V. TEMPORAL SUBORDINATE CLAUSES, CONJUNCTIONS, AND MATRIX CLAUSES

1. Introduction

1.1. What the chapter is about

Temporal subordinate clauses are introduced by temporal conjunctions like nachdem ('after'), seit ('since'), and bevor ('before') and others. Depending on their conjunction, they can express a positional or a durational meaning, and they function as temporal adverbials in their matrix clause. Thus, the temporal subordinate clauses or short: TEMPORAL CLAUSES - in (1-1a, c, e) function analogously to the temporal adverbials in (1-1b, d, f), respectively.

(1-1) a. Nachdem Maria aufgewacht war, begann das Ungewitter.
   after Maria woken-up was/had started the thunderstorm
b. Nach Marias Aufwachen begann das Ungewitter.
   after Maria's waking-up started the thunderstorm
c. Seit das Ungewitter stattfand, ist der Garten zerstört
   since the thunderstorm took-place is the garden destroyed
d. Seit dem Ungewitter ist der Garten zerstört
   since the thunderstorm is the garden destroyed
e. Bevor das Ungewitter begann, war Maria aufgewacht.
   before the thunderstorm began was/had Maria woken-up
f. Vor dem Ungewitter war Maria aufgewacht.
   before the thunderstorm was/had Maria woken-up

Since temporal clauses function just like other, non-clausal, temporal adverbials, it is not surprising that some lexical items can be temporal prepositions as well as conjunctions or part of conjunctions. This is the case for nach ('after'), seit ('since'), and vor ('before') above and some other items.

In contrast to many temporal nonquantificational adverbials, temporal clauses do never directly provide time intervals by naming them; rather, they indirectly provide them by describing situations that in turn provide time intervals, e.g. by their situation
times. In the examples in (1-1), the situation used for providing time intervals indirectly is the thunderstorm mentioned and the time when it took place.

The data in (1-1) also show that temporal conjunctions taken together with the rest of the subordinate clause form a syntactic constituent; this is shown by the fact that the constituent can be moved to the topicalization position before the finite verb. A basic approach to temporal subordinate clauses that takes this observation seriously is sketched in (1-2a), where the syntactic constituent consisting of the temporal conjunction together with its clausal complement forms a temporal predicate semantically, which is integrated semantically into the matrix clause. This approach crucially differs from the one sketched in (1-2b): here temporal conjunctions are analyzed as 2-place-predicates that take the matrix clause and the rest of the subordinate clause as their two arguments simultaneously; semantically, they establish a particular temporal relationship between the situation of the matrix clause and the situation of the rest of the subordinate clause.

(1-2)

a. Conjunctions form predicates

\[
\begin{align*}
\text{matrix clause} & \quad \text{temporal clause} \\
5 & = \text{temporal adverbial} & 5 & \text{qgo} \\
\text{conjunction} & \quad \text{rest of temp. clause}
\end{align*}
\]

b. Conjunctions establish temporal relations

Both approaches are known from the literature on temporal clauses: while Heinämäki (1974) and de Swart (1991), for instance, use variants of (1-2b), Stump (1985), Ballweg (1988a), Herweg (1990), Johnston (1994), and van Geenhoven (1999), for instance, employ variants of (1-2a). The advantages of (1-2a) above (1-2b), however, are obvious. First, we can analyze temporal clauses semantically analogously to other temporal adverbials. Second, the resulting semantic composition is analogous to the syntactic composition. Hence, we will adopt the view that the approach in (1-2a) is adequate.

We will proceed as follows. The remainder of this section provides a brief characterization of the semantics of subordinate temporal clauses in general. Sections 2-5 will then discuss some selected temporal conjunctions of different types and the corresponding temporal subclauses in more detail. Some of the conjunctions discussed clearly create positional subclauses, i.e. \textit{als} (‘when’), \textit{bevor} (‘before’), \textit{nachdem} (‘after’), \textit{während} (‘while’), and \textit{wenn} (‘when’). Some other conjunctions are usually classified as introducing durational subclauses; these are \textit{bis} (‘until’), \textit{seit(dem)} (‘since’), and \textit{solange} (‘as long as’). As will be explained below, however, the durational status of \textit{bis} and \textit{seit(dem)} is questionable.

