, Zeno (1957): Verbs and Times. *Philosophical Review* 56: 143–160.