The Parsons Project

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Doctoraalscriptie
ter verkrijging van het doctoraalexamen
Cognitieve Kunstmatige Intelligentie

door

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geboren op 28 januari 1971
te Nijmegen

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Another thing that got forgotten was the fact that against all probability a sperm whale had suddenly been called into existence several miles above the surface of an alien planet. And since this is not a naturally tenable position for a whale, this poor innocent creature had very little time to come to terms with its identity as a whale before it then had to come to terms with not being a whale any more. This is a complete record of its thought from the moment it began its life till the moment it ended it.

- *Ah! What's happening? it thought.*
- *Er, excuse me, who am I?*
- *Hello?*
- *Why am I here? What is my purpose in life?*
- *What do I mean by who am I?*
- *Calm down, get a grip now . . . oh! this is an interesting sensation, what is it? It's a sort of . . . yawning, tingling sensation in my . . . my . . . well I suppose I'd better start finding names for things if I want to make any headway in what for the sake of what I shall call an argument I shall call the world, so let's call it my stomach.*
- *Good. Ooooh, it's getting quite strong. And hey, what about that whistling sound going past my head? Perhaps I can call that . . . wind! Is that a good name? It'll do . . . perhaps I can find a better name for it later when I've found out what it's for. It must be something very important because there certainly seems to be a hell of a lot of it. Hey! What's this thing? This . . . let's call it a tail – yeah, tail. Hey! I can really trash it about pretty good can't I? Wow! Wow! That feels great! Doesn't seem to achieve very much but I'll probably find out what it's for later on. Now – have I built up any coherent picture of things yet?*
- *No.*
- *Never mind, hey, this is really exciting, so much to find out, so much to look forward to, I'm quite dizzy with anticipation . . .*
- *Or is it the wind?*
- *There really is a lot of that now isn't there?*
- *And wow! Hey! What's that thing suddely coming towards me very fast? Very very fast. So big and flat and round, it needs a big wide sounding name like . . . ow . . . ound . . . round . . . ground! That's it! That's a good name – ground!*
- *I wonder if it will be friends with me?*

(Douglas Adams, *The Hitchhikers Guide to the Galaxy*)

Preface

The work that is lying before you is my masters thesis in Computational Linguistics and Logic (CTL) of the study Cognitive Artificial Intelligence (CKI) in Utrecht, The Netherlands. CKI is an interdisciplinary study, combining the efforts of computer scientists, (cognitive) psychologists, philosophers, logicians and (computational) linguists. The goal of CKI is to search for methods to simulate human behavior, not only in order to develop computer programs that are hopefully more efficient and better assimilated to our own behavior, but also to get a better understanding of the way the human body/mind works. The path of CTL is mainly focussed on computational grammar, especially on the framework of Categorial Grammar.

This thesis, like CKI, is interdisciplinary in character: it is in part linguistic and in part philosophical, and philosophical beyond the point of 'regular' philosophical linguistics. The purpose of this thesis, therefore, is that it will be of interest to both linguists and philosophers. But writing for such a diverse group means that you can assume less prior knowledge of the various theories. That is why every theory used in this thesis is provided with a thorough introduction, so that it should be in principle understandable for anyone with a basic knowledge of predicate logic. A consequence of this approach is that these introductions may seem rather superfluous and dull for those who are already familiar with the theories discussed. I invite anyone who develops such feeling while reading this thesis to skip those introductions that are found unnecessary.

In English literature it is common to quote translated texts. But I have always disliked reading for instance that Wittgenstein said '*The world is everything that is the case.*' Not only is this incorrect but, especially in philosophic literature, translations are often interpretations of the original text (for instance Frege's notion *Bedeutung* has been translated as Sense, Reference and Denotation). I have therefore chosen to give all quotations in their original language. But since this thesis is meant to be readable by anyone who masters the English language, a translation has been added in a footnote. Since a lot of the literature quoted in this thesis has not been translated, these footnotes, as a rule, contain my own translations, sometimes even when a translation *does* exist, such as for instance the quote from Merleau-Ponty on page 60, when the existing translation did not fit the need. On other occasions, existing translations *have* been used, either because it was a good translation, as with the quote from St. Thomas Aquinas on page 58, or because of my incapacity to translate the text myself, as with the quote from Aristotle on page 9. In these cases, the source of the translation has been mentioned in the footnote.

As you can see in the text that was quoted from the Hitchhikers Guide to the Galaxy on the previous page: Wittgenstein's private language argument, nor Kripke's variation on it, applies to sperm whales.

Acknowledgment

First of all, I would like to thank my supervisor, prof. dr. Henk J. Verkuyl, who has been a great support and who has put many hours in critically reading the text, discussing problems and errors with me, handing out references and so on.

Secondly, I would like to thank all those who have helped me with specific problems, or provided me with literature, amongst which my co-supervisor Albert Visser, Menno Lievers, Paul Dekker, Michael Moortgat and Ralf Naumann.

Thirdly, I would like to thank some friends of mine who helped me a great deal by listening to and commenting on some of the ideas in this thesis, amongst which Knud Boucher, Anouschka Busch and Marije van Duijne Strobosch.

And last but not least I would like to thank my parents, not only for their financial support throughout my studies, but even more for raising me in the right frame of mind to get this far in the first place.

Contents

1 Introduction

A central question in this thesis is a metaphysical one: are there events? or in more philosophical terms: do events exist? Before we can answer this question, we will first have to define what events are. Events are things that happen in the world, episodes in history. Examples of events are the eruption of the Vesuvius, the shooting of Robert Kennedy, the tennis-match between Boris Becker and Ivan Lendl, but also the more everyday things as you getting up this morning.

But if it is possible to give a list of events, how then can we still question the fact that there are events? There are two commonly taken routes for denying that there are events. The first is asking: how can we be really sure the Vesuvius erupted, wasn't the shooting of Robert Kennedy just an illusion, didn't I just dream that I got up this morning? The general idea behind these questions is: how can we be sure that there really is a world out there? This is not the line of thought I want to pursue in this thesis. Idealism is not commonly considered a tenable position.

The second line of argument is exhibited for example by Judith Thomson (Thomson, 1977). The answer is this:

> No doubt that if there was an entity that was a killing, there was an [event]. And no doubt *'There was a killing of Kennedy by Sirhan'* looks as if it says there was an entity that was a killing. But does it? Does *'There was a shortage of beef recently'* say there was an entity that was a shortage? Surely the fact that a sentence begins with "There was a . . . " does not by itself show anything. (Thomson, 1977 [14])

A shortage of beef is what I will call a *derived entity*. It exists only because of the fact that there is a need for beef. Referring to a shortage of beef is another way of referring to the *fact* that there is no beef around.

So we can reformulate our question as follows: do events exist as non-derived entities? Are there so-called *event particulars*, individual entities of the category EVENT?

Over the last few decades this question has attracted a lot of attention. This attention can be seen as the result of an article of no more than 18 pages, called "The Logical Form of Action Sentences" (Davidson, 1967). In this article, Davidson (re)introduces the notion of an event particular. This notion was introduced not in the light of some visionary metaphysical argument, but because of some formal logic consideration, concerning linguistic data. Event particulars are, according to Davidson, linguistic devices. This device is still used in linguistics nowadays. That is why the metaphysical question of the existence of event particulars is not only studied by philosophers, but also by linguists.

In this thesis, I will review the event-semantic theory as proposed by Terence Parsons. This theory is mainly a refinement of the theory as originally proposed by Davidson[1]. Davidson presented a logical form that is widely used in linguistics, but he himself was not interested in the linguistic consequences. Parsons used this framework to built a theory that can account for more linguistic data than the original proposal. In a paper introducing this theory he started with:

> The purpose of this paper is to explore the idea that many sentences of English can be assigned logical forms that make reference to, or quantify over, events, states and processes. (Parsons, 1985 [235])

This purpose that Parsons formulates at the beginning of one of his papers: *Underlying Events in the Semantics of English*, to test the so called *event-ontology approach*,

[1] Parsons, amongst others, credits Hans Reichenbach for the introduction of events: *This idea was first proposed by Hans Reichenbach, and was worked out in some detail by Donald Davidson.* (Parsons, 1985 [235]). Also Panini and Ramsey are given this credit (*'That Caesar died' is really an existential proposition, asserting the existence of an event event of a certain sort.* (Ramsey, 1927).

seems to be not only the purpose of that specific paper, but of his entire work on semantics. It is this purpose that I have labeled *The Parsons Project*, the very title of this thesis.

This thesis is split up in four parts. The first part is meant to set the stage. The theories of Davidson, Parsons and Verkuyl will be introduced as well as some useful terms for categorizing verbs and sentences. In part II, I will discuss the linguistic merits of the event-ontology approach. In part III, I will look at the ontological consequences of the introduction of event-particulars and look at some alternatives. Finally, in part IV I will use the remarks made throughout this thesis to make some minor and major changes to the event-ontology approach as introduced by Parsons.

This thesis is partly philosophical in character. That means that the event semantic approach that was proposed by Terence Parsons, is judged on the basis of philosophical considerations. Parsons does have the following to say about this method:

> My methodology regarding events differs from that of the main philosophical tradition. Philosophers typically begin with general hypotheses about events, gleaned from intuitions and first principles. The principles include views about, for instance, the identity conditions for events. These general principles are then brought to bear on a theory such as the one I investigate to test its validity. This usually results in a conflict between the principles and the theory, and in consequence the theory is rejected. . . .
> I have reservations about this type of approach. I usually lack the intuitions that others begin with, and I note that the writers in question rarely agree among themselves as to the truth about events. This gives me the courage to ignore their criteria, at least temporarily, and to pursue a theory having implications for events that would be rejected by many of the main tradition. (Parsons, 1990 [9])

As you will note in part III, events are indeed considered from the viewpoint of intuitions and first principles such as criteria of identity. But nonetheless, I hope to avoid Parsons' criticism, since philosophy is not used to reject, but to adapt the theory, and explain why the theory makes an appeal to our intuitions. I believe that without proper 'philosophical' considerations, the theory would not exceed being a mere tool or magic box that happens to predict correct entailments for sentences. The way I see it, event semantics reflects the world as we live it, and since language is used to describe this 'lives world', event semantics gives a very good representation for sentences.

Part I Basic Account

In this part theories and notions that are necessary for the discussion will be explained in five chapters. In chapter 2, I will describe the original event-semantics Donald Davidson proposed in 1967. In chapter 3, I will introduce the notion of verb-classes and give a little historic background. In chapter 4, I will describe the most important theory: the event-ontology approach such as Parsons presents it in his 1990 book. This is the most important, because for a large part this thesis is a critical review of this (more) up-to-date version of event-semantics. In chapter 5, I will give an interpretation of the aspectual theory of Verkuyl. In this interpretation, Verkuyl claims that there are no event-particulars, that the things we are intended to call *events* are in fact derived entities. Finally, in chapter 6, I will define three very important terms that are in some way related to the term *event*: *state of affairs*, *fact*, and *generic event*.

2 Donald Davidson

The subject of this thesis is the event-semantic logical form such as it was presented in 1967 by Donald Davidson. This logical form is in itself not very complicated and seems at first glance not to be a very drastic extension of the traditional predicate logic. To strengthen this feeling, I will present in section 2.1 the event-semantic logical form straight-forward as a simple extension traditional argument-predicates structures, taking up less than a full page. But all the rest of this thesis can be seen as a discussion of the various questions that are raised by this logical form.

2.1 The Logical Form of Action Sentences

In 1967, Donald Davidson proposes a logical representation for action sentences, that is nowadays known as the *event semantic* form. This representation very much resembles the traditional predicate logical representation, in which a verb is interpreted as an n-place predicate. Take a simple example like:

[1] Brutus killed Caesar.

The verb *to kill* is interpreted as a 2-place predicate KILL, having as its first argument the subject of the killing, in this case Brutus, and as its second argument the object of the killing, in this case Caesar. So the logical form looks like:

(2) $\text{KILL}(\text{Brutus}, \text{Caesar})$

The only alternation that Davidson makes on this standard approach is to add an extra argument to the verbal predicate. So *to kill* is not interpreted as a 2-place predicate, but as a 3-place predicate. The new argument is a bound variable *e*. The predication expressed in (2) is thus expanded to:

(3) $\exists e.\text{KILL}(\text{Brutus}, \text{Caesar}, e)$

The added variable *e* is called an *event-variable*: it is a variable whose value is an event particular. In a simple predicate structure like (3) this event-variable doesn't do much. But in a sentence like [4], the quantifier binds the different occurrences of the variable.

[4] Shem hit Shaun in the bathroom.

The main part *Shem hit Shaun* is analyzed as above. The adverbial phrase *in the bathroom* is placed together with the predicate structure under a quantifier:

(5) $\exists e.[\text{HIT}(\text{Shem}, \text{Shaun}, e) \,\&\, \text{IN}(e, \text{bathroom})]$

If it were not for the event-variable, the two predicates HIT and IN would be totally independent. With the extra argument however, the two predicates are related because they apply to the same event.

2.2 Event Descriptions

Logical equations can be written out in words. If this is done with the representation in (3), the resulting sentence is not the sentence it represents, but this:

[6] There is a killing of Caesar by Brutus.

Both [1] and [6] relate to an event, the event of Brutus killing Caesar. But they do so in a different way. To use Hempel's terminology, sentence [1] refers to a *sentential* event, while [6] refers to a *concrete* event. These notions are made explicit by R.M. Martin (1969) at the 1966 University of Western Ontario Philosophy Colloquium. Their purported meaning can best be described along Fregean lines. In [1] the killing of Caesar by Brutus is referred to by the entire sentence. And the denotation of a sentence is, according to Frege, a truth-value, not a concrete thing in the world. But in [6], reference is made by a definite description: *a killing of Caesar by Brutus*. And the denotation of a definite description is an *individual*. That is why Martin calls such NP's as 'a killing of Caesar by Brutus' *event-descriptions*.

2.3 Evidence

Davidson brings forward three types of arguments in favor of the proposed logical form. The evidence brought forward is not hard evidence in the philosophical sense, but it shows that the system works and that it works better than the traditional predicate logic approach.

2.3.1 Adverb-Dropping Inferences

Adding adverbials to a sentence makes it more informative. Therefore, a sentence containing adverbials is more informative than one without. This is easily seen in the following set of sentences: each one entails all others below:

[7] Jones buttered the toast with a knife in the bathroom at midnight.

[8] Jones buttered the toast in the bathroom at midnight.

[9] Jones buttered the toast at midnight.

[10] Jones buttered the toast.

Event-semantics renders a logical form that preserves these entailments. Adverbials are analyzed as independent predicates, placed in conjunction with the verb. We can do this because we have a way of linking these independent predicates to the verb: by placing it under a quantifier that binds the event-variable. So if we analyze sentence [7] as in (11), we preserve adverb-dropping inference.

(11) $\exists e.[\textsc{butter}(\text{Jones}, \text{toast}, e) \,\&\, \textsc{in}(\text{bathroom}, e) \,\&\, \textsc{at}(\textbf{0:00}, e) \,\&\, \exists x.[\textsc{knife}(x) \,\&\, \text{with}(e, x)]]$

In the traditional predicate logic approach, these entailments are hard to come by, if not impossible to get. As said, this is not real evidence for the event-semantic approach, but an argument why the event-semantic approach is better than the traditional (first order) predicate logic approach.

2.3.2 Variable Polyadicity

The second type of evidence is in fact negative evidence for the traditional logic approach. This approach has some problems. If we want to analyze sentence [7] without the use of an event-variable, the expression would be a 5-place predicate BUTTER:

(12) BUTTER(Jones, toast, Jones, knife, bathroom, midnight)

But this logical form has a couple of drawbacks. One of these we have seen: we lack inferences in case of adverb-dropping. Because there is no logical connection between BUTTER/5 and the related predicates BUTTER/4, BUTTER/3 and BUTTER/2.

Another is that we can add an infinite number of adverbs, so we would have an infinite number of independent predicates BUTTER all with their own arity. This is what Davidson calls *variable polyadicity*.

There are related problems, such as the question in which order to place the adverbial arguments. If we just take them in word order, we would get a different logical form if we would put the adverbs in sentence [7] in a different order. But these problems are either easily solvable, or rewritable in terms of the problems mentioned above.

2.3.3 Anaphora

The last type of evidence is only mentioned at the very beginning of the article, but seems nonetheless important. Look at the first sentence used in *The Logical Form of Action Sentences*:

[13] He did *it* slowly, deliberately, with a knife, in the bathroom at midnight.

This sentence contains an anaphor: *it*. Contrary to the predicate logical expression, the logical form proposed by Davidson contains something to which this anaphor can refer, namely the event-variable *e*. So in the event-semantic analysis, the referent of the anaphor *it* is the event denoted by this variable.

2.4 Exceptional Adverbs

So one of the main advantages of event-semantics is the smooth way in which it can handle adverbs. But we cannot treat all adverbs in the way described. Davidson gives in *The Logical Form of Action Sentences* two examples of adverbs that need a special treatment, both taken from sentence [13]. The first is the adverb *deliberately*. Treated as a normal adverb, it would be interpreted as a predicate DELIBERATE(*e*). However, the buttering was not deliberate, the agent (he) who was acting deliberately when doing the buttering. Trying to formalize the precise meaning of 'deliberate' is in fact one of the central problems in the philosophy of action.

The second example is a relational adverb: the adverb *slowly*. If Jones buttered the toast slowly, it was not slow in every imaginable way, but it was slow *for a buttering*. The example Davidson gives is this:

[14] Susan slowly crossed the Channel.

Treating the adverb *slowly* as SLOW(*e*) means trouble. Because Susan's crossing was slow because she swam, and taking the boat would have got her there much quicker. But since her crossing was a swimming, you might feel tempted to say the crossing and the swimming are the same event[2]. But if they are, the predicate SLOW is said to apply to both. But [15]:

[2] Sameness will be discussed at length in chapter 10.

[15] Susan slowly swam across the Channel.

is not true, for Susan is an excellent swim. Therefore Davidson *decided to ignore, for the moment at least, the first two modifiers in [13]* (Davidson, 1967).

According to Barry Taylor it is not surprising that not all adverbs can be treated equally, since *adverbial constructions, as identified by schoolboy grammar do not form a unitary semantic class* (Taylor, 1985 [23]). He suggests a division in three types: *sentence* adverbs, *phrase* adverbs and *mode* adverbs, of which *only the last sort form a proper domain of Davidsonian analysis* (Taylor, 1985 [20]).

2.5 Anomalous Monism

The introduction of event-particulars is not something that stands on its own in the work of Davidson. Event-particulars serve a strong function in his philosophy of the mind, and in the interpretation of for example Malpas (1992), Davidson introduced event-particulars because he needed them in his mind-body philosophy. This need arises as follows.

The world surrounding us has been found to be ordered by physical laws. Because the claim of physics is that those laws apply universally, it is an undesirable situation that there are things that don't seem to fit into the physical system. One classical example of these is what Descartes called the *res cogitans*: our thinking self.

According to Descartes, the world around us is physical, while the cogito is placed outside the spatio-temporal realm. The view that the res cogitans and the physical realm are constituted out of radically different material is called (Cartesian) *dualism*.

The dualistic framework Descartes proposed has one serious problem: the physical and the mental are supposed to interact within the pineal gland. But how this interaction between two ontologically different things is supposed to take place was never explained.

This interaction between the mental and the physical is the core of what is called the *mind-body* problem. In the analytical tradition, the idea is that a solution to this problem has to hold two premises:

Physical Closure The world is physically closed, which means that there are only physical entities in the world. All assumed abstract entities and mental entities only exist by virtue of physical entities.

Physical Determinateness All things are to be explained by referring to physical causes. All non-physical causes such as mental causes, telekinesis, supernatural powers are either denied or to be explained in terms of physical causes.

In this picture, the mental has to be explained in terms of the physical, which is problematic:

> Mental events such as perceivings, rememberings, decisions, and actions resist capture in the nomological net of physical theory. (Davidson, 1970 [207])

If we redescribe the mental in physical terms, we have to be careful not to lose track of the mental altogether. Because if we can redescribe the mental, we can presumably reduce the mental, and if we can reduce the mental, we can as well get rid of it. The most famous defender of this view is Paul Churchland (1988).

One of the key notions in Donald Davidson's philosophy of mind is the notion of *supervenience*, which was originally formalized by Blackburn and introduced into the mind/body problem by Jaegwon Kim (1978). The idea of supervenience is this. There are two classes of entities, one supervenient, the other subvenient. These two classes

are related in a very strict way: whenever there is a change in the supervenient class, there also is a change in the subvenient class.

Reduction can also be described in this way, but reduction is much more demanding. Imagine that the human body would only have three neurons. Now we would like to prove that our mental life was reducible to neural states. That would be the case if the firing of neuron A was experienced as 'pain', neuron B as 'love', neuron C as 'the image of a beautiful lady on a sunny beach', and the simultaneous stimulation of neuron A and C as a 'desire for hot chocolate'. In the case of supervenience, the only demand would be that if someone had pain, there is *some* neural activity, but not necessarily the firing of any particular configuration of neurons. There are at best some *bridge laws*, restricting principles on the relation between the supervenient and the subvenient class.

In the philosophy of mind, it is mostly *mental contents* that are said to be supervenient on something else, for instance *functional* states of the brain (Putnam), a *language* of thought (Fodor), *brainstates* (Price) or the causal *history* of the brainstates (Burge). Davidson proposed that mental *events* are supervenient on physical *events*. But for this proposal to make sense, event-particulars have to exist. This is one of the reasons why events are so important in Davidson's philosophy.

2.6 Ontology

With the event semantic approach, Davidson merely introduces a logical form. And why would a logical form have ontological consequences? In the logical form proposed, there is a variable for events. And according to Davidson's teacher, W.V.O. Quine, that is the ultimate proof for existence:

> To be is to be the value of a variable. There are no ultimate philosophical problems concerning terms and their reference, but only concerning variables and their values; and there are no ultimate philosophical problems concerning existence except insofar as existence is expressed by the quantifier '(∃)' (Quine, 1950 [224])

And existence is meant here in the strong sense: there are event-particulars, events exist as non-derived entities. The three types of evidence mentioned in the last paragraph should assure this. And according to Davidson, we cannot see events as reducible, events have to play a central role in our semantics. For instance, Strawson (1959) argued that events are dependent on objects. Davidson replies:

> ...we cannot give an acceptable analysis of 'This animal was born' and 'Peter struck John' without supposing that there are such things as births and blows. ...Thus if my interpretation of the evidence is correct, there is no reason to assign second rank to events; while if, contrary to what I have maintained, total reducibility is possible, then again events do not take a back seat, for there are no events. (Davidson, 1969b [175])

This will be the purpose of much of the rest of this thesis: to uphold a theory that accepts events as first-rank, non-reducible entities. The event-semantic theory of Parsons, as presented in chapter 4, does uphold (almost) *all* of the assumptions made in this chapter.

In this chapter, I presented Davidson as the Godfather of events. But already in the work of Aristotle, we find talk about events. Before turning to the more up-to-date version of event semantics in chapter 4, I will therefore first describe this very old discussion of events: the discussions of verb-classes.

3 Vendler-Classes

Where the theory of Parson's is based on Davidson's event-semantics, the theory of Verkuyl is primarily a theory of aspectuality. One of the purposes of an aspectual theory is to explain why there are different aspectual classes, and by what means we can decide to which aspectual class a sentence belongs. So here is a little bit of history on aspectual classes.

Already in the work of Aristotle we find a bipartition amongst actions/processes (πραξεως), that could be interpreted as an introduction of verb-classes. What Aristotle tells us is that some processes have a τελος (purpose) while others don't. Processes with a purpose are not complete until the end is included:

> en qron gar pasa kinhsic kai telouc tinoc, oon oikodomikh, kai teleia tan poihs o efietai. h en panti dh t qron h tout. en de toic meresi tou qronou pasai ateleic, kai terai t eidei thc lhc kai allhlwn.[3]
> (Aristotle, Nicomachean Ethics X 4 [1173])

Processes without a telos on the other hand can go on forever, and every part of such a process is of the same kind as the 'whole' process. So if the current moment is of a certain type, some moment before also is:

> Oon r ma kai fronei kai noei kai nenohken, all' ou manjanei kai memajhken oud' giazetai kai giastai. eu z kai eu ezhken ma, kai eudaimonei kai eudaimonhken. ei de mh, edei an pote pauesjai sper tan isxnain, nun d' ou, alla z kai ezhken.[4]
> (Aristotle, Metaphysica Θ [1048^b])

Processes without a purpose just express (undirected) movement and are therefore called κινησις (movements), while processes with a telos are actual, complete things called ενεργειας (actualities).

3.1 Gilbert Ryle

After Aristoteles this line of work has been discontinued for quite some time. The first modern philosopher[5] to mention verb-classes was Gilbert Ryle (1949).

In the last chapter we have seen Davidson's event-semantic analysis for action sentences. In this analysis, action sentences refer to events. Events may prove to be, contrary to Davidson's claim, complex structures that can be reduced to ontologically more basic ones, but even then, in the event-semantic approach, action sentences signify events or, as Ryle calls them, *episodes* or *occurrences*. However, not all sentences are action sentences:

> To say a person knows something, or aspires to be something, is not to say that he is at a particular moment in process of doing or undergoing anything, but that he is able to do certain things, when the need arises, or that he is prone to do and feel certain things in situations of certain sorts. (Ryle, 1949 [112])

[3] For every movement (e.g. that of building) takes time and is for the sake of an end, and is complete when it has made what it aims at. It is complete, therefore, only in the whole time or at the final moment. In their parts and during the time they occupy, all movements are incomplete, and are different in kind and form from the whole movement and from each other. (Translation: Barnes, 1984)

[4] E.g. at the same time we are seeing and have seen, are understanding and have understood, are thinking and have thought: but it is not true that at the same time we are learning and have learned, or are being cured and have been cured. At the same time we are living well and have lived well, and are happy and have been happy. If not, the process would have had sometime to cease, as the process of making thin ceases: but, as it is, it does not cease: we are living and have lived. (Translation: Barnes, 1984)

[5] In section 3.3 we will see that verb-classes were examined in linguistics before this date.

Whether or not something is an action sentence is, according to Ryle, decided by the verb. Only a certain class of verbs signifies occurrences. These verbs are labeled *activity verbs* or *process verbs*. Examples mentioned are 'run', 'wake up' and 'tingle'.

Within the class of activity or process verbs, there is a class of verbs that deserves special attention. These are the verbs that denote a culmination of some sort, verbs that Ryle calls *achievement verbs* or *success verbs*. This 'achieving' can either be something that takes no more than an instance, like '*winning*' or '*finding*', or throughout a longer span of time, like '*keeping a secret*' or '*holding a bay*'. According to Ryle, Aristoteles was the only one not to overlook the differences between verbs of this class and other verbs of activity or process, partly since

> ... we very often borrow achievement verbs to signify the performance of the corresponding task activities, where the hopes of success are good. A runner may be described as winning his race from the start, despite the fact that he may not win it in the end. (Ryle, 1949 [143])

The verbs that do not signify an occurrence or episode, like 'know', 'possess' and 'aspire', are called *disposition*. For Ryle, the class of dispositions is the most important class of verbs, because it contains what he calls *semi-hypothetical* statements, law-like statements saying what someone, under the right conditions, is likely to do. These law-like statements play a leading role in the mind-body philosophy of Ryle's.

But there are other sorts of dispositions besides these law-like statement. Dispositions fill, you might say, the 'garbage-can of verbs': *merely to classify a word as signifying a disposition is not [yet] to say much more about it than to say that it is not used for an episode*. (Ryle, 1949 [112]).

3.2 Zeno Vendler

When aspectual classes are used in linguistics, they are not called Aristotle-classes or Ryle-classes, but Vendler-classes. The classifications made by Aristotle and Ryle were only meant to classify eventualities into different ontological classes. Language is mainly used as a way to denote these different classes.

Zeno Vendler (1967) on the other hand, tried to narrow the gap between linguistics and philosophy. Vendler tried to ascribe this classification to language. He develops a set of linguistic tests to determine to which class a certain eventuality belongs. According to Vendler, the members of a verb-class belong together because they all allow certain temporal modifications. And this is explained by the fact that aspectuality is a form of 'tense': the verb-classes are related to time-schemata.

The linguistic tests Vendler proposes seem to apply not so much to verbs, as to what we now-adays call *Verb-Phrases*. But since the term VP was not yet introduced in 1967, you see that on the one hand Vendler's test applies to VP, but he tries to force the classification into something he can ascribe to the verbs itself. The usual interpretation is that the Vendler-classes are verb-classes, but you might also interpret them as VP-classes. I will therefore avoid the suggestive words 'verb' and 'VP' and use instead the more neutral 'term'.

There are two major groups of sentences: *continuous* sentences and *discontinuous* sentences. Continuous sentences express things that you do or that happen, things that are like processes going on in time. Continuous terms accept the progressive form, so as an answer to the question "what are you doing?" you can answer "I am running", or writing, working, and so on (Vendler, 1957 [99]).

Discontinuous sentences are not like this, due to the same argument as Ryle used:

> [A]lthough it can be true of a subject that he knows something at a given moment or for a certain period, knowing and its kin are not processes going on in time. It may be the case that I know geography now, but this does not mean that a process of

> knowing geography is going on at present consisting of phases succeeding one another in time. (Vendler, 1957 [100])

Discontinuous terms therefore do not accept the progressive form, it sounds queer to say “I am knowing geography”.

Within the class of continuous terms there are two subclasses: *homogeneous* terms and *non-homogeneous* terms. Homogeneous events fill the time: if someone is running during a given period, he will also be running at every subinterval of that period. Of course a running starts at a given moment in time and ends at another, but the beginning and the end are of little importance. Homogeneous terms are called *activity terms* and their test is that we can ask: “How long did he run?”

For non-homogeneous terms, the culmination point is of vital importance, after their culmination point there is no sequel. Drawing a circle starts at a given moment and is only ready when you finish drawing the circle. They are called *accomplishment terms* and take a limited amount of time. Therefore you can ask: “How long did it take you to draw that circle?”.

Amongst the discontinuous terms there are also two groups: instantaneous terms and ‘lasting’ terms. The lasting terms express states of affairs, things that last for some time and yet do not ‘happen’. These are the disposition of Ryle’s, covering terms like ‘know’, ‘love’, ‘believe’. Vendler calls them *state terms*. Of state terms you can ask: “for how long did you love her?”.

The instantaneous discontinuous terms[6] express the culmination point of some action, like ‘reach the top’, ‘win the race’ and ‘find the treasure’. They are called *achievement terms*. Of achievement terms you can ask: “At what time did you reach the top?”.

Summing up, Vendler proposed a quadripartition for terms. This quadripartition is structured in the following way:

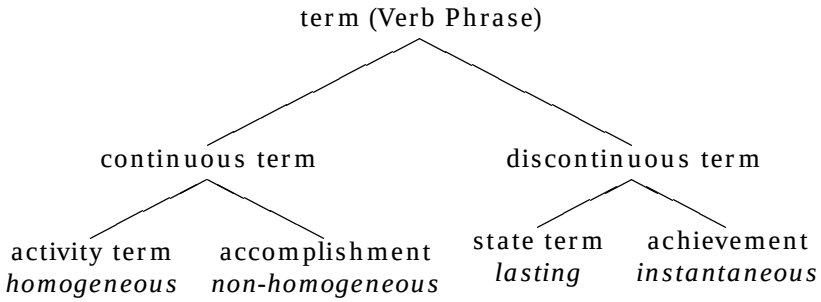


Figure 1: Hierarchy of Vendler Classes

There is one peculiar difference in opinion between Ryle and Vendler. Where Ryle mentioned ‘borrowing’ cases like ‘winning the race’, Vendler rejects these cases:

> [I]f I write a letter in an hour, then I can say “I am writing a letter” at any time during that hour; but if it takes three hours to reach the top, I cannot say “I am reaching the top” at any moment of that period. (Vendler, 1957 [104])

This is the sort of *borrowing* that we saw mentioned by Ryle. To reach a top is the culmination point of the process of climbing to the top. The reaching itself is not something you can be busy doing. But this is so clear that any hearer will automatically interpret ‘reaching the top’ as closing in on the moment of the actual reaching of the

[6] It is maybe a bit strange to say of an instantaneous event that it is discontinuous. Maybe *not continuous* would be better, since the main point is that they are not continuous.

top. It is an achievement term that is forced into an accomplishment interpretation by the use of the progressive form. In literature, 'reaching the top' is both said to be grammatical and ungrammatical. I will return to this point in section 11.3.3

3.3 Vendler's Linguistic Tests

One of the most frequently used parts of Vendler's work on verbs and times is his linguistic test to distinguish homogeneous terms from non-homogeneous ones. Take for instance the test to distinguish durative from terminative sentences in the work of Verkuyl: durative sentences allow the addition of the words *for an hour*, while terminative sentences allow *in an hour*. This allows you to mark *John walked* as durative and *John crossed the street* as terminative, by using the following sample:

[16] John walked for an hour.

[17] * John walked in an hour.

[18] * John crossed the street for an hour.

[19] John crossed the street in an hour.

This test was not taken from Vendler or Ryle, but from earlier linguistic work. Linguistic studies of Slavonic languages make a distinction between three aspectual classes:

> Die slavischen Sprachen unterscheiden von jeher drei Hauptsaktionsarten, die man als *perfektiv*, *imperfektiv*, *iterativ* bezeichnet. Perfektiv und Imperfektiv dürfen nicht, wie es oft geschieht, durch ¡¡ vollendet ¿¿ (perfectus) und ¡¡ unvollendet ¿¿ (imperfectus) übersetst werden; das veranlaßt eine falsche Auffassung, denn es handelt sich dabei gar nicht darum, ob eine Handlung abgeschlossen (vollendet) oder nicht abgeschlossen (unvollendet) ist, sondern ... daß sie eine Beziehung zu den Begriffen der Vollendung oder Nichtvollendung hat.[7] (Leskien, 1909 [215])

So the core of the test is to check whether or not the action referred to by the sentence has a flair of completeness. And when the test is used this should be kept in mind, or the test will have wrong results. For instance, *John gave Mary a book* would have to be considered durative:

[20] John gave Mary the book for an hour.

[21] * John gave Mary the book in an hour.

Of course giving a book is perfectly bounded, so why this strange result? The reason why [21] is ungrammatical is that giving a book is an achievement: it does not take time. It is a bounded event, but an instantaneous bounded event.

The reason why [20] is grammatical is that it is ambiguous. The two readings of [20] are distinguished if we translate it into for instance German[8]:

[22] John hat Maria das Buch für eine Stunde gegeben.

[7] Slavonic languages of old distinguish three major aspects, called *perfective*, *imperfective* and *iterative*. Perfective and imperfective should not, as is often done, be rephrased as 'finished' and 'unfinished', because the point is not whether an action is completed or not completed, but that it has a relation to the notion of completeness or non-completeness.

[8] This idea comes from Ralf Naumann (Naumann, 1995 [123]).

[23] * John hat Maria das Buch eine Stunde lang gegeben.

The test for durativity is therefore to be made more precise: whether or not the addition of *for an hour* is grammatical in the *single event* reading, the reading that translates as [22]. This restriction is justified by the fact that what is tested this: Could John have prolonged what he was doing? And the answer to this question is *no*, because the giving of a book is bounded.

3.4 Conclusion

As we have seen in this chapter, verbs can be divided in different groups. The most famous categorization is the one presented in figure 1. These categories depend on different feature events or event-terms can hold. It is these features that will play an important role in the rest of this thesis: homogeneous vs. non-homogeneous, continuous vs. discontinuous, terminative vs. durative, lasting vs. instantaneous. The theories that will be discussed in the next two chapters, the theories of Parsons and Verkuyl, make use of this terminology. But this terminology will play an even more central role in the revised event-semantic theory I will present in part IV.

4 Terence Parsons

In this chapter I will describe in which regards the Parsonian version of event-semantics differs from the original Davidsonian one. What I will call the Parsonian version is the version that can be found in *Events in the Semantics of English* (Parsons, 1990).

4.1 Neo-Davidsonian

The logical form proposed by Parsons is known as the *neo-Davidsonian* approach. The neo-Davidsonian approach is a variant of the logical form we saw in chapter 2, in which the agent and the patient are separated.

A first version of the neo-Davidsonian approach comes from Castañeda (1967). His reason for introducing a variant on the Davidsonian proposal can be found in these two sentences:

[24] I flew my spaceship to the Morning Star.

[25] I flew my spaceship.

[26] I flew.

In chapter 2, we saw that, in the Davidsonian approach, the entailment from [24] to [25] is preserved. But it is also true that [25] entails [26], and this entailment is not preserved. We can mend this by separating the subject from the object, for if we do that, the object is just another conjunct that can be dropped. That is why Castañeda proposes the following logical form:

(27) $\exists x.[\text{FLEW}(\text{I}, x) \,\&\, \text{FLEW}(x, \text{myspaceship}) \,\&\, \text{TO}(x, \text{themorningstar})]$

Davidson objects to this added entailment. Although it might be true that [25] entails [26], this is not due to the logical form of the two sentences, so we should not make the logical representation of [25] entail [26]:

> 'I flew my spaceship' may entail, 'I flew', but it does not, I think, because of the logical form of the sentences. My reason for saying this is that I find no reason to believe the logical form of 'I flew my spaceship' differs from that of 'I sank the *Bismarck*, which does not entail 'I sank', though it does happen to entail 'The *Bismarck* sank'. (Davidson, 1969c [125])

Disregarding this critique, Parsons uses a logical form in which agent (subject) and patient (object) are separated. It is even further split up than in the form proposed by Castañeda. Parsons' logical analysis for [24] is:

(28) $\exists e.[\text{FLYING}(e) \,\&\, \text{AGENT}(\text{I}, e) \,\&\, \text{PATIENT}(\text{myspaceship}, e) \,\&\, \text{TO}(\text{themorningstar}, e)]$

Also here, the agent and patient are treated independently, that is why Parsons calls this approach the *independent approach*, as opposed to the original *incorporated approach*. But, according to Parsons, the difference between these two approaches is not all that big:

> [My proposal] is slightly different from Davidson's original proposal, in which all three conjuncts were combined into one single three-place predicate. For most of this paper, this difference is irrelevant. (Parsons, 1985 [235])

We will have a closer look at whether or not this difference is really so insignificant and why Parsons uses this independent approach instead of the incorporated approach discussed in section 7.2.

4.2 Evidence

According to Parsons, the event semantic logical representation is more complex than the original predicate logical one, so we should look for evidence supporting it. The predicate logical representation of a sentence like:

[29] Mary saw John.

would be simply SEE(Mary, John). The event-ontology approach expresses this same fact in a much more complicated way, by the logical form given in (30):

(30) $\exists e.[\text{SEEING}(e) \,\&\, \text{AGENT}(\text{Mary}, e) \,\&\, \text{PATIENT}(\text{John}, e)]$

We might rephrase the Parsons project, saying that it is a question *whether – and why – the additional complication is necessary or desirable* (Parsons, 1990 [236]). Parsons obviously claims the additional structure is needed and comes up with four types of evidence for the event-ontology approach (Parsons, 1990). The first is the inference-argument discussed in section 2.3.1, the fact that sentences with more adverbials entail the same sentences with less adverbials.

The second type of evidence is coming from *perceptual idioms*, sentences like for instance [31] (Parsons, 1990 [16]):

[31] John felt Mary shuffle her feet.

What John is feeling here is an event. In a 'normal' approach, one would just be able to analyze this as reporting two facts: John felt Mary, and Mary shuffled her feet. But the conjunction of these two is neither sufficient nor necessary for the complete sentence. We have to connect these two events. In the event-ontology this is done easily, by making the event of Mary shuffling her feet the object of the feeling by John:

(32) $\exists e.[\text{FEELING}(e) \,\&\, \text{AGENT}(e, \text{John}) \,\&\, \exists e'.[\text{SHUFFLING}(e') \,\&\, \text{AGENT}(e', \text{Mary}) \,\&\, \text{OBJECT}(e', \text{maryfeet}) \,\&\, \text{OBJECT}(e, e')]]$

The third kind of evidence is the fact that one can give definite descriptions of events, like *'the singing of the Marseillaise'*. What is being described is not an object, but an event. One can take this event as the subject of the sentence, or any other way. The only way to treat this in a neat and correct way, according to Parsons, is to treat these descriptions as signifying what they stand for: events.