The main purpose of this chapter is to point out the basic mechanisms that are relevant for capturing the interpretation of temporal clauses in general and in connection with the interpretation of perfect constructions in particular. Hence, the
chapter does not try to take all temporal conjunctions into account. For instance, conjunctions like *da* (‘when’) or *indem* (‘while’), which are less common than the ones mentioned above or often used instead of others just for stylistic reasons, and conjunctions like *sobald* or *sowie* (‘as soon as’), whose semantic contribution seems to be quite similar to the one of other conjunctions, e.g. in this case, *nachdem*, are not discussed here. Moreover, most of the conjunctions treated also have other, nontemporal, meanings; *während*, for instance, can also introduce adversative clauses, and *wenn* can also introduce conditional clauses. We will neither account for these nontemporal meanings nor discuss how they are related to the temporal meanings. For a discussion of these issues, the reader is referred to Herweg (1990).

Much of the literature on the semantics of temporal clauses and temporal conjunctions is about the corresponding constructions in English while less work has been done on them in German. The most comprehensive treatment on temporal clauses in German and a thorough discussion of their previous treatments in the literature is provided in Herweg (1990). Thus, Herweg’s account will be a main orientation point in the discussion below.¹

In discussing the semantics of these temporal clauses and conjunctions, we will follow a certain pattern. Specifically, we will try to find answers to the following questions with respect to specific temporal conjunctions and their resulting complex clause structures.

1. **WHICH GENERAL RESTRICTIONS APPLY TO THE MATRIX CLAUSE** with regard to the situation type it contains and perhaps other factors? - As will become clear below, temporal subordinate clauses impose little, if any, restrictions on the nature of their matrix clause. This holds at least for positional temporal clauses. As one expects, however, durational temporal clauses require the situation they specify to be temporally long enough so as to be able to cover the whole time interval provided by the temporal clause, and they trigger reinterpretations if this is not the case directly.

2. **WHICH GENERAL RESTRICTIONS APPLY TO THE SUBORDINATE CLAUSE** with regard to the situation type it contains and perhaps other factors? - In contrast to

¹ Herweg’s (1990) account formally differs from the present account in several respects. I will "translate" the content of his account into the present account where possible. Herweg uses the notion *Satzradikal* (‘clause radical’), i.e. a clause without the temporal information provided by its tense and, possibly, temporal adverbials. Tense and adverbials are analyzed as operators on clause radicals. Subordinating temporal conjunctions are operators that map the radical of the subordinate clause to an adverbial; this clausal adverbial in turn maps the radical of the main clause to the radical of the complex clause. Herweg distinguishes event radicals and state radicals, which are 1-place-predicates of events and times, respectively, and perfect radicals, which are 2-place-relations between events and times. The formal distinction of these kinds of radicals makes it possible to encode aspectual or *Aktionsarten*-requirements that temporal conjunctions impose on their subordinate clause or on their main clause as restrictions on the sort (event radical vs. state radical) or the logical type (1-place-predicate vs. 2-place-relation) of their argument radicals (p26f).
their few requirements on the matrix clause, temporal conjunctions often impose clear
and strict restrictions on their clausal complement. Especially the situation type of the
embedded clause plays an important role in this respect.

3. WHAT CAN THE TEMPORAL CLAUSE APPLY TO IN THE MATRIX CLAUSE? -
Being a special kind of complex temporal adverbial, temporal subordinate clauses are
expected to behave like other temporal adverbials in essential respects. As we will see
below, this is indeed so: like other temporal adverbials, temporal clauses can apply on
different levels in the semantic representation.