The fourth kind of evidence is this: events can be explicitly quantified over, as is done for instance in [33]:[9]

[33] In every burning, oxygen is consumed.

Just as in the case of similar generalizations over objects, we can use [33] in a logical deduction along the classical syllogistic lines. Combining [33] and [34], it follows that [35].

[34] Agatha burned some wood.

[35] Oxygen was consumed.

Not only does Parsons' event-ontology approach explain the quantification, but the inference from [33] and [34] to [35] is also captured by this logical deduction:

1. $\forall e[\text{BURNING}(e) \rightarrow \exists e'[\text{CONSUMING}(e') \,\&\, \text{OBJECT}(e', \text{O}_2) \,\&\, \text{IN}(e, e')]]$
2. $\exists e[\text{BURNING}(e) \,\&\, \text{SUBJECT}(e, \text{Agatha}) \,\&\, \text{OBJECT}(e, \text{wood})]$
3. $\exists e'[\text{CONSUMING}(e') \,\&\, \text{OBJECT}(e', \text{O}_2)]$

[9] In chapter 6 I will call sentences like [33] definition-facts.

4.3 Event Variables

In section 2.6 I showed that, according to Quine, the presence of the existential quantifier '$\exists e$' poses the need for events to exist. In a linguistic system, this means that there is a domain of events *E*, such that the event variable *e* ranges over this domain.

In the neo-Davidsonian approach, the event variable may be restricted to the domain *E*, but this is not necessary. Take for instance the logical form in (30). Even if the restricted variable *e* (ranging only over events) is replaced by an unrestricted variable, the predicate SEEING would restrict the set of denoted objects, since it only applies to events.

> I have employed special styles of variables in these sentences to quantify over events and states, but they are dispensible ... I typically use the variable *e* to quantify over events ... This is for heuristic purposes only; the real work is done by the predicate 'Running'. ... An unrestricted variable could be used here in place of the *e* with no effect on the semantics[10]. (Parsons, 1990 [303])

This is also the reason why we can refer to events with general anaphora like *"it"*, instead of heaving to use a special event-anaphor. There is no confusion about what is meant if we say that *it* happened. We cannot refer back to an object here, for objects don't happen.

So in the neo-Davidsonian approach, the importance of event-predicates like SEEING is emphasized. There is a silent claim that we can make sense of something being of the type SEEING without knowing who is doing the seeing or what is being seen. This is often considered a weak point of the event-ontology approach, but in my view it is not a weak point at all. In Parsons (1990) this is only a footnote remark, but in chapter 12 I will present a different interpretation of event-semantics using what I will call *sortal dependent reference*. In this interpretation, the special status of the event-predicates is of crucial importance.

4.4 Aspectuality

Even though the theory called the underlying *event* approach is presented by Parsons in a book called *"Events* in the semantics of English", Parsons does not really discuss events, but a larger class of objects called *eventualities*[11]. The class of eventualities contains all the four Vendler-classes: Events (Accomplishments), Events (Achievements), Processes and States. I will now describe the way in which these four classes are treated.

As pointed out in chapter 3 Ryle made a difference between homogeneous and non-homogeneous terms. For non-homogeneous terms, their culmination point is of crucial importance. Homogeneous terms on the other hand, begin at some moment in time and end at another, but the important point is that they hold in the meantime.

Parsons tries to incorporate this division by defining two predicates: HOLD and CULM. The intuitive interpretation of these predicates is easy to see: for homogeneous events, like *"Mary ran"*, we can only say that at a given moment in time, this sentence was true. This is expressed by the predicate HOLD:

$$(36)\quad \exists t.[t < now \,\&\, \exists e.[\text{RUNNING}(e) \,\&\, \text{AGENT}(\text{Mary}, e) \,\&\, \text{HOLD}(e, t)]]$$

Here it is claimed that the event of Mary being busy running held for some moment in time, labeled *t*. The only information we have about this time *t* is that it preceded the time of speech, labeled *now*.

[10] If we use a variable that ranges over objects as well as events, this makes no difference in the neo-Davidsonian approach. Since the predicate RUNNING applies only to events, the variable is restricted anyhow.

[11] This term was first used by Bach (1986).

Non-homogeneous events *do* have to have a distinct culmination point. This culmination point is captured in their logical form, as for instance in this representation for *"Mary drew a circle"*:

(37) $\exists t.[t < now \,\&\, \exists e.[\text{DRAWING}(e) \,\&\, \text{AGENT}(\text{Mary}, e) \,\&\, \text{PATIENT}(\text{circle}, e) \,\&\, \text{CULM}(e, t)]]$

claiming that the event of Mary drawing a circle, culminated at some yet unspecified moment in time *t*.

The predicate CULM applies to accomplishment-events as well as achievement-events. This is in line with the observations of for instance Ryle. The predicate HOLD, on the other hand, applies to states. As shown in (36), processes can be analyzed, like states, with the predicate HOLD. The reason for this is that processes are *like states in apparently having no clear culmination point* (Parsons, 1990 [21]).

Parsons did indeed treat processes this way, but in 1985, he changed this view, claiming that processes should be treated just like events with the predicate CULM. If Mary is running, there may be no explicit culmination point, but the running has to stop eventually. Processes are less interesting descriptions of events[12]:

> For most of this text, the basic items of investigation are Events and States. I generally ignore the difference between the two kinds of events, Accomplishments and Achievements. Later ... I argue that Processes are analyzable in terms of Events, and so I omit discussion of Processes as a separate case, but nothing in the theory prevents Process from receiving special treatment. (Parsons, 1990 [21])

The effect of this changed view is that the role of the predicate CULM changes too. It no longer denotes the aspectual classes that explicitly refer to a culmination point, but it denotes an event, an episode in history as opposed to a state of affairs.

Despite the initial appeal, the HOLD / CULM approach has a lot of draw-backs. I will discuss some strong objections to this approach as part of the objection to the temporal approach that will follow in section 7.1

4.5 States

So, in the post-1985 version of Parsons' theory, the predicate HOLD is used exclusively for stative verbs. But the converse is not true: stative verbs are not analyzed exclusively using the predicate HOLD. In fact, most stative verbs are not even analyzed in terms of an underlying event. The reason for this is that, according to Parsons, stative verb simply do not refer to events. Take for instance this sentence:

[38] Brutus is clever.

There is no event, no episode in history, in which Brutus was busy being clever. This is not a new idea, we saw the same idea in chapter 3. But if there is no such episode in history, it would be misleading to represent such an episode in the logical form of this sentence.

What [38] describes may be called a *state of affairs*, it gives us information not about what happens in the world, but about the way the world is (statically) organized. Therefore, Parsons introduces besides the underlying-events approach, also an underlying-states approach. In this underlying-states approach, the logical form of [38] looks like this:

(39) $\exists s.[s \text{ is a state of being clever} \,\&\, \text{AGENT}(s, \text{Brutus})]$

[12] This idea will be explored in detail in chapter 11.

Since according to Quine – see the quote on page 8 – quantifying over something is the ultimate proof of existence, Parsons seems therefore to be claiming here that states of affairs exist. I will return to the status of states of affairs in chapter 6.

It is obvious that sentences can do more than just referring to episodes in history. We will see much more examples in chapter 6. It would be folly to posit entities for all these various verb-denotations. This does not necessarily mean that the underlying-states approach is wrong, but it does imply that the proof given here is not sufficient. Parsons gives more evidence for the existence of states; in fact, the evidence is analogous to the evidence for the underlying-events approach. We will look into the ontological status of states in section 6.1.

4.6 Temporal Structure

The two predicates HOLD and CULM assign a sentence to a specific aspectual class, and aspectuality is what Vendler called the *time* of a sentence. But there are other placeholders for time in a sentence. Parsons distinguishes four of them, so that, together with HOLD/CULM we have five ways of posing temporal structure on a sentence. The overall structure, containing all five placeholders, looks like this (Parsons, 1990 [209])[13]:

$$\text{(40)}\quad \text{FRAME}[(\exists \mathbf{I}).[\text{TENSE}(\mathbf{I}) \,\&\, \text{TC}(\mathbf{I}) \,\&\, (\exists e)(\exists t)[t \in \mathbf{I} \,\&\, \text{CULM}(e,t) \,\&\, \text{TM}(e)]]]$$

The idea behind the structure is this: the event *e* to which the sentence refers either holds or culminates at time *t*. Without reference to this time *t*, we can simply posit the event at a specific moment in time. This is done by the *temporal modifier* (TM). A temporal modifier is a simple predicate, expressing when an event happened, for instance *"I ran at 3pm"*, is analyzed in terms of a temporal modifier:

$$\text{(41)}\quad \exists t.[t < \mathit{now} \,\&\, \exists e.[\text{RUNNING}(e) \,\&\, \text{AT3PM}(e)]]$$

The other three placeholders don't apply directly to the event-time itself, but to some temporal interval **I**. This interval **I** is a restriction on the otherwise unrestricted time of culmination or holding *t*: $t \in \mathbf{I}$.

The first of these is the *tense*. Tense situates the event-time (**I**) relative to the *time of speech*. The time of speech is suggestively called *now*. There are only three possible situations: **I** ¡ *now*, **I** = *now* or **I** ¿ *now*. These represent the past-tense, present-tense and future-tense. More complex tenses, like the future perfect tense, have no representation and are therefore 'reduced' to the more simple tenses of past, present and future.

The second (TC) is called a *temporal constraint*. A temporal constraint is in many ways just like a temporal modifier, but it places an event within an interval. A temporal constraint is used in sentences like:

[42] Agatha ran in the afternoon.

The afternoon is here precisely the interval into which the event has to fall. The analysis of [42] is:

$$\text{(43)}\quad \begin{array}{l} \exists(\mathbf{I}).[\mathbf{I} < \mathit{now} \,\&\, \text{AFTERNOON}(\mathbf{I}) \,\& \\ (\exists e)(\exists t).[t \in \mathbf{I} \,\&\, \text{RUNNING}(e) \,\&\, \text{AGENT}(\text{Agatha}, e) \,\&\, \text{HOLD}(e,t)]] \end{array}$$

The last is the *frame adverbial* (FRAME). A frame adverbial is much like the temporal modifier, but it operates not so much on the predicated event, as on the entire sentence. A frame adverbial can be put 'on top of' a temporal modifier or constraint, as in:

[13] This is not a complete event-structure, it is a simplification of the equation Parsons gives; the verb itself, the Θ-roles and the 'normal' modifiers are left out to keep the equation readable.

[44] During the war, Agatha ran every day in the afternoon.

Although all these placeholders have a logically distinct function, it is sometimes a matter of interpretation how to analyze a certain adverbial:

> It is apparent that the same adverbials can occur in different places in a sentence and have different significance in those different places. For example, 'during the Monsoon' can function as a Frame adverbial, as a Time-Constraining adverbial, or as a predicate of events. (Parsons, 1990 [210])

So the temporal analysis of adverbs is somewhat flexible: one and the same adverb may be represented at different levels. So if the entailments of a sentence are predicted incorrectly when an adverb is treated in one way, Parsons' solution can be simply to treat the adverb differently, for instance as a Frame adverbial instead of a Time-Constraining adverbial.

5 Henk J. Verkuyl

As said before, the theory of Henk J. Verkuyl is a theory of *aspectuality*. Different sentences behave in different ways. But there are classes of sentences that behave in many ways the same (aspectually). The main goal of Verkuyl's aspectual theory is to formally describe an aspectual bipartition, i.e. to explain what it means for a sentence to be *terminative* or *durative*, where terminative is a marked phenomenon and durative unmarked, in the sense that it covers a variety of different aspectual phenomena, such as negation, bare plurality, habituality, etc. In this chapter I will outline the aspectual theory of Verkuyl from a slightly different angle as it is mostly presented, so that it better fits the discussion on events.

5.1 The Logic of Numbers

In Verkuyl's linguistic theory, natural numbers play a very important role. The reason for this central interest in numbers is that, according to Verkuyl, the most natural way to impose order on the world is by means of natural numbers. The idea behind this is best illustrated with an example.

A man walks home from his office. If you picture this event in space-time, it seems complex, weird, unstructured. If you want to think about this event, you impose a structure on it, for instance in the following way: draw an imaginary line beneath his feet as he walks. If you do so, you get an imaginary line, which is called the *path* of his walking. If you then 'project' this line on $\mathbb{R}$ (the real numbers), every point on this 'line' will have a unique index[14]. But in this fashion, every event would have infinitely many indices. Therefore, according to Verkuyl, in cognition, the path is not projected onto $\mathbb{R}$, but onto $\mathbb{N}$, the set of natural numbers. Discrete moments in the event are 'marked' as relevant indices.

The path does keep, as it were, track of the progression of the event. But this need not be spatial progression. It *is* in the case of a man walking home, but not so in many other cases. If a man is reading books, it is the amount of books he has read so far that forms the path. In the case of Judith eating 4 sandwiches, it is the number of sandwiches that counts. In these cases, the fact that not $\mathbb{R}$, but $\mathbb{N}$ is used makes more sense. Although during Mary's eating of 4 sandwiches there will be at any moment a distinct amount of sandwiches left (say 3.765). Yet it is only natural to assign 4 indices to this event.

Thus, according to Verkuyl, natural numbers play a central role in a theory of events. Every event involves progress, and this progress is counted in terms of numbers. Therefore, in Verkuyl's view, every event has an implicit beginning and an explicit end. Take Mary's eating of 4 sandwiches. It starts at some point where no sandwiches have yet been eaten, and it ends when none are left.

5.2 Plug$^+$ and Plus

There are various reason to claim that a sentence basically consists of an NP and a VP. One reason is that additional components, such as adverbials, can be dropped without too much affecting the sentence (see section 2.3.1). Verkuyl calls this the *(aspectual) kernel* of a sentence. It is this kernel that is responsible for the aspectual character of a sentence. Assuming that the VP consists of a TV and an NP, the basic structure of a sentence is as in figure 2.

[14] Not necessarily a unique point in space; if the man crossed his own path, he will have been at the same location twice. Yet these two occasions are different points on the (imaginary) path.

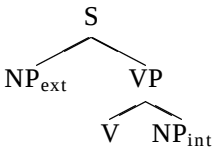


Figure 2: Basic structure of aspect construal

The three basic elements of this structure – the verb, the internal NP and the external NP – are the building blocks of the aspectual character. Each of these makes a specific contribution. In this section, I will describe each of these contributions in turn. The following sentence will count as the typical example:

[45] Three man lifted four tables.

For each of the three components, the description will consist of three parts: an informal description of the role of the component, its formal contribution to the aspectuality of the sentence and a description of its role in the PLUG$^+$ system.

5.2.1 The Verb

The head of the aspectual kernel, the verb, is related to the notion of a path. As noted in section 5.1, the path of an event need not be spatial: the path just keeps track of the progress of whatever kind. The role of the verb is, informally, to determine the nature of the progress. So for instance inn the case of [45], the progress consists of items (tables) being lifted. The verb provides a set of numbers which count as indices for the event. Thus, in the case of [45], the verb *'to lift'* provides four indices.

The contribution of the verb is thus the notion of progress. But not every verb involves progress. Take for instance the verb *'to dislike'*. There is no evolution towards an end in disliking. You can grow to like somebody, but that in itself has nothing to do with the disliking itself.

Verbs that do involve progress are labeled [+ ADD TO], those that don't are labeled [- ADD TO]. A sentence is only terminative if the head verb is [+ ADD TO]. So, if the verb in [45] is replaced by *'to dislike'*, the result is a durative sentence:

[46] Three man disliked (the) four tables.

For the formalization of the notion of ADD TO, Verkuyl makes use of a variation on the Wrightian operator **T**. The operator **T** is an operator signifying *change* of some sort: change from some state of affairs Φ to some other state of affairs Ψ. The von Wrightian operator is defined of follows:

$$(47)\quad [\![\Phi \mathbf{T} \Psi]\!]^{M,t} = 1 \Leftrightarrow [\![\Phi]\!]^{M,t} = 1 \,\&\, [\![\Psi]\!]^{M,t+1} = 1$$

But where there is a 'sudden' change in the original Von Wrightian operator, Verkuyl's notion of change is more gradual: there is a progress from one state to another, in which the indices mentioned above play a vital role. These indices are generated by the successor function *s*, which is defined as follows:

$$(48)\quad s : I \to I := \forall k \in I : s(k) = k + 1$$

Thus, formally, the contribution of the verb is the introduction of a specific successor function.

5.2.2 The Internal NP

The indices that are generated by the successor-functions *s* serve, as I said before, to mark relevant moments in the progress of the event. In the case of [45], these indices mark moments at which tables are lifted. So the tables, which are denoted by the internal NP, provide the *reach* of the successor function. Together, the verb and the internal NP constitute a path, consisting of a set of indices and their values. This path is formalized in the path function ℓ:

> ... ℓ constitutes a 'Path of *x*' keeping track of how *x* relates to the members of the internal argument denotation as far as satisfaction of the predicate is concerned ... [it] keeps track of the way in which the (individual) members of the predicate are involved in the predication. (Verkuyl, 1995b [8])

Formally, the path function ℓ is a function from indices to positions:

$$(49)\quad \ell : I \rightarrow \mathbf{D}_L \text{with } \ell \text{ injective and } \ell = \{< i, p >: [\![\text{AT}(p)(x)]\!]_{M,i} = 1\}$$

Once again: these positions need not necessarily be spatial positions:

> ... a pair $< i, p >$ ... contains information about the position at which the external argument *x* is at an index *i*. I have chosen a general "position value" *p* to underscore the localistic heritage: in the case of *Mary lifted four tables*, the value of *p* is taken from the set of tables, in the case of *Judith ate four sandwiches* it would be taken from the set of sandwiches, in *John walked home* from the set of spatial positions, etc. (Verkuyl, 1995a [8])

The VP, consisting of the verb and the internal NP, has as a whole an aspectual character: it can be either durative or terminative. It is terminative if the path, represented by ℓ, is finite. And the path is only finite if the related function *s* is bounded. And the function *s* is only bounded if it has a proper, finite reach. So for the VP to be terminative, the internal NP has to denote a finite set of entities. NP's denoting a finite set are labeled [+ SQA], while NP's that don't are labeled [- SQA]. The most common [- SQA] NP's are bare plurals. Therefore, replacing the internal NP in [45] with the bare plural *tables* results in a durative sentence:

[50] Three man lifted tables.

So, sentences with a [- SQA] internal NP are durative, since the path, represented by ℓ, is infinite.

5.2.3 The External NP

The function ℓ represents the path of an object. But in some cases, as for instance in the case of [45], the external NP does not denote *one* object, but a set of objects. Each of these objects does have its own path. The contribution of the external NP is to provide agents for each of these individual paths.

Formally, the external NP maps entities from the set of subjects onto their path, represented by the *participancy* function π, defined as follows:

$$(51)\quad \pi : [\![\text{NP}_{\text{ext}}]\!] \rightarrow (I \rightarrow \mathbf{D}_L) := \forall x \in [\![\text{NP}]\!]_{\text{ext}} : \pi(x) = \ell_x$$

Even if all individual paths are bounded, the sentence can still be durative. For a sentence to be terminative, not only do the paths have to be bounded, but there also has to be a finite number of paths. Formally, only sentences having a [+ SQA] NP in the

external NP position are terminative. So replacing the external NP in [45] by a [- SQA] NP again results in a durative sentence[15]:

[52] Nobody lifted four tables.

5.2.4 The System at Work

In Verkuyl's opinion, the aspectual character of a sentence is a result of the three components of the aspectual kernel of the sentence. The interplay between the three components is presented graphically in figure 3 (from (Verkuyl, 1995c [22])):.

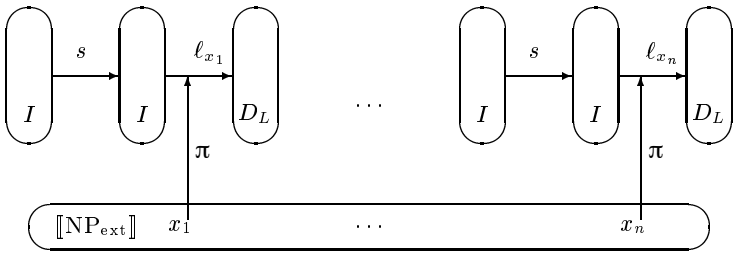


Figure 3: The relation between s, ℓ and π.

The result of this interplay is a set of paths, and these path are the representation for the actualization of a sentence. For instance, the representation of [45] contains three paths, $\pi(\mathrm{man}_1) = \ell_{man_1}$, $\pi(\mathrm{man}_2) = \ell_{man_2}$ and $\pi(\mathrm{man}_3) = \ell_{man_3}$. A possible actualization of these paths looks as follows:

$$\begin{array}{ll} & \{\mathrm{man}_1\} \mapsto \{<1, t_1>, <3, t_4>, <4, t_5>, <7, t_9>\} \\ (53) & \{\mathrm{man}_2\} \mapsto \{<2, t_{2,3}>, <5, t_{6,7}>\} \\ & \{\mathrm{man}_3\} \mapsto \{<6, t_8>, <8, t_{10}>, <9, t_{11}>, <10, t_{12}>\} \end{array}$$

So in this actualization of sentence [45], first the first man lifted a table, then the second man lifted two at a time, after that the first man lifted one again, etc. As a whole, all three men lifted a total of four tables, which is indeed the distributive reading of [45].

The aspectual character is related to these paths: the sentence is terminative only if there is a finite number of finite paths. And this is only the case if the $\mathrm{NP_{ext}}$ is [+SQA], the verb is [+ADD TO] and the $\mathrm{NP_{int}}$ is [+SQA]. Otherwise, the sentence is durative. So the actualization in (53) is terminative, since *"the function* s *must come to a stop: after [index 10] there is no table available for being lifted."* (Verkuyl, 1995b [9]).

With this framework, called the plus principle, it is easy to determine the aspectual character of these four sentences:

[54]	Judith	ate	a sandwich.	*terminative*
	[+ SQA]	[+ ADD TO]	[+ SQA]	
[55]	Judith	ate	sandwiches.	*durative*
	[+ SQA]	[+ ADD TO]	[- SQA]	
[56]	Nobody	ate	a sandwich.	*durative*
	[- SQA]	[+ ADD TO]	[+ SQA]	
[57]	Judith	disliked	a sandwich.	*durative*
	[+ SQA]	[- ADD TO]	[+ SQA]	

[15] Note that empty sets are considered to be [- SQA].

In a event-ontology view the plus principle can be described as follows. In [54] we have a description of a distinct event: Judith's eating a sandwich. This has clearly to be terminative, for if the sandwich is finished, there is no sandwich left to eat. In [55] we have a set of these eatings. But although every single eating is terminative, there is not clearly a last sandwich. For all we know, Judith can have kept on eating for ever. So, the overall action of eating sandwiches is durative. This is also the idea in [56]. Although everybody must have finished his or her sandwich in a limited amount of time, there might be unlimited many people[16], so the overall event has no clear end, so the sentence is durative.

5.3 Event (In)dividuality

It is clear that Verkuyl's analysis of event-sentences differs greatly from Parsons' approach. As a result, the two approaches will predict different linguistic entailments. Some of these linguistic differences will be discussed in chapter 7. But not only do they differ as a linguistic system, they in fact use a different conceptual idea of events.

According to event semantics, events are individual entities, which can be referred to with a variable. Verkuyl's analysis, on the other hand, is focussed on described how these 'individuals' are construed; how they can be divided. The conceptual problem that can be deduced from this difference is the following: are event individual, and, if they are, do event-sentences always denote an in-dividual even, or can they also describe 'sets' of events?

Using the terminology of the PLUG$^+$-system, this question can be somewhat further specified: if events are in-dividual, what should count as an individual event? Within the PLUG$^+$-system there is a couple of candidates for the name 'event'. The first is the participancy function π, the second is the path-function ℓ, and the last is best described as the set of elements of the function ℓ. To take the actualization in (53) as an example: if three man lift 4 tables, should this entire episode count as an in-dividual event, does [45] in fact denote three events, one for each man, or should every lifting of a table by a man count as a separate event?

In order to be able to answer this question, it is necessary to first explore the notion of 'event' in more detail. A part of the answer will be given in section 7.6, but a more detailed answer will be given at the end of chapter 10.

5.4 The Distributivity Scale

In the logic tradition there is a well established phenomenon called *scope reversal*. If you have two quantifiers in one sentence, you get another reading if you assign a *narrow* or a *wide scope* to the first quantifier. This is easily shown:

[58] Every boy loves a woman.

In the most natural reading, this is almost a saying, predicting that every boy will find his match. But it might also mean that there is one very special woman, say Marilyn Monroe, that is loved by all the boys in the world. These two readings have a different logic representation:

(59) $\forall x.\exists y.[\text{LOVES}(x, y)]$

(60) $\exists y.\forall x.[\text{LOVES}(x, y)]$

[16] Though in this case this 'unlimited amount' is 0.

This phenomenon has another name in the field of *generalized quantifiers*. There, the two readings are labeled a *distributive* (as in 59) or *collective* (in 60).

Verkuyl rejects the phenomenon of scope reversal. According to him, the normal approach lacks generality, the true phenomenon is much more complex as it is usually taken to be. His reason for claiming this can be shown by an example:

[61] Hammerstein, Rodgers and Hart wrote musicals.

In the traditional view, this can mean either that the three of them all wrote a musical of their own, or that they wrote a musical together. But neither of these is true: they have never written a musical with the three of them, and none of them wrote a musical alone. Rodgers wrote one musical together with Hammerstein, and another together with Hart[17]. Therefore, we should not talk about two readings (one distributive and one collective) but about a *scale* of readings ranging from collective to distributive. The authors of the musicals would be as follows:

distributive	{Hammerstein}, {Rodgers}, {Hart}
...	
	{Hammerstein, Rodgers}, {Hart, Rodgers}, {Hart, Hammerstein}
intermediate	{Hammerstein, Rodgers}, {Hart, Rodgers}
	{Hammerstein, Rodgers}, {Hart}
...	
collective	{Hammerstein, Rodgers, Hart}

Figure 4: The Distributivity Scale

5.5 Conclusion

In this chapter I showed three facets of Verkuyl's theory of aspectuality: the PLUG$^+$ framework for the formal representation of paths, the plus principle for the determination of the aspectual character of a sentence, and the distributivity scale. One aspect of Verkuyl's theory has been deliberately left out: the theory of Verkuyl is integrated with a theory of generalized quantifiers. But generalized quantifier theories start from such a different point of view as the event semantic theories do, that a relevant discussion of generalized quantifiers in relation to event semantics would be extremely difficult. For not to drift to far from the main stream of this thesis: the discussion of the event-ontology approach, I have chosen to leave generalized quantifier theories out.

The three facets discussed in this chapter account for phenomena that are not explicitly accounted for in Parsons' event-ontology approach. I will further consider these phenomena within event semantics further on in this thesis: distributivity and collectivity, as well as the differentiation in paths produced by the function π will be discussed in section 7.6, and the plus principle will be considered at various places throughout this thesis, but conclusively in section 13.3.

[17] This example was first introduced by Gillon (1987).

6 Dispositions

One of the important features of the event-semantic approach is the reference to an event *e*. According to this approach, a sentence directly claims the existence of a certain event. Leaving aside some ontological considerations, this is (probably) a preferable situation for sentences that do indeed signify an event. But in paragraph 4.5 we saw that it is not very plausible to say that there is an *event* of Brutus being clever. Therefore, in Parsons' state-ontology approach, the sentence *Brutus is clever* does not refer to an event, instead it is said to refer to a state of affairs.

This point was made in a more general way by Ryle (see section 3.1: not all sentences signify events. For the same reason mentioned in section 4.5, it would be better if all these sentences that don't signify events, Ryle called them *dispositions*, are not interpreted using the event-ontology approach. Because if a disposition would be interpreted this way, a sentence that does not signify an event would nonetheless be said to refer to one.

In the following chapters, criticisms on the event-ontology approach will be discussed. My claim is that some of these criticisms turn out to be invalid, since the sentences that induce these criticisms are in fact not event-sentences, but dispositions, signifying facts, states of affairs or generic events. So in the rest of this thesis I will sometimes, for instance in section 7.4, put some criticism aside, while the example sentences on which the criticism is based are no event sentences, but facts, state-sentences or other forms of dispositions.

Terms like states, facts or generic events are commonly used in linguistic literature. Their exact meaning however is not the same in every work. Therefore in this chapter it will be explicated which meaning these terms are intended to have in this thesis. It is important to have a clear notion of which sorts of disposition we can distinguish in order to know which sentences *can be assigned a logical form that makes reference to, or quantify over, events, states and processes*.

6.1 States of Affairs

States of affairs behave, in many ways, just like events. That is probably why Parsons, as well as many other, treats states of affairs alongside with events[18]. According to Jonathan Bennett, who has had at least some influence on Parsons[19], we should not even be making a distinction between states and events:

> ... I shall suggest that any philosophical theory of events should be extended to states as well, because the differences between them are of the superficial kind that would seem significant only to someone doing the kind of "conceptual analysis" that shades off into mere lexicography. (Bennett, 1988 [7])

But even Bennett admits there is a difference between states and events. What then is the difference? According to Verkuyl, there is at least a linguistic difference. States and events form two distinct aspectual classes and can therefore linguistically be told apart by the plus-principle. This I doubt. According to the notions of event and state used in this thesis, there is no easy way of separating state-sentences and event-sentences. Why this is so can be clarified using these two Dutch sentences:

[62] De Dom staat in Utrecht.

[18] Verkuyl also has three aspectual classes, amongst which states and events, but his notion of *state* covers much more than the one that is intended here.

[19] "The philosophical literature on events is enormous, and a critical survey of it deserves at least a book of its own. Fortunately, while I was finishing this manuscript, Jonathan Bennett's book *Events and their names* (1988) was published; it surveys the literature and draws many conclusions that I probably should draw." (Parsons, 1990 [148])

[63] Jan staat op de hoek van de straat.

The first of these expresses a state of affairs: the only dome in the Netherlands is situated in Utrecht. This is not something happening in the world, but a property of the dome. And that is what states of affairs seem to be: relations between objects and their properties.

Sentence [63] on the other hand describes the event of someone called 'Jan' standing on the corner of the street, for instance waiting for the bus. It is even a specific sort of event, namely an action (though it is *not* the involvement of a human being that makes [63] an event rather than a state sentence). Although it does not necessarily involve change, it is something Jan is doing. The difference in interpretation between these two sentences is due to our knowledge of the world, it is not result of an aspectual difference between [62] and [63]. In a fairy tale, the dome might be wandering around the country looking for his beloved cathedral, and somewhere in the story be standing in Utrecht while waiting for the fairybus. So [63] has two sorts of use, which you might call a *state*-use and an *event*-use, but in regular discourse, only the state-use is practiced.

This can generalized: the difference between states and events is not a linguistic one, but an ontological one. Events happen, while states obtain. Because states are relations between objects and their properties, they are derived entities, while events (according to Parsons) are non-derived entities.

The sentence *This ball is green* thus refers to an object THIS-BALL having the property of BEING-GREEN. But the same semantic content, say BALL(x) & GREEN(x), is referred to by the nominal phrase *this green ball*. Parsons, however, would give both a radically different semantic interpretation. This can be illustrated by the following two sentences:

[64] This green ball is round.

[65] This round ball is green.

Both sentences involve a ball that is both green and round. In Parsons' state-ontology approach, however, there is little or no semantic overlap between both sentences. There is no logical connection between these two logic formulas:

(66) $\exists s.\exists x.[s \text{ is a state of being round} \,\&\, \text{AGENT}(s,x) \,\&\, \text{BALL}(x) \,\&\, \text{GREEN}(x)]$

(67) $\exists s.\exists x.[s \text{ is a state of being green} \,\&\, \text{AGENT}(s,x) \,\&\, \text{BALL}(x) \,\&\, \text{ROUND}(x)]$

But the satisfaction conditions for [64] and [65] are identical: they are both true only if 'this' ball is both green and round[20]. So it does not seem correct to assign non-related logical representations to them.

6.2 Facts

Fact is a very general term that covers a lot of things. A fact is just a sentence with a positive truth-value. But in the literature, when the term *fact* is used, it refers to a specific sort of facts. I would like to make a categorization in four sorts of facts here, of which the last one will be most useful for the rest of the discussion.

In literature we often find definitions like *"facts are states that obtain"*. The way the notions 'fact' and 'state' are used in this thesis, this definition is incorrect. But there is a close link between states that obtain and facts. Look at this sentence:

[20] Their truth value might be different if there is no referent for either 'this green ball' or 'this round ball', dependent on our theory. For instance in the theory of Strawson they can differ. But in the theory Parsons himself proposed (Parsons, 1980) they will be always the same.

[68] This book is green.

If [68] is true, this proposition is a fact. Or, in other words, facts are *true propositions*. The four groups of facts that I am about to present differ in what makes them true, it is a quadripartition based upon satisfaction conditions.

6.2.1 Property Facts

Sentence [68] is true, if THIS-BOOK has the *property* of being green. In Verkuyl's terms, this means that the predicate GREEN applies to THIS-BOOK.In Parsons' terms, it means there has to be a state of affairs, that is a being- green state, and has THIS-BOOK as its agent. The proposition in [69]:

[69] John walked home.

is a fact if the predicate WALK applies to John (according to Verkuyl) or if there is an event, having John as its agent (according to Parsons).

What is common in these two cases is that the proposition being true is due to the fact that an object/individual has a certain property. In the theory of Verkuyl this is straight-forward: having a positive truth value is the same as being a member of a certain set (in the two cases above resp. the set of green objects and the set of walkers) and objects belong to these sets grace to their having a certain property (either being green or being a walker). In the theory of Parsons, this is somewhat less clear: having a property is being the agent of either a state (such as the state of being green) or an event (such as a walking event). Since in all these cases the truth conditions are dependent on properties, I call this sort of facts *property facts*. Most of the examples discussed in the literature on event-semantics are property-facts[21]. The truth conditions for property facts are easily determined. If the individual under consideration has, in the universe of discourse, the predicated property, the proposition is true.

Property facts do not always concern one individual: they sometimes concern groups of individuals, like in [45] it concerns three men, all having the same property (lifting four tables).

6.2.2 Potentialities

Being-green is, in a way, a clear-cut property. Not because there is a sharp line between being green and being blue (for instance), but for another reason: When you look at an entity, its being green is a simple empirical fact: the object itself 'decides' as it were, whether or not it is green[22]. But not all facts are like this. It is very hard to tell if someone has the property of speaking-french. The ontological status of the less than clear properties have had much attention in philosophy. Their existence is often denied:

> Potentialities, it is truistically said, are nothing actual. The world does not contain, over and above what exists and happens, some other things which are mere would-be things and could-be happenings. To say of a sleeping man that he can read French, or of a piece of dry sugar that it is soluble in water, seems to be pretending at once to accord an attribute and to put that attribute into cold storage. (Ryle, 1949 [115])

Linguistically the difference between property facts and these less clear statements that I will call *potentialities* is not so very important for present purposes, although for other it is. The semi law-like statements I mentioned in section 3.1 are potentialities, and for Ryle their not-being proposition facts was of vital importance.

[21] If they are true that is.

[22] In section 9.6.3 we will see that this is too sharp, since this is not true for all entities: some entities might be neither green nor non-green.

6.2.3 Definition Facts

Property facts, as well as potentialities, concern one or more objects. For these objects, something is predicated. In terms of the plus-principle, they are [+ SQA] facts. These are the sorts of facts that are mostly discussed in linguistic literature concerning facts.

But in the philosophical tradition, the facts that get the most attention are [- SQA] facts. An example:

[70] Dogs have four legs.

In a definition fact, a class of objects (dogs) is said to have a certain property (being-white); as if this property is part of the definition of what it is to belong to that class. If you don't have four legs, you are not a dog. Since definition facts relate properties to kinds, definition facts have to have a kind-denoting noun in subject position. This is often a bare plural (as in [70], but can also be a description, as for instance '*this kind of animal*'. A nice analysis of such terms can be found in Carlson (1979).

Even though [70] is said to be true, dogs with an amputated leg still count as as dogs, in spite of the fact that they have only three legs left. With few exceptions[23], definition 'facts' are in fact generalizations: [70] does not deny the odd dog to have just three legs. To quote Hilary Putnam:

> In ordinary language as opposed to formalized language ... [holism] is made even more pervasive by what is sometimes called the "nonmonotonicity" of the logic of everyday discourse. In a formalized language, if one says, "All birds fly," and he also says, "Ostriches are birds," one can deduce, "Ostriches fly." But ordinary language isn't like that. If I say, "Hawks fly," I do *not* intend my hearer to deduce that a hawk with a broken wing will fly. What we expect depends on the whole network of beliefs. If a language describes experience, it does so as a network, not sentence by sentence. (Putnam, 1988 [9])

There is another group of sentences that should be considered to be definition fact. An example is the following:

[71] Cats are intelligent when they have blue eyes.

Such sentences are labeled *atemporal when* sentences by Carlson (1979), since the word '*when*' does not refer to any sort of temporal coincidence between the being intelligent and the having of blue eyes. That these sentence also count as definition facts is easily shown by the fact that [71] is synonymous with:

[72] Cats with blue eyes are intelligent.

In a way, definition facts are very strict. Sentence [70] could therefore be interpreted as follows:

(73) $\forall x \in [\![\text{DOG}]\!].[\text{HAS-4-LEGS}(x)]$

But this interpretation does not represent the normal way in which [70] is used, because [70] is even said to be true, in cases where (73) is false. So a theory for definition facts should allow this freedom. The analysis of Carlson (1979) is in many ways a good theory for definition facts[24]. But of main importance to the present thesis is the fact that definition facts should be treated independently of the event semantic approach.

[23] Such as for instance *Molecules are constellations of atoms*.

[24] His analysis of [70] would be: $\mathbf{Gn}(\hat{x}^0[\text{HAS-4-LEGS}(x^0)])(\text{DOG})$.

6.2.4 Tendencies

Tendencies are like definition facts in that they also relate to kinds/groups of objects, rather than individuals. But where definition facts might be called group-property facts, tendencies are group-potentiality facts: Tendency facts mostly assign a notion of habituality to a kind of objects. An example:

[74] Dogs chase cats.

This does not mean that every dog is at any given moment in time busy chasing cats. It means that dogs have a tendency of chasing cats. Most dogs will chase a cat given the right circumstances. Epistemologically, these tendencies are not very useful, for it is very hard to establish a truth-value for them.

Another difference between tendencies and definition facts is that where definition facts have an atemporal *when* reading, tendencies have a temporal one.

What we can say about the truth-conditions for [74] is that there have to be a lot of individual dogs chasing cats, a lot of individual events of dogs chasing cats. Because of this close link to events, tendencies are very important. Another reason why tendencies are important is that sentences like [74] not only have a (tendency) fact reading, but also an event reading: in that reading it means that a certain group of dogs chases a group of cats. However, this reading is not always easy to get:

> We can *only* understand *John walks home from work* as saying that this is how, in general, John goes home. This sentence cannot be used to report any particular occasion [event, ed.] of John's walking home from work, for any such particular occasion is either already past (in which case we should say either *John walked home from work* or *John has walked home from work*), or still in the future (in which case we should say either *John will walk home from work* or *John is going to walk home from work*), or, finally, even now in progress (in which case we should say *John is walking home from work*). (Galton, 1984 [12])

In fact, [74] is a case in which the event reading doesn't seem to be a natural interpretation. But if [74] is put in past tense, the event reading is more natural. Since this is a thesis on event sentences, it will be the event reading that is intended in for instance the discussion on aspectuality in section 13.3.