4. WHAT CAN THE CONJUNCTION APPLY TO IN THE SUBCLAUSE? - As will
become clear below, similar to the ability of temporal adverbials to apply on different
levels of the semantic representation, temporal conjunctions can also apply on
different levels of their clausal complement - a point that has so far been ignored in
the relevant literature.

5. WHICH TEMPORAL RELATION DOES THE CONJUNCTION EXPRESS? -
Subordinate temporal clauses are often distinguished with regard to the main types of
temporal relationships between the situation described in the subordinate clause and
the situation described in the main clause. The term ANTERIORITY in the context of
temporal relationships between main clause and subordinate clause roughly speaking
means that the situation time of the subordinate clause is anterior relative to the
situation time of the main clause - i.e. the situation of the subordinate clause takes
place earlier than the situation of the main clause. Accordingly the term
POSTERIORITY means that the situation time of the subordinate clause is posterior
relative to the situation time of the main clause - i.e. the situation of the subordinate
clause takes place earlier than the situation time of the main clause. Hence, anteriority
and posteriority refer to the situation of the subordinate clause viewed from the
perspective of the situation of the main clause (cf. Helbig and Buscha (1989:206ff)
and others). Finally, the term SIMULTANEITY covers several options of obligatory
minimal intersections of the situation times of subordinate clause and main clause.
Note, however, that the notions of anteriority and posteriority are sometimes used the
other way round, i.e. as viewing the situation of the main clause from the perspective
of the situation of the subordinate clause (cf. Gelhaus (1974) and others). Since this
easily leads to confusion, we will try to avoid these notions.

Moreover, trying to capture the semantics of temporal clauses in terms of
anteriorty, posteriority, and simultaneity is not very productive. As will become clear
below, their semantics often seems to be much more complicated and the temporal
relations they establish are much less straightforward than one might wish for. What is
the reason for this?

Previous work on the semantics of temporal subordinate clauses is essentially
concerned with the question how the VP-situation in the subordinate clause is
temporally related to the VP-situation in the main clause - does it precede it, follow it,
or are they more or less simultaneous. This is reflected in statements such as the following, taken from Helbig and Buscha (1989:680).

"Der Temporalsatz gibt an, wann sich das Geschehen des HS (= Hauptsatzes, R.M.) vollzieht. Der NS (= Nebensatz, R.M.) kann dabei Gleichzeitigkeit eines Geschehens mit dem Geschehen des HS oder Vor- bzw. Nachzeitigkeit im Verhältnis des NS zum HS bezeichnen."  

The problem with this almost canonical view is, however, that a clause, be it a matrix clause or a subordinate clause, normally involves not just a situation time but several time intervals. In the case of the perfect in particular, it involves a tense time, an aspect time, and a situation time. Even under a more conventional approach, such as Reichenbach's, two time parameters, the situation time (or: event time) and the reference time, are regularly present in both clauses, and it is not at all clear what is temporally related to what by a temporal conjunction. Does a temporal conjunction establish a relation between the situation time of the main clause and the situation time of the subordinate clause, or the reference time of the main clause and the situation time of the subordinate clause, to mention but two possibilities?

In what follows, we shall pursue a somewhat different line. The central idea is as follows. A temporal conjunction, such as als, bevor, or nachdem, serves to define a temporal interval in relation to some other temporal interval. This latter interval is provided by the subordinate clause; the exact way in which this functions depends on the internal temporal composition of this clause, on the one hand, and on the particular lexical contribution of the conjunction, on the other. There may be specific restrictions in the way in which the temporal conjunction applies to the internal temporal structure of the subordinate clauses. In each case, however, the entire temporal clause provides a time interval with various durational and positional properties, just as any other temporal adverbial. This interval is then used to modify one of the various time intervals contained in the matrix clause. Again, there may be specific restrictions in the way in which this modification functions.