6.3 Event Sortals

The neo-Davidsonian event ontology approach Parsons proposes, just like the original Davidsonian approach, to use event variables to refer to events. This event variable is used, amongst others, as the argument of a verb-predicate, such as the predicate SEEING in (30). The predicate SEEING can be seen as a function that has TRUE as its value iff the event referred to is a seeing-event.

So the truth value of the predicate depends on the existence of a class of seeing-events, on the possibility to classify event in categories. These classes themselves are called *event sortals* or *generic events*. In common talk, event sortals are used quite often:

> To do [that] we must be able to form event names, which requires us to be able to count events: we cannot be competent with statements of the form "the [ES_1] is the [ES_1]" if we are never sure whether ES_1 supplies to one event or to more than one. Fortunately, the counting of events under sortals is something we do all the time: there is plenty of evidence about how that is done, given the event concept we actually have. (Bennett, 1988 [11])

Event sortals themselves are not events, but rather categories of events, or event types. Event sortals are what I consider to be generic events, though this terms is used to refer to all sorts of things: to tendencies, or event sentences. I will not pay much attention to event sortals at this particular moment, since they will be discussed at length later on, especially in part III.

6.4 Cambridge Events

Events are often associated with change. In section 5.2.1 I showed that Verkuyl even formalizes this idea along the lines of the Van Wrightian operator **T**. There are some doubts whether or not every event necessarily involves change. But the converse seems much less under discussion: every change is an event. And, according to the Van Wrightian operator, change is the transition from one state of affairs to another. For instance, the door's opening is the change from the door being closed to the door being open.

But some transitions do not seem to purport to events. Imagine two balls, a red ball and a green ball. The green ball is smaller than the red ball, but at a certain moment, it starts growing until it is finally bigger than it. So there was an event (the growing of the green ball) since the green ball changed from being smaller than the red ball to being bigger than it. So far so good. But now consider the red ball. It changed from being bigger than the green ball to being smaller than it. Nonetheless, it seems incorrect to say that there was an event of that was the shrinking of the red ball. This sort of indirect change is called a *Cambridge change*, and the purported event of the green ball's shrinking is called a *Cambridge event*.

One clear motivation for not accepting Cambridge events as events is this. At least according to Parsons and Davidson, you can see events (remember the evidence from perceptual idiom in section 4.2). Now consider the often cited Cambridge event of Xantippe becoming a widow because Socrates died in his cell. Imagine you were at Socrates' house drinking wine with Xantippe the moment Socrates died. You cannot truly say in this case that you saw Xantippe becoming a widow. What was there to see was Socrates dying, which of course is an event. So Cambridge events are events only in an indirect way.

Part II Linguistics

In chapter 4, I introduced the event semantic approach as it was explained in 1990 by Terence Parsons. There have been many objections raised against event semantics in general, and Parsons' version of it in particular. These objections can be divided roughly in two groups: linguistic objections and ontological (philosophical) objections. In the next part, I will review event semantics as an ontological position, but in this part I will review the validity of (Parsons version of) event semantics as a linguistic system.

Both Davidson and Parsons presented some positive evidence in favor of event semantics (see section 2.3 and section 4.2). All, or most, of these arguments can be attacked or at least weakened, as I will show in chapter 8. But there is a much stronger point of evidence in favor of the event semantic approach:

> The evidence for the theory lies in its ability to explain a wide range of data better than other existing theories. (Parsons, 1990 [146])

And it is this evidence that I will tackle first, in chapter 7. Because it has been claimed that although the event semantic approach might be able to reasonably deal with a couple of linguistic phenomena, it bluntly fails on other phenomena. In chapter 7 I will try to present all major objections known to me. Since the intention of this thesis is to defend the event semantic system, I will not only present these critiques, but also try to answer them. But in chapter 7, I will only try to answer the critiques within the framework presented by Parsons. On some occasions, I will argue that the objections cannot be effectively answered within the framework as it was presented by Parsons in 1990. Replies to these objections will be postponed till part IV, where some improvements on Parsons' system are proposed.

7 The Case against Events

Event semantics is a heavily attacked linguistic theory. There are not many aspects of the theory that have not been under fire at one time or another. In this chapter I will try to list all attacks that apply to the event-ontology approach that is given in Parsons (1990). I tried to group the various attacks on the base of which part of the event-ontology approach they attack. I will not only describe the criticisms, but also try to find an answer to them within the event-ontology approach. Defenses against criticisms that call for an adaptation or an extension of the event-ontology approach will be postponed until part IV.

In section 7.1 I will discuss criticism on what I called the HOLD/CULM approach. In section 7.2 I will discuss the viability of the neo-Davidsonian approach, mainly as opposed to the incorporated approach. I section 7.3 I will discuss the lack of demonstrative element in the event-ontology approach. In section 7.4 criticism on the way monotone decreasing NP's are treated and finally in section 7.5 and 7.6 I will discuss the lack of clarity towards event-splitting tags.

7.1 Hold and Culminate

In chapter 4 I explained the predicates HOLD and CULM. One of the problems Parsons wants to tackle with these predicates is the so-called *imperfective paradox*[25]. This paradox can be clarified along the following two sentences:

[75] Mary was leaving.

[76] Mary left.

These two sentences are not synonymous. The second of these is more informative than the first, for although [76] implies [75], it is not true that [75] implies [76]. Possibly, Mary dropped dead while making a last round to say goodbye to everyone. Mary had every intention of leaving, so you can correctly claim that she was leaving; but she never actually left. So the paradoxical situation is that it is possible to have been doing something in the past, without having done it.

There is another way of putting the paradox and that is the one Parsons uses (Parsons, 1990 [168]): although *Mary leaves* implies that *Mary will have left*, *Mary is leaving* doesn't. This presentation is slightly more complex, since it involves both present and future tense. The underlying problem however is in both cases the same.

Parsons tries to capture the semantic difference between [75] (*progressive*) and [76] (*non-progressive*) in terms of the two predicates we saw in section 4.4: HOLD and CULM.

> I propose an account of the progressive in terms of underlying events. For event sentences in the non-progressive form of the verb requires that its underlying event culminate, whereas the progressive version requires only that the underlying event be going on (it need only "hold"). This account is immune to the imperfective paradox. (Parsons, 1990 [167])

In her thesis, Lascarides attacked this solution of Parsons' for the imperfective paradox. Her critique is fierce, concluding that *the logical distinction between the predicates* CULM[26] *and* HOLD *[is] not sustainable* (Lascarides, 1988 [92]). Her critique can be divided in two parts, each of which will be discussed in this section.

[25] This term was introduced by Dowty (1979 [137]).

[26] Both Lascarides and Verkuyl (page 35) use the term *Cul* and *Hold* for the predicate that is called CULM and HOLD in this thesis. I took the liberty to replace these terms.

7.1.1 Temporal Adverbials

As explained in section 4.6, the predicates HOLD and CULM fill only one of the five temporal placeholders in the temporal structure Parsons proposes (see equation (40)). Where the predicate CULM relates an event to a certain moment in time (t), so does the temporal constraint (and the other three in a more indirect way, since they link the event to the interval **I** and $t_{\text{¡}}\mathbf{I}$). This does not have to be a problem. Take a sentence like [77]:

[77] Mary left at noon.

The (instantaneous) event of Mary's leaving culminates at *t*, and this *t* can be correctly equated with 12 o'clock:

(78) $(\exists e)(\exists t)[\text{LEAVING}(e) \,\&\, \text{AGENT}(\text{Mary}, e) \,\&\, \text{CULM}(e, t) \,\&\, \text{ATNOON}(e, t)]$

But although (78) is an adequate representation for [77], this is only because [77] is an achievement: an instantaneous event, with no internal structure. Processes and accomplishments cannot be treated in this way. Take these two sentences:

[79] Mary ran to the store at 3pm.

[80] Mary ran at 3pm.

Sentence [79] clearly refers to an event. It refers to an event that culminates the moment Mary reaches the store, and [79] implies that she actually arrived. But if we interpret [79] similar to (78), this would mean that Mary arrived at the store at 3 pm. And as Lascarides (1988) correctly points out, that is not what [79] means. The natural interpretation is an *inchoative* one: that Mary *started* running at 3 pm, or that Mary *was busy running* at 3 pm.

Lascarides founds her criticism on the definition that Parsons gives in 1980 for the temporal adverbial 'At 3 pm'. It was then defined as a basic expression whose translation is as in (81):

(81) $\lambda \text{P} \lambda e \lambda t.[\text{P}(e, t) \,\&\, \text{AT3PM}(e, t)]$

The predicate P is to be replaced with either HOLD or CULM, depending on whether it is applied to a stative verb, a process verb or an event verb. This means that for event verbs the time 3pm is always linked to the culmination time.

In his 1990 work, Parsons introduces the five placeholders for temporal modifiers described in section 4.6. In this framework, AT3PM is interpreted as a temporal modifier TM(*e*). But this expression makes no reference to the culmination time *t*. It directly links the event to a moment in time.

Linking an event to a moment in time is possible in situations like (78). Leaving is an instantaneous event, an event that happens at one specific moment in time. So we can position this event-moment on a time-line, by saying that it happened at 3 pm. But running to the store takes longer than an instance. Therefore, we can say of a running event that it lasted from one time to another, but *not* that it happened *at* 3 pm, or any other time for that matter.

So Parsons' original 1980 proposal – AT3PM(*e*,*t*) – gives a wrong interpretation for [79], while the renewed 1990 proposal – AT3PM(*e*) – gives a nonsense interpretation. At least if we interpret AT3PM(*e*) in the most intuitive way: meaning that *e* happened at 3 pm.

In order to get an inchoative reading in event-semantics we need not the culmination-time of the event, but the starting-time. We need to have more information on the temporal structure of the event.

7.1.2 Entailment

For non-instantaneous events, the predicate CULM is stronger than the predicate HOLD[27], because knowing that an event culminated gives extra information. Therefore, *Mary left* implies *Mary was leaving*. The logical form that Parsons would assign to these two sentences would be respectively:

(82) $(\exists e)(\exists t)[t < now \,\&\, \text{LEAVING}(e) \,\&\, \text{AGENT}(\text{Mary}, e) \,\&\, \text{CULM}(e, t)]$

(83) $(\exists e)(\exists t)[t < now \,\&\, \text{LEAVING}(e) \,\&\, \text{AGENT}(\text{Mary}, e) \,\&\, \text{HOLD}(e, t)]$

But there is no logical implication from (82) to (83). That is, not if the predicates HOLD and CULM are defined as to be logically independent. And since [76] and [75] are so closely related, there is much reason to suppose that the two predicates HOLD and CULM should be related.

It has proven however very difficult to give a correct and informative definition of their relationship. The idea is this: if an accomplishment culminates at time *t*, that very same event can be said to hold during the interval between the onset of the event (say *t'*) and that culmination-time *t*. This holding is then the corresponding process to the accomplishment and is usually expressed in the progressive form.

But this idea of event-intervals has many problems. One problematic example is this: if John is polishing a pile of shoes, starting at 3 and not finishing until 12, you can say that he was polishing shoes from 3 to 12. But if at 2:00 sharp he just finished one shoe and reaches for another, it seems at least strange to say that he was polishing shoes at 2:00. Nor is it normal to say at any moment that he was polishing 12 shoes, because polishing is something you do one at a time. But at 12 o'clock, he *has* polished 12 shoes.

But even if these difficulties could be overcome, that would mean we need more internal structure into events. Just as we saw in the last section, there is a need for for some notion of a starting-time of events, and of an event-interval. There are many ways to add structure to Parsons' event-ontology approach, as will be pointed out in chapter 13.2.

7.1.3 Minimal Representation

The predicates HOLD and CULM distinguish terminative sentences from durative ones. Where [84] is said to culminate, [85] is only said to hold:

[84] Judith ate three sandwiches.

[85] Judith ate sandwiches.

But according to Verkuyl, the way in which these sentences are distinguished is not very informative:

> [F]rom the purely aspectual point of view it should be obvious that the aspectual difference between [84] and [85] must be found in the difference between *three sandwiches* and *sandwiches* and it is very hard to see what HOLD and CULM could possibly contribute to explaining that difference ... At best, the addition of the Hold- and Cul-predicate is a way of saying that the two sentences ... differ, but this is what we already knew by looking at them. (Verkuyl, 1995b [19])

[27] The predicate HOLD is interpreted as non-applicable to instantaneous events: if something doesn't last, it cannot hold.

And indeed, in Parsons' event-ontology approach, there is no explanation *why* [84] is terminative, while [85] is durative. The proposed logical form is only tested to be *observationally adequate*, not to be explanatory. The reason for this difference in approach between Verkuyl and Parsons is that the linguistic theory of Parsons is much more directed towards ontology: the two events that are referred to in [84] and [85] differ with respect to their boundedness, and it is this difference that is projected in the logical form.

7.1.4 Conclusion

In this section I tried to show that the HOLD/CULM approach on the one hand fails to be explanatory, and on the other hand gives an incorrect analysis of sentences. It is incorrect because it fails to interact properly with the other temporal placeholder, and it does not explain the difference between durativity and terminativity, but simply postulates it. It even does not solve the imperfective paradox, as Parsons claims, because the entailment of the progressive form by the non-progressive is not accounted for.

One of the recurring problems is that the predicate CULM only takes into account the last moment of an event, thereby ignoring the internal temporal structure of the event. Therefore, every linguistic phenomenon that makes use of the internal structure can not be explained. In chapter 13 I will discuss alternatives for the HOLD/CULM approach and add a notion of event-structure to the event-semantic approach. I will than show that this more structured version is immune for the three types of criticism discussed in this section.

7.2 Neo-Davidsonian Approach

As we have seen (section 4.1), Davidson objected to the independent approach, because the very motive for introducing it is wrong. If we take a sentence like

[86] I sank the Bismarck.

what is expressed is the fact that I did something and this something resulted in the sinking of the Bismarck. The Parsonian derivation would be:

(87) $\exists e.[\text{SINKING}(e) \,\&\, \text{AGENT}(\text{I}, e) \,\&\, \text{PATIENS}(\text{Bismarck}, e)]$

The clauses are placed in conjunction on purpose, so that we can infer things like *There was a sinking of the Bismarck*. But this representation seems wrong on view of a process called *detransitivization*. If we drop the patiens in (87), we should get a logical inference from [86] to:

[88] I sank.

But if I can report [86], I was obviously smart enough not to be on board of the Bismarck when I made it sink, so [88] will be false.

There clearly is a difference between the intransitive verb *to sink* and the transitive one. According to the Longman Dictionary of Contemporary English, the first means *to go below a surface, out of sight, or to the bottom (of water)*, while the second means *to cause (esp. a ship) to sink*. But if there are more meanings to the word *sink*, it might be better to distinguish the related predicates. So we should (at least) have a predicate $\text{SINKING}_{\text{iv}}$ and a predicate $\text{SINKING}_{\text{tv}}$. Since the sinking in (87) is a sinking in the transitive meaning, the logical form that is begotten by dropping the *patiens* is not the logical form for [88], but:

(89) $\exists e.[\text{SINKING}_{tv}(e) \,\&\, \text{AGENT}(\text{I}, e)]$

And this is not the logical form for any sentence, since the transitive $\text{SINKING}_{\text{tv}}$ needs a direct object and there is none present in (89). The grammaticallity of [88] is accidental, due to the fact that there also is an intransitive verb *to sink*. Mostly, dropping the patiens of a transitive verb does not give a grammatical sentence, take for instance *John devoured* (from *John devoured his lunch)* or *He watered* (from *He watered the plants)*[28]. Now the point that we can substract from Davidson's criticism is that the incompleteness of (89) is much more clearly expressed if [86] is not analyzed with the independent, but with the incorporated approach:

(90) $\text{SINK}(\text{I}, \text{bismarck}, e)$

The strategy for determining the arity of SINK is simple:

> ... reduce the number of places of the underlying verbal predicate to the smallest number that will yield, with appropriate singular terms, a complete sentence. But do not think you have a complete sentence until you have uncovered enough structure to validate all inferences you consider due to logical form. (Davidson, 1985a [232])

In its basic form, the independent approach lacks a notion of ungrammaticallity for sentences like *John devoured*. Perhaps the most natural way to reintroduce this notion is by means of *meaning postulates*, as proposed for instance by Dowty (1989). Consider the following sentence:

[91] John gave Mary a book.

To give is a transitive verb needing both a direct and an indirect object. Since the independent approach lacks this restraint, we can simply postulate it (Dowty, 1989 [85]):

(92) $\forall e \Box[\text{GIVING}(e) \rightarrow \exists x.\text{AGENT}(x, e) \,\&\, \exists y.\text{SOURCE}(y, e) \,\&\, \exists z.\text{GOAL}(z, e)]$

But a theory assuming this kind of meaning postulate for every single verb lacks generality. In chapter 15 I will therefore describe a computational framework for event semantics using categorial grammar (henceforth CG), that has no need for meaning postulates like (92). The idea behind this framework is this: a parser, consisting of grammar rules and lexical entries, formalizes the relation between sentences and their logical representation. The fact that (87) is the representation for [86] is a direct result of the derivation tree for [86]. The logical form in (87) has by simple means of predicate logic some logical implications, amongst which (89). All these entailed logical forms express a different semantic content. And (89) is a perfectly valid consequence of [86]. The common mistake is to assume that [88] is the sentence that belongs to it, for there is no sentence that corresponds to (89). In an ideal situation, (89) could be used to have the parser generate a sentence. The result could only be an incomplete sentence, as in [93]:

[93] I sank NP_1.

[28] These examples are taken from Verkuyl 1995b [21].

So the principle is this: a sentence translates into a logical representation. This logical representation has logical implications. But not all these implied logical forms translate back into (complete) sentences. And this principle makes postulates like (92) redundant.

The conclusion is that with the addition of CG, it is justified to say that the difference between the independent and the incorporated approach is (in a way) *irrelevant* (Parsons 1990, see section 4.1), i.e. that Davidson's criticism on the independent approach has been answered.

7.2.1 Silent Anaphora

So far we have seen cases of detransitivization in which the resultant sentence is either ungrammatical (as in *John devoured*) or correct only in a different meaning (as in sentence [88]). But there are other cases (Dowty, 1989 [94]) in which the resultant sentence is correct, and does maintain its meaning:

[94] John shaved.

[95] John entered, but no one noticed.

These sentences in a way still implicitly contain the NP that was dropped, they are synonymous to the sentences in which the NP is still present:

[96] John shaved himself.

[97] John entered the room, but no one noticed it.

Sometimes the NP can only be dropped in a certain context, such as in this example that I owe to Verkuyl, where it is clear whom the book is given to, so it need not be repeated:

[98] What did John give Mary? John gave a book.

Using the framework of CG (see chapter 15) this problem can be tackled in a natural way: [94] as well as [95] and [98] are incomplete sentences, but nonetheless grammatical. The reason is that in these sentences there is still a *trace* of the dropped NP. In CG, this is called an *NP-gap*. Instead of the 'real' direct object that is present in [96] and [97], there is an empty element. Note here again that in [98] we get the same reading as in [91], without the use of the postulate in (92)[29].

I should notice that this approach is not without problems. The empty element has by itself no meaning. Therefore, it can only serve as an anaphor, referring back to something mentioned in the text before. In the three cases mentioned above, this is no problem: the empty element refers to resp. John (in [94]), the event of John entering the room (in [95]) and to Mary (in [98]). But there is not always a referent present:

[99] Mary nodded, and John understood.

What John understands here is *how to interpret Mary's nodding*. And since this is not explicitly stated, there is a silent reference to silent information. But this cannot be an attack against the event-ontology approach, since any theory will have problems explaining this.

[29] Although the meaning-postulate in (92) is nonetheless correct.

7.2.2 Flipping the Prowler

The neo-Davidsonian approach takes a sentence to assign certain predicates to an event[30]. A second sentence about the same event should only add extra information. However, there is a problem. Consider the following situation:

> I flip the switch, turn on the light, and illuminated the room. Unbeknownst to me I also alert a prowler to the fact that I am home. Here, I need not have done four things, but only one, of which four descriptions have been given. (Davidson, 1963)

Let us focus on two of these four descriptions, namely the ones expressed in [100] and [101]:

[100] I flipped the switch.

[101] I alerted the prowler.

In the neo-Davidsonian approach, these two sentences are thus represented:

$$(102)\quad \exists e_1.[\textsc{flipping}(e_1) \,\&\, \textsc{agent}(e_1, \mathrm{I}) \,\&\, \textsc{patient}(e_1, \mathrm{switch})$$

$$(103)\quad \exists e_2.[\textsc{alerting}(e_2) \,\&\, \textsc{agent}(e_2, \mathrm{I}) \,\&\, \textsc{patient}(e_2, \mathrm{prowler})$$

According to Davidson, these are two descriptions of the same event. Therefore, $e_1 = e_2$. Putting these two representations in conjunction is violation the uniqueness of role-bearer constraint (Dowty, 1989 [85]):

$$\forall e.\forall x.\Box[\Theta_i(x,e) \rightarrow \Theta_i(y,e) \rightarrow x = y]] \qquad (104)$$

since there is, in the conjunction, more than one agent, and more than one patient. But furthermore, the combination of (102) and (103), combined with the extra $e_1 = e_2$ should lead to the representation of:

[105] I flipped the prowler.

But surely there is no implication from [100] and [101] to [105]. The most commonly accepted solution to this problem is to say that flipping a switch is not the same as alerting a prowler. This idea is called the fine-grained identity and will be discussed in section10.1.

In section 12 I will propose another solution to this problem: the two variables refer to an event, but do so *under a certain description*. The idea is not that events themselves are events under description, but that the reference is bounded under the description. I will call this thesis *sortal dependent reference*.

7.3 Event Demonstratives

In the event-ontology approach, reference to an event is established by using an existential quantifier. So a simple example-sentence like[31]:

[106] Doris was singing next to the piano.

[30] At least, Parsons uses the neo-Davidsonian approach this way. Further on, especially in section 12 I will refute this claim.

[31] This example is taken from Stoecker (1992).

is true if there is an event, that is a singing by Doris and that takes place next to the piano. Not only event-sentences refer to events, but also event-nouns. Within the standard event-semantic representation, these are even represented equally, so that [106] is, according to its logical form, synonymous to:

[107] Doris' singing took place next to the piano.

But where [106] can be fulfilled, as is requested by the existential quantifier, by any singing of Doris in the past, the rephrased sentence [107] refers to a *specific* singing of Doris, claiming that, within the domain of discourse, there is only *one* singing-event performed by Doris. Sentence [107] has a *demonstrative* element, which has it referring explicitly to a certain event. This is even more clear in the following example:

> Ein Tennisschiedsrichter, der einen Spieler belehrt: *"Dieser Aufschlag war aus"*, äußert nicht die Trivialität, daß es irgendwann einmal einen Aufschlag gegeben hat, der aus war; er sagt *von* dem bestimmten Aufschlag, über den beiden diskutierten, daß er aus war, und was er sagt, ist nur dann wahr, wenn *dieser* Aufschlag tatsächlich aus war. Der satz kann also nicht die logische Form haben: $\exists x.[\text{AUFSCHLAG}(x) \,\&\, x \text{ war aus}]$.[32] (Stoecker, 1992 [147])

The demonstrative element is explicitly present in [107]. But in 'normal' use, also [106] does not utter the triviality that at some time in the past, Doris was singing next to the piano. So also [106] has a demonstrative element, though many less firmly than in sentences containing an event noun. And thus there should be a place for the demonstrative interpretation in event semantics.

Stoecker follows what I think to be the only line to solve this problem within the standard event-semantic representation. The standard representation for [107] is expanded by adding as extra argument, which explicitly picks out a certain element from the universe of discourse: *this is x*.

> ... Man muß ein demonstratives Element in die logische Form aufnehmen: $\exists x.[\text{AUFSCHLAG}(x) \,\&\, x \text{ war aus} \;\&\; \text{dies ist } x]$, und dazu muß man in die Axiomen der Wahrheitstheorie Erfüllungsbedingungen für den offenen Satz *"dies ist x"* aufnehmen: Der Satz *"dies ist* x_i*"* ist genau von all den Folgen erfüllt, auf deren i-tes Folgenlied der Sprecher hinweist.[33] (Stoecker, 1992 [147])

But even though this solution might work, it is very indirect: the existential quantifier introduces an arbitrary variable, and afterwards, the set of possible denotations of this variable is reduced to 1 by the conjunct *this is x*. The existential quantifier seems no longer to have a function in this situation: the actual variable-binding operator is the conjunct *this is x*. Therefore, I will propose in chapter 14 a dynamic event semantic approach, using DPL. In this approach, variables are used to capture entities in the universe of discourse: an entity is given a label (a variable) so that it is possible to talk about it.

7.4 Decreasing Subjects

In section 2.3.1 we saw that one of the strong arguments in favor of the event-ontology approach is the preservation of adverb-dropping inferences. But Verkuyl (1993) makes

[32] A tennis-referee, who tells a player: *"This ball was out"*, does not utter the triviality that somewhere in the past there was a ball, that was out; he claims *this* specific ball, about which the two had been arguing, to be out, and what he says is only true, if *this* ball was indeed out. Therefore, the sentence cannot have the logical form: $\exists x.[\text{SERVE}(x) \,\&\, x \text{ was out}]$.

[33] A demonstrative element should be added to the logical form: $\exists x.[\text{SERVE}(x) \,\&\, x \text{ was out} \,\&\, \text{this is } x]$, and to the axiomata of the truth-theory the conditions of fulfillment of the open sentence *"this is x"*: The sentence *this is* x_i*"* is fulfilled by every sequence whose i-th element is denoted by the speaker.

an objection to this 'evidence' for event-semantics. One of the examples used by Davidson (Davidson, 1971 [200]) is that if we take sentence [108], we can infer less informative sentences from it like for instance [109]: :

[108] Sebastian strolled in Bologna at 2 a.m.

[109] Sebastian strolled in Bologna.

Davidson pretends this sentence is exemplary, that any sentence should show this implication-pattern. But according to Verkuyl this isn't true. The inference from [108] to [109] is a property of the subject. Sebastian is a *monotone increasing* NP. A monotone increasing NP by definition retains any property, including event-properties such as strolling, in case of extension of the universe of discourse. In [108] the universe of discourse is Bologna at 2 a.m. In [109] this universe is extended to Bologna at any given moment in time. So since Sebastian had the property of strolling in the first, he will still have it in the second.

If we replace the subject however with a monotone decreasing NP, like *at most three girls*, the inference fails. So from [110] we cannot infer [111]:

[110] At most three girls strolled in Bologna at 2 a.m.

[111] At most three girls strolled in Bologna.

because at noon, many girls stroll in Bologna. If we analyze [110] however along Davidsonian lines, this inference should hold, by simply dropping the IN predicate in (112):

(112) $\exists e.[\text{STROLLING}(e) \,\&\, \text{AGENT}(e, \text{Atmost3girls}) \,\&\, \text{IN}(e, \text{Bologna}) \,\&\, \text{AT}(e, \text{2am})]$

A solution to this is proposed by Verkuyl himself: maybe we should not analyze [110] as in (112), but as in (113):

(113) $\exists \leq 3x[\text{GIRL}(x) \,\&\, \exists e[\text{STROLLING}(e, x) \,\&\, \text{IN}(e, \text{Bologna})]]$

This representation does get the right entailments, but *"this is not the sort of entailment we are interested in, given the temporal structure of sentences like [110]."* (Verkuyl, 1993 [247]). Since [110] has the same structure as [108], the adverb dropping inference argument, however, would predict the inference from [110] to [111] to hold. Therefore, according to Verkuyl the inference dropping argument only shows the event ontology approach is wrong.

According to me, it is not surprising that [110] is not correctly treated in the event-semantic approach, since [110] is not an event sentence. Sentence [110] is naming a property of the city of Bologna at a certain time: it says that at 2am, the situation in Bologna was such, that no more than three girls were strolling on its streets. It tells that Bologna was rather quiet at that time of night. And therefore it is not an event sentence, but a fact, and to be precise a *property fact*.

This claim is supported by the fact that the temporal adverbial in [110] does not refer to a certain moment in any event (as it does in for instance *"John ran at 2am"*). Rather it refers to the time of night at which the number of girls strolling in Bologna has been counted. So [110] is a property fact, which should be compared with a sentence like:

[114] At most three girls in Bologna have red hair.

Sine [110] is a fact, it is not surprising that monotonicity plays a role in the correctness of implications such as the one from [110] to [111], since monotonicity is a property connected with the relations between fact/properties[34]

[34] It should be noticed that also similar cases in which adverb dropping inferences are correctly handled, like *'At least three girls strolled in Bologna at 2 a.m.'* are exempted in this fashion, since their correctness is incidental.

7.5 Adverbial Event Splitting

In chapter 6 we saw some sentences that fall out of the range of the event-ontology approach, because they do not signify events. But according to Verkuyl the event-semantics also has a problem handling certain sentences that definitely *do* signify events: sentences referring not do one, but to *two* events.

[115] Doris capsized her canoe yesterday and the day before.

This sentence is related to both the fact that Doris capsized her canoe yesterday and the fact that she did that same thing the day before[35]. So if [115] is to be analyzed in event-semantics, the best option is:

$$(116)\quad \begin{array}{l}\exists e, e'.[\textsc{capsizing}(e) \,\&\, \textsc{agens}(e, \text{Doris}) \,\&\, \textsc{object}(e, \text{canoe}) \,\&\, \textsc{yesterday}(e) \,\&\\ \textsc{capsizing}(e') \,\&\, \textsc{agens}(e', \text{Doris}) \,\&\, \textsc{object}(e', \text{canoe}) \,\&\, \textsc{daybefore}(e')]\end{array}$$

Verkuyl objects to this analysis. His reason for doing so is this:

> Apart from its high degree of artificiality, suppose that Davidsonians commit themselves to [equation 116]. Then they have to explain why sentences like [117] do not lead to event splitting. (Verkuyl, 1993 [250])

[117] Doris capsized her canoe quickly and unexpectedly.

It is not hard to come up with a plausible theory that explains why there are two possible reading for sentences containing two adverbials (a *single event* reading and a *plural event* reading), and in doing so shows that (116) is not artificial at all. The complex expression in (116) can be split in two subequations, each of a very familiar form:

$$(118)\quad \exists e.[\textsc{capsizing}(e) \,\&\, \textsc{agens}(e, \text{Doris}) \,\&\, \textsc{object}(e, \text{canoe}) \,\&\, \textsc{yesterday}(e)]$$

$$(119)\quad \exists e'.[\textsc{capsizing}(e') \,\&\, \textsc{agens}(e', \text{Doris}) \,\&\, \textsc{object}(e', \text{canoe}) \,\&\, \textsc{daybefore}(e')]$$

Since (116) is the concatenation of these two, it is the logical representation for the sentence that is the conjunction of the two sentences belonging to (118) and (119):

[120] Doris capsized her canoe yesterday and Doris capsized her canoe the day before.

Now the assumption is, that [115] is in fact not just a simple sentence, but (also) the concatenation of the of the compound sentence in [120]. And this is not a far-fetched assumption; there is syntactic evidence for the fact that [115] is ambiguous, since it can have either of these constituent structures:

[121] [$_s$ Doris capsized her canoe quickly] and [$_s$ unexpectedly].

[122] [$_s$ Doris capsized her canoe [$_{s\backslash s}$ quickly and unexpectedly]].

[35] More about the fact that the second capsizing is called *the same thing*, as if it would not be two distinct event-particulars, will be said in chapter 9.

In the derivation belonging to (122), there is one sentence with a compound adverbial, while in the case of (121), there is a compound sentence, where each of the composing parts contains an adverbial, just like in the compound sentence in [120]. And thus, it is not artificial, as Verkuyl claims, to represent [115] as in (116).

The hard part is to come up with a consistent theory explaining why there is no similar plural event reading in [117]. The best way to start is by supposing that [117] *does* have a plural event reading, so that it can correctly be thus represented:

$$(123)\quad \begin{array}{l}\exists e, e'.[\text{CAPSIZING}(e) \,\&\, \text{AGENS}(e, \text{Doris}) \,\&\, \text{OBJECT}(e, \text{canoe}) \,\&\, \text{QUICK}(e) \,\&\\ \text{CAPSIZING}(e') \,\&\, \text{AGENS}(e', \text{Doris}) \,\&\, \text{OBJECT}(e', \text{canoe}) \,\&\, \text{UNEXPECTED}(e')]\end{array}$$

But standardly, this compound sentence is to be interpretated so as that the quick capsizing *equals* the unexpected capsizing; otherwise they would not have been named in the same breath. And if this identity ($e = e'$) is added to (123), and all doubly appearing clauses are remove – since AGENS(*e*, Doris) & AGENS(*e*, Doris) simply equals AGENS(*e*, Doris) – the representation in (123) is identical to the representation for the single event reading. So although there are syntactically two readings, there is semantically only one, since the two readings are semantically identical.

So that explains why [117] does only partially lead to event splitting. But what it does not explain is why [115] *does* lead to event splitting, and in fact does not have a single event reading. To explain this, let me first turn to an intermediate case, which has both a single *and* a plural event reading:

[124] I was walking on the beach yesterday and the day before.

This sentence contains two temporal adverbials. The suggestion is, that it is impossible for *one* sentence to contain *two* temporal adverbials. In many cases sentences containing two temporal adverbials are ungrammatical, such as for instance:

[125] *? I laughed at noon and on Monday.

A sentence such as [124] is grammatical only under certain circumstances. Firstly, it has to be a concatenation of a compound sentence. And secondly, the two temporal adverbials have to be of the same type (for instance both denoting a day, or a year) so that they either distinguish two different events of the same type, or denote the period of the event. But in that last case, the two temporal adverbials have to denote successive moments, such as the *'yesterday'* and *'the day before'* in [124]. So [124] has two readings, one in which I walked on the beach for two days on a row, and another in which I walked on the beach on two occasions.

Now also in [115] the two temporal adverbials are of the same type, denoting consecutive days. Yet [115] only has a plural event reading. The reason for this difference with [120] is that the composing sentences in [120] are durative sentences, while the composing sentences in [115] are *terminative* sentences. A terminative sentence expresses the fact that the denoted event terminated. So if [115] would denote a single event, this event would have to have terminated on two different days, which is impossible. I will return to the formal notion of terminativity in section 13.3.

7.6 Plural NPs

In the aspectual field there is a lot of discussion on Kolkhoz-collective, collective, intermediate and distributive readings. In section 5.4 we saw Verkuyls' distributivity-spectrum. Much of the findings in this field are not accounted for in the Parsonian approach. Consider the following sentence:

[126] John and Mary wrote a book.

This sentence has both a distributive and a collective reading. For clarity sake, let me make these two readings explicit:

[127] John and Mary each wrote a book.

[128] John and Mary wrote a book together.

If John and Mary each wrote a book, then it follows that John wrote a book, just as well as Mary did, and that it is not the same book in these two cases. So there is entailment from [127] to both [129] and [130]:

[129] John wrote a book.

[130] Mary wrote a book.

This is easily accomplished by viewing [127] as a contraction of a compound sentence:

[131] John wrote a book and Mary wrote a book.

And if [126] is a contraction of [131], its representation should be the conjunction of the two representation for the constitutive sentences of the compound sentence in [131]:

$$(132)\quad \begin{array}{l} \exists e.\exists x.[\text{WRITING}(e) \,\&\, \text{AGENT}(e, \text{John}) \,\&\, \text{OBJECT}(e, x) \,\&\, \text{BOOK}(x)] \,\& \\ \exists e.\exists x.[\text{WRITING}(e) \,\&\, \text{AGENT}(e, \text{Mary}) \,\&\, \text{OBJECT}(e, x) \,\&\, \text{BOOK}(x)] \end{array}$$

The more troublesome reading is the collective reading. For starters, the collective reading in [128] does not entail [129] nor does it entail [130]. The reason for this is that John can be credited only half for writing the book. Parsons mentions this problem, and his solution to it, only briefly:

> Certain constructions in English appear to refer to groups. Examples are 'the women' in "*The women elected Mary president.*". ... Other NPs do not usually denote groups, but they can do so in certain contexts; examples are ... 'Mary and Bill' in "*Mary and Bill (together) lifted the piano.*". I shall not rehearse the substantial literature on group reading of English NPs. I shall simply assume that sometimes reference to groups is required ...
> Conjunctions such as 'Shem and Shaun ' may ... pick out subjects of events, as in "*Shem and Shaun lifted the piano.*" which has, as one of its reading (133). In this form, 'Shem and Shaun' denotes the two-membered group of boys.
> (Parsons, 1990 [47])

$$(133)\quad \exists e.[\text{LIFTING}(e) \,\&\, \text{SUBJECT}(e, \text{Shem and Shaun}) \,\&\, \text{OBJECT}(e, \text{piano})]$$

So if John and Mary write a book together, there is one event, having a two-membered group as it subject. For clarity sake, let me introduce a group operator $\bullet$, so that the interpretation of [128] will be:

$$(134)\quad \exists e.\exists x.[\text{WRITING}(e) \,\&\, \text{AGENT}(e, \text{John} \bullet \text{Mary}) \,\&\, \text{OBJECT}(e, x) \,\&\, \text{BOOK}(x)]$$

Since it is the group consisting of both John and Mary that is the agent of the writing of the book, it is correctly predicted that nor John nor Mary alone can be given full credit for writing it. So it might be said that the word 'together' forces a collective reading, leading to an event having a group as its agent. But though this is correct in the case of [127], but not in cases like:

[135] John and Harry went to Cleveland together.

A reason for this is given by Peter Lasersohn:

> *Together*, in examples like [135] does not serve to indicate that John and Harry went to Cleveland collectively, rather than to indicate that John and Harry went to Cleveland in each other's company. (Lasersohn, 1995 [194])

But the problem is not in the first place that the word *'together'* has a different meaning in [135]. The point Lasersohn wants to make is that [135] does not truly have a collective reading:

> Unlike lifting a piano or lifting 500 pounds, going to Cleveland or to the movies is not something a group of individuals can do without the individual members of the group also doing it. That is to say, going somewhere is not something a group can do in an authentically collective manner; *go* is a lexically distributive predicate. (Lasersohn, 1995 [194])

However, despite the fact that [135] *does* imply the distributive reading, there is a difference between the distributive and the collective reading even in the case of going to Cleveland: [136] only expresses that both John and Harry went to Cleveland, while [135] *adds* the information that they did so as a group. In fact, the only difference between the two sets is that while [127] and [128] are contradictory, [135] and [136] are not. Therefore, I think it is reasonable to suppose that [135] does simply describe a single event having the group John•Harry as its agent, and that the fact that we still infer from it that Harry went to Cleveland is due to world knowledge and needs not be incorporated in its logical representation.

[136] John and Harry each went to Cleveland.

There are more problems related to the collective reading. One of these is pointed out by these two sentences, taken from Lasersohn (1988):

[137] John and Mary lifted every piano together.

[138] John and Mary together lifted every piano.

These two sentences have a different meaning: *[137] means that John and Mary lifted each of the pianos together, while [138] simply means that between the two of them, John and Mary lifted all the pianos*. (Lasersohn, 1988 [38]). The logical representation for [137] is consistently given in (139). But representing [138] is much more difficult. A possible representation in (140) not only contains an unanalyzed 'all-pianos', but it also fails to make clear that every single piano is lifted John and Mary together or by either John or Mary on their own. However, it might be argued that such information is again obtained by using world-knowledge.

(139) $\forall x.[\textsc{piano}(x) \rightarrow \exists e.[\textsc{lifting}(e) \,\&\, \textsc{object}(e, x) \,\&\, \textsc{agent}(e, \text{John} \bullet \text{Mary})]]$

(140) $\exists e.[\textsc{lifting}(e) \,\&\, \textsc{object}(e, \text{all-pianos}) \,\&\, \textsc{agent}(e, \text{John} \bullet \text{Mary})]]$

Even though the collective reading is, for many reasons, more problematic than the distributive one, also the distributive reading is not without problems. According to the proposed analysis, [126] is distributive if it is a contraction of the compound sentence in [131]. Now the word *'each'* in [127] does force the distributive reading, so you would expect *'each'* to have a place in the non-contracted sentence, like the similar word *'both'* does:

[141] Both John and Mary wrote a book.

[142] Both John wrote a book and Mary wrote a book.

But surprisingly, the word *'each'* cannot be grammatically added to [126]. A possible explanation, that I will work out in section 15.3.1, is that the word *'each'* is a modifier of the word *'and'*, where *'and'* is a conjunctor for two NPs. So *'each'* is a semantically empty word, that can be used only in contracted sentence, to indicate the distributive reading.

7.6.1 Numerals

If John and Mary are children, then [143] should have the same meaning as [126]:

[143] Two children wrote a book.

And if they have the same meaning, their representation (expressing this meaning) should be alike. For the collective reading this is easily accomplished: since the group John•Mary is the group of two children, it should be allright to replace the agent in (134) with AGENT(*e*, two-children).

The distributive reading is more problematic. In the case of [126], the distributive reading is analyzed as a contraction of a compound sentence. But clearly [143] cannot be a simple contraction. It is possible to represent [143] analogous to (132)[36]:

(144) $\exists^2 e.\exists x.\exists y.[\text{WRITING}(e) \,\&\, \text{AGENT}(e,x) \,\&\, \text{CHILD}(x) \,\&\, \text{OBJECT}(e,y) \,\&\, \text{BOOK}(y)]$

but the motivation for this representation should be different from the motivation for (132). I have been able to find no such motivation, but nonetheless the representation in (144) seems to cover the meaning of [143] pretty well. For instance, the representation proposed gives a consistent analysis of the example sentence used on page 21:

[45] Three man lifted four tables.

According to Verkuyl, this sentence has a whole series of possible actualizations, which can be roughly divided into collective actualizations and distributive ones. The event-semantic representation for the collective reading looks like this:

(145) $\exists e.[\text{lifting}(e) \,\&\, \text{AGENT}(e, \text{3-man}) \,\&\, \text{OBJECT}(e, \text{4-tables})]$

What is expressed here is that the three man, as a group, lifted the four tables. It is not made explicit how this was done, only that the three man were, as a group, responsible for the lifting of the total of four tables. Using world-knowledge, many situations in which this might have happened are imaginable. For instance, they might have piled them up and lifted the pile in one go. Or taken one table each and afterwards tackled the last table with the four of them.

The distributive reading, on the other hand, looks as follows:

(146) $\exists^3 e.\exists x.[\text{lifting}(e) \,\&\, \text{AGENT}(e,x) \,\&\, \text{OBJECT}(e, \text{4-tables}) \,\&\, ,\text{MAN}(x)]$

What is expressed here is that there are four events, each consisting of a man lifting a group of four tables. So there is a total of twelve tables, although the same table might occur more than one time. Also in this case, there is a number of ways in which the men lifted the table, but precise information on the manner in which the tables were lifted is not included in the sentence.

[36] Where $\exists^2 e.[X]$ is an abbreviation for $\exists e_1.[X] \,\&\, \exists e_2.[X]$.

7.7 Conclusion

In this chapter I discussed various objections that have been made against the event-semantic analysis. Furthermore, I showed that many of these objection have been, or can be answered. All the suggested solutions will be reviewed in more detail in the last part of this thesis. In section 7.1 I discussed the fact that the notions HOLD and CULM provide too little structure to account for many of the temporal phenomena. The discussion of a more structured temporal analysis for events can be found in chapter 4.6.

In section 7.2 I suggested that the undesirable entailments that are seemingly a result of the neo-Davidsonian approach, do not appear if event-semantics is combined with Categorial Grammar. I will discuss a CG-based event semantic framework in chapter 15. In section 7.2.2 I showed that identity plays an important role in the the network of entailments. Therefore, in chapter 10 I will discuss event-identity. But in chapter 12 I will present a more direct solution to many problems connected with identity, a solution called Sortal Dependent Reference.

In section 7.3 I discussed the fact that in traditional event-semantics, the demonstrative element that is present in many uses of event sentences, is ignored. Therefore, in chapter 14 I will present a dynamic version of event semantics, in which the demonstrative element is respected.

In section 7.5 I discussed the question of adverb splitting: when do two adverbs lead to two events? Within the Parsonian event-ontology approach, this question is difficult to answer. Therefore, I will address this question again in section 13.3 and present a formal solution in section 15.3.3.

Finally, in section 7.6 I discussed the interpretation of plural NPs. Though there are many subtly different readings, event semantics seems to be powerful enough to represent all these different readings. The finding of this section will be formalized further in section 15.3.1. But it should be said that this is only a preliminary sketch. For this analysis to be worked out in detailed, it would require a thorough investigation.

8 Pro-Event Arguments Reconsidered

As we saw in the previous chapter, the event-ontology approach has been attack on many accounts. But also the evidence that we saw in paragraph 4.2 is not left untouched. We already saw that Verkuyl suggested that the argument from adverb-dropping inferences should in fact be considered as negative evidence for the Parsons' Project. In this chapter doubts are expressed on account of the other pro-event arguments.

8.1 Variable Polyadicity

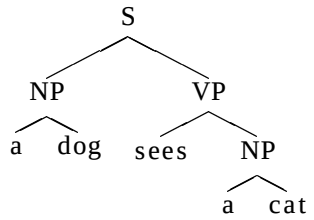
One of the main motivations for introducing the event semantic logical form is the fact that the traditional predicate logical form has a fixed polyadicity (see section 2.3.2). A predicate modeling the core of a sentence has a fixed number of argument, and there is no logical relation to predicates with a larger or smaller arity. This was a correct argument against the traditional logical form when Davidson wrote his article in 1967. At present time however, there are theories at hand that allow the traditional predicate logic to have a more flexible treatment of arity. One such theory is proposed by Vermeulen and Visser (1995).

The theory presented by Vermeulen and Visser is partly motivated by an observation that, at first, only seems to strengthen Davidson's argument. In section 7.2 I claimed that the phenomenon of detransitivization leads to incomplete sentences (Although these incomplete sentences are sometimes grammatical by means of a feature called NP-gapping). But in real life we are often confronted with real incomplete sentences. Take a complete sentence, like:

[147] A dog sees a cat.

In a basic chomskian analysis, this sentence has the following deep structure:

(148)



Now imagine that someone is telling you a story that contains [147]. But after he has said *a dog sees*, there is a big explosion behind you and he jumps back with fear and afterwards forgets to finish his sentence:

> ... This analysis prescribes that we first interpret *(a dog)* and *(a cat)*. Then we process *(sees (a cat))* and finally *((a dog) (sees (a cat)))*. Suppose we are hearing someone saying very slowly: *a ... dog ... sees ... a ... cat*. Our "theory" predicts that after hearing *sees* we cannot combine the meaning of *sees* with the meaning of *a dog*. But, surely, we can. (Vermeulen & Visser, 1995 [2])

The predicate logical expression representation for [147] is:

(149) SEE(a dog, a cat)

The suggestion made by Vermeulen and Visser is the same one Davidson and Parsons made: it should be possible to freely add and delete arguments in (149). But their solution to this problem makes no use of event variables.

The core of their proposal is simple: a verb is represented by a predicate. But where Davidson suggests to reduce the number of arguments of an underlying verbal predicate to a minimum, Vermeulen and Visser define these predicate with their *maximum* number of argument. This is best illustrated with an example. Buttering is represented as a predicate BUTTER. Buttering has an agent and an object that is being buttered. Furthermore, there is a possible tool used for buttering, a place where the buttering takes place and a time at which the buttering takes place. So, BUTTER is defined as a five-place predicate, where the first argument is for the agent,the second for the object, etc. Representing a sentence in which all places are filled, like [7] is easy:

(150) $\text{BUTTER}(\text{Jones}, \text{toast}, \text{knife}, \text{bathroom}, \text{midnight})$

But in the Vermeulen/Visser proposal, representing a 'incomplete' event, like [10], is equally simple:

(151) $\text{BUTTER}(\text{Jones}, \text{toast})$

Davidson's objection to this analysis was that the two representations in (150) and (151) are not logically related. In the Vermeulen/Visser approach this criticism is no longer valid: both (150) and (151) are projections of a saturated predicate, which might be called $\text{BUTTER}^{\dagger}$. In fact, both representations are notational variation of an underlying formula: (150) is a nicer representation for (152), and (151) is an abbreviation for (153):

(152) $\text{BUTTER}^{\dagger}(\text{Jones}, \text{toast}, \text{knife}, \text{bathroom}, \text{midnight})$

(153) $\exists xyz.[\text{BUTTER}^{\dagger}(\text{Jones}, \text{toast}, x, y, z)]$

So it is only the superficial representation that can be said to have a variable polyadicity, while the underlying predicate, in this case $\text{BUTTER}^{\dagger}$, has a fixed arity, in this case it is a 5-place predicate.

8.2 Anaphoric Reference

The one evidence proposed by Davidson that is not used by Parsons is the evidence from anaphoric reference we saw in chapter 2. The reason why Davidson thought this was positive evidence is best explained by himself:

> ... the 'it' of 'Jones did it slowly, deliberately, ... ' seems to refer to some entity, presumably an action ... Asked for the logical from of this sentence, we might volunteer something like, 'There is an action *x* such that ... '. But then we need an appropriate singular term to substitute for '*x*'. ... allowing a little slack, we can substitute for *x* ['Jones buttered a piece of toast'] ... The trouble is that have nothing here we would ordinarily recognize as a singular term. (Davidson, 1967 [105])

Verkuyl's objection to this evidence is twofold. Firstly, the *it* that Davidson has referring to an event-particular, is not so strict as Davidson's claims. If the opening sentence would have been:

[154] Three girls buttered their toast in the bathroom.

this, according to Verkuyl, would

> ... underdetermine what really happened: the girls may or may not have been in the bathroom together and they may or may not have shared the toast. What we need in the case of [154] is that *it* may pertain to three or two events, or to just one. It must indeed be sloppy. (Verkuyl, 1995b [15])

Secondly, the anaphoric referent of *it* might also be an abstract entity. In the PLUG$^+$ framework, the anaphoric referent of *it* will be the function ℓ. So even without accepting events, the anaphora that are supposed to refer to events still have a referent. This second argument is strengthened by the first, because the function ℓ underdetermines the actual event.

The first part does not seem to do justice to the system Davidson proposes. Because in the Davidsonian representation [154] just claims that there is an event, having some properties, like taking place in the bathroom and involving toast. There is no claim about how many pieces of toast are involved or whether all girls were in the bathroom together. But maybe it should. It sounds funny to say that *it* happened at midnight if the three girls were in no way related. There is however the question whether [154] refers to one or three events[37].

The second part might be formally correct, but seems very counter-intuitive. The path-function ℓ is an abstract entity, that can in a way be said to exist. But it does not exist in the same way as objects do (and in the same way Davidson claims that events do). They are logical constructs, and it sounds very strange to say that in using anaphora, people refer back to entities of whose existence they are not even aware.

8.3 Perception Verbs

If John felt Mary shuffle her feet, then no doubt John felt something that happened: that Mary shuffled her feet. And since things that happen, episodes in history, are what we call events, it sounds reasonable to say that the object of sentences like:

[155] John saw Mary throw a ball.

is an event, so [155] can be seen as supporting the event-ontology approach. But this statement has to be taken carefully. *To see* is not a verb that introduces an *intentional context*. This means that if :

[156] Mary saw the Queen of Holland.

and Mary did so this very year, then it is also true that:

[157] Mary saw Beatrix.

even though Mary, being an American girl, was totally oblivious to the name of our queen. So let's return to [155]. Mary is a professional baseball pitcher, and a good one too. But this time, she has a sudden itch and throws it far too slow so that it easily results in a home-run. It seems fair to say that:

[158] Mary clumsily threw a ball.

Since it is the same throwing as the one John saw, it also sounds reasonable to say that Mary's throwing a ball was the same event as her clumsily throwing a ball. But John was watching the match on television and the telephone rang right after Mary had thrown the ball. So he never saw the result of the throw. And since there was no visible difference between this throw and any other, we cannot say that:

[37] The third option Verkuyl proposes, that it refers to two events, sounds strange to me, so I will neglect it.

[159] John saw Mary clumsily throw a ball.

The solution that is proposed also by Parsons himself is to say that Mary's throwing a ball is *not* the same as her clumsily throwing a ball. The first vision (them being equal) is called *coarse grained identity*, while the second is called *fine grained identity*. But in section 10.1 I will question the tenability of fine grained event identity. The solution has thus to be different. Consider the following: if John saw a yellow ball, that was blue on the inside, we can say:

[160] John saw a yellow ball that was blue inside.

But if John only saw the outside of the ball, it would be incorrect to say that John saw *that* the ball was blue inside, although he saw the ball that was blue on the inside nontheless. Likewise, if John saw Mary throw a ball, and Mary did saw clumsily, John saw a clumsy throwing of a ball by Mary. But that does not mean that he saw *that* it was clumsy. So even though the throwing is considered to be the same event as the throwing having such-and-such properties, this does not mean that if the event wa the object of the seeing, that all properties of the event were seen by John.

8.4 Event Reasoning

The fact that we reason with events, that we can use them in syllogistic deduction, like the one we saw in paragraph 4.2 (from *In every burning, oxygen is consumed* and *Agatha burned some wood* to *Oxygen was consumed*) is of course only positive evidence for the event-ontology approach if (a) the term *burning* really refers to an event and (b) the inference made is correct.

This last point is denied by Verkuyl. For although in the example oxygen *is* consumed, this is not due to the logical form of the sentences used. There are examples of deductions with the same canonical form that are not valid. The alleged counter-example is this (Verkuyl, 1993 [249]):

[161] In every blessing, the pope speaks twelve languages.

[162] The pope blessed Agatha.

[163] Twelve languages were spoken (to bless Agatha).

The situation Verkuyl wants us to imagine is this: Agatha, a Spanish girl, went to an audience with the pope in order to get blessed. But since she is in a terrible hurry, and the pope started his blessing in spanish, she runs off right after the pope starts blessing in french. So although in the end the pope will have spoken twelve languages, and Agatha will have been blessed by the pope, the blessing of Agatha only took one, or maybe two languages.

Let me walk through the example to point out why Verkuyl's criticism is wrong. According to [161], every time there was a blessing by the pope, the pope spoke twelve languages. And since according to [162] the pope *did* perform a blessing (in which Agatha was blessed) he *did* speak twelve languages. And he did, or else [161] would have been wrong. But what misleading in this example is sentence [162]. In order for the reasoning to be sound, this has to be interpreted as:

(164) $\exists e.[\text{BLESSING}(e) \,\&\, \text{AGENT}(e, \text{pope}) \,\&\, \text{PATIENS}(e, \text{Mary})]$

So [162] is interpreted as if there had been a blessing by the pope specially dedicated to Agatha, since Agatha is the patiens of the complete event, and the uniqueness of role-bearer constraint (see section 7.2.2) tells that there can be no other patiens. And this in the proposed example is simply not true. The explanation is that [162] is meant in a less direct way: it is meant to say that Mary got blessed in a blessing by the pope, of which she attended only a part. And since Agatha got blessed in one, there must have been a blessing by the pope. And if there was a blessing by the pope, sentence [161] tells us that twelve languages were spoken. So it is not [162] itself that can count as a real premise in this reasoning, but the fact that from it can be derived that there was a blessing by the pope.

8.5 Conclusion

Davidson claimed that we should accept event semantics because predicate logic is not capable of explaining the flexibility of adverbs in sentences. In section 8.1 I showed that that is no longer absolutely true. He also claimed we should accept event semantics because it is the only theory that provides a referent for 'event anaphora'. In section 8.2 I showed that there are other theories that provide such a referent.

In section 8.3 I showed that although event semantics in some ways represents the structure of perceptual idiom better than most competing theories, this argument has to be taken with care. If event semantics is combined with a broad ontology, the logical form for perceptual idiom does predicts wrong entailments and is therefore only negative evidence. And in section 8.4 I showed an objection to the event reasoning argument (although it is, according to me, a wrong one).

But the fact that the motivation for event semantics is not as strong as it is supposed to be, this does not mean that event semantics is wrong[38]. In chapter 11 I will bring forward some more ontological motivation for the event ontology approach, thereby claiming it is still the best theory around.

[38] Although, as we saw in the previous chapter, there are problems with it.

Part III Metaphysics

In the previous part, Parsons' event-semantic approach has been discussed as a linguistic device to explain entailments from one sentence to another as in the case of adverb-dropping. One of the purposes of this thesis is however, as said in the introduction, to explore the question: *"do events exist?"*. The claims of the event-ontology approach do not stop at adverb-dropping inferences:

> Understood as a merely technical device – a way of organizing adverb-dropping inferences – this is no threat to the supervenience of events. But Davidson means more. He is doing psychology, claiming to lay bare the logical principles that do in fact guide us in our handling of adverbs. (Bennett, 1988 [17])

In this chapter we are going to see the event-ontology approach from the point of view of ontology. Before doing so, I should say that the metaphysical considerations presented in this part are not necessarily part of event-semantics, although it is in many cases the position presented will be the one best to fit the needs for an event-ontology approach.

The central claim will be that events exist, and that they exist in much the same way as material objects exist. For Quine, the existence of events is a necessary consequence of the event-ontology approach – remember the quote in section 2.6. But there are other positions in which this will not be a natural implication:

> Let us suppose that, among the things that can be values of our variables for individuals, we shall count things as a run that was slow. One could represent the sentence "Something ran slowly" as $\exists x.\exists e.[\text{RUNNING}(e) \,\&\, \text{AGENT}(x, e)$[39] $\,\&\, \text{SLOW}(e)]$ ... This is to construe running as a relation between a person and a run he performs. In this case, such an analysis is readily seen to be essentially a *façon de parler*. We are not required to suppose that somehow runs have an existence of their own apart from things that run. (Ziff, 1970 [32])

The general strategy will be this: unless explicitly stated otherwise, the ontological position presented in this chapter will be merely an extension of the event-ontology approach. Everything that is essential to event-semantics will be thus noted. But it will be a natural extension and an extension that interprets the logic representation in a most natural way.

This part is split in three sections. In section 9 the question *do events exist?* will be clarified by defining what it means for an entity to exist. In section 10, I will try to answer this question by comparing no-event theories – theories denying the existence of events – with pro-event theories[40]. And finally in section 11 I will look at the differences between processes and events from a metaphysical point of view.

[39] Ziff uses the form *Pxy*, signifying *x performed y*. The formula is transformed to Parsons notation just for the sake of clarity.

[40] These terms were introduced in *A world without events?* (Thalberg, 1985)

9 Ontology

Existence is a term that is very hard to define. If used in everyday life, it is almost exclusively in a negative fashion:

[165] Unicorns don't exist.

Everyone knows what [165] means: there are no such things as unicorns. You may find them in movies and fairytales, but you will never meet one in real life, for there are no unicorns. The best synonym for existence seems to be *being-in-the-world*.

Existence is something that relates to things, objects. If we want to say of other 'things' besides objects that they are-in-the-world, we use other terms. For instance, states of affairs *obtain* and events *happen* or *occur*. So what do we mean to ask if we ask: *do events exist*?. Why is the question not simply *do events occur*?

The suggestion is that events are in the world in a way that is relevantly similar to the way objects do. If we want the question to make sense, we have to define *existence* so that it not only applies to objects, but to events as well, and do this in such a way that we don't get a positive answer simply because of the way we defined existence. This difficult task is the goal of this chapter.

9.1 Das Ding an Sich

In the 'standard' interpretation, the existence of events is considered extremely questionable, while the existence of material objects is taken for granted: if I look beside me, I see a chair. A chair is a material object, so material objects exist. I will start this chapter by pointing out some of the problems connected with this 'naive' view on material objects. This first section is merely meant to indicate the problems, not to provide any solid philosophical point. For instance, no differentiation is made between the problem of epistemic access and the problem of individuation.

Physics tells us that matter consists of molecules, which are construed out of atoms, which in turn are formed by quarks. So the world around us consists, in this model, of innumerably many small particles, so small that we cannot see them, even when using an (optical) magnifying tool.

Since atoms are present everywhere[41], you would expect them to play an important role in our lives. But we rarely think of them. What we *do* think of are concrete material objects, like chairs, people, mountains, planets. Chairs exist, for there are chairs in this world. But what does it mean to say that there are chairs in the world? Certainly not that there are things in the world that are necessarily called chairs[42], because the very same things that are called *chairs* by English speaking people, are called *stoelen* by the Dutch, *chaises* by the French, and *seggiole* by the Italian.

So what remains is that there are things in the world, that by English speakers are called *chairs*. Even though the *word* 'chair' might be arbitrary, the underlying *concept* is less so, because the Dutch, the French and the Italian have (almost) the same concept/idea when they use the words 'stoel', 'chaise' and 'seggiola'. So a instead of saying that 'chairs exist', it might be better to say that there are things in the world that *satisfy* the concept CHAIR.

Whatever else the concept CHAIR may imply, part of it will be that you can sit on them. And even though it might be correct to say that there are 'sittable' things in the world, sitting is something done by people (or animals). Something is only 'sittable' because of the way we use them. Think of a culture in which the things that we call

[41] On earth that is, because large parts of the galaxy are vacuum.

[42] There is a movement that *does* make this claim. This movement, called *natural nomenclaturism*, is based mainly on the bible: and God created . . . So *certainly* is perhaps a bit too strong.

chairs are used as altars. Then the *same thing* can be either a chair (in our culture) or an altar (in theirs). We not only *call* it a chair, we *conceptualize* it as a chair.

But if we seriously conceptualize *something* as a chair, that *thing* would have to be something apart from being a chair, or an altar, or a piece of furniture. This supposed 'thing' beyond conceptualization is often referred to *das Ding an Sich*. Since this Ding-an-Sich is beyond conceptualization, we cannot talk about it, for it has no name. Kant claimed that we cannot even know it, or think about it. So if we follow this line of thought, existence is finally dependent on something we cannot see nor think about. How than can we be sure that the world does exist?

In any form of *idealism*, the world is said not to exist independently, but to come into being by our perceiving it and thinking about it. If the world doesn't exist, events don't either. But as I said in the introduction, in the thesis I will maintain a *realistic* point of view, so the least we have to do is accept that there are things in the world. The question is whether events exist in much the same way objects do. Even if you do accept idealism, this doesn't change much for the rest of the discussion. For if we make up the world, events can still have the same status as object. The claim would only have to be altered to something like: events are, just like objects, basic entities in the world as we create it. I will return to this in the next chapter.

9.2 Conceptual Idealism

Whenever we interact with the world, we do so using concepts. These concepts are somehow related to the things in the world. The relation between concepts and the world is best explained not by trying to describe existence, what things there are in the world, but by describing the way in which we perceive the world, the things around us.

Perception is a strange phenomenon when closely considered. There is an object in the world and there is an idea in our mind. And then there is some sort of causal relation between the two that we call perception. A *Ding-an-Sich* is non-conceptual or, to use the terms of Wilfrid Sellars (1956) , outside the *space of concepts*. The idea in our mind is conceptual, so somewhere concepts got introduced.

In the previous section it was suggested that, since a single Ding-an-Sich can be labeled with different concepts, a concept is something *we* add to the thing. Since we can only add things 'in our head', concepts have to be mental. When we think back at perceiving an object when it is no longer there, we use this mental concept in absence of the material object. So concepts have a status independent of material things.

This is not a strange conclusion if we look at [165]. Unicorns don't exist, so what are these things that are claimed not to exist? This problem is called *Plato's beard* (or also *Meinong's beard*), it suggests that we should say that unicorns *do* exist, even though there are none in this world (they do not *subsist*). This strange conclusion can be avoided if we say that concepts have a status independent of material things, because [165] only makes appeal to the *concept* of unicorns.

This is the traditional view on concepts, that is forced by the Kantian Ding-an-Sich. I call the view that concepts are mental *conceptual idealism*. The major problem for conceptual idealism is that concepts are intuitively seen as concepts *of* the Ding-an-Sich, the concept has to *correspond* to the thing in the world. But how can a mental concept correspond to something that is material and non-conceptual?

There have been various attempts to answer this question. Mostly by replacing the notion of correspondence by another. Davidson replaces it by the notion of *coherence*, stating that our picture of the world does not have to be confronted with the layout of reality. Another, less drastic, view is to say that the concept has to be *projectable* on the object, that the Ding-an-Sich has in a way to 'allow' the concept.

But on top of the specific problems that some of these positions have, they all share one problem. In conceptual idealism, the concept is said to relate in whichever way to

the Ding-an-Sich, some non-conceptual thing in the world around us, a material object. This notion of a material object is considered non-problematic, the existence of objects is proven and need not be discussed. I will try to explain why objects are considered non-problematic and why this is not true.

9.3 Criteria of Individuation

Since Frege, a well accepted method of proving the existence of a category of entities is by giving its criterion of individuation: what it is to be a member of that class of entities. To see what is meant by a criterion of individuation, here is an example.

If we want to know whether or not *sets* exist, we should first define what sets are. And one of the questions that has to be answered in order to define what sets are is this: *when are two sets identical?*. This question is then supposed to be easy to answer:

> Wenn es Mengen gibt, dann sind sie genau dann identisch, wenn sie in allen Elementen übereinstimmen – ganz unabhängig von ihren sonstigen Eigenschaften.[43] (Stoecker, 1992 [5])

The suggestion is that we now have answered the question *do sets exist*, and that the answer is *no*. Because saying what sets are involves giving a relevant way of determining when two sets are equal. Such a 'way of determination' is called a *criterion of identity*. This we gave above. And the answer to our first question can be directly deduced from this criterion of identity:

> ... streng genommen bietet die Individuationsbedingung für Mengen keine den Mengen wesentlichen *Eigenschaften*, sondern ihnen wesentlichen *Beziehungen*, und zwar Beziehungen zu Entitäten anderer Kategorien (z.B. materieller Gegenstände).[44] (Stoecker, 1992 [6])

The identity of sets is by definition dependent on other ontological categories, so sets themselves are dependent on other categories, so sets do *not* exist as non-derived entities and are therefore said not to exist at all. Sets are abstract notions that are useful in certain descriptions of the world[45].

9.4 Identity

Now let us return to this crucial question:*when are two entities the same?* Sameness is a notion that we use all the time. You can say that you have the same car as your neighbor. Or tell the waiter to get you the same food as your husband. This familiar notion of sameness is called *qualitative* identity, and this notion is irrelevant for a criterion of identity. Because if you say you have the same car as your neighbor, you do not mean that you share a car with your neighbor: you both have a car, but they are of the same type. And if you ask the waiter for the same food, you do not expect him to bring just one plate, but that you each want a meal, but of the same recipe.

The notion that *is* relevant for identity criteria is the notion of *numerical* identity. Qualitative identity is the being-the-same of two things. In the case of numerical identity, this is not clearly so:

[43] If there are sets, they are exactly then identical, when they correspond in all their elements – independently of their other properties.

[44] strictly taken, the criterion for individuation of sets gives no *properties* that are essential to them, but *relations*, relations to entities of other categories (e.g. material objects).

[45] Although this *is* the conclusion that is taken by for instance Stoecker (and others who use this example, it is not quite right: there is a whole universe of sets that are not dependent on other entities, to be precise: $\{\emptyset, \{\emptyset\}, \{\emptyset,\{\emptyset\}\}, \ldots$

> There is a familiar embarrassment in asking [numerical] identity question ... : when are two events identical? Or, when is one event identical with another? It seems that only one answer is possible: no *two* events are identical, no event is ever identical with *another*. It is hopeless to try to improve matters by asking instead, when is an event identical with itself? For again, only one answer is possible: always.
> (Davidson, 1969b [163])

To see the point behind numerical identity, consider this: John is going to school and Frank is going to school. In that case, you might say that there are two schools involved: the one that John is attending and the one that Frank is attending. Now we want to know if these two schools are the same. Not if they are both primary school, or both catholic, but 'really' the same. Or, in other words, if John and Frank are going to the same school.

Leibnitz proposed a law to determine when two things are the same, called the *Identity of Indiscernibles*. This law tells us that two things are the same when they share all their properties:

$$(166)\quad \forall f.[f(x) \leftrightarrow f(y)] \Rightarrow x = y$$

Now this law has been largely attacked. Take two ping-pong balls, one in your left hand and one in your right hand. These two balls are obviously not the same, for they are two balls and not one. But they are both white, they are both round and they have an equal size. In real life, you will always find a difference between them: one has a small dent, or a small red spot on one side. But these are all incidental so let us suppose that there are no such differences.

Strawson (1959) claims that there is still always a difference between them: the one is in your left hand and the other one in your right. And if you take them both in your left hand, the one will be at the front of your hand and the other one in the back. For objects we have a *single, comprehensive and continuously usable framework*. Only one material object can be at a certain place at a certain time, so if you want to know if two ping-pong balls are the same, you just look if they share a spatiotemporal position.

Material objects are said to be individuated by this framework. And according to this framework, the identity of objects is not dependent on other entities. The relation to spatiotemporal positions is not regarded as dependence, so material objects exist as non-derived entities.

But the individuation of material objects is not as non-problematic as it seems at first. There are mainly two problems with it. The first of these I will discuss here, the other one in the next section.

> ... physical objects are well individuated, being identical if and only if spatiotemporally coextensive. Yet it has been felt that physical objects ... are poorly individuated. Who can aspire to a precise intermolecular demarcation of a desk? Countless minutely divergent aggregates of molecules have equal claims to being my desk.
> (Quine, 1985 [167])

According to conceptual idealism, the concept DESK should be projectable on the world. The material object should allow the concept. This view is hardly compatible with the solution Quine proposes to the desk-problem:

> ... this circumstance attests only to the vagueness of the term 'desk', or 'my desk', and not to that of 'physical object'. Each of these visually indiscriminable candidates for the status of being my desk is a distinct physical object, individuated by the requirement of spatiotemporal coextensiveness. (Quine, 1985 [167])

But the consequence of having this many physical objects is that the concept DESK has nothing to do with the keeping-together of the matter constituting the desk. In

this view, any portion of matter should be a different physical object. Even the object constituted by half my desk including the three books on the left and the glass on the right, or a very small slice of desk under my computer. So that is what we should keep in mind when Quine concludes that:

> Physical objects, despite the vagueness of terms that denote them, are individuated to perfection by spatiotemporal coexistensiveness. (Quine, 1985 [168])

But these things are not physical objects, they are just portions of matter. The criterion for individuation in terms of spatiotemporal positions is not for the individuation of physical objects, it is a criterion of individuation for portions of matter. The only thing we have thus proven is that matter exists, or maybe not even that. What about the physical object with the same size as (one of the many variants of) my desk, placed halfway between our sun and stella proxima, the first neighboring star? By the standards of Quine, there is no reason for not calling this a physical object. But since this bit of the galaxy is utterly empty, there is no matter present, just space. So the only thing that is proven is that physical objects are dependent on spatiotemporal positions. Just like sets are dependent on their elements.

9.5 Reidentification

Along the lines of 166 there is a second law, that is also ascribed to Leibnitz, but which has been around since Aristotle (De Sophisticis Elenchis [179^{a37}]). This law is closely related to (166) and is called the *Indiscernibility of Identicals*: If two objects are the same, they share all their properties.

$$(167)\quad x = y \Rightarrow \forall f.[f(x) \leftrightarrow f(y)]$$

This law is much less disputed. The identity in (167) is of course a numerical identity. But also this law is not without problems:

> As Aristotle pointed out, the most distinctive mark of substance is that, while remaining numerical one and the same, it is capable of admitting contrary qualities at different times. The rusty and dilapidated bicycle that I now own is identical with the brand new bicycle I purchased fifteen years ago; it was shiny and new and is now rusty and old. (Hacker, 1982 [6])

If you look at a particular moment in time, it is easy to say whether or not two objects are the same by looking at their place. But if you take two distinct moments in time, it is very hard to tell when two objects are the same. This is the problem of *reidentification*. The problem behind reidentification was already accurately formulated over 700 years ago:

> ... fluvius Sequana non est hic fluvius propter hanc aquam fluentem, sed propter hanc originem et hunc alveum, unde semper dicitur idem fluvius, licet sit alia aqua defluens.[46] (St. Thomas Aquinas, De Spiritualibus Creaturis, art. IX [16])

At one single moment in time, the individuation of a river is no more problematic than the individuation of a desk. There is a problem defining its exact boundaries, but the water will be (part of) the river. But this water flows, so if you look at the Seine now and again in a month, it will be the same river, the Seine, but there is no material correspondence between the two. All the water that was the Seine then, is now part of

[46] ... the Seine river is not 'this particular river' because of 'this flowing water', but because of 'this source' and 'this bed', and hence is always called the same river, although there may be other water flowing down it. (Translation: Fitzpatrick and Wollmut).

the Atlantic Ocean. Neither will any of the spatiotemporal position coincide, for it is not the same time. What other means do we have for calling things the same river or the same bicycle?

An important feature of material objects seems to be their *persistence*, the fact that they do not suddenly disappear. The suggestion is that we call something a material object iff it is constituted of matter that stays together for a longer period of time. To test this hypothesis let us consider a little story, about the ship of Theseus:

> The ship, when it came to be, was made entirely of wood. One day a wooden plank was replaced by an aluminum one ... and the wooden plank was cast off. But we still had the same ship, it was said, since the change was only slight. Somewhat later, another wooden plank was cast off and also replaced by an aluminum one. Still the same ship, of course, since, again, the change was only slight. The changes continue, but they are always sufficiently slight so that the ship on any given day can be said to be the same as the ship on the day before. Finally, of course, the ship is made entirely of aluminum. (Chisholm, 1970 [25])

Now imagine the former boatsman of the ship. He used to sail on the ship when it was wooden. After a few years of vacation, he decided to join the crew again. Since he knows nothing of the ships history, he will naturally ask why Theseus got a *new* ship and what happened to the old one. Theseus will have a hard time convincing the man that the aluminum ship *is* the wooden ship.

Chisholm suggests a solution that is rather drastic:

> when we say of a physical thing existing at one time that it is identical with or the same as a physical thing at some other time ("this is the same ship we traveled on before") we are likely to using the expression "same" or "identical" in a "loose and popular sense". (Chisholm, 1970 [25])

But if the expression *the same* is not *strict and philosophical* but only *loose and popular*, how can a criterion for such an identity serve as hard evidence for the existence of material objects?

9.6 Conceptual Realism

Although the idea of conceptual idealism seems to be so closely connected to our intuitions concerning the world, it is a rather problematic position when closely considered. First of all, because we think merely in conceptual terms, it is hard to relate our thinking to the world we are thinking about. Second, concepts like DESK are vague. They do not relate to one material object, but to many visually indiscriminable ones. Third, when taken strictly, material objects do not exist, or should be counted as supernumerary. The world can be fully described in terms of spatiotemporal positions and sets. Fourth, persistence is a mere figment of our imagination. And since there is no persistence, we can also do away with the notion of change.

So in conceptual idealism talking about chairs is in many ways futile. Chairs do not exist, they are just complex structures of spatiotemporal positions. If we want to take things like chairs seriously, we have to make a big change in the theory.

The most obvious way to save the existence of conceptual things is to give them a firm place in our ontology by taking them as the basic ingredients of the world (instead of material objects). Concepts are not just things in our mind, concepts are in the world around us. This idea was already in a way presented by Aristotle, who said that the form of things is in the things themselves. Conceptual realism is somewhat more drastic: concepts are not *in* the things around us, concepts *are* the things around us.

This ontology is drastically different from conceptual idealism[47] and it will therefore effect everything said so far in this chapter. Let us walk through the problems again with this new ontology.

9.6.1 Direct Perception

If concepts are in the world, there no longer is a problem how the world can relate to the mind, for there will be simply correspondence between the world an the content of our thought, because *the world is embraceable in thought* (McDowell, 1994 [33]).

This conceptual-realistic view on perception is called *direct perception*;[48] because the world is directly perceived without the mediation of something like sense-data. A sense-datum is the non-interpreted raw information such as it (allegedly) falls on our retina. But since the world is made up of concepts, there is no such thing as non-conceptual information.

Even the image on our retina is bounded within the space of concepts. This may sound strange, since this image is built up of points seemingly having only a color and intensity. But even these points are interpreted:

> Soit une tache blanche sur un fond homogène. Tous les points de la tache ont en commun une certain ¡¡ fonction ¿¿ qui fait d'eux une ¡¡ figure ¿¿ . La couleur de la figure est plus dense et comme plus résistante que celle du fond; les bords de la tache blanche lui ¡¡ appartiennent ¿¿ et ne sont pas solidaires du fond pourtant contigu; la tache paraît posée sur le fond et ne l'interrompt pas. Chaque partie annonce plus qu'elle ne contient et cette perception élémentaire est donc déjà chargée d'un *sens*.[49] (Merleau-Ponty, 1945 [9])

9.6.2 Relative Identity

Identity is the being equal of two things. In the traditional view, the two things said to be equal were non-conceptual material objects. But in conceptual realism, the real things in the world are conceptual things. So identity has to hold between two concepts. Identity will be sortal-dependent, since everything is sortal-dependent.

If we have sortal-dependent identity, two things are not plain the same, they are always the same *something*. They may be the same bicycle, the same ship, or the same desk.

The Leibnitz law of indiscernibility of identicals should be replaced by a principle that you might call the principle that *identity under a sortal concept entails indiscernibility*;[50]:

$$(168)\quad a \stackrel{c}{=} b \Rightarrow \forall f.[f(a) \leftrightarrow f(b)]$$

This allows us to say that the individuation of Quine's desk is not vague. There is only one desk, and this desk is identical to itself. The many visually indiscriminable 'things' are all sets of molecules, and they are indeed all different sets of molecules. And sets of molecules are not desks.

[47] I shall sometimes refer to conceptual idealism as *the traditional view*, not because it is particularly traditional in philosophical literature, but because it is the way people normally look at the world.

[48] This term was introduced by J.J. Gibson, claiming that our neural system is construed so as to directly pick up invariants in the world.

[49] Take a white spot on a homogeneous background. All the points of the spot share a certain 'function' that makes them a 'figure'. The color of the figure is more dense and more resistant as the color of the background; the borders of the white spot 'belong' to it and are not related to the adjoining background; the spot seems to be place on the background and not to interrupt it. Each part indicates more than it contains and even this elementary perception is therefore already loaded with a *meaning*.

[50] This term was introduced by Noonan, 1980 [26].

The ship of Theseus is still the same ship, but it is not the same wood or the same aluminum. When somebody would, like Thomas Hobbes suggested, *kept the old planks as the were taken out, and by putting them afterwards together in the same order, had again made ... the same numerical ship with that which we had at the beginning,* this ship would *not* be numerical the same, but qualitatively the same. It would however be numerically the same wood.

Now relative identity has a consequence that might seem absurd:

> ... a single portion of space may be occupied by distinct entities (provided that they belong to different kinds). (Wiggins, 1980 [16])

So any place at which an object like the one described in section 9.1 is present, there are two things present: a chair and an altar. These things are not the same, since one is an altar and the other is a chair. This altar and this chair happen to share the same portion of space. So if you were standing next to a person of this imaginary culture and both look at the 'chair' you would both see literally something different.

9.6.3 Le Monde Perçu

The theory presented in this section is called *conceptual realism* as opposed to the conceptual idealism described in section 9.2. Conceptual realism is a very broad field of theories. Conceptual realism in fact only claims two thing: there is a world (we do not just imagine there to be one) and concepts are basic entities in this world. The main theory of David Wiggins, such as described at length in *Sameness and Substance* (Wiggins, 1980) is also called *conceptual realism*. This theory, that is based upon the relative identity thesis, is a version of what will be called conceptual realism here, but by far not the only one. To show the variety of theories that are conceptual realistic in the wider sense, I will now describe a position that is fairly different from Wiggins': the existentialism as proposed by Merleau-Ponty (1945).

In both realism and idealism, the world is seen as totally determinate. In the case of idealism this is of course imaginary determinacy, since the world is imaginary, but it is still determinacy. If we take a simple argument-predicate structure, such as BLUE(ball), the world will always non-ambiguously determine whether or not the predicate applies to the argument. Ambiguities are only in the mind of the perceiver, never in the world itself.