Hence, the reason why previous accounts of temporal relationships between temporal subclauses and their matrix clauses were often not very satisfactory can at least in part be found in the indirect relationship between the situation described by the matrix clause and the situation described by the subclause: each of the clauses provides a complex temporal interpretation consisting of a tense time, the situation time of the VP, and - in the case of perfect constructions - a post-state. If temporal conjunctions can establish relations between different times on these different levels, and if temporal conjunctions do not relate situations as a whole but rather truth-intervals of situations, then it is clear that the possible relationships sometimes appear blurred.

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2 "A temporal clause says when the situation of the main clause takes place. In doing this, the subordinate clause can express simultaneity of a situation to the situation of the main clause, or anteriority or posteriority in the relationship of the subordinate clause to the main clause."
6. WHICH RESTRICTIONS EXIST FOR THE COMBINATIONS OF TENSE CONSTRUCTIONS in matrix clause and subclause, and why? - Because of the lexical semantics of individual conjunctions, the subordinate clauses as well as the matrix clauses are sometimes subject to requirements concerning their situation type, and they express more or less well-defined temporal relations between the matrix clause and the subclause. As a consequence, the occurrence of particular tense constructions, e.g. the present perfect and the past perfect in contrast to the simple past tense may be restricted (cf. traditional grammars, Heinämäki (1974), and many others). This phenomenon seems to be independent of sequence-of-tense phenomena, and it is not immediately clear how the distribution of the tense constructions can be explained adequately. One main goal of this chapter is thus to explain the restrictions on the use of perfect constructions in subordinate temporal clauses by deriving them from the semantics of the construction. In the course of doing so, we will have to deal with the semantics of the past tense, with the semantics of temporal clauses and temporal conjunctions, and with the semantic functions of temporal clauses in the main clauses they modify.

According to Hauser-Suida and Hoppe-Beugel (1972), combinations of present tense in the main clause and present perfect in the subordinate clause cannot be substituted by a combination present tense/past tense when the temporal connective imposes a tight temporal connection between the subordinate clause and the main clause and it is intended to express completedness that is still given at the time of utterance. Past tense in this context would express a temporal opposition to the present tense in the main clause (p51). Other but temporal subordinate clauses (i.e. daß-Sätze (that-clauses), relative clauses, indirect speech) do not impose strict temporal relationships between main clause and subordinate clause; only in cases where completedness is to be expressed (as may be signalled, for instance, by certain temporal adverbials like schon ('already'), eben ('just'), bisher nie ('so far never'), noch nie ('not yet ever')) and the perfect construction of the verb in question expresses a target-state (as with finden ('find'), werden ('become'), geschehen ('happen'), sterben ('die'), verändern ('change'), vergessen ('forget'), ausersehen ('select')) is the present perfect sometimes not substitutable by the past tense but at most by other 'resultative constructions', e.g. stative passives (pp54ff). We will introduce the restrictions on tense constructions in subordinate clauses in detail below when the semantics of individual temporal conjunctions is discussed.

7. WHAT IS THE LEXICAL ENTRY OF THE CONJUNCTION AND HOW IS IT FORMALLY INTEGRATED INTO THE SEMANTIC REPRESENTATION? - The answers to the questions listed above must, of course, be reflected in the lexical entry of the conjunction in question. In order to define thus the semantics of a temporal conjunction, one must be able to separate out which phenomena concerning its behavior are directly due to its semantics and which are due to independent, e.g. pragmatic, factors that affect their interpretation in one way or the other.
Which pragmatic factors could this be? - According to Heinämäki (1974), de Swart (1999), and others, temporal clauses, like other adverbials, generally presuppose the situations, and hence the times, they provide, i.e. with the exception of some clearly definable cases of before- and until-clauses (cf. Heinämäki (1974)), they generally presuppose that the situation they describe is true at some time. But in order for a temporal clause to be informative, there must also be times at which it is not true, i.e. temporal clauses must allow for contrasts. Heinämaki (1974) notes, however, that this latter requirement is not so obvious in the case of temporal clauses expressing simultaneity, e.g. when-clauses. In any case, as a consequence of the presuppositional and contrasting nature of temporal clauses, their meaning contribution does not only consist in truth conditions but also in conversational implicatures.