Merleau-Ponty objects to this idea, calling it *le préjuge du monde objectif*;[51] [12]. His claim is that the world is not as determinate as it is often taken to be:

> Les deux segments de droit, dans l'illusion de Müller-Lyer, ne sont ni égeaux, ni inégeaux, c'est dans le monde objectif que cette alternative s'impose.[52]
> (Merleau-Ponty, 1945 [12])

Merleau-Ponty suggests that we should replace the notion of an objective world by another: *le monde perçu*;[53]. The lived world and the mind of its perceiver are mutually dependent. Neither the notion of a world, nor the notion of a mind have any content without the other. You might say that the lived world come into being by the interaction between the world and the mind[54].

This phenomenological form of conceptual realism has certain advantages over its analytical counterpart. First, it may sound strange that notions that are so very much

[51] The prejudice of the *objective world*.

[52] The two horizontal segments, in the Müller-Lyer illusion, are neither equal nor unequal, it is only in the objective world that such an alternative is forced.

[53] Literally: the perceived world, but in this thesis I will use a more liberal translation and call it the *lived world* (Hammond *et al.*, 1991 [131])

[54] Although this is a wrong image, since the two supposedly interacting 'entities' cannot be meaningfully be told apart.

related to the human way of living, such as CHAIR are said to really exist in the world. That sounds like a very antropocentrical point of view. When we follow Merleau-Ponty, this is not strange at all, since 'we' are partly responsible for the way the world is.

9.7 Conclusion

The task of this chapter was to say what it is for an entity to exist, so what is the answer? To exist is to be a conceptual object in the world. But what does that mean, especially if there is only an intentional world, as Merleau-Ponty claims?

Unfortunately, I have no answer to offer. But a very strong claim on the term 'existing' have all those things without which the world cannot be accurately described. So from the following quotation:

> Events are not basic items in the universe; they should not be included in any fundamental ontology. I do not say and do not believe that we can in practice tell all the truth about events without using the event concept, which is why I avoid the language of reduction or elimination, in favor of the language of supervenience. (Bennett, 1988 [12])

I would not go with Bennett in saying that events are supernumerary, but rather conclude that events obviously are at least in some way basic entities in the world as we perceive it.

Since there is no clear cut definition for existence I will now turn to a notion that is granted a central place in the discussion on existence in modern philosophic discourse: the notion of a criterion of identity. When can we say that two events are identica? The next chapter will be dedicated to answering this question.

10 Local Ontology

One of the ongoing discussions connected with event semantics is the debate on the existence of events. In this debate, an answer is sought to the question I posed at the very beginning of this thesis: are there events? According to Davidson, linguistics plays a very important role in answering this question. In that respect, both of the previous parts can be seen as relevant to this question. But the existence of events is a metaphysic rather than a linguistic point, so at first it may seem strange that Davidson suggests linguistics has anything to do with it. In this chapter I will try to approach the matter of the existence of events from a more metaphysical point of view, and try to make clear what function linguistics serves in this discussion

What are events, according to Davidson? The answer is to this can be found in *The Individuation of Events*:

> [E]vents are taken to be unrepeatable, dated individuals such as the particular eruption of a volcano, the (first) birth or death of a person, the playing of the 1968 World Series, or the historic utterance of the words, 'You may fire when ready, Gridley'. (Davidson, 1969c [209])

To this we can add that events are basic entities in the universe that are related to, but not dependent on material objects. With this thesis, Davidson takes a position opposite to the one of his teacher, W.V.O. Quine: Quine is a nominalist, his belief is that we should not accept events as ontologically primitive, since there should be as little ontological categories as possible. Davidson had various reasons for introducing event-particulars, some of which I have already discussed. But the evidence Davidson provides for the existence of event-particulars is linguistic (section 4.2).

Even though nominalists deny that events should be accepted as an independent ontological category, events do, even for nominalists, count as entities, be it *derived* entities. And entities have to have a criterion of identity. If there is such a criterion, they can righteously be called entities:

> Quine has quipped: 'No entity without identity' in support of the Fregean thesis that we ought not to countenance entities unless we are prepared to make sense of sentences affirming and denying identity of such entities. But then more obvious even still is the motto: 'No identity without an entity', and its linguistic counterpart: 'No statement of identity without singular terms'. (Davidson, 1969b [163])

But the existence of a criterion of identity is not enough to prove that events are non-reducible entities. And since there is little point in denying events even as derived entities, what reasons do we have to look for a criterion of identity? The first reason is rather modest:

> Es gibt eine ganze Reihe von Theoretikern, die auch nach Wittgenstein den Optimismus teilen, daß Philosophen etwas darüber sagen können, was Ereignisse sind. Gemeinsam ist ihnen aber nicht nur dieser Optimismus, es verbindet sie auch eine Vorstellung davon, wie die philosophische Antwort in etwa auszusehen habe: Mann weiß zumindestens sehr viel besser, was Ereignisse sind, wenn man die *Individuationsbedingungen* für Ereignisse kennt.[55] (Stoecker, 1992 [2])

A second reason is provided by the dilemma of intersubsitutability of co-referential terms that I discussed in section 7.2.2: it should be possible to replace a term with another term, without loss of validity, if the two denote identical events. But this can

[55] There is a whole series of theorists, that share the optimism that philosophers can say something about the question what events are. They share however not only this optimism, but also an idea of what the philosophical answer would look like: we know at least a lot better what events are, when we know their *criteria of individuation*.

also be put the other way around: events should only be said to be identical if the terms denoting them are interchangeable. This reason, however, will play much less important a role with the introduction of SDR in chapter 12.

In this chapter I will discuss the three most influential theories concerning the identity of events: In section 10.3 Davidson's original proposal that events are individuated by their causes and effect, in section 10.2 events as property exemplifications as proposed by Jaegwon Kim, and in section 10.4 a proposal that is often ascribed to Quine, but has been proposed by many different people: events as 4-dimensional objects. But first I will introduce the notion of fine-grained identity to bring structure to these proposals.

10.1 Fine Grained Identity

The notion of *fine-grained identity* was first introduced by Alvin Goldman (1970), using the following example:

> John answers the phone and says "hello." He says "hello" because he wishes to greet the caller. But John has just been quarreling with his wife and is in a tense emotional state. As a result, he says "hello" very loudly. He doesn't intend to shout over the phone; it just comes out that way. Now consider the following acts: John's saying "hello" and John saying "hello" loudly. (Goldman, 1970 [3])

According to Goldman, these two acts are not the same, since the second is caused by John's being in a tense emotional state, while the first isn't. The law of indiscernibility of identicals thus forces them to be different. He pleaded therefore for a more fine-grained identity than the one which he called the *identity thesis*, the theory used by Davidson.

Fine- and coarse-grained identity is in fact a distinction related to two theories and a pair of events. Two theories can differ with respect to the identity of a pair of events, such as John's saying "hello" and John's saying "hello" loudly. In that case, the theory claiming them to be identical is coarse-grained (with respect to that pair of events) while the other is fine-grained (with respect to that pair of events). But in the literature, their connotation is different: the claim that makes the fine-grained identity different from the coarse-grained identity is its claim that two events can share the same *spatio-temporal position*. Fine-grained identity theories accept the possibility of *multiple occupancy*: various events can share the same space and time. And in this respect, the two events in Goldman's example are exemplary. In the rest of this chapter, fine-grained will therefore mean fine-grained with respect to the pair <John saying "hello", John saying "hello" loudly>, which will be labeled e_{sec} and e_{loud} respectively.

In the next sections, I will discuss criteria of identity for events. These criteria pick out one property as the *individuating property* for events: if two events share this property, they are numerically identical. And from this, with the law of indiscernibility of identicals, it follows that if two events share this individuating property, they share *all* properties. And the distinction between coarse- and fine-grained can be used to make a tripartition in these criteria:

> Mann kann die mögliche Vorschlägen für die Ereignis-Individuation in verscheidene Gruppen einteilen in Abhängigkeit davon, wie fraglich es ist, daß Hallo-Sagen und lautes Hallo-Sagen die individuierende Eigenschaften teilen. Es gibt dann drei Gruppen: Erstens Vorschläge, denen zufolge Ereignisse durch eine Eigenschaft individuiert werden, die Hallo-Sagen und lautes Hallo-Sagen *zweifellos* teilen; zweitens Vorschläge, bei denen es *fraglich* ist, ob Hallo-Sagen und lautes Hallo-Sagen die individuierende Eigenschaft teilen; und drittens Vorschläge, bei denen sie die individuierende Eigenschaft *unbestreitbar nicht* teilen.[56] (Stoecker, 1992 [29])

[56] The possible proposals for event-individuation can be divided in different groups, depending on how

10.1.1 Highlighting

The proposal of fine-grained identity is to discriminate e_{sec} from e_{loud}, to account for the fact that John did e_{loud}, but not e_{sec} because he was in a tense emotional state. But Dretske (1975) presses this point even further: It is John's saying "hello" *loudly* that was a consequence of his being in a tense emotional state, and not his *saying* "hello" loudly. Should we than also say that John's saying "hello" *loudly* is different from his *saying* "hello" loudly?

This is what Bennett (1985) calls *highlighting*, but which has more commonly been referred to as *emphasis*. Most arguments that suggest that e_{sec} should be different from e_{loud} can be copied to suggest that the two differently emphasized sentences also refer to different events. I will label these two events $e_{*\text{say}}$ and $e_{*\text{loud}}$.

Some theorists have actually accepted the conclusion that $e_{*\text{say}}$ and $e_{*\text{loud}}$ are different events. I will call such theories *emphasis-dependent* event theories. But more often such an emphasis-dependent theory is considered to be far too fine-grained. Saying that $e_{*\text{say}}$ and $e_{*\text{loud}}$ are different events is an example of confusing an event with its description.

10.2 Property Exemplification

Jaegwon Kim's theory of events is often set over against that of Davidson's. And indeed their theories differ in important respects. But let me start by saying that Kim does not reject the notion of event-particulars, in fact he explicitly embraces this idea:

> Events presumably are not linguistic entities; like trees and molecules, events can be talked about, referred to, and described but they are not themselves statements, sentences, descriptions, or any other kind of linguistic units. Nor are events propositions; propositions are supposed to be abstract entities, whereas events are spatio-temporally bounded particulars. Events and relations between events would exist even if there were no humans, or language, to describe them. (Kim, 1969 [198])

Kim even has a similar notion of the relation between sentences and events. According to Kim, a sentence *E* describes an event *e*, and 'describe' is interchangeable with 'assert the occurrence of' (Kim, 1969 [201]), so an event-sentence asserts the occurrence/existence[57] of an event *e*, which justifies representing an event sentence as $\exists e.[\ldots]$. The main difference between Kim and Davidson lies in their criteria of identity for events.

According to Kim, events do not have *one* individuating property, but *three* unique constituents: *a substance (the "constitutive object" of the event), a property it exemplifies (the "constitutive property" or "generic event"), and a time.* (Kim, 1976 [160]). Two events are identical if they share these three constitutive elements:

$$(169)\quad e_1 : [x, P, t] = e_2 : [y, Q, t'] \Leftrightarrow x = y \,\&\, P = Q \,\&\, t = t'$$

Although Kim is often credited with the idea of events as complexes of objects, times and properties, this proposal has been made by various people in more or less the same form. Definitions very similar to (169) have been made by Martin (1969) and Goldman (1971), for instance:

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questionable it is, that saying "hello" and saying "hello" loudly share the individuating property. This leads to three groups: first the proposals, according to which events are individuated by a property that is *undoubtedly* shared by saying "hello" and saying "hello" loudly; second the proposals in which it is *possible* that saying "hello" and saying "hello" loudly share the individuating property; and third the proposals according to which they *surely do not* share the individuating property.

[57] ... an event exists (occurs if you like) ... (Kim, 1976 [160]).

'$< x, F, t >^e$' abbreviates 'the virtual triadic relation among *y*, *G* and t_1 such that $y = x$, $G = F$, $t = t_1$ and *y* has *G* at t_1' (Martin, 1969 [68])

As I said before, Kim has no intention of rejecting the event-semantic representation. Take the following sentence:

[170] Flora dried herself at noon.

The event semantic representation as $\exists e.[\text{DRYING}(\text{Flora}, \text{Flora}, e) \,\&\, \text{AT}(\text{noon}, e)]$ there is an event variable *e* present, about which Kim claims the following:

> [T]here seems to be no reason why the variable '*e*' cannot take as its value the event structures of the property-exemplification account: in fact, no reason why the particular event-structure [(Flora,Flora), ① dries ②, noon] isn't just the value of '*e*' that makes [170] true. (Kim, 1976 [164])

Kim's theory is a fine-grained identity theory. In fact, it is a *very* fine-grained and, according to many, even a *ridiculously* fine-grained identity theory. It's fineness is often considered its weakest point, as is accurately stated by Kim himself:

> One of the most frequently voiced objections to the theory of events as property exemplifications is the point that this theory multiplies events beyond necessity. Not only is Brutus's stabbing Caesar distinct from his killing Caesar and also from his assassinating Caesar; but in fact no stabbings are killings, and no killings are assassinations. What seems worse, Brutus' stabbing Caesar is also a different event from Brutus's stabbing Caesar with a sword, since stabbing and stabbing with a sword presumably are different properties; and neither of these events is the same as Brutus's stabbing Caesar in the heart; and so on. These considerations seem to have led some philosophers to thinking that the property-exemplification account does not permit redescription of events, since any addition of deletion from a given description would alter the constitutive property of the event in question. (Kim, 1976 [167])

But it is not Kim's criterion of identity that forces a fine-grained identity. Reconsider the case of e_{sec} and e_{loud}. These two events clearly have the same constitutive substance (John) and also seem to have the same time of occurrence[58]. The reason for Kim to say that e_{sec} and e_{loud} are different is that the constitutive property of e_{sec} is *saying "hello"*, while the constitutive property of e_{loud} is *saying "hello" loudly*. Since Kim does allow substances to be specified differently (for example Socrates = Xantippe's husband), why does he not allow to say that *saying "hello"* and *saying "hello" loudly* are the same property? He does in fact suggest this himself:

> Should we also say that if the same property is ascribed by two statements to the same object, although the property is specified by different predicative expressions, the two statements specify the same event? (Kim, 1969 [205])

Kim's motivation for interpreting the identity by property exemplification as strict as he does comes from independent motivations. Let us first look at the conclusion:

> Every event has a unique constitutive property ... namely the unique constitutive property an exemplification of which by an object at a time is that event. And thus, for us, these constitutive properties of events are generic events. ... each event falls under exactly one generic event. (Kim, 1973 [226])

In his article *Events as Property Exemplifications*, he refers to articles by Davis (1970), Thomson (1971) and Goldman (1971)[59] in defense of the distinctness of Brutus's stabbing Caesar and Brutus's killing Caesar.

[58] At least there is no clear reason for assigning a different time of occurrence to them.

[59] "I do not want to discuss here the question whether Brutus's stabbing Caesar is the same event as Brutus's killing Caesar; for I have little to add to the existing arguments in favor of their distinctness." (Kim, 1976 [169]).

It is important to see that most arguments presented in these three papers are arguments in favor of distinguishing between actions. One of the central problems concerning action has been introduced by G.E.M. Anscombe:

> Are we to say that the man who (intentionally) moves his arm, operates the pump, replenishes the water-supply, poisons the inhabitants, is performing *four* actions? Or only one? (Anscombe, 1957 [45])

Davis, Thomson and Goldman give various reasons why these should be considered *four* events / actions rather than one. One such reason is the following:

> It is true to say that the man poisons the inhabitants *by* replenishing the water supply, that he replenishes the water *by* operating the pump, and that he operates the pump *by* moving his arm up and down. As used here, the preposition 'by' seems to express a relation that holds between acts ... if Anscombe is right in claiming that the man's operating is *identical* with his replenishing the water supply, then any relation that holds between these acts in one direction must hold between them in the opposite direction. ...[But] it is also to say that he operates the pump *by* replenishing the water supply. (Goldman, 1971 [673])

Also in the case of Brutus' killing Caesar and his stabbing Caesar, Brutus killed Caesar *by* stabbing him, but did not stab him *by* killing him. Again, the fact that the stabbing is not the killing, is not due to the criterion of identity in (169):

> [D]enials, of such claims as that a certain shooting is a killing, however, are *not* consequences of the idea that identical events must be exemplifyings of the same properties. For if events are exemplifyings at all, that idea is obviously correct. The denials follow from that idea together with the idea that an event can be an exemplification of only one property. (Lombard, 1986 [55])

A more correct name for Kim's view on events is *events as explicanda* (as Lombard calls it). But if this is so, the criterion Kim uses is not the one expressed in (169), but a criterion based on explanations (Lombard, 1986 [54]):

$$(171)\quad e_1 = e_2 \Leftrightarrow \forall e.[e \text{ explains } e_2 \leftrightarrow e \text{ explains } e_1]$$

Kim's proposal has been much discussed, but I will only consider two reason for rejecting Kim's proposal. In order to make these considerations more relevant for the Parsons project, I will first redescribe Kim's proposal as a variant on the Davidsonian representation. My claim is that this redescription does do no harm to Kim's theory, since it is only a notational variant. But if this does prove not to be true, the considerations for rejecting it are not dependent on this notational variation.

10.2.1 Kimian Event Semantics

Kim's representation for an event is, as we have seen, [*x, P, t*] or more generally (also covering dyadic cases) [x_n, *P, t*]. This can be rewritten to [($x_1 \ldots x_n$), *P, t*], since x_n is an abbreviation of ($x_1 \ldots x_n$) (Kim, 1973 [222]). As quoted in the previous section, Kim considers it reasonable to take this structure as the value of an event-variable *e*. Furthermore, he also claims that the structure asserts the existence of such an event. So if we were to make the existential statement explicit, and furthermore make explicit of each of the elements *P*, ($x_1 \ldots x_n$) and *t* that they relate to the event *e*, we could rewrite it as:

$$(172)\quad \exists e.[\textsc{p}(e) \,\&\, \Theta_1(x_1, e) \,\&\, \ldots \Theta_n(x_n, e) \,\&\, \textsc{at}(e, t)]$$

with the same meaning as the original notation, being that at time t the elements $(x_1 \ldots x_n)$ exemplified the property P.

This notational variant of $[x_n, P, t]$ is what I will call the *Kimian event semantic* logical form. In this Kimian version, the event predicate P plays a much stronger role than in it's Davidsonian counterpart: two logical representation can only describe the same event if they contain the same event predicate, if they belong to the same *event sortal*. This also means that an event only exists as belonging to a certain event sortal.

But the specific concept that is used to describe the event is not the event itself, it is the *description* of an event. So the identity conditions Kim proposed are not the criteria of identity for *events*, but for *event-descriptions*. And event-descriptions are propositional in nature, so Kim only gives criteria of identity for true propositions, i.e. for facts. And to be precise, *property facts*. To use a Davidsonian turn of phrase, Kim is not talking about event causation, but about causal explanation. I will return to the notion of causal explanation in section 10.3.1.

But if events are property exemplifications, as Kim claims, doesn't the law of indiscernibility of identicals force us to say that a killing can never be a stabbing? No, they only have to share all properties, and the property Kim mentions is the property of *being describable as* a killing cq. a stabbing. And if the stabbing is the same event as the killing, both events are describable as a killing as well as as a stabbing. So the fact that events are property exemplifications does not entail fine-grained identity nor a coarse grained identity theory. Property exemplifications simply do not provide a valid theory of identity for events.

10.3 Causal Dependency

According to Davidson, we should not see events as explicanda, but as *causal relata*. The individuating property for events is their effectiveness:

(173) $e_1 = e_2 \Leftrightarrow \forall e.[e \text{ caused } e_1 \leftrightarrow e \text{ caused } e_2] \,\&\, \forall e.[e_1 \text{ caused } e \leftrightarrow e_2 \text{ caused } e]$

There are several common criticisms against Davidson's proposal. The first of these is that (173) fails to name a property that is unique for events. The idea behind this criticism is this:

> [W]e cannot confidently turn to the range of significance of the *cause* relation to determine what Davidson would be prepared to label as an event. States are said to be causes (the car skidded because the tyres were worn) and to be effects (the tyres were worn by 100,000 miles of travel). Are states to be considered as events, their identity criterion given by Davidson's formula, or do they require a separate account? People are said to be causes. Are we to go so far as to count people as events?
> (Tiles, 1976 [186])

But this is a misconception of Davidson's point of view. According to Davidson, *only* (members of the ontological category of) events are causally effective. States of affairs and people are just used in *causal explanations*, explaining the causal relations between events. Using Parsons' terminology, the role of states of affairs can be described as follows: the tires being worn is the state of affairs that marks the *culmination* of the wearing out of the tires. And the tires wearing out *is* an event.[60]

Davidson's claim that events are the entities that are causally effective is often seen as controversial. Many, including Jonathan Bennett, consider *objects* to fulfill that role:

> When an explosion causes a fire, what happens is that molecules bump into other molecules, increasing their velocity to the point where they react rapidly with the ambient gas, etc. The idea that the pushing is done not by the molecules but by the explosion is just the afterglow about what an explosion is. (Bennett, 1988 [22])

[60] This was suggested by Lombard (1986 [73]).

Davidson's reply would probably be that within this physical view, the molecules are indeed involved in the effects of the explosion, but the molecules themselves are not the cause of the pushing, but the *rapid movement* of the molecules. And that, again, is an event.

Another point of criticism is that Davidson's (173) is circular. Davidson anticipated this criticism the moment he introduced it, and had a defense at hand:

> This criterion may seem to have an air of circularity about it, but if there is circularity it is certainly not formal. (Davidson, 1969b [179])

Davidson's criterion is not formally circular, since there is no identity sign on the righthand side of the definition. This admitted, philosophers like Wilson (1974), Tiles (1976) and Quine (1985) have argued that the circularity in Davidson's criterion is nonetheless a vicious one. Of these, the most effective one was Quine's criticism, since it made Davidson abandon his position:

> [Quine] says my suggested criterion for individuating events is radically unsatisfactory, and I agree. I accepted it only tentatively, but stressed that I thought it was about as good a criterion as we have for physical objects. Quine has made clearer to me what was wrong with my original suggestion, and I hereby abandon it. (Davidson, 1985b [175])

Quine's main criticism is that Davidson's criterion is an *impredicative* definition; a *definition of something by appeal to a totality that includes or depends on the thing that is to be defined*, and, according to Quine, *impredicative definition is no good in individuation* (1985 [166]). To explain why this is so, Quine compares (173) with a similar definition in which the circularity is less direct:

$$(174)\quad x = y \Leftrightarrow \forall z.[x \in z \leftrightarrow y \in z]$$

As Quine points out, (174) does not individuate events, because of the following reason:

> It justly defines identity, for events and other things too; but it does not individuate them. And why not? Because in quantifying over classes z, it makes sense only insofar as classes make sense, and hence only insofar as classes are individuated. But are classes not individuated to perfection by the law of extensionallity? No; this law individuates classes only to the degree that their members are individuated. Since (174) explains identity of events by quantifying over classes of events that are already individuated, and hence only if events are already individuated.Here is the circularity of (174) – not as a definition but as an individuation. (Quine, 1985 [166])

But as Lowe (1989) correctly points out, the circularity of (174) does not show (173) to be circular, since the circularity of (174) is, as Quine already says, less direct than the one in (173). That there is in principle little wrong with impredicative criteria is clear since the criterion of individuation for sets on page 56 is impredicative but harmless:

$$(175)\quad x = y \Leftrightarrow \forall z.[z \in x \leftrightarrow z \in y]$$

Why is the circularity in (175) harmless? Since it is supplemented by the other axioms of set-theory, above all the existence of the empty set. According to Lowe, the real problem with (173) can be shown using the comparison to set theory:

> [E]ach set in the university of discourse can be uniquely individuated in terms of its membership, beginning with the empty set itself (which alone has no members) and then moving up through the hierarchy of sets which at each level contain only members belonging to lower levels. The real trouble with (173), then, is that it is presented to us without the supporting framework ... Nor does it seem at all likely

> that such a theory of events could realistically be developed, for no event seems apt to play a role analogous to that of the empty set ... Hence we see why (173) cannot effectively determine the answer to *any* identity question concerning events, for any answer it attempts to give will presuppose answers to further such questions, and so on *ad infinitum*. (Lowe, 1989 [181])

This problem is not new. One of the prominent philosophers to follow this line of thought was William of Ockham, who claimed that everything has a cause. And since every cause has itself a cause, this proves that everything goes back to The Great Uncaused Cause: God. And in modern times, this line of thought has been copied not to prove the existence of God, but to provide the idea of the Big Bang, which is often thought of (implicitly) as the one uncaused cause. The problem of *infinite regression* is not specifically related to Davidson's criterion of identity for events, but more generally to the notion of a deterministic universe. Of course the idea of a deterministic universe is controversial, but anyone who accepts it, as I believe Davidson does, has to account for this problem, and once an Uncaused Cause is somehow accepted, events form a hierarchy just like sets.

The relation between determinism and Davidson's proposal is even more close than this. A direct consequence of the criterion in (173) is that there is at most one causally ineffective event. According to some, this is a wrong presupposition, since causally ineffective events are at least logically possible. I think this claim is not much better than the claim that there might be spatio-temporally displaced objects.

The problem with the criterion in (173) seems to be an interplay between circularity, infinite regression and global determinism. But is think Davidson was to hasty to abandon it, that within a deterministic universe, 'causal position' is just as well a 'single comprehensive and continuously usable framework' as spatio-temporal position is. The main difference is that we are more used to spatio-temporal positions as 'fixing elements' than causal positions. That spatio-temporal positions face much the same problems can be made clear by redescribing the criterion of identity for objects as follows:

> Two objects x and y are identical iff at a certain time t for every object z it holds that if z has a distance l from x, it also has a distance l from y and vice versa.

The spatio-temporal framework, just like the causal framework, consists of *external* relations, the spatio-temporal position of an object is just its position relative to other objects. Nonetheless, the spatio-temporal framework is very effective, so there is at least a strong suggestion that the causal framework might be just as powerful.

Before turning to the currently most popular criterion of events as 4-dimensional objects, I will first return to the criticism against the coarse-grained identity, raised in the previous chapter.

10.3.1 Primitive Actions

Reconsider Anscombe's example (page 67) of a man replenishing the water supply and extend this example a little. While operating the pump, his brother was standing behind him. Somewhat clumsily, the man hits the glasses of his brother with his elbow, thereby breaking them. We can now say he broke the glasses by hitting them and he hit them by moving his arm up and down. Furthermore, in replenishing the water supply, he happens to drown a rat who was living there. All these actions are somehow connected, and Thomson (1971) proposed a way of representing such situation by means of *action trees*. The action tree for this example is given in figure 5.

In Thomson's view, all nodes in such action trees have to be different events, since the ones higher up in the tree are done *by* the ones further down. Hence all these events have at least one property they don't share and and therefore different because

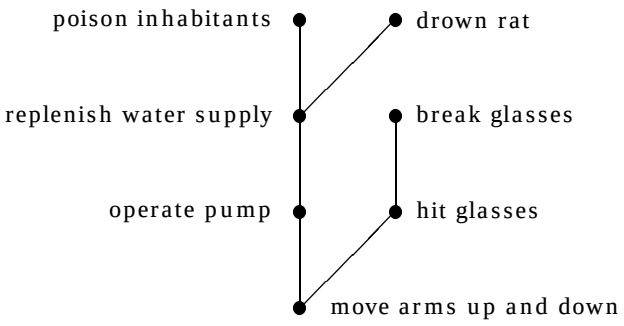

Figure 5: Action-tree for Anscombe's example

of Leibnitz's law. Davidson for one tries to uphold the claim that all nodes in figure 5 represent the same event. This can be achieved by either claiming that it is only strange, but not incorrect to say that the man operated the pump by replenishing the water supply. However, this does not seem to be a fruitful exercise.

Davidson therefore uses the other escape route: being done *by* something else in not really a property of events. The relation between events is that of *causation*: one event causes another. But sentences like:

[176] John replenished the water supply by operating the pump.

do not express causal relation, they only give *causal explanations*. Giving a causal explanation is no more than pointing at a relation between the event that is to be explained and a more simple event. In the case of [176] it is pointed out that the more complex event of John replenishing the water supply is related to his operating the pump. And how they are related is not mentioned, but nonetheless quite clear: the two are identical. According to Davidson, many of the problems in the philosophy of action stem from a confusion between causal relations (in reality) and causal explanations (in the eye of the beholder).

10.4 4-Dimensional Entities

The idea that events are 4-dimensional objects was first introduced by W.V.O. Quine (1960). But it was first used in connection with event semantics by E.J. Lemmon. The proposal is as follows:

> ... a necessary condition for the identity of events e_1 and e_2 is that they take place *over exactly the same period of time*. ... It is clear that this is not a sufficient condition; something must be said about the *place at which* the events take place. ... a further necessary condition for the identity of e_1 and e_2 is that they take place in the same place – we might even say they "take the same place." ... This means that we may invoke a version of the identity of indiscernibles and identify events with *space-time zones*. (Lemmon, 1967 [99])

In line with (169) and (173) this criterion can be represented as follows:

(177) $e_1 = e_2 \Leftrightarrow \forall r.[e_1 \text{ falls within } r \leftrightarrow e_1 \text{ falls within } r]$

I guess there is little doubt that occupying the same place and the same time are *necessary* conditions for the identity of events. But there are various reasons for doubting Lemmon's conclusion of *taking these two conditions as jointly necessary and sufficient for* e_1 *and* e_2 *being identical* (Lemmon, 1967 [99]).

Davidson was the first to comment on this proposal, saying that he is *not at all certain that this suggestion is wrong, but before we accept it we shall first need to remove two doubts*. (Davidson, 1969d [124]). The first of these is the question *whether we have adequate criteria for the location of an event.* The example Davidson gives is this:

> [I]f a man's arm goes up, the event takes place in the space-time zone occupied by the arm; but if a man raises his arm, doesn't the event fill the zone occupied by the whole man? Yet the events may be identical. If a man drives his car into the garage, how much of the garage does the event occupy? All of it, or only the zone occupied by the car? (Davidson, 1969d [124])

If there is a solution to this problem, I fail to see it. In fact, this problem can be stressed even further by saying that it is not only hard to decide which spatial zones are to be counted as part of an event, but that also the temporal zone occupied by an event is vague. As an example we could take Parsons' example of a man polishing a pile of boots. Should we only count the moments he was actually polishing or also the moments he was reaching for a new boot, or even the moments he was taking a break and eating his lunch?

But however difficult, this same problem occurs in the realm of material objects. Take the garage in Davidson's example. Are the tools the empty space within the garage to be counted as part of the garage or just the walls? The first is suggested by the fact that we talk about the car *in* the garage instead of the car *of* the garage. But if the garage is attached to the house, where does the garage end and the house begin? This gets even worse if we remember Quine's remark on page 57. The spatial position of the *minutely divergent aggregates of molecules* is somehow determined (if you forget problematic points like the fact that molecules consist mainly of vacuum), but the spatial position of 'real' objects like desks is vague. There seem to be almost as many reasons for questioning the role of spatial position in the determination of material objects as there is for question the role of spatio-temporal positions of events.

10.4.1 Necessity: Brand

If Susan crosses the Channel swimming and catches a cold while doing so, it is at least reasonable to say that these two events occupy the same spatio-temporal positions, but on the other hand, many share the intuition that Susan's swimming was not identical to her catching a cold, but merely spatio-temporally coincidental. The idea behind this intuition is that there is no logical connection between the two events: Susan's catching a cold is merely a side-effect. Myles Brand (1976) has therefore suggested that two events are only identical if they *necessarily* share space-time:

$$(178)\quad e_1 = e_2 \Leftrightarrow \Box\forall r.[e_1 \text{ falls within } r \leftrightarrow e_1 \text{ falls within } r]$$

This suggestion reintroduces the possibility of multiple occupancy, while staying close to the notion of events as 4-dimensional objects. But this change, however small it may look, results in an ontology that is even more fine-grained than the one proposed by Kim. Because according to this view, the event of Oswald killing Kennedy is not the same event as the event of Oswald killing the 37th president of the United States, since there is a possible world in which someone else won the election.

Another objection against Brand's suggestion is this: necessity is not related to the event itself, but only with the event description. Two events simply fall within the same spatio-temporal zone or don't. But two event-sentences can be such that they *necessarily* describe two events that occur within the same space and time.

10.4.2 Event Sortals: Savellos

What is the reason why we have the intuition that Susan's swimming the channel is not the same event as her catching a cold, but are at least much more willing to say that it is the same event as her crossing the channel? I think it is not so much the element of necessary coincidence as Brand suggested, but the fact that swimming is a way of crossing, while swimming has no *conceptual* relation with catching a cold. The swimming and the crossing share a conceptual description: they are both movings across the channel. So what is needed is a relative identity condition for events. Though Savellos (1992) does not explicitly introduce it as a relative identity condition, he does give a criterion of identity for events that might count as such:

> Where e_1, e_2 are events, e_1=e_2 if and only if: There is an event-sortal f such that a) 'e_1, e_2 are f' tells us *what* e_1, e_2 are and b) e_1 spatio-temporal coincides with e_2 under f, that is, where $\mathbf{D}_F$ denotes the subclass of spatio-temporal properties, all pairs $<e_1,e_2>$ that are members of the relation 'spatio-temporally coincides under f satisfy the schema: $(F)(F\in\mathbf{D}_F) \rightarrow (Fe_1 \leftrightarrow Fe_2)$ (Savellos, 1992 [830])

Now let me return to the criticism that, within this view of events, there is no difference between objects and events, since both are spatio-temporal units (most strongly suggested by Quine). The idea behind this is, I think, much the same as the idea behind the following quote:

> [N]othing prevents us from dissecting surrounding material into fragments constructed in a matter completely different from what we are used to. Thus ... we could build a world in which there would be no such objects as "horse", "leaf", "star", and other allegedly devised by nature. Instead , there might be, for example, such objects as "half a horse and a piece of river", "my ear and the moon", and other similar products of a surrealistic imagination. ... No division ... is theoretically less justified or less "true" than the one we accept in actuality. (Kolakowski, 1968 [48])

I believe that Michael Ayers is right in saying that such objects as "half a horse and a piece of river" do not exist. Material objects are more than just arbitrary conglomerations of spatio-temporal position. Material objects have to persist[61], they have to form a natural unit. It has proven hard to formalize the notion of 'natural unit', but nonetheless I believe it is clear to anyone that a horse *is* a natural unit, while 'half a horse and a piece of river' is not.

Once we have established that a material object is more than just a portion of space-time, there is no longer a need to conclude from the fact that event are, like objects, related to spatio-temporal positions, that there is no difference between them. Objects are 3-dimensional entities that persist through time, while events are 4-dimensional entities that occur at a certain time.

Quine, amongst others, points at the fact that an object, for instance a human being, comes into existence at a certain moment (its birth) and disappears at a later time (its death). Therefore, objects should be viewed, just like events, as 4-dimensional objects. But I think this is a misconception. The 4-dimensional object Quine is talking about is the *life* of a human being, and the life of an object is itself not an object, but an event, just like the agent of an event, like Mary's running, is not an event, but an object. Objects and events are most certainly interrelated, but they form two intrinsically different categories of existence. So if Quine rejects the existence of 3-dimensional entities, this should not be regarded as a statement about event, but as a rejection of the existence of material objects.

[61] There have been several objections to this: God is not persistent, instantaneous particles are not persistent. I hope to avoid this by talking about *concrete* material objects.

11 Descriptive Metaphysics

11.1 Sortal Predicates

In the previous two chapters I emphasized the importance of concepts: we can only perceive the world in conceptual terms and even the notion of identity can hardly be separated from concepts. This brings me to what I believe the most important virtue of the event semantic representation: the presence of an event sortal predicate. Take a simple sentence like *Mary ran*[62]. The neo-Davidsonian representation should be familiar by now:

$$(179)\quad \exists e.[\text{RUNNING}(e) \,\&\, \text{AGENT}(e, \text{Mary})]$$

In this section, I will focus entirely on the event sortal predicate RUNNING. What does this predicate express? According to Parsons, it is a notion that is *already familiar to us*:

> If I say "Her running lasted three hours" I assume "Running" as a term true of runnings; this is the meaning utilized in the predicate RUNNING that appears in the logical forms. (Parsons, 1990 [146])

So the predicate RUNNING expresses the fact that whatever it is applied to, in this example the event variable *e*, is a running. More concrete, that the event that is denoted by the event variable *e* belongs to/is an exemplification of the event concept *running*.

The logical form in (179) can be interpreted in two ways: as a logical representation of an idea or a mental content, and on the other hand as a representation of a fact concerning reality. I will consider both here. The mental part is best seen in the light of the so called *Generality Constraint*, which was introduced by Gareth Evans[63]:

> ... any thought which can be interpreted as having the content *that a is F* involves exercise of an ability – knowledge of what it is for something to be F – which can be exercised in indefinitely many distinct thoughts, and would be exercised in, for instance, the thought that *b* is *F*. (Evans, 1982 [100])

So if (179) is the right representation of *Mary ran*, then the utterance of *Mary ran* can only be done by virtue of the exercise of the knowledge of *what it is* for something to be a running. And in that case the sentence *Mary ran* should be said to communicate the information that a specific event is a running. And what better way to represent this information than by means of an event predicate?

On the other hand, event sentences are *about* the world, and do so in a particular way: the sentence *Mary ran* claims about a particular part of/change in the world that it is of the event type *running*. If events are indeed 4-dimensional objects, and Mary's running only occupies the space occupied by Mary, then Mary's running in a way is fully characterized by giving the position of Mary at the various moments during her running. But this would miss a crucial point: what fails in this redescription is the fact that these various positions of Mary constitute a natural unit, of which the binding force is the concept *running*. Without the concept, the positions of Mary are just bits and pieces, like the examples in Kolakowski's examples on page 73.

If the concept plays so strong a role in the reality described by the sentence, it seems only natural to incorporate the concept in the logical representation of the sentence. For if it wouldn't be incorporated, the representation would lack crucial information of the sentence it represents.

[62] Tense will be disregarded here for clarity.

[63] This constraint has two sides: *Fa* involves an idea of *a* and an idea of *F*. The Generality Constraint is defined in terms of the second part: ... *if a subject can be credited with the thought that* a is F, *then he must have the conceptual resources for entertaining the thought that* a is G, *for every property of being* G *of which he has a conception. This is the condition that I call 'The Generality Constraint'* (Evans, 1982 [104]). But for present purpose the first part, the idea of a concept, is more important.

11.2 Processes

As we have seen for instance in section 4.4, there is a close relation between processes and events. According to Parsons, they are even so much alike that *Processes are analyzable in terms of Events* (Parsons, 1990 [21]). But there seems to be little consensus on the precise status of processes, and Parsons even seems to switch from one position to another.

The reason for the multitude of theories towards processes is, as I take it, a result of the fact that processes share many characteristics with other categories. Therefore, most of the process-theories are very illuminative for the nature of processes. In this section I will briefly review these various positions.

11.2.1 Event Substances

In some theories, processes are regarded as forming an ontological category of their own. Parsons for one does not really reject such a view, since he claims that *nothing in the theory prevents Process from receiving special treatment* (Parsons, 1990 [21]). The 'special treatment' Parsons refers to here is what might be called a 'process-ontology' approach, in which there would be process-variables much like there are event variables in the event-ontology approach.

One of the best of such theories was proposed by Ray Jackendoff (1990). His view can be visually presented as in figure 6.

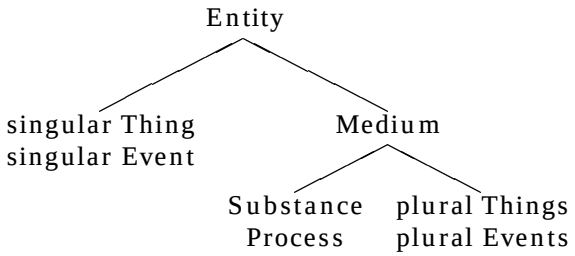

Figure 6: Hierarchy of entities (Jackendoff, 1990 [30]).

So in this theory, processes are seen as 'event substances'. The consequences of this view are best seen by considering a example, like the process expressed by *Mary ran*. According to the process-substance theory, Mary's running should be compared with a lump of gold. A lump of gold is a portion of the substance 'gold'. Likewise, Mary's running is a portion of the process 'running'.

But if processes are truly to be compared with substances, there is more to conclude about the nature of processes. An object is often made of various substances. Take for instance a chair. A chair can be made of wood, but have a reed seat. So even though it is still called a wooden chair, it is in fact made of both wood and reed. In the same fashion, an event, like the one referred to by [180]:

[180] John drove home in his car.

may consist for a large part of driving a car, but also in part by the process of waiting for the traffic lights. And more complex events, such as a football-match, consist of many processes, like a television is made out of many different substances.

So the event-substance approach correctly predicts a lot of characteristics of processes. But where the theory goes astray is that the relation between objects and

substances is quite different from the relation between events and processes. In the case of objects, this relation is as follows: an objects is made of a certain substance, for instance a chair is made of wood. The relation between the concept (object-type) and the substance is for a large part arbitrary. The chair could be made for instance of metal, or plastic, and the wood could also have been made into something else besides a chair, such as for instance a table, or a cupboard.

For events this relation is different: for every event there is a related process. If Mary ate a sandwich, the event-substance theory would say that this event was made of eating (a sandwich). And since the relation between the event in which Mary ate a sandwich and the related process of eating a sandwich is predicated to be arbitrary. But of course this relation is far from so. To put it in other words: knowing the constitutive substances of an object is not enough to tell what object it is; the object is more than just a collection of substance. But events and process describe their object at the same level of description. If the relation between processes and events were to be applied to objects, it would be more correct that an object, for instance a chair, was made of 'chair', the substance of which chairs are made. Such use of object-sortals in the role of substance is rare, but is practiced in sentences such as *'There was dog all over the street.'*

11.2.2 Process-States

Processes are not only compared with substances, but also with states of affairs. The initial motivation for such a view might be that processes are *like states in having no clear culmination point* (Parsons, 1990 [21]). But the relation between processes and states is often viewed as much closer than this mere likeness. Take the following sentence:

[181] Mary was running.

According to the process-state approach, [181] is a fact, expressing a state of affairs; the state that Jane had, at a certain time in the past, the property of being busy swimming. So [181] is a property fact.

This still does not explain the relation between processes and events. But there are versions of the process-state approach which do connect processes and events, such as for instance the one proposed by Anthony Galton (1984):

> [T]he same objective situation may be reported either by the sentence *Jane was swimming* or by the sentence *Jane had a swim*; the first sentence presents the situation as a state of affairs, the second presents it as the occurrence of an event.
> (Galton, 1984 [24])

The state-of-affairs presentation of the objective situation has some characteristics different from its presentation as the occurrence of an event:

> [A] state is homogeneous, dissective, and negatable, and obtains or fails to obtain from moment to moment; an event, on the other hand, is inhomogeneous and unitary, and occurs a definite number of times (possibly not at all) within a period of time.
> (Galton, 1984 [27])

In Galton's analysis only perfective sentence presents the 'objective situation' as the occurrence of an event. So although Galton doesn't speak about event semantics, this can be seen as a direct comment that process-sentences should not be analyzed as claiming the existence of an event, and therefore not analyzed with event semantics. But the 'same objective situation' that is presented by both the perfective *and* the imperfective sentence is exactly the (ontological) event that is referred to by the event variable in the event semantic representation. Therefore, it would be illuminative to analyze

process-sentences in terms of event semantics and therefore to *have* process sentences claim the occurrence of an event. So even though the state-process approach as for instance proposed by Galton has a lot of truth in it, I will look for another approach in order to make it possible to analyze process-sentences with event-semantics.

11.2.3 Viewpoint Aspect

The most direct way to account for the close relation between processes and events is to say that *Processes are analyzable in terms of Events* (Parsons, 1990 [21]). Only in this position, it is justified to analyze process-sentences with the event-ontology approach. There is, of course, a difference between process-sentences and event-sentences. But the difference between processes and events is merely a difference in point of view, depending on what Carlota Smith (1983) calls *viewpoint aspect.*

What is meant by viewpoint aspect is best explained by an example. Consider the following situation: a person called John is, at a certain time t_i, at one side of a street. He walks across it, so that at a later time t_t, he is at the other side of the street. The event, stretching from t_i (the initial moment of the event) till t_t (the moment of termination of the event) having John as its extent can be described in either of the following ways:

[182] John crossed the street.

[183] John walked.

Since (in this example) both [182] and [183] describe the same episode of history, they both refer to the same event. But they do so from another point of view, with another viewpoint aspect. In [182], the event is described as an accomplishment[64], while in [182] it is described as a process. Verkuyl correctly point out an important difference between these two descriptions: [182] is terminative, and [183] is durative. But an easy mistake is to conclude that since [183] is durative, it refers to a non-bounded event. In our example, it is easy to see that this must be a wrong conclusion, since [183] refers to the event beginning at t_i and ending at t_t, and therefore, to a bounded event.

The main difference between the event-viewpoint and the process-viewpoint is also easily displayed using the two example sentences. In [182], the event is described as a crossing. Crossing a street involves, by its very nature, being on the one side of a street before the crossing, and being on the other side afterwards. So the initial and the final state of the event are explicitly described in [182]. And since the boundaries of the events are thus named, it is also made explicit that the event *did* terminate. So in the event-viewpoint, the boundaries of the event are explicitly referred to, and thereby the boundedness of the event is made explicit.

In the process-viewpoint, this situation is different. In describing the event as a walking as in [183] you ignore the boundaries of the event. Therefore, as for the process-description of the event is concerned, the event might just as well have lasted longer than it actually did. And this not naming the boundaries has many consequences. For instance, temporal modifiers in a process-sentence cannot have an inchoative reading (as I discussed in section 7.1), since in the inchoative reading, the temporal modifier applies to the onset of the event, and since the process-viewpoint *ignores* this initial moment, it cannot be referred back to. A similar reasoning can be used to explain why '*for an hour*' can only be used for event-sentences, but I will return to these issues in section 13.3.

[64] The term 'accomplishment' is often replaced by the term 'event', but this leads to a confusion between the linguistic term 'event' and the ontological term. I will therefore avoid to use the term 'event' here when talking about the linguistic notion.

This theory is supported by the fact that [183] can be easily transformed from a process to an accomplishment by adding reference to the boundaries, as in [184]:

[184] John walked to the other side of the street.

With the added reference to the boundaries of the event, [184] has the same characteristics as [182].

11.3 The Progressive Form

However nice the 'viewpoint aspect' theory may seem, it only works smoothly for process-sentences in the non-progressive form. As soon as the progressive form is introduced, the problems start. The relation between progressive verbs and non-progressive verbs is formalized by Parsons as follows:

> If 'A' is an event verb, then 'be A-ing' is to be treated semantically as a state verb; otherwise, 'be A-ing' is to be treated the same as 'A'. (Parsons, 1990 [170])

To explain the problems with the progressive form, I will distinguish three types of progressive sentences, which I will label the process-progressive, the accomplishment-progressive and the achievement-progressive. In this section I will discuss these three types of progressive sentences in turn, starting with the least problematic and building up to the more difficult ones.

11.3.1 The Process Progressive

What we can learn from Parsons' quote is that a progressive sentence is always the progressive form of a non-progressive sentence. So a non-progressive sentence can be put in the progressive form. I will refer to this 'putting in the progressive form' as *progressification*. When a sentence is progressified, it is turned from whatever it was into a process. One of the characteristics of a process-sentence is, as I discussed in the previous section, that a process is a description of an event in which the initial state/moment and the final state/moment are not mentioned.

If progressification turns a sentence into a process, it is not strange that the progressification of sentences that are already processes is the least problematic. In fact, it is even awkward to express a process in the non-progressive form, as in [183]. It is more natural to report such a situation in the progressive form:

[185] John was walking.

Another way of explaining why the process-progressive is the least problematic is to say that in the process of progressification, the boundaries of the event described are 'forgotten'. But since in process sentences the boundaries were never mentioned in the first place, the difference between the two descriptions is minimal. Yet there *is* a difference between [183] and [185]: while the non-progressive focuses on the event as the whole, the progressive focuses on a moment, or a set of moments, and claiming of these moments that they fall within the event period. So for instance:

[186] At noon, John was walking.

says that at noon, there was an event going on which was a walking by John. And since at this focal time the event had not not yet finished, it is not surprising that the culmination of the event is 'forgotten' in progressive sentences. This temporal focusing becomes even clearer if the temporal adverbial does not refer to a moment, but to a stretch of time, such as for instance in:

[187] John was walking on Saturday.

The analysis of such a sentence is that all of the Saturday, John was walking; that for every moment of the Sunday, there was an event going on that was a walking by John. So in the representation for progressive sentences, this temporal focus should be made clear. For instance, the logical representation for [187] might look like this:

(188) $\exists e.[\text{WALKING}(e) \,\&\, \text{AGENT}(e, \text{John}) \,\&\, \text{AT}(e, t) \,\&\, \forall t'.[t' \in \text{SATURDAY} \Rightarrow t' \in t]]$

There are more problems related with this, but I will return to the logical analysis of time in chapter 13.

11.3.2 The Accomplishment Progressive

Progressification of process sentences merely results in a difference of nuance: since the progressive form is focussed on moments, the progressive form is TRUE at any moment within the event-period. But when a non-process sentence is progressified, the difference between the original and the progressified sentence is much larger. Take for instance the process sentence that is the result of the progressification of [182]:

[189] John was crossing the street.

Like with the process-progressive, progressification of an achievement sentence involves the 'forgetting' of the boundaries. As we have seen, one of the motivations for this 'forgetting' is that the progressive form focuses on a moment within the event, at which time the event had not yet terminated. So if we look at [189], at the time of reference it was still uncertain if John was going to finish his crossing. And therefore, [189] does not entail that John *did* reach the other side of the street.

It is this 'forgetting' the boundaries that causes the imperfective paradox. The source for the paradox is that crossing a street, a I said in section 11.2.3, involves being at the one side of a street at the beginning, and being at the other side afterwards. On the other hand, since the progressive form does not imply that the event referred to did terminate, [189] can be used to refer not only to 'complete' crossings, but also to situations in which John never managed to reach the other side of the street. But how can John's event be called a crossing-the-street if he never reached the other side?

A lot of attempts to answer this question, including Krifka's analysis that I will discuss in section 13.1, are based upon the following idea: a process is only a part of an event, so John's action can be called a crossing-the-street, since it is part of a bigger event, which *is* a proper crossing-the-street. But this line cannot lead to a satisfactory answer, for exactly in those cases which cause the paradox, there is no such bigger event, in which the crossing was completed[65].

The solution to this, I think, is to be found in the fact that progressive sentences are, as I said before, focussed on a moment of an event: the time of reference or *focal moment*. So the event is describe as it appeared at that moment. When John was in the middle of the street, it was already possible to say that he was crossing the street. So you can say that someone is crossing the street before he finished his crossing. This is something we often *have* do to, since we always perceive the world at a certain moment. You say that someone is crossing the street because it *looks* like if he is crossing the street. So something can be a crossing-the-street before it is finished because of some crucial *similarity* to previous crossing-the-streets. In the case of crossing-the-street someone will be considered to be crossing the street if he is steadily moving to the other

[65] It has been attempted to solve this problem by introducing possible worlds. A detailed analysis of such attempts can be found in Lascarides (1988), chapter 3.

side of the street, but someone will be said to be baking a cake if his intention is to bake a cake (and he already started doing so).

But this still does not solve all problems concerning the accomplishment progressive, in some situations the paradox is even bigger. Take for instance the following example:

[190] John was building a house.

This sentence can be used to refer to two types of situations: those in which John finished building the house and those in which John never got that far. The cases where John finished his house are not problematic. But now consider a situation in which [190] is used to refer to an incomplete building. In the event-semantic approach, [190] is represented as follows:

(191) $\exists e.\exists x[\text{BUILDING}(e) \,\&\, \text{AGENT}(e, \text{John}) \,\&\, \text{HOUSE}(x) \,\&\, \text{OBJECT}(e, x)]$

Beside the fact that an event in which no house was built is nonetheless called a building-a-house, this representation has another problem: in (191) it is claimed that there is some object of the building, and that this object is a house. But if John never finished the house (and nobody else did), there is no such house. There might have been (if John *would* have finished building it), but there isn't. So the logical representation seems to contradict the actual situation.

Parsons presents the following solution to this dilemma:

> In northern California one can visit Jack London State Park and see the house that Jack London was building when he died. At least that is what the tourist guides say. It isn't much of a house—only the foundation and parts of some walls. But native speakers of English call it a house. What evidence could there be that they are wrong? Ordinary language seems to be governed here by something like Plato's theory of forms: material things that "aspire after" ideals are named after those ideals, in spite of their failure to live up to the ideal itself. In short, people describe unfinished houses as "houses," and my analysis assumes that this is correct usage.
> (Parsons, 1990 [174])

This idea, I take it, is a result of the fact we speak of 'the house that Jack London was building when he died', so that we at least seem to be bound to acknowledge the existence of such a house. But Parsons correctly raises the question *how much of a house needs to be built before it is a house?* (1990 [174]). According to his analysis, we are bound to call the dough of a cake itself a cake, the mere foundations of a house itself a house. And this would way too much devalue the notion of a concept.

But in the line of Platonian metaphysics, there is a more modest solution to this dilemma: (191) is correct also in those cases where John did not finish building the house, since although in these cases there does not *exist* a house fitting the description in the real world, there nonetheless *is* a house that is the object of John's building. This house, however, has a different *mode of existence* than the objects around us. Let me call this mode of existence *telic existence*, and say that the house is not the OBJECT of John's building, but the TELOS of John's building. Than we can say that the house that John was busy building, had, before it was finished, as *telic existence*: it existed only *as* the purpose/telos of John's. If John would have finished the house, the house would have changed its mode of existence at the culminating moment of the building from telic to actual existence.

11.3.3 The Achievement Progressive

In the previous section I discussed that event sortals are only called upon in the accomplishment progressive by means of similarity. So accomplishment progressives in

some way refer to the event in a sort of 'indirect' way. The relation between an achievement and the related achievement progressive is even much more indirect. Consider the following sentence:

[192] Max reached the top.

Reaching a top is an accomplishment, since reaching the top is the instantaneous transition from not-being-at-the-top to being-at-the-top. There may be a period of moments that all have equal right to the called the moment the top was reached, but though it may be disputable *which* moment is the moment of transition, it is sure to be an instantaneous transition.

Now let's consider the achievement progressive. Progressification of [192] produces the following progressive sentence:

[193] Max was reaching the top.

Reconsider the characteristics of the progressive form: The process of progressification involves the 'forgetting' of the boundaries, and in the progressive form, the focal moment of the progressive is claimed to be a part of the denoted event. But if the event is *only* a boundary, the boundaries cannot be forgotten. And if the event-time is a mere moment, no focal moment can be said to be a part of it. To put it bluntly: a progressive sentence describes a durational event, not an instantaneous one.

It is easy to see *which* durational event is denoted by an achievement progressive like [193]: it is the event *preceding* the instantaneous event denoted by the achievement, the event that *culminated* in the transition denoted by the achievement. So in the case of [193] it is the event of John climbing the mountain.

Like in the case of accomplishment progressives, this event is denoted in a *progressified* way, so that it does not entail that the denoted event actually came to a conclusion. So the achievement progressive is doubly indirect: it describes an event by referring to its culminating transition, and ascribes this description to reality only by means of similarity.

This assumption can be motivated in the following way: achievement describe instantaneous events, events that *are* in fact boundaries of durational events. So an achievement describes either the *culmination* or the *beginning* of an accomplishment. If our assumption that the achievement progressive describes the event *preceding* the achievement is correct, than progressification of what you might call *initial* achievements would have to be impossible or at least a bit odd. And indeed is the progressive form of [194] in [195] ungrammatical, or at least odd:

[194] Max started to race.

[195] * Max was starting to race.

Achievement progressives have not always been considered grammatical. In fact, Vendler (1957) called them ungrammatical. So either the grammaticallity of achievement progressives is questionable, or it is a fairly new linguistic phenomenon. It is, however, interesting to see that Vendler describes, in explaining why achievements cannot be put in the progressive form, exactly the process of achievement progressification described above:

> When I say that it took me an hour to write a letter (which is an accomplishment), I imply that the writing of the letter went on during that hour. This is not the case with achievements. Even if one ways it took him three hours to reach the summit, one does not mean that the "reaching" of the summit went on during those hours.

> Obviously it took three hours of climbing to reach the top. Put it another way: if I write a letter in an hour, then I can say *"I am writing a letter"*, at any time during that hour; but if it takes three hours to reach the top, I cannot say *"I am reaching the top"* at any moment of that period. (Vendler, 1957 [104])

However, in this thesis I will consider sentences such as [193] to be grammatical, though it is only natural that they are 'barely' grammatical since the reader is asked both to 'ignore' the boundaries *and* to interpret [193] as describing not the actual reaching itself, but the climbing that preceded it.

11.4 Event (In)dividuality

Now that we have a better notion of what events are, it is possible to answer the question that I issued in section 5.3: are events individual, and if they are, what is the relation between sentences and individual events? Because of the close relation between events and objects, I will (once again) try to first answer this question for material objects. Are objects individual, and if they are, what is the relation between nominal phrases and individual objects?

We call a person an individual, because he is not all by himself a group of people. So the term 'individual' is used as opposed to 'complex', it is the distinction in fig 6 between 'singular thing' and 'plural thing'. This does not mean that the person is literally in-dividual; we can cut his legs off and have three pieces of human body. But as I discussed in chapter 9, these parts will be the same material out of which the body was construed, but it is not the same human being. So a human being is an individual *as* a human being; he is not two human beings.

So these events should be called individual that are not themselves groups of events (under the same concept). With this criterion, if three man lift four tables, there is a total of twelve individual liftings. But according to the analysis in section 7.6, the representation for *three men lifted four tables* is:

$$(145)\ \exists e.[\textsc{lifting}(e) \,\&\, \textsc{agent}(e, \text{3-man}) \,\&\, \textsc{object}(e, \text{4-tables})]$$

So this says that the denotation of the sentence is *one* event, which (possibly) consists of four smaller events. So, something is called an event that is in fact not an individual event, but a group of events. In section 13.1 I will discuss (and reject) a theory in which this suggestion is taken seriously: the so-called mereological approach claims that individual events and groups of events are of the same type. But apart from this solution, there is a conflict between calling something an individual on the one hand and a group on the other.

There are two solutions for this problem, and I have no special preference for one over the other. The first is to say that (145) is a sloppy representation: that it should be taken to mean that there is a group of *n* events, for the total of which three men were responsible, and in which a total of four tables was involved. In that case, the representation is indeterminate to the question if there were one, two, three or four individual liftings.

The other solution is to say that there is no question of a group of events, consisting of several events of the same type: consider the situation in which all three men lifted one table, and the last table was lifted together. In that case, there were four individual liftings of a table. But there was only one (complex) lifting of *four* tables. So the event is seen – as a whole – as an individual event of a certain type.

11.5 Conclusion

In this chapter, I discussed four types of viewpoint aspect: three for the non-stative Vendler classes, and one for the progressive form. These four viewpoint can be visually

represented as in figure 7.

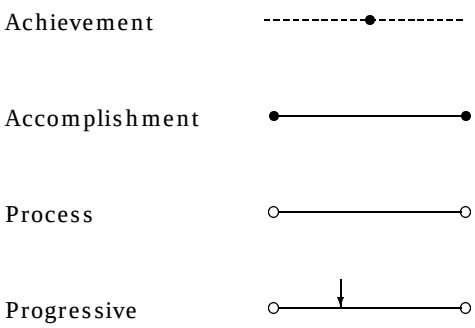

Figure 7: Viewpoint Aspect of the Vendler Classes

Accomplishments describe a durational event, and in describing it they refer to the boundaries of the event. Processes also describe durational events, but *without* reference to the boundaries (although the event itself is surely bounded). Achievements describe instantaneous events, that are either the culmination or the initiation of another event. And finally, progressive sentences describe durational event without reference to their boundaries (like processes do), but they do so by focusing on a certain moment of the event, a moment at which the event itself had not yet finished.

Within the class of progressive sentences there are three groups: process progressives, accomplishment progressives and achievement progressive. These three groups of progressive sentences all behave in the same way: they describe a durational event through the use of a focal moment, and do not make reference to the boundaries of the event. The difference between the three groups of progressive sentences is only their relation to their original non-progressified sentence. If a process sentence is progressified, the only difference is the introduction of a focal moment. In fact, non-progressified process sentences often sound queer, since process sentences are so naturally expressed in a progressive sentence.

If an accomplishment is progressified, a focal moment is introduced *and* the boundaries of the denoted event are 'forgotten'. Finally, if an achievement is progressified then the denoted event shifts from the instantaneous event it originally denoted to the durational event that precedes it. This durational event is of course described without reference to its boundaries, and with a focal moment.

Part IV Emulating Parsons

Parsons' event-ontology approach, the way it was described in chapter 4, was proven in chapter 7 to be imperfect on some accounts. This part is dedicated to amending or extending Parsons' event-ontology approach where necessary. This will be done in four separate chapters:

Chapter 12 introduces what I called *sortal dependent reference*. SDR is an interpretation of event semantics, which is better equipped to handle such problems as the 'flipping the prowler'-problem (section 7.2.2).

Chapter13 introduces a new temporal analysis for event semantics, as an alternative for Parsons' HOLD/CULM approach. This structure is for a large part a formalization of the metaphysic analysis of events in chapter 11.

Chapter 14 introduces a dynamic version of event semantics. one of the virtues of the dynamic version is that it provides better means to account for the demonstrative element, which was discussed in section 7.3.

Chapter 15 introduces a Categorial Grammar framework for event semantics. The main motivation for discussing CG is the problem of unwanted detransitivization, discussed in section 4.1.

12 Sortal Dependent Reference

In section 7.2.2 I introduced the problem of intersubstitutability of coreferential terms, to which the fine-grained identity thesis in chapter 10 is supposed to be an answer. Let me reexamine the situation. Take these two sentences:

[196] Oswald killed Kennedy.

[197] Oswald pulled the trigger.

Since these two sentences are so closely related, it is useful to ask: is Oswald's killing of Kennedy the same as his pulling the trigger? According to Davidson, it is. But this raises the following problem:

> Oswald's killing of Kennedy is by Davidson's standards identical with his pulling the trigger; but Oswald killed Kennedy with a rifle; so if the unacceptable conclusion that Oswald pulled the trigger with a rifle is to be avoided, complex mode adverbs formed by means of the humble 'with' must join the attributive pariahs.
> (Taylor, 1985 [26])

This idea can be copied to other cases, for example Oswald killed Kennedy *by* pulling the trigger (although, as I showed in chapter 10, this is more problematic). Taylor uses this argument to discredit the event semantic representation. Parsons uses this argument the other way around: it is not event semantics that is wrong, but the thesis that Oswald's killing of Kennedy is identical with his pulling the trigger is, because of the event semantic representation.

Taylor's solution leads to a very weak version of event semantics, in which the event-semantic representation can only be used for a small number of adverbials. Parsons' solution, however, leads to a very fine-grained ontology. So what other options do we have? In the view that I will present in this chapter the phrase *with a rifle* is not so much connected with the event itself, but with the *description* of the event. This leads to an interpretation of the event semantic logical form which I will call Sortal Dependent Reference (SDR).

12.1 SDR

Sortal dependent reference (SDR) is most easily explained by an example. Take the following sentence:

[198] He is a friendly man, but a rude philosopher.

In this sentence, two definite descriptions are used: *a friendly man* and *a rude philosopher*. It is not a very difficult sentence, no intentional contexts are introduced, and even time can be neglected. We can represent these two descriptions as follows:

(199) $\exists x_1.[\text{MAN}(x_1) \,\&\, \text{FRIENDLY}(x_1)]$

(200) $\exists x_2.[\text{PHILOSOPHER}(x_2) \,\&\, \text{RUDE}(x_2)]$

These representations both refer to an object, resp. x_1 and x_2. Taken the thesis that all objects are within the space of concepts (see chapter 9), these cannot be non-conceptual objects. There is even a good reason for saying that x_1 and x_2 are objects under description.

In [198], the friendly man and the rude philosopher are said to be the same person, that is referred to by *he*. Since the friendly man equals x_1 and the rude philosopher equals x_2, it seems correct say that:

$$(201)\quad x_1 = x_2$$

But this analysis has a rather unfortunate consequence. Person x_1, who is according to (199) a man is also, according to (200) in combination with (201). So from these three equation it should be possible to derive that he is a rude man. Since the same goes for the parts *friendly* and *philosopher*, [202] should be a valid inference from [198]:

[202] He is a rude man and a friendly philosopher.

Let's consider an example in which [198] is clearly right, but [202] is plain wrong: McX is a friendly man. He has a soft voice and whenever you ask him something, he answers politely. Now his profession is professor of philosophy at the university of U. His philosophical position is rather controversial and he defends it with his life. His articles hardly ever contain a positive word about a rival theory. When you ask his wife to characterize him, she often answers with [198]. What solution do we have to avoid the problematic conclusion in [202]?

At first glance the notion of a *phased* concept seems to provide an angle: MAN is what Wiggins calls a *substance-concept* – these are *concepts that present-tensedly apply to an individual x at every moment throughout x's existence* (Wiggins, 1980 [24]) — while PHILOSOPHER is a *phased concept*. This distinction was used by Wiggins to account for the fact that *John Doe, the boy whom they thought a dunce at school, is the same* human being *as Sir John Doe, the Lord Mayor of London, but not the* same boy *(for the Lord Mayor is not a boy*. (Wiggins, 1980 [23]). But although this distinction definitely applies in this case, it makes no difference. [198] is used while McX is a philosopher, and if his wife asks him something while he is writing a rude article, he is still answering friendly. Therefore, temporal notions cannot be of help.

Another possible attempt is that FRIENDLY is relative to the noun in the following way: people nowadays are rude, only philosophers are friendly. So McX is rude for a philosopher, because all other philosophers are even more friendly, but he is much more friendly than most people, and therefore relative to all men, he is friendly. In our example however, this is just plain false: MacX is rude *as* a man and not rude *for* a man.

The incorrect conclusion in [202] cannot be drawn if we take x_1 and x_2 to refer to objects under description. Which description? That is easy if we look at [198]. The denotation of x_1 is a man, and the denotation of x_2 is a philosopher. This man and this philosopher are not independent; they are conceptual descriptions belonging to the same *Ding-an-Sich*. But the properties they are said to hold, resp. to be friendly and rude, to not relate (directly) to this *Ding-an-Sich*, they relate to the objects within the space of concepts. This idea is also expressed by Merleau-Ponty:

> . . . ce rouge ne serait à la lettre pas le même s'il n'etait le ¡¡ rouge laineux ¿¿ d'un tapis.[66] (Merleau-Ponty, 1945 [10])

Sortal dependent reference is not limited to material objects, but can be applied to any ontological category, including events. For events, however, it is more difficult to find a good example, since we have not (yet) a good notion of when two *Ereignisse-an-Sich* are the same. Quine suggests an example:

[66] This red would not be literally the same if it weren't the 'woolly red' of a carpet.

> [Imagine] a ball simultaneously rotating and heating up ... if it is rotating rapidly and heating slowly, can we say that the event is both rapid and slow?
> (Quine, 1985 [167])

But this example was introduced by Davidson to show the rotation does *not* equal the heating up.You might also see this as positive evidence for the approach, since sortal dependency would also claim the heating up not to be the same as the rotation, since they have a different sortal description. So if we analyze *John walks* as:

(203) $\exists e.[\text{WALKING}(e) \,\&\, \text{AGENT}(e, \text{John})]$

the event *e* is not an *'Ereignis-an-Sich'*, it is an event within the space of concepts, a running. The event sortal predicate has a special place within this representation, it cannot be dropped or it will no longer be a well-formed-formula.

Conceptual realism seems to be closely linked to sortal dependent reference. But conceptual realism is neither a necessary nor a sufficient condition for sortal dependent reference. Their evidence should therefore be considered independently. Sortal dependent reference is also not the same as the fine grained identity approach I discussed in chapter 10. Sortal dependent reference is a much more restrictive approach; even a fine-grained identity approach may still be sortal independent.

12.2 Frege

We can find support for the idea that adjectives and adverbs do not apply to things outside the space of concepts, but to a sortal dependent object, can be found in the *Grundlagen der Arithmetik*. In this work, Frege notes that:

> Wenn ich in Ansehung derselben äußern Erscheinung mit derselben Wahrheit sagen kann: "dies ist eine Baumgruppe" und "dies sind fünf Bäume" oder "hier sind vier Compagnien" und "hier sind 500 Mann," so ändert sich dabei weder das Einzelne noch das Ganze, das Aggregat, sondern meine Benennung. Das ist aber nur das Zeichen der Ersetzung eines Begriffes durch einen andern.[67] (Frege, 1891 [60])

The point here is that natural numbers do not apply to the Ding-an-Sich, for if they did, the same thing could be said to be both 1 and 500. Where the above discussion suggests that sortal dependent reference is best combined with conceptual realism, Frege holds a conceptual idealistic view. This becomes clear when he claims:

> Wenn ich sage: "die Venus hat 0 Monde", so ist gar kein Mond oder Aggregat von Monden da, von dem etwas ausgesagt werden könnte; aber dem *Begriffe* "Venusmond" wird dadurch eine Eigenschaft beigelegt, nämlich die, nichts unter sich zu befassen.[68] (Frege, 1891 [60])

The evidence for the sortal dependence of natural numbers is much stronger than the evidence for the sortal dependence of adverbs and adjectives. Not including a concept leads in the case of natural numbers to ungrammaticality:

> It makes no sense to ask of an object how numerous it is: we ask of a kind how of things how many objects there are of that kind, i.e. if we ask of a *concept* how many objects there are falling under it. As Frege says, to the question, 'How many are England and Wales?', we should reply, 'How many *what?*' (Dummett, 1981 [262])

[67] While looking at one and the same external phenomenon I can say with equal truth both 'It is a copse' and 'It is five trees', or both 'Here are four companies' and 'Here are 500 men'. Now what changes here from one judgment to another is neither any individual object, nor the whole, the agglomeration of them, but rather my terminology. But that is itself only a sign that one concept has been substituted for another. (translation by J.L. Austin)

[68] When I say: "Venus has 0 moons", there is no moon or agglomeration of moons there to say something about; but the *concept* "Venusmoon" is attached a property, the property of not covering any objects.

It is however fully correct to say: “England and Wales are big”; it will not evoke the question ‘big *what?*’. But that does not mean that something can be big without being a big so-and-so. When it is clear which concept is considered, there is no need to add the concept. So England and Wales are countries, so if they are said to be big, that will mean that they are big countries. Also in the case of numbers, we can leave out the concept, although this is rarely ever done. But if you are a teacher and you take your class to the zoo, the ticket-salesman will probably ask: *How many are you?*. In that case, it will be sufficient to say: *We are fifteen*.

12.3 Relational Adverbs

In section 2.4 we saw that Davidson does not provide an analysis for the ‘special’ adverbs, amongst which the relational adverbs. To remind you, his example was the following:

[14] Susan slowly crossed the Channel.

The problem in this example is that Susan crossed the Channel swimming, and therefore crossed it slowly. But she did not swim across the Channel slowly. Using SDR, this problem disappears. Look at this representation:

(204) $\exists e_{\text{crossing}}[\text{CROSSING}(e) \,\&\, \text{AGENT}(e, \text{Susan}) \,\&\, \text{SLOW}(e)]$

The predicate SLOW applies to *e*, and *e* is an event, under the description of a crossing. Under another description, for instance that of a swimming, it can have a contradictory property, such as QUICK.

Parsons suggested that we should interpret *slowly* not as a simple predicate SLOW, but as a verb-dependent predicate $\text{SLOW}_{\text{cross}}$, indicating that what Susan did was slow *for a crossing*. But firstly, such a solution invokes the problem how to interpret these dependent predicates in such a way that they are not simply new, complex predicates. Secondly, as I showed in section 12.1, such an analysis is, at least in some cases, incorrect. The proper interpretation in SDR would not be to say that Susan’s action was slow *for* a crossing, but slow *as* a crossing.

13 Temporal Structure

In section 7.1 I discussed some shortcomings of the HOLD / CULM-approach . In both 7.1.1 and 7.1.2 this shortcoming was due to the lack of internal structure of events in Parsons' logical representation. And Verkuyl, for one, considers this a fatal shortcoming of event-semantics:

> In this section, it was argued that event semantics along the lines of Davidson and Parsons fails to be of interest for linguistic purposes, in particular the study of aspectuality. Their representations may be valuable to warrant a certain set of entailments, but evidently these sets are not involved in the study of temporal properties of sentences. (Verkuyl, 1993 [267])

In this chapter I will therefore look for a more detailed temporal analysis of events. This analysis, presented in 13.3 is based on ideas from two other proposals, which I will discuss first. One is a mereological approach presented by Manfred Krifka and the other is an interval-semantic approach proposed by Barry Taylor.

13.1 Mereology: Krifka

The thesis of Manfred Krifka (1989) presents a theory for events that is the event counterpart for an architecture that he developed for the treatment of *count nouns* and *mass nouns*. Count nouns are names for individuals in the world, things that we can count, such as horses, sonatas, rings, numbers etc. Mass terms are names for in essence complex and uncountable things such as gold, happiness, police, dirt, music, cattle, etc.

According to Krifka, plural terms are of the same type as the singular terms. The motivation for this view is that we treat treat plural and singular terms equally in (almost) every respect. If single and plural terms are of the same kind, a plural term cannot be simply a set of singular terms:

> [Der Zusammenfassung von Entitäten und der Relation der Teilbeziehung zwischen Entitäten] kann nicht die Zusammenfassung von Elementen zu einer Menge bzw. die Elementschafts-Relations sein, da die komplexe Entität vom selben Typ sein muß wie die Entitäten, aus denen sie sich zusammensetzt, und dies ist bei der Zusammenfassung von Elementen zu einer Menge nicht der Fall.[69].
> (Krifka, 1989 [41])

He therefore presents a mereological model in which the concatenation of two entities renders an entity of the same type (events and objects alike). This model can be formally described as a six-tuple $< O, E, T, \sqcup, \leq, \tau >$. In this, *O* denotes the realm of objects, *E* the realm of events and *T* the realm of times.

The fourth element is the operator $\sqcup$. This is the operator that relates plural and singular terms: it takes two entities (objects, events or times) together to form a bigger entity of the same type. It is a commutative, idempotent, associative, complete operator called the *sum-operator*. For convenience, he also introduces three other operators, which are just templates using the sum-operator:

Part-relation: $a \sqsubseteq b \Leftrightarrow a \sqcup b = b$

Proper Part: $a \sqsubset b \Leftrightarrow a \sqsubseteq b \,\&\, \neg a = b$

Overlap: $a \circ b \Leftrightarrow \exists x \in \mathrm{A}.[x \sqsubseteq a \,\&\, x \sqsubseteq b]$

[69] [The taking together of entities and the relation part-relations between entities] cannot be the taking together of elements to a group cq. the element-relation, because the complex entities must be of the same type as the constituting entities, and this is not the case when you take elements together to form a group.

The fifth element is the ordering-operator $\leq$, which imposes the natural sequential order upon the realm of times. Formally: $\forall t, t' \in T.[t \leq t' \vee t' \leq t]$. And the last element, the operator τ relates an event to its time of occurrence. There is a relation between the two operators τ and $\sqcup$: the time taken up by the sum of two events is the sum of the times taken up by the individual events: $\tau(e \sqcup e') = \tau(e) \sqcup \tau(e')$. This mereological model is combined with an event semantic approach:

> Dynamische Verben werden als Prädikate über Ereignisse rekonstruiert. Die Bedeutung von *essen* wird also nicht wie üblich der Menge der Essenden gleichgesetzt, sondern der Menge der Essens-Ereignisse.[70] (Krifka, 1989 [156])

The logical representation for event sentences is very much like Parsons', the logical representation of [205] is expressed in (206)[71]:

[205] A girl eats an apple.

(206) $\exists exy.[\text{EATING}(e) \,\&\, 1\text{GIRL}(x) \,\&\, 1\text{APPLE}(y) \,\&\, \text{AGENT}(e, x) \,\&\, \text{PATIENT}(e, y)]$

But the difference with the Parsonian approach is that events in Krifka's interpretation are structured entities. Since two events taken together constitute another event, the reverse is also true: any event is, or at least can be, the concatenation of two other events. This being structured of events in sub-events makes it possible to formalize the difference between homogeneous and heterogeneous terms described in section 3.2 and 11.2. Homogeneity is expressed in the predicate HOM and heterogeneity in the predicate GQU, which are defined as follows (M is the set of all events belonging to an event-predicate and A is the universe) :

Cumulative: $\text{KUM}(\text{M}) \Leftrightarrow \forall x, y \in \text{M}.[x \sqcup y \in \text{M}]$

Divisive: $\text{DIV}(\text{M}) \Leftrightarrow \forall x, y \in \text{A}.[x \in \text{M} \,\&\, y \sqsubseteq x \Rightarrow y \in \text{M}]$

Homogeneous: $\text{HOM}(\text{M}) \Leftrightarrow \text{KUM}(\text{M}) \,\&\, \text{DIV}(\text{M})$

Quantified: $\text{GQU}(\text{M}) \Leftrightarrow \forall x \in \text{M}.\neg\exists y \in \text{M}.[x \sqsubset y]$

Note that the description of homogeneity differs from its naive interpretation: it is not claimed that any part of a homogeneous event, such as walking, is itself a walking-event. It only says that two walking-events taken together constitute another walking-event (I will refute this in section 13.1.3). In many cases, there will be minimal or atomic events of a certain type, events that no longer consist of sub-events. This anticipates the criticism that a part of a walking containing no more than someone lifting his leg cannot be rightly called a walking. Atomicity is defined in terms of the predicates ATM and ATOM:

M-Atom: $\text{ATOM}(x, \text{M}) \Leftrightarrow \text{M}(x) \,\&\, \neg\exists y \in \text{A}[y \sqsubseteq x \,\&\, \text{M}(y)]$

Atomic: $\text{ATM}\ (\text{M}) \Leftrightarrow \forall x \in \text{M}.\exists y[y \sqsubseteq x \,\&\, \text{ATOM}(y, \text{M})]$

In her thesis, Lascarides (1988) had to leave open the possibility that a mereological approach can solve the problems I discussed in section 7.1, since mereology at the time was fairly new:

[70] Dynamic verbs are reconstructed as predicates over events. The meaning of *eat* is therefore not as usual taken to be the set of eating (people), but as the set of eat-events.

[71] This representation contains two terms that are somewhat strange: 1GIRL and 1APPLE. However, since their intent is clear, and Krifka does use them, I will not further explain these terms.

> Bach claims that the imperfective paradox is solved since processes that form part of an event may occur without the event itself occurring. However, Bach does not say how a definition of the homomorphism h might contribute to such a solution. It is difficult to assess the viability of Bach's approach, because he does not show how the homomorphism h blocks the entailment between [Max is building a house] and [Max builds a house]. Indeed, he does not even state the logical forms of these sentences, and so one cannot see how they are related at all. Bach's lattice-theoretic approach may lead to a solution to the imperfective paradox, but so far, one has not been developed. (Lascarides, 1988 [79])

Krifka's work is clearly an attempt to solve the imperative paradox along the lines of mereology. So let me now turn to the question how Krifka tries to solve the problem of entailment of the progressive by the non-progressive and the problem of inchoative temporal adverbials.