Moreover, it is to be expected that the interpretation of temporal clauses, like the interpretation of other items in a clause, is affected by the information structure of the clause. This is indeed the case. At the end of this chapter, we will discuss some phenomena concerning the interpretation of temporal clauses that are influenced by information structural factors.

1.2. More about temporal subordinate clauses

As has already been stated above, temporal clauses in principle function in their matrix clause as temporal nonquantificational adverbials. In the present framework, they introduce predicates of times, i.e. they are of the same semantic type as non-clausal temporal adverbials, i.e. in our framework, of type \(<i,t>\). Temporal clauses as a whole function as restrictors in the restrictive clauses of the quantificational adverbs \(\exists T\), \(\exists A\), or \(\exists P\) in the matrix clause and can potentially take over other functions as was pointed out for temporal adverbials in chapter IV.

Temporal clauses are constructed of propositions by the addition of temporal conjunctions. Depending on the choice of the conjunction, temporal clauses can correspond to position or to duration adverbials. The former type is realized by conjunctions like als ('when'), bevor ('before'), and nachdem ('after'), for instance, while the latter type is realized by conjunctions like bis ('until') and solange ('as long as'), for instance. The semantics of the conjunctions must be able to capture the fact that the conjunctions can form temporal predicates on the basis of different time parameters in their clausal complement. Thus, they will be like functors that abstract over a time variable contained in their clausal complement; for more details, see section 3 on the interpretation of als-clauses.

Because of these characteristics, the semantics of temporal clauses is anything but easy to understand. It is even more complex, however, because any temporal clause as well as any matrix clause seems to open up an independent temporal structure of its own. Thus, as will become clear below, the tenses contained in temporal clauses receive an independent interpretation relative to the local evaluation time - in most cases, the time of utterance. Moreover, temporal clauses, like matrix clauses, have tense times on their own. We will see below in more detail how the temporal
parameters of matrix clauses and temporal clauses interact when we discuss the semantics of individual temporal conjunctions.

Hence, let us start by narrowing down the semantics of the conjunction *als* (definite, past-oriented 'when'). Some issues concerning the interpretation of temporal subclauses in general will be discussed illustratively in the section on *als*; in this section, we will also show how temporal subclauses are integrated into our formal semantic framework.

2. 'Simultaneity' between main clause and subclause

2.1. *Als* (definite, past-oriented 'when') and general characteristics of the semantics of temporal subordinate clauses

The conjunction *als* has often been said to be synonymous to temporal *wenn* ('when') (cf. Wunderlich (1970), Steube (1980), Herweg (1990:268), and others), as far as the temporal relation established between the matrix clause and the subclause is concerned. Temporal *wenn*, however, is future-oriented, while *als* is past-oriented.

RESTRICTIONS ON THE MATRIX CLAUSE. *Als* does not impose any specific restrictions on the situation type of its matrix clause. As will become clear below, this is typical for temporal conjunctions in general. (2-1) provides some illustrating examples with states, processes, accomplishments, and achievements in the matrix clauses, respectively.³

(2-1) a. Ich war froh, als ich raus war.

*I was happy, when I out was*

b. ... doch was half ihm seine Unschuld, als sein Ehrenschild gebrochen.

*yet what helped him his innocence, when his honor-shield broken*

c. Und als ein fliegender Buchhändler eines Tages...über seine schlechten Einnahmen wetterte, trat Cäsar Flaischlen an den Bücherkarren.

*takings scolded, stepped Cäsar Flaischlen at the bookcart*

d. Schreck fuhr in ihn, als er die Rosenthaler Straße herunterging...