13.1.1 Entailment

As I discussed in section 7.1.2, for non-instantaneous events the non-progressive is stronger than the progressive: if *John wrote a letter* then it is necessarily also true that *John was writing a letter*, although the reverse is not true. The reason for this is that the non-progressive past forces the existence of a letter, while the progressive doesn't. The solution Krifka proposes for this problem is quite idiosyncratic. The analysis of *write a letter* is, as we saw in (206), much like Parsons' analysis[72]:

$$(207)\quad \lambda e.\exists x.[\textsc{writing}(e) \,\&\, \textsc{letter}(x) \,\&\, \textsc{patient}(e,x)]$$

The logical representation of the progressive form can be obtained from (207) by applying a *topological operator*:

$$(208)\quad \lambda X.\lambda e.\exists e'.[e \sqsubseteq e' \,\&\, X(e')]$$

The analysis of the progressive *writing a letter* is the result of applying (207) to (208):

$$(209)\quad \lambda e.\exists e'.[e \sqsubseteq e' \,\&\, \exists x.[\textsc{writing}(e) \,\&\, \textsc{letter}(x) \,\&\, \textsc{patient}(e,x)]]$$

In this representation, the event that is object of *writing a letter* no longer has a letter as its object. The letter is the object of a bigger event, the event that is the object of the non-progressive. But as Krifka himself already points out, (209) claims the existence of e', so the progressive should be entailed:

> Daß das Imperfektiv-Paradox mit der hier gegebenen Progressivanalyse nicht erfaßt wird, ist offensichtlich: Beispielweise folgt aus *John is writing a letter* nach dieser Analyse die Existenz eines Briefes[73]. (Krifka, 1989 [177])

Krifka's solution to this is that the bigger event e' does not have to be actualized. Suppose that John was writing a letter but stopped halfway. According to Krifka's analysis, the sentence *John was writing a letter* does, even in this case, refer to an event that is a part of writing a letter, even though this bigger event, that would be referred to by *John wrote a letter*, does not exist. Something can be part of a whole even before the whole is complete. As an analogy he refers to the fact that a wheel can be part of a car even before it is attached.

[72] Krifka does not use the predicate PATIENT here, but the predicate SUK, to expresses a *successive* patient, having three properties: object-uniqueness, event-projectability and object-projectability. Its meaning is that the object is involved in the event not all at once, but cumutativily. For present purpose however, this difference is not important.

[73] That the imperfective paradox is not solved with the analysis of the progressive given here, is clear: it follows for example from *John is writing a letter* after this analysis that there exists a letter.

Krifka defines a property that, together with this example, leads to an interesting conclusion. This property is called *object projectability*:

Object-Projectability: $\text{SUK}(e, x) \,\&\, e' \sqsubseteq e \Rightarrow \exists x'[x' \sqsubset x \,\&\, \text{SUK}(e', x')]$

If we combine this property with the logical representation in (209), we get the following:

(210) $\lambda e.\exists e'.[e \sqsubseteq e' \,\&\, \exists x.[x \sqsubseteq x' \,\&\, \text{WRITING}(e') \,\&\, \text{LETTER}(x') \,\&\, \text{PATIENT}(e', x')]]$

So the object of a part of a writing of letter is a part of a letter. And this seems very true: if John stops halfway writing a letter, he will have written somewhat half a letter.

But the problem with (209) is this: the *e'* will be the completed writing of a letter and *its existence* is explicitly stated. Therefore, the introduction of the possibility of something being a part of something that doesn't exist is of no use. So although in Krifka's analysis the objection made by Lascarides that the progressive and the non-progressive are not related is solved, but in a wrong way.

13.1.2 Inchoative Temporal Adverbials

Krifka provides the notion of internal structure of events by means of the fact that an event can be seen as the sum of two smaller events. Furthermore, he introduces the operator τ which relates events to times. As an extra temporal mechanism, he introduces the *mass-function* MIN which indicates the *length* of an event in minutes. The definition of MIN is that the length of a mereologically complex time is the sum of the length of its parts:

(211) $\neg t \circ t' \Rightarrow \text{MIN}(t \sqcup t') = \text{MIN}(t) + \text{MIN}(t')$

With this apparatus, Krifka is capable of given a consistent interpretation of many temporal adverbials. Let me give some examples.

[212] ... between 10 and 11 o'clock.

(213) $\lambda X.\lambda e.[X(e) \,\&\, 10{:}00 < \tau(e) < 11{:}00]$

If an event takes place between two moments, it is the time of occurrence of the event, denoted by the operator τ that is placed between these two moments.

[214] ... in June.

(215) $\lambda X.\lambda e.[X(e) \,\&\, \tau(e) \sqsubseteq \text{JUNE}]$

If an event takes place within the month of June, then the moment of occurrence falls within the set of moments that are moments in June.

[216] ... for ten minutes.

(217) $\lambda X.\lambda e.[X(e) \,\&\, \text{MIN}(\tau(e)) = 10 \,\&\, \text{KUM}(X)]$

The length of an event that takes ten minutes is ten minutes. Furthermore, the propositional phrase in [216] can only be added to durative sentences, as I showed in chapter 3. This is forced by the additional clause that the predicate in the applied sentence has to be cumulative.

Finally, also the sentence that was object of discussion in section 7.1.1 can also be represented. To refresh your memory, the sentence was this:

[80] Mary ran at 3pm.

In fact there are two possible representations. The first is this:

$$(218)\ \exists e'[e \sqsubset e' \,\&\, \exists x[\text{RUNNING}(e') \,\&\, \text{AGENT}(e', x) \,\&\, x = \text{Mary} \,\&\, \tau(e) = 3\text{pm}]]$$

This makes the inchoative reading explicit: some sub-events of Mary's running took place at 3 o'clock. But there are two less attractive facets of this representation. The first is that this representation has the logical form of a progressive form. The other is that presupposes a infinitely short event that can still be called a walking. Therefore this second logical representation is better:

$$(219)\ \exists e.\exists x[\text{RUNNING}(e) \,\&\, \text{AGENT}(e, x) \,\&\, x = \text{Mary} \,\&\, 3\text{pm} \sqsubseteq \tau(e)]$$

These two representation are clearly better than the Parsonian representation. But still there is a reading that cannot be made explicit: that Mary *started* running at 3pm. This because there still is not enough structure in events, there is no notion of a *starting point*.

13.1.3 Mereology and Space-Time

The mereological event semantics proposed by Krifka is, in some respects, clearly better than the Parsonian approach, since it supplies some necessary temporal structure. With this additional structure, the criticism by Lascarides can be answered better. But apart from the fact that Krifka's solution to both the problem with entailment and the problem with temporal adverbials is not entirely satisfactory, there is another reason to reject Krifka's mereological framework.

Objects are represented with conceptual predicates. So the representation of an ear is EAR(x) and the representation of a moon is MOON(y). According to its definition, the sum operator '$\sqcup$' takes two objects as its arguments and delivers as a result a larger objects. Since the *x* in EAR(x) and the *y* in MOON(y) are objects, so is their conjunction $x \sqcup y$. But this compound object is the representation of *my ear and the moon*. And, as I tried to show in section 10.4.2, this is not really an object, but just a portions of matter or space-time.

This situation gets even worse if the two entities that are taken together have the property KUM. According to the definition of cumulativity, two entities of a KUM type taken together result in a larger entity that is of the same type as its composite parts. Since 'walking' is of type KUM, it should follow that there is an walking event that consists partly of Caesar's walking to the senate just before getting killed and partly of my walking to the supermarket this afternoon. Here it should be even more clear that there is no such compound event.

Therefore, the system I will propose in section 13.3 will not be based upon a mereological ontology. It is more like an extension of the system such as it is proposed by Parsons.

13.2 Interval Semantics: Taylor

One of the starting points for Taylor (1985) is the Fregian way to add time to logic formulas. Frege proposed to extend an *n*-place predicate to an *n+1*-place predicate, reserving the extra argument-place for occupancy by a singular-term for a *time*. This method very much resembles the way in which Davidson introduced an extra argument-place for events. It takes little imagination to transform this order-argument approach into an independent approach, that would look much like the temporal structure Parsons proposed.

But Taylor proposes not to think of these *times* as moments in time, but as temporal units that can be either moments or periods in time. He introduces the two predicates MOM and PER to formalize these notions. The way in which two times are related can be symbolized by three operators: temporal precedence ($\prec$), temporal inclusion ($\sqsubset$) and proper temporal inclusion ($\sqsubseteq$). Every sentence introduces three special moments in time, which are labeled *S* (point of speech), *R* (point of reference) and *E* (point of event). In the 'simple' tenses past, present and future *E* and *R* coincide. But if they don't coincide, we get the complex tenses like past perfect, present perfect, future perfect, etc.

With this machinery the differences between events, processes[74] and states can be made formal, using meaning postulates. I will not go into the details of these meaning postulates for two reasons: firstly, Taylor's theory is, as I said before, a form of *interval semantics*, and not a form of event semantics. Secondly, Taylor's theory is attacked at least as fiercely as Parsons' theory. A good deal of criticism can be found in Lascarides' thesis (Lascarides, 1988).

What I will use from the theory of Taylor, however, is his clear distinction between moments and periods, and his richer notion of time involved with it.

13.3 Structured Intervals

13.3.1 Aspectuality

In chapter 5 I discussed Verkuyl's plus-principle, in which the aspectual character of a sentence can be determined from specificity of the internal and external NP, and the progression of the verb. Dowty objects to this analysis:

> Verkuyl finds it necessary to subcategorize a large variety of syntactic categories for aspectual class – not only verbs, but their complements, verb phrase nodes, NP nodes, and sentence nodes; in addition, elaborated cooccurrence restrictions among these subcategories are needed as well. But, as I have argued ... this syntactic method misses the point: it is surely the *semantic* properties of verbs, of the propositional phrase ... of the indefinite versus definite plural NPs ... that are responsible for the ultimate aspectual properties of the sentences in which they appear.
> (Dowty, 1986 [40])

But on the other hand, Dowty acknowledges the need for an aspectual analysis. Aspect has a great influence on the temporal interpretation of sentences, as for instance in the following two sentences (Dowty, 1986 [37]):

[220] John entered the president's office. The president woke up.

[221] John entered the president's office. The president sat behind his desk.

In [220], the waking up takes place *after* the entering, and presumably even because of it. But in [221], the entering takes places 'during' the sitting. This difference is due to the aspectual character of the second sentences of these examples: in [221] it is a durative sentence, but in [220] an terminative one. There are more cases in which the aspectual character of a sentence influences its interpretation, as for instance in the case of adverbial event splitting (see section 7.5). Therefore, the aspectual character of a sentence should be reflected in its logical representation.

As I already discussed in section 7.1.2, terminativity is *added* information in a sentence, since terminative sentences entail their durative counterparts. This idea can be explained by the description of process-sentences in section 11.2: a process-sentence is

[74] Taylor uses the Aristotelian terms energeia and kinesis, but for the sake of clarity I use the same terms used thus far in this thesis.

a way of describing an event in which the initial- and the final state are *ignored*. Therefore, a durative (process) sentence gives *less* information than the related terminative one. In this light, I propose an approach slightly different from the one proposed in section 4.4. Parsons uses the pair of complementary predicates HOLD and CULM. However, since terminativity is *extra* information it is better to use only one predicate. Let me use the predicate TERM to avoid confusion, signifying terminativity. To show the profit of using only one predicate, I will now return to the example in section 7.1. Reconsider the following sentence:

[76] Mary left.

Since this is a terminative sentence, it is analyzed with the predicate TERM. So its representation is the following:

(222) $\exists e.[\text{LEAVING}(e) \,\&\, \text{AGENT}(e, \text{Mary}) \,\&\, \text{TERM}(e)]$

If we now drop the last conjunct in this formula, we get the logical representation for the following durative sentence:

[75] Mary was leaving.

So with this analysis, there is a logical entailment from [76] to [75], but not vice-versa, just like Lascarides desired.

13.3.2 Moments and Periods

Achievements are, according to Vendler, instantaneous events. Consider the following example:

[223] Jim reached the finish.

Since achievements are instantaneous, the predicate MOM (as defined by Taylor) applies to it. The logical representation might thus look as follows:

(224) $\exists e.[\text{REACHING}(e) \,\&\, \text{AGENT}(e, \text{Jim}) \,\&\, \text{OBJECT}(e, \text{finish}) \,\&\, \text{AT}(e, t) \,\&\, \text{MOM}(t)]$

Dowty objects to this analysis. According to him, reaching the finish is not truly instantaneous:

> ... many event usually classified as achievements do in fact have some duration. A physicist may object that reaching the finish, no matter how defined, has duration. (Dowty, 1986 [42])

This reasoning can be compared with the claim that every point, no matter how small, does have a size. If you put a dot on a paper, this is irrefutably true. But the mathematical point is defined so as to have no size. A true (mathematical) point is usually the end of something. For instance, at the end of a line there is a point that is its end. In much the same way, reaching the finish is the spatio-temporal end-point of racing a race. It needs no appeal to the physicist to see that reaching the finish has no duration. As I discussed in section 11.3.3, the progressified version of (223) *does* describe a durative event, but this durative event is in fact the event preceding the reaching of the finish and not the achievement itself.

So the difference between MOM(t) and PER(t) indicates the (aspectual) difference between accomplishments and achievements. As noticed by Galton (1984), the progressive form is also related to moments in time:

> We can say ... things like '*Jane had a swim at midday*', but in this sentence we can only understand the phrase '*at midday*' as referring to an interval which *contains* the exact moment of noon, rather than to that moment itself. By contrast '*Jane was swimming at midday*' can be understood quite literally as saying that Jane was engaged in swimming at the exact moment of noon. (Galton, 1984 [25])

But though temporal adverbials both with achievements and with progressive sentences related to a moment in time, they do so for very different reasons. In the case of achievements, it is the denoted event itself that is instantaneous, while the denoted event in the case of progressive sentences is by definition non-instantaneous: in the case of progressive sentences, it is the focal moments of the durational event that is instantaneous (see section 11.3). This difference becomes explicit if we consider a temporal adverbial denoting a period, such as *'from 3 to 4'*. With a progressive sentence like [225], the resulting sentence is interpreted as saying that at every moment within the period, John was swimming. In the case of an achievement like [226] however, the use of such adverbials is simply ungrammatical[75].

[225] From 3 to 4, John was swimming.

[226] * Max reached the finish from 3 to 4.

The interpretation of the temporal adverbial '*at midday*' has a different interpretation in the case of achievements, progressive sentences and accomplishments. In the case of an achievement, '*at midday*' places the event-time at midday:

(227) $\exists e.[\text{REACHING}(e) \,\&\, \text{AGENT}(e, \text{Max}) \,\&\, \text{OBJECT}(e, \text{finish}) \,\&\, \text{AT}(e, t) \,\&\, \text{MOM}(t) \,\&\, t = \text{NOON}]$

In the case of a progressive sentence like '*John was swimming at midday*', '*at midday*' says that at the focal moment of 12:00, John was the agent of a swimming event. Or, in other words, some moment within the event period equals 12:00:

(228) $\exists t.[t = \text{NOON} \,\&\, \exists e.[\text{SWIMMING}(e) \,\&\, \text{AGENT}(e, \text{John}) \,\&\, \text{AT}(e, t') \,\&\, t \in t']]$

In the case of an accomplishment, it cannot locate the event-time, since NOON is a moment, and accomplishments denote durational events. Therefore, it has to denote some crucial moment within the event period. It is therefore usually interpreted in an inchoative way (see section 7.1), saying that the event *began* at noon, so that for instance [182] is interpreted as follows:

(229) $\exists e.[\text{CROSSING}(e) \,\&\, \text{AGENT}(e, \text{John}) \,\&\, \text{AT}(e, \text{STREET}) \,\&\, \text{AT}(e, t) \,\&\, \text{START}(t, t') \,\&\, t' = \text{NOON}]$

13.3.3 The Plus Principle

Verkuyl's plus-principle, discussed in section 5.2, is a formal way of deciding whether a sentence is durative or terminative. Since aspect is an important characteristic of a sentence, such a principle should be incorporated into the event-ontology approach to decide whether or not a certain sentence should be analyzed with the predicate TERM. Verkuyl's original plus-principle, however, is not readily adapted for event-semantics. Therefore, I will describe in this section a slightly modified version, which I will call EV^{+}.

According to the plus-principle, the aspectual character of a sentence is due to the interplay between the internal NP, the verb and the external NP. However, this interplay can be divided in two parts: the external NP and the VP. I will start to describe the role of these two parts. Reconsider the following two sentence (Verkuyl, 1995c):

[75] In some cases, such a prolongation of achievements *is* possible, but in such cases, this is due to the same kind of 'borrowing' as described in section 11.3.3.

[54] Judith ate a sandwich.

[55] Judith ate sandwiches.

Sentence [54] rightly describes an event, in this case an individual eating of a sandwich by Judith. Sentence [55] on the other hand, merely[76] describes what *kind* of action was performed by Judith. So it doesn't describe the event, it merely classifies it, without specifying the event itself. Because it doesn't specify the event, it also doesn't refer to the boundaries of the event, and therefore, [55] is a process sentence by the definition of section 11.2.

If process sentences like [55] do indeed name the *kind* of action, then the opposition is not so much between NPs denoting a finite or an non-finite group, but between those NPs that denote a group, and those events that denote a kind, or a concept. So NPs will be labeled [± KIND], instead of [± SQA]. This is not just a different name for the same concept, there is a real difference between the two. But this difference is more easy to explain when discussing the external NP.

Also for the role of the verb I will use an analysis that is slightly different from the analysis proposed by Verkuyl. According to Verkuyl, sentences that have a [- ADD TO] verb are durative. Let us look at an example sentence with a [- ADD TO] verb:

[56] Judith disliked a sandwich.

But 'to dislike' is a verb like 'to know', of which we saw already in chapter 3 that *knowing and its kin are not processes going on in time* (Vendler, 1957 [100]). So what Verkuyl calls [- ADD TO] sentences should not be analyzed as process-sentences, but as facts, and for the largest part as potentialities in particular. It may sometimes be hard to distinguish event sentences from potentialities: some sentences, like *John speaks French* have two readings, but for this thesis I will pretend this problem to be solvable and ignore those potentiality sentences.

Now let me consider the external NP. According to Verkuyl, the external NP, like the internal NP, has to be [+ SQA] in order for the sentence to be terminative. His example was the following:

[57] Nobody ate a sandwich.

But if nobody ate a sandwich, this means that there was not an event which was an eating of a sandwich by someone[77]. And thus, [57] makes no reference to an event, only to the non-existence of one. So [57] is not an event-sentence, but a fact.

So here again, the relevant feature is not [± SQA], and my proposal is that also here it is [± KIND]. And one of the differences between these two is that NPs denoting an empty set *are* [- SQA], but they are not [+ KIND]. Also the notion of (in)finity is not relevant for [± KIND]. This means, that EV^+ there is no need for a principle like the Fixed Context Assumption (FCA), which was used by Verkuyl (1993 [94]) to account for the fact that (some) sentences where the internal NP denotes an infinite set are terminative, like for instance:

[230] God counted the reals in a minute.

However, it is very hard to give a formal definition of [± KIND] that is as strict as Verkuyl's definition for [± SQA]. But since sentences like [57] should clearly be exempted from analysis with event semantic, the change from [± SQA] to [± KIND] is a necessary one.

[76] The fact that 'merely' is the correct word here underlines the fact that accomplishments are more informative than processes, as discussed in section 13.3.1.

[77] This is not to say that this should be its representation.

13.3.4 Conclusion

In this section I proposed an alternative temporal analysis for event semantics. The main innovation is the introduction of a set of predicates:

$\text{AT}(e, t)$	Links the event *e* to the event-time *t*, being either the period during which the event took place, or the moment at which the event took place.
$\text{MOM}(t)$	Claims that the time *t* is a moment.
$\text{PER}(t)$	Claims that the time *t* is a period.
$\text{TERM}(e)$	Denotes that the event *e* is described in a terminative way, which amongst others means that the boundaries of the event are named.
$\text{START}(t', t)$	Says that the t' is the initial moment of the period *t*. So if t' is an event period, *t* names the initial boundary of the event.
$\text{TELOS}(e, x)$	Claim that *x* exist (only) as the telos of the event *e*.

14 Dynamic Event Semantics

In the (neo)-Davidsonian interpretation, event semantics can be thus characterized: The event semantic logical representation for action/event sentences contains an existential quantifier binding an event-variable. This logical representation is satisfied iff, within the universe of discourse, there is an event satisfying all conditions within the scope of the quantifier.

In this chapter I will consider a dynamic interpretation of event semantics. In this interpretation, the logical representation still contains an existential quantifier binding an event variable. But it differs from the above characterization in two respects. Firstly, the (event) variable bounded by the existential quantifier is not a variable in the strict sense: it is a 'tag' for an entity in the universe of discourse. Secondly, the existential quantifier does not have a scope in the strict sense as it traditionally has.

I will elaborate both these points and give a motivation for both. In section 14.1 I will discuss the new interpretation of event variables and in section 14.2 I will discuss the new notion of scope.

14.1 Demonstrative Variables

Event sentences tell about events. For instance, sentence [231] tells about an event of me going to London. In the event semantic representation, [231] should be interpreted as in [232]:

[231] I went to London.

[232] In the past, there has been an event of me going to London.

It does not matter when, or how often I went to London, only that I did. So in the event semantic representation, event sentences do not tell about a *particular* event, only about the existence of a certain type of event:

> A sentence such as 'Vesuvius erupted in 79 A.D.' no more refers to an individual event than 'There's a fly in here' refers to an individual fly. Of course there may be just one eruption that verifies the first sentence and just one fly that verifies the second; but that is beside the point. The point is that neither sentence can properly be interpreted as referring or describing, or being about, a particular eruption or fly. (Davidson, 1969a [82])

But as Stoecker (see section 7.3) correctly establishes, this is at least in some cases not the way in which event sentences are used. Often a sentence like [231] will be used not simply to notify the existence of a specific type of event, but to refer to a specific event. If someone asks you where you did go, and you answer with [231], you refer to a specific trip, and claim of it that it's destination was London. In such a case, [231] is not synonymous with [232]; [231] should, in these cases, not be compared with *There is a fly in here*, but with *This fly is green*, which *does* refer to an individual fly.

But in such a case, the event semantic representation in (233) is, in its normal interpretation, not a correct representation for [231]:

(233) $\exists e.[\text{GOING}(e) \,\&\, \text{AGENT}(\text{I}, e) \,\&\, \text{DEST}(e, \text{London})]$

I therefore propose a different interpretation of (233) in such cases, which is taken from dynamic semantics[78]. The existential quantifier '$\exists$' functions as a 'tagger': it singles

[78] It can also be viewed as a formalization of Reichenbach's η operator.

out an individual (event) and labels it with a unique name. So the *e* in (233) is not a variable in the strong sense, it is what I call a *demonstrative variable*: a unique name for a specific event in the universe (of discourse).

In the rest of this thesis I will use the following convention: $\exists^!$ will indicate this 'tagging' quantifier, $\exists^?$ indicates the traditional existential quantifier, and the non-labeled $\exists$ is indifferent between these two.

The notion of demonstrative variables does justice to another idea:

> ... es ist nicht einzusehen, weshalb wir durch *falsche* Ereignis-Sätze weniger auf die Existenz von Ereignissen festgelegt sein sollen als durch wahre. Ein Ereignis-Satz kann ja deshalb falsch sein, weil er etwas Falsches über ein Ereignis aussagt, und das ist nur möglich, wenn es ein entsprechendes Ereignis gibt.[79] (Brandl, 1992 [208])

Consider now (233), where the existential quantifier is replaced with $\exists^!$. In that case, an existing event is singled out from the universe by the event variable *e*. Of this event it is claimed that its destination is London. Now if [231] is wrong, this can be because there was an event *e* which was a going by me, just its destination was not London.

14.2 Scope-Exceeding Anaphoric Reference

The introduction of different existential quantifiers as suggested above may seem like a rather drastic solution, for which the problem is too small a foundation. But multiple existential quantifiers are quite common in dynamic logical frameworks, such as DPL (Dynamic Predicate Logic), and dynamic logic is useful because of a totally different reason.

The original ground for the development of dynamic logic is the problem of scope-exceeding anaphoric reference. This problem was introduced by Thomas Geach (1962). Examine the following sentence:

[234] If a farmer owns a donkey, he beats it.

This sentence, known as the donkey-sentence, consists of two parts: *A farmer owns a donkey* and *He beats it*, which are combined by a conditional. The logic representation of the first part would, in traditional first-order logic, be simply:

(235) $\exists x.\exists y.[\text{FARMER}(x) \,\&\, \text{DONKEY}(y) \,\&\, \text{OWN}(x,y)]$

and the representation of the second part would be $\exists x.\exists y.[\text{BEAT}(x,y)]$. If these two representation are combined, this leads to the following:

(236) $\exists x.\exists y.[\text{FARMER}(x) \,\&\, \text{DONKEY}(y) \,\&\, \text{OWN}(x,y)] \Rightarrow \exists x.\exists y.[\text{BEAT}(x,y)]$

At first glance this seems to express nicely the content of [234]. But the *x* and the *y* on the right-hand side of the '$\Rightarrow$' are independent of those on the left-hand side. So (236) does not say that the donkey owned by the farmer was beaten, but that something was beaten by someone.

This problem can be copied onto the realm of event semantics. Consider the following sentence:

[237] I went to London and it was a good trip.

In this example, the *it* in the second part refers to the event in the first part. But if the logical representation is construed compositionally, the anaphor will fall out of the scope of the quantifier binding the event variable.

[79] It is unclear why false event sentences would commit us less to the existence of an event than true ones. An event sentence can be false, because it claims something untrue of an event, and that is only possible, if there is a corresponding event.

14.2.1 Adverbials and Scope

In traditional first-order logic scope becomes only problematic in case of compound sentences[80]. But within event semantics, a large group a simple sentences already is problematic: the group of sentences containing adverbials. Consider the following sentence:

[238] Mary wrote with a pencil.

Throughout this thesis I assumed such cases to be non-problematic, its representation being simply:

(239) $\exists e.[\text{WRITING}(e) \,\&\, \text{AGENT}(e, \text{Mary}) \,\&\, \text{WITH}(e, \text{pencil})]$

The adverbial *with a pencil* is a sentence modifier. In terms of CG (see chapter 15) it is of the type $s \setminus s$. Its purported meaning is that some event involved the use of a knife. So its most natural representation is this:

(240) $\lambda P.P \,\&\, \text{WITH}(e, \text{pencil})$

But if this representation is used, the clause WITH(*e*, pencil) falls without the scope of the quantifier binding the event variable in P. Therefore, there will be no logical connection between the event that is predicated to involve a pencil and the writing event. As I discussed in the previous section, the notion of scope is liberated in DPL. But this does not solve the problem: in (240), an *arbitrary* event variable *e* is introduced. And there is no easy way of relating this variable to the event-variable in WRITING(*e*).

Parsons' solution to this problem is the following: the representation of *"Mary wrote"* is taken to be not $\exists e.[\text{WRITING}(e) \,\&\, \text{AGENS}(e, \text{Mary})]$, but $\lambda e.\exists e.[\text{WRITING}(e) \,\&\, \text{AGENS}(e, \text{Mary})]$. Furthermore, (240) is replaced by:

(241) $\lambda P.\lambda e.\exists e.[\,P(e) \,\&\, \text{WITH}(e, \text{pencil})]$

Parsons' solution makes use of one of the central mechanisms of dynamic logic. In dynamic logic, the sentence is no longer seen as the unit of meaning: the text as a whole is. Therefore, a sentence is a *function* operating between an input state and an output state; the representation of a sentence is a λ-abstract. Since the sentence is thus not a closed unit, the adverb can still affect the sentence through the abstracted *e*.

But in dynamic discourse, many other facets play a role. For instance, the input for a dynamic framework is not plain natural language, but natural language, extended with labels. Consider the following fragment:

[242] The$_1$ farmer laughed$_a$ and hit$_b$ the$_2$ donkey hard^b, until it^2 started to bleed.
It^b was cruel.

The labels in this fragment are meant to solve the problem of reference: the *b* indicates that *hard* refers to the hitting, and not to the laughing. This labelling however, is hard if not impossible to generate automatically. Take for instance:

[243] John stumbled and stood up again several times.

[80] It also does in fragments containing more than one sentence, but since Frege claimed that fragments have no truth-value, such fragments already are treated differently in traditional first-order logic.

In this example, the adverb *several times* modifies to both the stumbling *and* the standing up, because in order to stand up, you have to be down first. And there are cases in which world-knowledge is even more entangled into the interpretation. For instance:

[244] The car hit the trash can and it turned over.

is interpreted as meaning that the trash can fell over and not the car, because cars down turn over because of hitting a can. But then again, it is not unthinkable that they do, so it is actually not a linguistic fact.

In order for the fragment of Categorial Grammar described in the next chapter to give a proper treatment of adverbia, it should somehow incorporate the notion of a sentence as a function on information states. A dynamic version of CG that does this was discussed by Reinhart Muskens (1994). But although the next chapter does describe a categorial event semantics, this is not a thesis on categorial grammar. CG merely functions as a tool. In order not to render half work, I will avoid the subject of sentences as functions on information states all together. The only adverb that is used in chapter 15 (page 110), is typed $\lambda P.P^e \,\&\, \text{WITH}(e, \text{pencil})$ to indicate that there is a problem, that the sentence represented by *P* should somehow provide a handle for the adverb to operate on.

14.3 Concluding Remarks

In this chapter, I discussed the need for a dynamic version of the event semantic logical representation. But what was not argued for, was the specific choice for DPL over other dynamic frameworks, such as for instance Update Semantics (US), or Discourse Representation Theory (DRT). And indeed, the choice for DPL is rather arbitrary. It is, however, the most obvious choice, since its logical representation is most like the traditional predicate logical representation used by Parsons. In fact, the representation is identical, but the interpretation of the logical formulas is different.

But where a DPL version of event semantics resembles most to the Parsonian event semantics, a representation in terms of DRT's Discourse Representation Structures (DRSs) might be more comprehensible. But rewriting event semantics to DRT would require a lot of work, and the merits would be limited, besides perhaps for clarity sake, since DRT and DPL are proven to be intertranslatable.

15 Categorial Grammar

In this final chapter I will give the outlines of a computational linguistic system which connects sentences with their event semantic logical form. This system, as I already suggested in section 7.2, will be a Categorial Grammar framework. Before introducing this system, let me first return to two reasons for combining event semantics with Categorial Grammar.

In the introduction of his book, Parsons (1990) mentions that the sentence *"Caesar died"* is traditionally represented as

(245) $\text{DIED}(\text{Caesar})$

In the event semantic logical form, this simple representation is replaced with the much more complex $\exists e.[\text{DYING}(e) \,\&\, \text{OBJECT}(e, \text{Caesar})]$. According to Parsons, the representation in (245) can be seen as the abbreviation of this more complex structure. But he also suggests a more elegant relation between the two:

> A more elegant explanation can be given using lambda abstracts. The predicate 'D' of the logic text account then has the structure 'λx(∃e)[Dying(e) & Object(e,x)]'. The logic text account is thus completely accurate as it stands (for such examples); it just fails to exhibit the additional structure encapsulated in the lambda abstract.
> (Parsons, 1990 [283])

In Categorial Grammar, this relation is explicitly incorporated. The lexical entry for *'died'* will be much like the mentioned λ-term. And while the complete representation for *Caesar died* will have the more complex event semantic form, the equation in (245) will appear as what I will call the *grammatical* semantics for *"Caesar died"*. I will show this in section 15.2.

A more constructive contribution of Categorial Grammar is the notion of NP-gapping that I mentioned in section 7.2. Let me outline the underlying problem once more, using an example from Borowski (1974). This example uses the sentence in [246] and its Davidsonian representation in (247):

[246] Jack opened the door with a key at 10 o'clock.

(247) $\exists e.[\text{OPENED}(\text{Jack}, \text{door}, e) \,\&\, \text{WITH}(\text{key}, e) \,\&\, \text{AT}(10{:}00, e)]$

Without a restrictive system, such as provided by CG, the event semantic representation would be vulnerable to the criticism Borowski builds upon this example:

> Davidson cannot explain why we are prepared to delete the second and third conjuncts, but not the first; (247) should also entail **Something was with [a] key*.
> ... [This] is the standard reading of the second conjunct, and if it is not English, so much the worse for the theory which allows it to be derived. (Borowski, 1974 [486])

Within the framework I am about to present, the logical derivation of $\text{WITH}(\text{key}, e)$ from (247) is of course valid, since it is a standard logical derivation. But there is no logical relation between $\text{WITH}(\text{key}, e)$ and *"Something was with a key"*. So the claim is in fact that $\text{WITH}(\text{key}, e)$ does not standardly read as *"Something was with a key"* but as: in the event *e* (of unknown kind) somehow a key was involved.

15.1 Lambek Gentzen Calculus

Categorial Grammar exists in many different forms. It was introduced by Ajdukiewicz (1935) and Bar-Hillel (1953) as a form of rewrite grammar (called AB-grammar), it is often present in natural deduction style, but in this chapter I will present it as a form of proof-theory, known as the Lambek-Gentzen calculus (or L for short).

The basis of the calculus is extremely simple. There are three basic categories: sentences (*s*), noun phrases (*np*) and common nouns (*n*)[81]. There are two basic operations: concatenation and abstraction. The concatenation-operator is the bullet (•) and there are two versions of abstraction: leftward abstraction (\) and rightward abstraction (/). If you take an *s* and you remove the leftmost *np*, the result is an $np\backslash s$. Intransitive verbs are typically of type $np\backslash s$ for the obvious reason that a sentence consists basically of a subject and a VP. To get a TV (transitive verb), you have to abstract another *np*, this time on the right, so a TV is of the category $(np\backslash s)/np$.

In Lambek-Gentzen style CG, a typical inference looks like this:

$$(248)\quad np, (np\backslash s)/np, np \Rightarrow s$$

which is to be read as follows: three elements of the categories *np*, $(np\backslash s)/np$ and *np* (typically the NP_{ext}, a TV and the NP_{int}) together form a sentence. Such an inference can be proven by a so called proof-tree. There are five rules to make a proof-tree:

$$(249)\quad \frac{}{c \Rightarrow c}\ Ax$$

$$\frac{T \Rightarrow b \quad U, a, V \Rightarrow c}{U, a/b, T, V \Rightarrow c}\ /L \qquad \frac{T \Rightarrow b \quad U, a, V \Rightarrow c}{U, T, b\backslash a, V \Rightarrow c}\ \backslash L$$

$$\frac{T, b \Rightarrow a}{T \Rightarrow a/b}\ /R \qquad \frac{b, T \Rightarrow a}{T \Rightarrow b\backslash a}\ \backslash R$$

The Left-rules might be called the application-rules. Remember that a/b is an *a* from which a *b* is abstracted at the right-hand side. So if an a/b is applied to a *b* on the right-hand side, they together form a type *a*. Or in other words, if there is a *b* present on the right-hand side of a a/b, both the *b*'s can be removed. The clause $T \Rightarrow b$ just makes sure that *T* is of the same type as *b*.

The Right-rules are best understood if compared with arithmetics. In this comparison, application equals the multiplication and abstraction equals division. Now the Right-rules says no more than $3 = 6/2$ iff $3 * 2 = 6$. The Axioma serves to round off the proof.

15.1.1 Curry-Howard-van Benthem Isomorphism

With each type corresponds a term. This term can be viewed as the semantics for the type. In Lambek-Gentzen style, the terms follow naturally from the proof-tree, for the following reason: with every proof-tree corresponds a semantic proof-tree, because with each of the five rules in (249) corresponds a semantic rule. The five corresponding rules are the following:

[81] For those who are used to reasoning with the basic types *e* and *t*: It is possible to say that *s* is the same as *t*, and that *np* is the same as *e*, but it is more common to use a separate model semantics in combination with CG, for instance a Kripke-Frame model semantics. Since there is a wide diversity of models used in combination with CG, and the choice is not relevant for the present discussion, I will assume any model theoretic framework.

$$\frac{}{x \Rightarrow x}\ Ax$$

$$(250)\quad \frac{T' \Rightarrow \beta \quad U', \varphi(\beta), V' \Rightarrow \gamma}{U', \varphi, T', V' \Rightarrow \gamma}\ /L \qquad \frac{T' \Rightarrow \beta \quad U', \varphi(\beta), V' \Rightarrow \gamma}{U', T', \varphi, V' \Rightarrow \gamma}\ \backslash L$$

$$\frac{T', \upsilon \Rightarrow \alpha}{T' \Rightarrow \lambda\upsilon.\alpha}\ /R \qquad \frac{\upsilon, T' \Rightarrow \alpha}{T' \Rightarrow \lambda\upsilon.\alpha}\ \backslash R$$

15.2 Example Deduction

Parsons calls his event ontology approach a form of *subatomic* semantics. What he means by this can be made clear using this example sentence (Parsons, 1990 [6])[82]:

[251] Every boy dated a girl.

According to Parsons, this sentence has a semantic structure like:

(252) $(\forall x).(\mathrm{B}(x) \rightarrow (\exists y)(\mathrm{G}(y) \,\&\, x \text{ dated } y))$

But this structure is not the goal of Parsons' event semantics. The goal is the additional structure for the constant part 'x dated y' in this representation. In this section, I will give an example deduction for two purposes: firstly to show how the Lambek-Gentzen style CG works in practice, and secondly to show that this sub-atomic structure Parsons is talking about has a natural place within this system.

Apart from the five rules described in the previous section, there is only one thing more needed to make a Lambek-Gentzen style proof, and that is a lexicon. To get exactly the semantics Parsons gives in (252), this lexicon should look as follows:

every	$((s/np)\backslash s)/n$	$\lambda P \lambda Q \forall x[P(x) \rightarrow Q(x)]$
a	$(s/(np\backslash s))/n$	$\lambda P \lambda Q \exists x[P(x) \,\&\, Q(x)]$
boy	n	BOY
girl	n	GIRL
dated	$(np\backslash s)/np$	$\lambda x \lambda y \exists e[\text{DATING}(e) \,\&\, \text{AGENT}(e, y) \,\&\, \text{OBJECT}(e, x)]$

Each lexical entry consists of three parts: the word itself, the category to which the word belongs and its semantics. For example the lexical entry for 'dated' contains the word 'dated' itself, the category $(np\backslash s)/np$ I explained in the previous section, and a λ-term. Note that this is exactly the λ-term that was mentioned at two previous occasions in this chapter: it is the λ-term that connects traditional predicate-logical representations like (245) with their event semantic counterpart, and it is exactly the sub-atomic structure for *x* dated *y*.

The goal of a proof-tree is to proof that set of words together form a sentence. In this case:

(253) every, boy, dates, a, girl $\Rightarrow s$

The first step is to replace all words with their corresponding category. This results in the following sequence:

(254) $(s/(np\backslash s))/n, n, (np\backslash s)/np, ((s/np)\backslash s)/n, n \Rightarrow s$

[82] Parsons' example included 'Allegedly', which has been left out here for simplicity.

The next step is to build a proof-tree using the five rules in (249). This proof-tree is presented in (255). The bottom line is simply the sequence in (254) which is the goal of the proof. The first line on top of it is the result of applying a /L rule. The result of this application is that 'a' is applied to 'girl'. This is possible since 'a' is a type $((s/np)\backslash s)$, from which an *n* is abstracted to the right, and 'girl' is of type *n*. The rest of the proof works in a similar fashion.

(255)
$$\dfrac{\dfrac{n \Rightarrow n \qquad \dfrac{\dfrac{\dfrac{np \Rightarrow np \quad s \Rightarrow s}{np, np\backslash s \Rightarrow s}\backslash L}{np \Rightarrow np \qquad np, (np\backslash s)/np, np \Rightarrow s}/L}{np, (np\backslash s)/np \Rightarrow s/np}/R \qquad \dfrac{\dfrac{s \Rightarrow s}{np, (np\backslash s)/np, (s/np)\backslash s \Rightarrow s}\backslash L}{(np\backslash s)/np, (s/np)\backslash s \Rightarrow np\backslash s}\backslash R \qquad s \Rightarrow s}{s/(np\backslash s), (np\backslash s)/np, (s/np)\backslash s \Rightarrow s}/L}{(s/(np\backslash s))/n, n, (np\backslash s)/np, (s/np)\backslash s \Rightarrow s}/L \qquad n \Rightarrow n}{(s/(np\backslash s))/n, n, (np\backslash s)/np, ((s/np)\backslash s)/n, n \Rightarrow s}/L$$

In section 15.1.1 I explained that with every proof-rule corresponds a semantic rule. So, with the proof-tree in (255) corresponds a semantic tree. To keep this semantic tree simple, I used a template for the semantics of the words. Every word is assigned as its semantics the capital of its first letter. The semantic tree is presented in (256).

(256)
$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{v \Rightarrow v \quad p \Rightarrow p}{v, R \Rightarrow R(v)}\backslash L}{w \Rightarrow w \qquad v, D, w \Rightarrow D(w)(v)}/L}{v, D \Rightarrow \lambda w.D(w)(v)}/R \qquad \dfrac{p' \Rightarrow p'}{v, R, Q \Rightarrow Q(\lambda w.\mathrm{D}(w)(v))}\backslash L}{D, Q \Rightarrow \lambda v.Q(\lambda w.\mathrm{D}(w)(v))}\backslash R \qquad p'' \Rightarrow p''}{Q', D, Q \Rightarrow Q'(\lambda v.Q(\lambda w.\mathrm{D}(w)(v)))}/L}{E, B, D, Q \Rightarrow \mathrm{E}(\mathrm{B})(\lambda v.Q(\lambda w.\mathrm{D}(w)(v)))}/L \qquad B \Rightarrow B}{E, B, D, A, G \Rightarrow \mathrm{E}(\mathrm{B})(\lambda v.\mathrm{A}(\mathrm{G})(\lambda w.\mathrm{D}(w)(v)))}/L \qquad G \Rightarrow G$$

On the bottom right in this tree is the term corresponding to the sentence. This is what you might call the *grammatical* semantics of the sentence, since its structure is due merely to the category that is assigned to each of the words, and this in turn is a reflection of the grammatic function of the words. So the grammatical semantics of '*Every boy dates a girl*' is:

(257) $\mathrm{E}(\mathrm{B})(\lambda v.\mathrm{A}(\mathrm{G})(\lambda w.\mathrm{D}(w)(v)))$

The next step is to replace all templates with the actual semantic representation for the words. The result is the semantic representation:

(258) $\lambda P\lambda Q\forall x[P(x) \rightarrow Q(x)](\textsc{boy})(\lambda v.\lambda P'\lambda Q'\exists y[P'(y)\&Q'(y)]$
$(\textsc{girl})(\lambda w.\lambda x'\lambda y'\exists e[\textsc{dating}(e)\&\textsc{agent}(e, y')\&\textsc{object}(e, x')](w)(v)))$

And the normal form of (258) is exactly the semantic representation Parsons presented (Parsons, 1990 [6]):

(259) $\forall x.(\textsc{boy}(x) \rightarrow \exists y.(\textsc{girl}(y) \,\&\, \exists e.[\textsc{dating}(e) \,\&\, \textsc{agent}(e, x) \,\&\, \textsc{object}(e, y)])$

15.3 Improvements

The logical representation in (259) is of course not complete in many respects: it does not include temporal structure, aspectual analysis, dynamic interpretation or any of the other improvements discussed in the previous chapters. This section will therefore be dedicated to gradually incorporate all these improvements in the proposed framework.

15.3.1 Plural NP's

In section 7.6, I discussed the event semantic representation of the collective and the distributive reading of sentences containing plural NP's. Both these readings can be produced in categorial grammar. Let me return to the example sentence in section 7.6:

[126] John and Mary wrote a book.

As I discussed in section 7.6, the difference between the collective and the distributive reading can be seen as a result of the different interpretation of the word *'and'*. Consider, for the moment, the following lexical entries for the other words[83]:

John	np	John
Mary	np	Mary
a book	np	book
wrote	$(np\backslash s)/np$	$\lambda x\lambda y\exists e[\text{WRITING}(e)\,\&\,\text{AGENT}(e,y)\,\&\,\text{OBJECT}(e,x)]$

In the collective reading, the NP_{ext} *'John and Mary'* is a complex NP which, however, is to be interpreted just like a normal *np*-type word. This can be achieved by assuming the collective *and* to be of type $np\backslash(np/np)$. In that case, the NP_{ext} can be proven to be of type *np*:

$$(260)\quad \frac{\dfrac{np \Rightarrow np \quad np \Rightarrow np}{np/np, np \Rightarrow np} \qquad np \Rightarrow np}{np, np\backslash(np/np), np \Rightarrow np}$$

Applying the Curry-Howard-van Benthem isomorphism to (260) (see appendix A), leads to the following grammatical semantics for the NP_{ext}:

$$(261)\quad A(J)(M)$$

The total semantics for the NP_{ext} should be John•Mary. But this is easy to get, if the lexical entry for *and* is thus defined:

$$\text{and} \quad np\backslash(np/np) \quad \lambda P\lambda Q[P \bullet Q]$$

This leads to the desired representation for the collective reading[84]:

$$(262)\quad \exists e.[\text{WRITING}(e)\,\&\,\text{AGENT}(e, \text{John} \bullet \text{Mary})\,\&\,\text{OBJECT}(e, \text{book})]$$

The distributive reading is more difficult. It can be given, but the solution is not entirely satisfactory. Let me first give a CG analysis of the distributive reading, and afterward return to the problems connected with it. The lexical entry for the distributive *'and'* might look like this:

[83] For clarity sake, the indefinite NP *'a book'* is considered here to be a single word.
[84] The derivation tree for this sentence is added in Appendix A.

$$\text{and} \quad np\backslash((s/(np\backslash s))/np) \quad \lambda P\lambda Q\lambda R[R(P)\,\&\,R(Q)]$$

In this case, the external NP *John and Mary* is not of type *np*, but of the more complex type *s/np\s*, which is called a *lifted np*. The reason for assigning this more complex type to the distributive *'and'* becomes clear when we look at the derivation tree for the distributive reading of [126]:

(263)
$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{np \Rightarrow np \quad s \Rightarrow s}{np\backslash s \Rightarrow np\backslash s} \quad s \Rightarrow s}{np \Rightarrow np \qquad s/np\backslash s, np\backslash s \Rightarrow s}}{np \Rightarrow np \qquad s/np\backslash s, np\backslash s/np, np \Rightarrow s}}{np \Rightarrow np \qquad s/np\backslash s/np, np, np\backslash s/np, np \Rightarrow s}}{np, np\backslash s/np\backslash s/np, np, np\backslash s/np, np \Rightarrow s}$$

Because of the more complex type of the NP_{ext}, it is no longer the verb that is the head of the sentence, but the word *'and'*[85] . This results in a grammatical semantics which also has the semantics for *and* as its head:

(264) $A(M)(J)(W(B))$

Due to the lexical semantics for *'and'* this results in what would also have been the semantic representation for *Mary wrote a book and John wrote a book*. The total representation belonging to the distributive reading is this:

(265)
$$\begin{array}{l}\exists e.[\text{WRITING}(e)\,\&\,\text{AGENT}(e, \text{John})\,\&\,\text{OBJECT}(e, \text{book})]\,\&\\ \exists e'.[\text{WRITING}(e')\,\&\,\text{AGENT}(e', \text{Mary})\,\&\,\text{OBJECT}(e', \text{book})]\end{array}$$

This does not solve all problems. As I discussed in section 7.6, adding 'together' to [126] forces a collective reading, and adding 'each' forces a distributive reading. It might be possible to interpret these 'reading indicators' as semantically empty modifiers of the corresponding type, so that their lexical entry looks like this:

each	$(np\backslash s/np\backslash s)\backslash(np\backslash s/np\backslash s)$	$\lambda X.X$
together	$(np\backslash np)\backslash(np\backslash np)$	$\lambda X.X$

But one of the problems of this analysis is that *'together'* is a floating-constituent: it can be put at different places without (much) affecting the interpretation:

[266] Together, John and Mary wrote a book.

[267] John and Mary together wrote a book.

[268] John and Mary wrote a book together.

However, with the lexical entry presented above only [267] can be derived, as described in Appendix A[86].

Numerals, in the analysis proposed in section 7.6, are treated very much like the word *'and'*. Therefore, the categorial typing for numerals much resemble the types for *and*, with this difference, that *and* binds two NPs (one to either side), while numerals only bind with an NP to the right and as such behave grammatically much more like determiners. Numerals can be analyzed as follows:

[85] The head of a sentence is that word which contains the *s* that appears together with the *s* on the right hand side of the ⇒.

[86] In Appendix B there is a different (labeled) type for *together* in a labeled version, that is nicer and should work better.

two	np/np	$\lambda P[2 * P]$
three	np/np	$\lambda P[3 * P]$
two	$(s/(np\backslash s))/np$	$\lambda P \lambda R[R(P) \,\&\, R(P)]$
three	$(s/(np\backslash s))/np$	$\lambda P \lambda R[R^3(P)]$

15.3.2 Telic Objects

As I discussed in section 11.3.2, verbs like *'to build'* don't truly have an object in the sentence that there is an entity in the objective world that is the object of the building. Parsons calls these verbs *verbs of creation*, since the internal NP of the verb denotes an 'object' that exists only after and because of the event itself. But as I argued in section 11.3.2, these 'objects' do exist in a certain way, since you can talk about 'the house you were building' even if you never finished it. And as I mentioned before, this form of existence is called telic existence.

Formalizing the notion of telic existence is easy: verbs of creation are transitive verbs, but don't have an OBJECT Θ-role. Instead, they have a Θ-role called TELOS. So for instance the lexical entry for *built* would be:

$$\text{built} \quad (np\backslash s)/np \quad \lambda x \lambda y \exists e[\text{BUILDING}(e) \,\&\, \text{AGENT}(e, y) \,\&\, \text{TELOS}(e, x)]$$

All the desired inferences can be obtained by using postulates, one of which might be something along these lines[87]:

$$(269) \quad \text{TELOS}(e, x) \,\&\, \text{TERM}(e) \,\&\, \text{AT}(e, t) \,\&\, \text{END}(t, t') \Rightarrow \exists t'' > t' \,\&\, x \text{ exists}$$

15.3.3 Relational Adverbs

With the use of SDR, the treatment of adverbs is rather straight-forward. Take for instance the problematic sentence on page 6[88]:

[14] Susan crossed the Channel slowly.

With SDR, *'slowly'* applies to an event under the description of a crossing. So *'slowly'* is an adverb like any other one. Adverbs are optional additions to a sentence, they modify the sentence to add more information. Therefore they are sentence-modifiers of type $s\backslash s$. So with the following lexicon, [14] can be parsed[89]:

Susan	np	Susan
the Channel	np	Channel
crossed	$(np\backslash s)/np$	$\lambda x \lambda y \exists e[\text{CROSSING}(e) \,\&\, \text{AGENT}(e, y) \,\&\, \text{OBJECT}(e, x)]$
slowly	$s\backslash s$	$\lambda P.[P^e \,\&\, \text{SLOW}(e)]$

Note that it is not necessary to modify anything to incorporate SDR into the CG framework, since SDR only provides a different *analysis* for logical formula's and doesn't change the representations themselves.

[87] Though the expression *x exists* is not a valid logical expression, but should be replaced with some expression signifying the non-telic existence of *x*.

[88] This sentence has been modified slightly; the adverb *slowly* has been moved to the end of the sentence for simplicity, since mid-sentence adverbs are much harder to parse. This subtlety however is not particularly relevant for present purposes.

[89] The parse-tree of this proof is added in Appendix A.

15.3.4 The EV$^+$ Principle

In section 13.3 I discussed that terminative sentences should be analyzed with the predicate TERM, and that EV$^+$, a slightly modified version of Verkuyl's Plus-Principle should, be used to determine terminativity. But incorporating EV$^+$ in the CG framework is not an easy task. A part of the reason why this is a difficult matter is that an EV$^+$-analysis uses a subtlety that is not present in standard CG: adverbia like *in an hour* combine not with any sentence, but only with sentences of a certain sort, in this case terminative sentences.

In standard CG this would call for a special type, for instance *st*, for terminative sentences. But this is a rather ugly solution. Therefore, in order to incorporate EV$^+$, I will introduced a form of so-called *labeled deduction* version of CG, in particular a simplification of the very appealing version proposed by Gosse Bouma (1993) called Categorial Unification Grammar (CUG).

Labeled Deduction Categorial Grammar was originally introduced to account for the linguistic phenomena of number and case. Take the following two example sentences:

[270] He hit him.

[271] * Him hit he.

According to standard CG, both *he* and *him* would be of type *np*, and *hit* would be of type $(np\backslash s)/np$. But according to that analysis, both [270] and [271] should be considered to be grammatical, though only [270] is. The reason is that to the left of *hit* should be a nominative np, and to the right an accusative np. The solution proposed by CUG is simple: incorporate this information in the lexical entries for the words, as a label that is attached to the category:

he	*np* [CASE nom]
him	*np* [CASE acc]
hit	(*np* [CASE nom]*s*)/*np* [CASE acc]

The verb *'hit'* now only combines with *'he'* to the left and *'him'* to the right. The other combinations, sich as *'him'* to the left fail, since although the categories match, the labels don't.

This very same method of labeling can be used to encode the notions of [± KIND] and [± TERM]. Take for instance the simple NP constructions with *'sandwich'*. According to EV$^+$, *'the sandwich'*, *'a sandwich'*, and *'the sandwiches'* are all [- KIND], but *'sandwiches'* is [+ KIND]. Since *'sandwich'* on its own is not a complete NP, it is of category *n*. The determiners *a* and *the*$_{\text{sing}}$ combine with an *n* to the right to yield a [- KIND], singular *np*. The plural *'sandwiches'* however, is an NP on its own, and a [+ KIND] to be precise. Combined with the determiner *the*$_{\text{plur}}$, however, it yields a [- KIND], plural *np*. This is made formal in the following lexicon fragment[90]:

the	$np\left[\begin{array}{ll}\text{KIND} & -\\ \text{NUM} & \text{plur}\end{array}\right]/np$ [KIND +]
the	*np* [NUM sg]/*n*
a	*np* [NUM sg]/*n*
sandwiches	*np* [KIND +]
sandwich	*n*

[90] This fragment is only an outline; it does not account for more delicate phenomena like bare singularity.

Intransitive verbs, which Verkuyl would have called [- ADD TO], are non-terminative no matter what kind of *np* they take on the left, but terminative sentences are only [TERM +] if they have a *np* [KIND -] on both sides. This information can be encoded as follows:

$$\text{walks} \quad np\left[\begin{array}{ll}\text{NUM} & \text{sg}\\ \text{CASE} & \text{nom}\end{array}\right]\backslash s\ [\text{TERM}\ -]$$

$$\text{ate} \quad (np\left[\begin{array}{ll}\text{KIND} & \textcircled{1}\\ \text{CASE} & \text{nom}\end{array}\right]\backslash s\ [\text{TERM}\ \neg\ \textcircled{1}\ \vee\ \textcircled{2}])/np\left[\begin{array}{ll}\text{KIND} & \textcircled{2}\\ \text{CASE} & \text{acc}\end{array}\right]$$

The numbers used in the definition of *ate* are feature-variables, that work as follows: if *ate* combines with an *np* [KIND -] to the left, all occasions of ① will instantiate with '-'. The symbols '∨' and '¬' are not symbols that feature standardly in CUG; they are meant as the logical ∨ and ¬, making sure that only with an *np* [KIND -] on both sides, the resulting sentence of *ate* is of type *s* [TERM +].

The result of this analysis is that the information concerning terminativity is not part of the logical representation of the sentence, but of its category. Perhaps not the nicest, but by far the easiest way to solve this problem is by means of a postulate (or notational convention if you want):

$$(272)\quad s[\text{TERM}\ +] : \exists e.[X] \stackrel{def}{=} s : \exists e.[X\ \&\ \text{TERM}(e)]$$

So we now have a formal incorporation of EV$^+$ in CG, to formally 'decide' on the terminativity of sentences. Take for instance the two example sentences from section 13.3.3:

[54] Judith ate a sandwich.

[55] Judith ate sandwiches.

In sentence [54], the resulting sentence is terminative, since *Judith* is a non-kind NP, and also the internal NP *a sandwich* is non-kind. The proof-tree looks as follows[91]:

$$(273)\quad \dfrac{n \Rightarrow n \qquad \dfrac{np[\text{KIND}-] \Rightarrow np[\text{KIND}-] \qquad \dfrac{np[\text{KIND}-] \Rightarrow np[\text{KIND}-] \quad s[\text{TERM}\neg - \vee -] \Rightarrow s[\text{TERM}+]}{np, np\backslash s \Rightarrow s}\backslash L}{np, (np\backslash s)/np, np \Rightarrow s}/L}{np[\text{KIND}-], (np\backslash s)/np, np/n, n \Rightarrow s[\text{TERM}+]}$$

Sentence [55] on the other hand, is durative, since it has a non-kind external NP, but the internal NP is a kind denoting term. This is proven as follows:

$$(274)\quad \dfrac{np[\text{KIND}+] \Rightarrow np[\text{KIND}+] \qquad \dfrac{np[\text{KIND}-] \Rightarrow np[\text{KIND}-] \quad s[\text{TERM}\neg - \vee +] \Rightarrow s[\text{TERM}-]}{np[\text{KIND}-], np\backslash s \Rightarrow s}\backslash L}{np[\text{KIND}-], (np\backslash s)/np, np[\text{KIND}+] \Rightarrow s[\text{TERM}-]}\backslash L$$

15.4 Conclusion

The fragment of Categorial Grammar presented in this chapter is meant as an implementation of all the features discussed in this thesis. But as such, it is not (yet) fully developed. For instance, the calculus discussed in section 15.1 is a an 'old' calculus, which is (probably) not powerful enough to deal with quantification, islanding, verb-crossings and other problems that are much discussed in recent literature on computational grammar. It might be necessary to replace this calculus with another, either

[91] Only by atomic categories their kind/term-label is mentioned, because otherwise the tree would not fit on this page.

one incorporating a so-called *wrapping* operator (see for instance Morrill, 1996) or a so-called *mixed* lambek calculus (see for instance Moortgat, 1994).

Also, though the representation of progressive sentences was discussed in section 11.3, I did not even try to incorporate them in the CG framework, because the verb phrase of a progressive sentence consists of an auxiliary verb and a present participle. So the present might be something like $(np \setminus s / np) \backslash (np \setminus s / np)$, but there are so many ways in which present participles and auxiliary verbs can be used that a fruitful computational treatment of progressive sentences needs a lot more attention.

But the goal of this thesis is not to develop a fully grown computational framework explaining all linguistic phenomena, but merely to show that event semantics can be fruitfully used in the development of such a framework. And I hope to have accomplished that much.

One of the possibilities for further development might be to make more use of the so-called *attribute-value matrices* (AVM) that were used as labels in the previous section. Since event-descriptions are structured, this structure might be made more formal using such matrices. For instance, the lexical entry for *build* might look like this:

(275)

WORD	build
CONCEPT	building
CATEGORY	s
LEFT	① [CATEGORY np ; KIND ③]
RIGHT	② [CATEGORY np ; KIND ④]
AGENT	①
TELOS	②
TERM	$\neg$ ③ $\vee$ ④
TIME	[SORT period ; START t_1 ; END t_2]
PLACE	p

In an AVM approach of event semantics, the total structure for a sentence is a result of unification. And in the process of unification, all sorts of information can be processed. For instance, it might very well be possible to incorporate the notion of *coercion* as it was discussed by James Pustejovsky (1991; 1995). Pustejovsky defines so-called *Qualia Structures*, in which many facets of the meaning of a word are captured. The feature LEFT and RIGHT can be regarded to correspond with the ARG structures proposed by Pustejovsky. To supply some of elements of the Qualia Structures to (275), the value for LEFT might be expanded to :

(276)

CATEGORY	np
KIND	③
FORMAL	*physical_object*
ANIMATE	+

to indicate that building takes a animate physical object as its external NP. Likewise, for the internal NP might be added that it should be an artifact (physical object). One of the results of such assignment is that if someone is said to be building a door, the argument *physical object* makes sure that '*door*' is interpreted as the thing itself, and not the aperture creates.

16 Conclusion

In this last part I hope to have formulated an event semantic approach which is better equipped to counter such attacks as I discussed in part II. In this conclusion I will survey the theory as a whole, but in a different order, putting those things I consider most important first.

According to science, the world surrounding us is a spatio-temporal continuum, in which particles move around. Apart from the question whether or not this picture is correct, it is not the way in which we perceive the world: we perceive concrete object moving around. Traditionally, there has been a lot of attention for categories amongst objects, such as 'chairs' and 'horses'.

The picture suggested by event semantics is this: objects move, and the movements of objects are themselves not object, but 4-dimensional entities, called events. We tend to categorize these events in much the same way as we categorize object. A specific type of empirical sentences, called action- or event-sentences, categorize both an object and an event at the same time. A typical example is this:

[277] This man walks.

This sentence both says that a certain object is of the type MAN, and at the same time that a certain event in which this man takes part is of the type WALKING. This information is represented in an easy and powerful way:

(278) $\exists x.\exists e.[\text{MAN}(x) \,\&\, \text{WALKING}(e)]$

So in the event semantic approach, object and events are treated in many ways the same: they both belong to kinds and they both can be referred to with a variable. The main difference between object and events is, as said, that objects are 3-dimensional entities that persist through time (under a certain concept), while events are non-repeatable, non-persistent 4-dimensional entities. The relation between space-time and events should not be taken the wrong way around: not any region of space-time is an event, but every event has an extension in space and time.

The temporal extension of an event is called the *event-time*. If John crosses the street, this is an event lasting from the time he left the one side to the street till the moment he reached the other. The event time is the period between these two moments. There is one special kind of events, the instantaneous events, which last but a moment. Instantaneous events are (usually) transitions that take place at the beginning or the end of a non-instantaneous event. So in John's crossing the street there are two such transitions: the transition from him being on the one side of the street till his no longer being there (John's starting to cross the street) and the transition from his not being on the other side to his having reached the other side (John's reaching the other side of the street). For some reason, transitions at the end of an event are more often referred to than those at the start of one.

As you can see in [277], sentences can refer to events. But not all sentences describe events. Those sentences that don't describe events are called *dispositions*. There are various sorts of dispositions, for instance definition facts (*dogs have four legs*), property facts (*this apple is green*), or habituality sentences (*I usually walk to school*). Dispositions can describe all kinds of things: states of affairs, habits of people, etc.

Sentences that *do* describe events are called event-sentences. There are four types of event sentences: achievements, accomplishments, processes and progressives. Of these four types, achievements are the only sentences that describe instantaneous events. So there is an ontological difference between the denotation of achievement

an the denotation of other event-sentences. But there is no such difference between the other types: they can all be used to describe the same events (this in contrast with for instance Parsons, who claims that *there are, in the world, events, states and processes* (1990 [20])).

The difference between them is only the way in which they *describe* events, what Carlota Smith calls *viewpoint aspect*. Their differences can be captured in three characteristics, as displayed in figure 8. As said before, achievements describe events that last but a moment. Accomplishments and achievements describe events in a terminative way. This means that they explicitly mention the boundaries of the event, so if John's crossing the street is described with an accomplishment (*John crossed the street*), his starting to cross it and his reaching the other side are made explicit. And since the termination is mentioned, John is said to actually *have* managed to reach the other side.

	MOM	TERM	FOC
achievement	+	+	-
accomplishment	-	+	-
process	-	-	-
progressive	-	-	+

Figure 8: Characteristics of the Vendler Classes

Progressive sentences are just the opposite. They describe an event by focusing on some moment within the event time, at which the event had not yet finished. And since at this focal moment the event had not yet terminated, the possibility is left open (and sometimes even suggested) that it never did terminate. Processes are somewhere in between: they do not mention the boundaries of an event, not do they focus on a moment. So if John's walking across the street is described as a process (*John walked*) no suggestion as to whether or not he reached the other side is made.

Progressive sentences are always the progressive form of a non-progressive sentence. There are thus three different types of progressive sentences: process, achievement and accomplishment progressives. The process progressive is considered to be the 'standard form': "*John is walking*" conveys the same information as "*John walks*" in a more natural way; the non-terminativity is 'explained' by presenting the event seen from a point within the event. In the accomplishment progressive, the non-terminativity is stressed just like in the process progressive. But since accomplishments are themselves terminative, this leads to a strange situation that is called the *imperfective paradox*: "*John was crossing the street*" does not imply "*John crossed the street*". You might say that the described event is not actually said to *be* a crossing-the-street, but at one point to have resembled one. With the achievement progressive the situation is even more strange: in order to be non-terminative, an event has to be durational. But achievements describe instantaneous events. Therefore, if an achievement describes an event taking place at time *t*, the related achievement progressive describes the durational event *preceding* this event, and does so in a non-terminative way, so that the instantaneous event at time *t* is not actually implied to have taken place.

Since progressive forms do, but accomplishments don't allow the denoted event to be unfinished, the viewpoint aspect of a sentence effects its meaning. Therefore, the viewpoint aspect has to have a place in the logical representation of a sentence. This is done by incorporating viewpoint aspect in the temporal analysis. The proposed temporal analysis is as follows:

Any event is necessarily related to an event time. This is made explicit by adding to each representation a clause AT(*e, t*), signifying that event *e* took place at/during time *t*. The time *t* is by default a period, so that instantaneous events have to be labeled as 'special'. Therefore, the representation for achievements contains an additional clause MOM(*t*), signifying that the event time of the denoted event is a moment as opposed to a period.

Terminative sentences are more informative than non-terminative ones: it is true that *"John left"* implies *"John was leaving"*, but not vice-versa. Therefore, you it is justified to say that sentences are non-terminative by default, and terminativity is added information. This 'addition' is represented by the predicate TERM(*e*). So, the complete representation for *"Max reached the top"* is the following:

$$(279)\quad \begin{array}{l}\exists e.[\textsc{reaching}(e) \,\&\, \textsc{agent}(e, \mathrm{Max}) \,\&\, \exists x.[\textsc{object}(e, x) \,\&\, \textsc{top}(x)] \,\&\\ \exists t.[\textsc{at}(e, t) \,\&\, \textsc{mom}(t)] \,\&\, \textsc{term}(e)]\end{array}$$

In the event semantic representation of transitive sentences, some object is said to be the object of a certain event. In some cases, however, this creates a problem. With the so-called *verbs of creation*, the internal NP denotes an object that comes into being as a *result* of the event itself. If such a verb is used in the progressive form (*John was building a house*), the denoted event might never have terminated, and therefore it is possible that there never was a house that was the result of the building. But on the other hand, it does not seem futile to talk about the house that John was (planning to) build. In a way, there *'exists'* a house that was the object of John building, even if it never came into being. This form of 'existence' is called *telic existence*. If John would have completed the building, the house would have shifted from telic to actual existence at the moment the telos was reached. Telic existence does not entail actual existence. Telic existence is represented as follows:

$$(280)\quad \exists e.[\textsc{building}(e) \,\&\, \textsc{agent}(e, \mathrm{John}) \,\&\, \exists x.[\textsc{house}(x) \,\&\, \textsc{telos}(e, x)]]$$

In some cases, the conjunctive word *and* calls for a special treatment in event semantics. Two such cases have been discussed in this thesis: sentences in which there is a conjunctive subject and sentences in which there are two adverbia in conjunction. A typical example of subject conjunction is this:

[281] John and Mary wrote a book.

This sentence has two readings: a collective and a distributive one. In the distributive reading, [281] is an abbreviation for *"John wrote a book and Mary wrote a book"*. So there are two separate events:

$$(282)\quad \begin{array}{l}\exists e.\exists x.[\textsc{writing}(e) \,\&\, \textsc{agent}(e, \mathrm{John}) \,\&\, \textsc{object}(e, x) \,\&\, \textsc{book}(x)] \,\&\\ \exists e.\exists x.[\textsc{writing}(e) \,\&\, \textsc{agent}(e, \mathrm{Mary}) \,\&\, \textsc{object}(e, x) \,\&\, \textsc{book}(x)]\end{array}$$

In the collective reading, however, there is only *one* book that was written by John and Mary in a joint effort. In such cases, a notation John•Mary is used, which is meant to represent the group that is the agent of this collective writing. This same mechanism of group-denotation is used for plural terms, like *'three men'*. For plurals, an extra remark should be made: if the internal NP also represents a group, like in *"Three men lifted four tables"*, there is a scale of possible situations that can be described by the sentence: for instance, the three men might have lifted the tables as a pile, or in little

bits and pieces. Or, two men might have lifted a heavy table together, while the last man took care of the rest. The sentence, and therefore the representation, does not make any claim about the actual situation. It only claims that a group of three men was responsible for the lifting of a group of four tables.

In the case of conjunctive adverbia, there is also a collective and a distributive reading. For instance *"I read a book in the garden and in the study"* can mean both that I read two books on two different locations, or that I moved from the garden to the study while reading a book. But not every reading is possible in every case: the distributive reading is suppressed if the two adverbia express different types of information, as in *"Doris capsized her canoe quickly and unexpectedly"*, the collective reading if they express incompatible information, as in *"John built a house in London and New York"*. A special treatment, however, is needed for temporal adverbia denoting two consecutive periods of time, such as *'yesterday and the day before'*. These adverbial conjunctions can either denote two periods, or *one* longer period. In these cases, the 'one-period' reading is suppressed if the sentence modified by the adverbial conjunction is terminative. The reason is that a termination is supposed to be present at both periods, so there can be no collective reading.

In the standard interpretation of event semantics, a logical representation is of the form $\exists e.[\text{SORTAL}(e) \,\&\, \text{ATTRIBUTE}(e, x)]$, which means that an event sentence is supposed to claim that there exists an arbitrary event that satisfies a certain event sortal, and has a set of attributes. There are two problems with this interpretation. Firstly, some sentences do not refer to there being an arbitrary event satisfying a set of condition, but they describe a specific sentence. For instance, *"I went to London"* can be used to describe the destination of a specific event instance of mentioning there one time having been a going by me to London. Secondly, some adverbia, like *'quickly'*, do not relate to the event itself, but to the event under a certain description. For instance, if Susan swam across the Channel quickly, that does not mean that she crossed the Channel quickly.

As a solution, two alternations were suggested to the interpretation of event semantic representations. Firstly, the existential quantifier can, apart from its normal function, also be used as a 'tagger', assigning an arbitrary name to a specific event, instead of naming an arbitrary event. Secondly, event variable do not denote non-conceptual events, but events under an event sortal. So $\exists e.[\text{CROSSING}(e) \,\&\, \text{QUICK}(e)]$ means that there is an event that is quick *as a crossing*. This interpretation is called Sortal Dependent Reference.

In Parsons' version of event semantics, all Θ roles are represented as independent clauses. Thus a sentence as *"I sank the Bismarck"* is represented as $\exists e.[\text{SINKING}(e) \,\&\, \text{AGENT}(e, \text{I}) \,\&\, \text{PATIENT}(e, \text{Bismarck})]$. But this should mean that all roles can be dropped independently. But *"I sank the Bismarck"* does not entail *"I sank"*. The reason is this: there are two verbs *'to sink'*, an intransitive and a transitive verb. So if the intransitive verb is meant in *"I sank"*, the inference is invalid since two different event sortals are meant. On the other hand, if the transitive verb were meant, *"I sank"* would be ungrammatical, since transitive verbs require an internal NP.

To assure that $\exists e.[\text{SINKING}(e) \,\&\, \text{AGENT}(e, \text{I}))]$ does not read as *"I sank"*, event semantics is combined with Categorial Grammar. With a formal grammar, like CG, a sentence like *"I sank the Bismarck"* translates into a logical representation. This logical representation has logical consequences, but not all of these logical consequences translate back into sentences.

As a conclusion to this thesis, I tried to incorporate all the features discussed in this thesis into the CG framework. The result of this is a CG lexicon that should at least translate a large group of sentences into their proper event logical representation. This

lexicon can be found in Appendix B. It was of course not possible to solve all problems, but I hope to have shown that most traditional problematic cases for event semantic can be countered. But before it would be justified to talk about a fully operational linguistic system, much more research would be needed.

16.1 Alternative version of ES

In this thesis I defended the event semantic approach, especially because of its explicit representation of event sortals. But the merits of the event semantic representation that have been discussed are not restricted to the neo-Davidsonian representation. In fact, other logical forms might be better or more explanatory than the 'event predicate logic' that was used throughout this thesis. One such alternative form was already suggested in section 15.4: the representation in terms of attribute value matrices. Another alternative was suggested in section 14.2.1: 'event semantics' in terms of the *Discourse Representation Theory*, introduced by Hans Kamp (1981). For instance the DRT version of (265) would look like this:

(283)

e_1, e_2, x_1, x_2
WRITING(e_1)
WRITING(e_2)
AGENT(e_2, John)
AGENT(e_2, Mary)
BOOK(x_1)
BOOK(x_2)

A DRT representation can also be used in combination with Categorial Grammar, as was shown by Reinhard Muskens (1994). But the syntax of most alternative logical forms is more complex (or at least less commonly known) than predicate logic, and to gain any profit from using them further development would be necessary. I have therefore deliberately avoided using any other logical form beside predicate logic.

But the use of an alternative logical form, such as DRT, is not always a trivial different. For instance the presence of special types of variables, such as event variables, in DRT does not have the same implications as it has in predicate logic, as was pointed out to me by Nicholas Asher. It is very well possible to use variables in a Discourse Representation Structure merely as a shorthand, which are translated away when the DRS is translated onto a model.

A Derivation Trees

Fragment: John and Mary.
pag. 107

(284)
$$\dfrac{\dfrac{A(J)(M) \Rightarrow A(J)(M) \quad M \Rightarrow M}{A(J), M \Rightarrow A(J)(M)}\ /L \qquad J \Rightarrow J}{J, A, M \Rightarrow A(J)(M)}\ \backslash L$$

Sentence: John and Mary wrote a book.
pag. 107

(285)
$$\dfrac{\dfrac{np \Rightarrow np \quad \dfrac{np \Rightarrow n \quad \dfrac{np \Rightarrow s \quad \Rightarrow s}{np, np\backslash s \Rightarrow s}\ \backslash L}{np, (np\backslash s)/np, np \Rightarrow s}\ /L}{np/np, np, (np\backslash s)/np, np \Rightarrow s}\ /L}{np, np\backslash(np/np), np, (np\backslash s)/np, np \Rightarrow s}\ \backslash L$$

Sentence: John and Mary together wrote a book.
pag. 108

(286)
$$\dfrac{\dfrac{np \Rightarrow np \quad \dfrac{\dfrac{np \Rightarrow np \quad np \Rightarrow np}{np, np\backslash np \Rightarrow np}\ \backslash L}{np\backslash np \Rightarrow np\backslash np}\ \backslash R \qquad \dfrac{np \Rightarrow np \quad \dfrac{np \Rightarrow np \quad s \Rightarrow s}{np, np\backslash s \Rightarrow s}\ \backslash L}{np, (np\backslash s)/np, np \Rightarrow s}\ /L}{np, np\backslash np, (np\backslash s)/np, np \Rightarrow s}\ \backslash L}{np, (np\backslash np)/np, np, (np\backslash np)/(np\backslash np), (np\backslash s)/np, np \Rightarrow s}\ /L$$

Sentence: Susan crossed the Channel slowly.
pag. 109

(287)
$$\dfrac{np \Rightarrow np \quad \dfrac{np \Rightarrow np \quad \dfrac{s \Rightarrow s \quad s \Rightarrow s}{s, s\backslash s \Rightarrow s}\ \backslash L}{np, np\backslash s, s\backslash s \Rightarrow s}\ \backslash L}{np, (np\backslash s)/np, np, s\backslash s \Rightarrow s}\ /L$$

B Lexicon

B.1 Templates

NPSING	$np\left[\begin{array}{ll}\text{KIND} & -\\ \text{NUM} & \text{plur}\end{array}\right]$
DET_{subj}	$((s/\text{NPSING})\backslash s)/n$
DET_{obj}	$(s/(\text{NPSING}\backslash s))/n$
IVSING	$np\left[\begin{array}{ll}\text{NUM} & \text{sg}\\ \text{CASE} & \text{nom}\end{array}\right]\backslash s\ [\text{TERM}\ -]$
TV	$(np\left[\begin{array}{ll}\text{KIND} & \textcircled{1}\\ \text{CASE} & \text{nom}\end{array}\right]\backslash s\ [\text{TERM}\ \neg\ \textcircled{1}\ \vee\ \textcircled{2}])/np\left[\begin{array}{ll}\text{KIND} & \textcircled{2}\\ \text{CASE} & \text{acc}\end{array}\right]$
TVSING	$(np\left[\begin{array}{ll}\text{NUM} & \text{sing}\\ \text{KIND} & \textcircled{1}\\ \text{CASE} & \text{nom}\end{array}\right]\backslash s\ [\text{TERM}\ \neg\ \textcircled{1}\ \vee\ \textcircled{2}])/np\left[\begin{array}{ll}\text{KIND} & \textcircled{2}\\ \text{CASE} & \text{acc}\end{array}\right]$
TVPLUR	$(np\left[\begin{array}{ll}\text{NUM} & \text{plur}\\ \text{KIND} & \textcircled{1}\\ \text{CASE} & \text{nom}\end{array}\right]\backslash s\ [\text{TERM}\ \neg\ \textcircled{1}\ \vee\ \textcircled{2}])/np\left[\begin{array}{ll}\text{KIND} & \textcircled{2}\\ \text{CASE} & \text{acc}\end{array}\right]$

B.2 Lexical Entries

every	DET_{subj}, DET_{obj}	$\lambda P\lambda Q\forall x[P(x)\rightarrow Q(x)]$
a	DET_{subj}, DET_{obj}	$\lambda P\lambda Q\exists x[P(x)\,\&\,Q(x)]$
boy	n	BOY
girl	n	GIRL
John	NPSING	John
Susan	NPSING	Susan
Mary	NPSING	Mary
dates	TVSING	$\lambda x\lambda y\exists e[\text{DATING}(e)\,\&\,\text{AGENT}(e,y)\,\&\,\text{OBJECT}(e,x)\,\&\,\exists t.\text{AT}(e,t)]$
write	TVPLUR	$\lambda x\lambda y\exists e[\text{WRITING}(e)\,\&\,\text{AGENT}(e,y)\,\&\,\text{OBJECT}(e,x)\,\&\,\exists t.\text{AT}(e,t)]$
crossed	TV	$\lambda x\lambda y\exists e[\text{CROSSING}(e)\,\&\,\text{AGENT}(e,y)\,\&\,\text{OBJECT}(e,x)\,\&\,\exists t.\text{AT}(e,t)]$
built	TV	$\lambda x\lambda y\exists e[\text{BUILDING}(e)\,\&\,\text{AGENT}(e,y)\,\&\,\text{TELOS}(e,x)\,\&\,\exists t.\text{AT}(e,t)]$
slowly	$s\backslash s$	$\lambda P.[P^e\,\&\,\text{SLOW}(e)]$
and	$np\backslash(np[\text{GROUP}\ +]/np)$	$\lambda P\lambda Q[P\bullet Q]$
and	$np\backslash((s/(np\backslash s))/np)$	$\lambda P\lambda Q\lambda R[R(P)\,\&\,R(Q)]$
each	$(np\backslash s/np\backslash s)\backslash(np\backslash s/np\backslash s)$	$\lambda X.X$
together	$np[\text{GROUP}\ +]\backslash np$	$\lambda X.X$
two	$np/np[\text{NUM plur}]$	$\lambda P[2*P]$
three	$np/np[\text{NUM plur}]$	$\lambda P[3*P]$
two	$(s/(np\backslash s))/np$	$\lambda P\lambda R[R(P)\,\&\,R(P)]$
three	$(s/(np\backslash s))/np$	$\lambda P\lambda R[R^3(P)]$

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