*terror drove into him, when he the Rosenthaler Straße down-went*

RESTRICTIONS ON THE SUBCLAUSE. *Als* does not impose any specific restrictions on the situation type of its clausal complement. This is illustrated with states, processes, accomplishments, and achievements in (2-2).⁴

³ The examples are taken from Alfred Döblin (1929): *Berlin Alexanderplatz*. DigWö, sentences 1874, 11416, 12478, and 106.

(2-2) a. Ich war froh, als ich raus war.
   I was happy, when I out was
b. Wer aber gar nicht erbaut war, als er seine blassen... Backen sah, war
   who but PARTICLE not pleased was, when he his pale... cheeks saw, was
   Biberkopf.
   Biberkopf

c. Sie triumphierte, als sie den ersten Gilka runtergoß...
   she was-triumphant, when she the first Gilka drank
d. ... als die Rufe zur Sündenbank anfingen, wurde Reinhold in dem Saal
   when the shouts to-the sin-bench began, became Reinhold in the hall
   ganz merkwürdig...
   quite strange

However, the subclause can only introduce past intervals, i.e. intervals that are located
before the time of utterance (2-3a, b). These intervals must be characterized by
definite or specific, nongeneric, situations (2-3c).

(2-3) a. Ich war froh, als ich raus war.
   I was happy, when I out was
b. *Ich bin froh, als ich raus bin.
   I am happy, when I out am
c. Als Haie an die Küste kamen, flüchteten alle Urlauber in die Berge.
   when sharks to the coast came escaped all tourists into the mountains
   = When, at a particular occasion, sharks came near the beach, all tourists
   escaped into the mountains.
   ≠ Whenever sharks came near the beach, all tourists escaped into the
   mountains.

WHAT THE TEMPORAL CLAUSE CAN APPLY TO IN THE MATRIX CLAUSE. In
chapter IV, temporal adverbials were shown to be able to apply on three main levels
of the semantic representation of perfect clauses - the tense level, the aspect level
(which corresponds to the post-state level of the perfect construction), and the
participle level (which corresponds to the situation time of the embedded VP). (2-4) -
(2-6) illustrate and paraphrase these readings for positional and quantificational
temporal adverbials and show again the respective semantic representations as well as
the truth conditions connected with each of the three readings. (Some paraphrases
contain additional contextual specifications in order to make the intended readings
clearer; these specifications are written in brackets in the paraphrases.) - (2-4) shows
the application of the adverbials immer ('always') and dies Jahr ('this year') on the
tense level. Here dies Jahr is one of the restrictors that provide the tense time of the
clause.

(2-4) APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
a. Immer WAR Lola dies Jahr gerannt.
always had Lola this year run
= For all times t of this year that are before now [at which I asked Lola out for jogging], Lola was in a post-state of having run [shortly before t].

b. $\lambda t \left( \text{IMMER}_T \left[ \lambda t' \left( \text{I_asked_Lola_out_for_jogging} \left( t' \right) \& \text{this_year} \left( t' \right) \right) \& \text{PAST} \left( t(t') \right) \right] \right)$

$$
\left[ \lambda t' \left( \exists_A \left[ \lambda t'' \left( \text{C} \left( t'' \right) \& \text{PERF} \left( t'(t'') \right) \right) \right] \right) \right]
$$

$$
\left[ \lambda t'' \left( \exists_P \left[ \lambda t''' \left( \text{shortly_before_t'} \left( t''' \right) \& \geq \ldots t \text{ sei-} \left( t'' \right) \left( t''' \right) \right) \right) \right]
$$

$$
\left[ \lambda t''' \left( \text{Lola_renn-} \left( t''' \right) \right) \right]
$$

(c)

$$
\left[ \text{Immer}_T \text{ war Lola dies Jahr gerannt } \right] \left[ \text{now} \right] = 1
$$

iff for all times t' such that t' is a subinterval of a time at which the speaker asks Lola out for jogging, and t' is contained in this year and t' < now, there is a time t" such that t" $\subseteq$ t' and there is a time t''' such that t''' is a subinterval of the time shortly before t' and t''' $\leq$ t" and Lola runs at t'''.

(2-5) shows the application of the adverbials immer ('always') and dies Jahr ('this year') on the aspect level. Here dies Jahr helps to locate the post-state introduced by the perfect.

(2-5) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.

a. Immer IST Lola dies Jahr gerannt
always had Lola this year run
= For all times t that were, are, and will be contained in this year [and at which I ask Lola out for jogging], Lola is in a post-state of having run [shortly before t].

b. $\lambda t \left( \exists_T \left[ \lambda t' \left( \text{PRES} \left( t(t') \right) \right) \right] \right)$

$$
\left[ \lambda t' \left( \text{IMMER}_A \left[ \lambda t'' \left( \text{I_asked_Lola_out_for_jogging} \left( t'' \right) \& \text{dies_Jahr} \left( t'' \right) \& \text{PERF} \left( t'(t'') \right) \right) \right] \right) \right]
$$

$$
\left[ \lambda t'' \left( \exists_P \left[ \lambda t''' \left( \text{shortly_before_t'} \left( t''' \right) \& \geq \ldots t \text{ sei-} \left( t'' \right) \left( t''' \right) \right) \right) \right]
$$

$$
\left[ \lambda t''' \left( \text{Lola_renn-} \left( t''' \right) \right) \right]
$$

(c)

$$
\left[ \text{Immer}_A \text{ ist Lola dies Jahr}_A \text{ gerannt } \right] \left[ \text{now} \right] = 1
$$

iff there is a time t' such that t' is a subinterval of the time of the speaker's jogging-aquaintance with Lola and now $\subseteq$ t' or now $< t'$ and for all times t''
such that \( t'' \) is a subinterval of a time at which the speaker asks Lola out for jogging, and \( t' \) is contained in this year and \( t'' \subseteq t' \), there is a time \( t'' \) such that \( t'' \) is a subinterval of the time shortly before \( t' \) and \( t'' \leq t'' \) and Lola runs at \( t'' \).

Finally, in (2-6) the adverbials \textit{immer} ('always') and \textit{dies Jahr} ('this year') apply on the participle level and \textit{dies Jahr} helps to locate the situation time of the VP that is contained in the perfect construction.

\begin{enumerate}
\item \textit{Lola ist dies Jahr immer geRANNT.}
\textit{Lola has this year always run}
\textit{= For all times t of this year [at which I saw Lola], Lola ran at t.}
\item \( \lambda t \left( \exists T \left[ \lambda t' \left( C \left( t' \right) \& \text{PRES} \left( t(t') \right) \right) \right] \right) \)
\( \lambda t' \left( \exists A \left[ \lambda t'' \left( C \left( t'' \right) \& \text{PERF} \left( t(t'') \right) \right) \right] \right) \)
\( \lambda t'' \left( \text{IMMER} \left[ \lambda t''' \left( \text{I_see_Lola} \left( t''' \right) \& \text{dies_Jahr} \left( t''' \right) \& \text{ge...t sei} \left( t''(t''') \right) \right) \right] \right) \)
\( \lambda t''' \left( \text{Lola_renn} \left( t''' \right) \right) \)
\item \([\left[ \text{Lola ist dies JahrP immerP geRANNT} \right] \left( \text{now} \right) = 1 \]
\textit{iff there is a time t' such that now} \( \subseteq t' \) \textit{or now} \( < t' \) \textit{and there is a time t'' such that} \( t'' \subseteq t' \) \textit{and for all times t'''} \textit{such that} \( t''' \) \textit{is a subinterval of the times when the speaker saw Lola, and t'''} \textit{is contained in this year and t'''} \( \leq t'' \) \textit{and Lola runs at t'''}.
\end{enumerate}

The question we are concerned with in this paragraph is whether \textit{als}-clauses are in principle able to have the same semantic functions as the adverbial \textit{dies Jahr} ('this year') in the examples above, i.e. whether they can function on the tense level as well as on the aspect level and on the participle level.

Before we consider each case in turn, it is important to recall from above that certain restrictions apply to \textit{als}-clauses; they can only introduce time intervals that are definite or specific and located in the past. As a consequence, we can test the applicability of \textit{als}-clauses only in cases where they refer to past intervals that are definite or specific; this also excludes sentences where an \textit{als}-clause restricts an adverb of quantification like \textit{immer} ('always'). Note, moreover, that the examples below differ from the examples above syntactically; this is due to the fact that in contrast to nonclausal adverbials (and arguments), subordinate clauses in German cannot easily be realized in clause-internal positions. Rather, there is a strong preference to move them either into the clause-initial, so-called topicalization position in V2-clauses or into the sentence-final, so-called \textit{Nachfeld} position. Since we have so far not established a precise semantics of \textit{als}-clauses, the semantic representations and
truth conditions below can only be tentative at this point; they are based on the tentative assumption that als-clauses locate the time they apply to in the matrix clause simultaneously to the time introduced by the als-clause.

As (2-7) - (2-9) show, an als-clause can in principle apply on all three main levels of the semantic representation of perfect constructions - the tense level as well as the aspect level and the participle level.

(2-7) APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.

a. Als Mika in Paris wohnte, WAR Lola zweimal beim Frühstück gerannt.

\textit{when Mika in Paris lived was/had Lola twice at the breakfast run} = There is a subinterval of the time when Mika lived in Paris at which it was twice the case that Lola had already run [shortly before the breakfast].

b. \( \lambda t \left( \exists T \left[ \lambda t' \text{ (als\_Mika\_in\_Paris\_wohn- (t') \& PAST (t)(t'))} \right] \lambda t' \left( \text{ZWEIMAL}_{A} \left[ \lambda t'' \text{ (beim\_Frühstück (t'') \& PERF (t')(t''))} \right] \lambda t'' \left( \exists P \left[ \lambda t''' \text{ (shortly\_before\_t'' (t''') \& \text{ge...t sei- (t'')(t'''))} \right] \lambda t'' \text{ (Lola\_renn- (t'''))} \right] \right] \right) \)

c. \([[[\text{Als Mika in Paris wohnte}] \_T \text{ WAR Lola zweimal beim Frühstück gerannt}]]C \text{ (now) } = 1 \)

\( \text{iff there is a time t' such that t' is a subinterval of the time when Mika lived in Paris and t' < now and there are two times t'' such that t'' is a subinterval of the breakfast time and t'' } \subseteq t' \text{ and there is a time t''' such that t''' is a subinterval of the time shortly before t'' and t''' } \leq t'' \text{ and Lola runs at t''}. \)

The matrix clause in (2-8a) contains a past perfect in order to make sure that the als-clause is able to specify the post-state of the perfect construction and to simultaneously fulfill the past reference requirement of als.

(2-8) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.

a. Letztes Jahr WAR Lola zweimal gerannt, als Mika joggen wollte.

\textit{Last year was/had Lola twice run when Mika run wanted} = Within last year, there were two times at which Mika wanted to run and at which Lola was in a post-state of having run [shortly before].

b. \( \lambda t \left( \exists T \left[ \lambda t' \text{ (letztes\_Jahr (t') \& PAST (t)(t'))} \right] \lambda t' \left( \text{ZWEIMAL}_{A} \left[ \lambda t'' \text{ (als\_Mika\_joggen\_woll- (t') \& PERF (t')(t''))} \right] \lambda t'' \left( \exists P \left[ \lambda t''' \text{ (shortly\_before\_t'' (t''' \& \text{ge...t sei- (t''')(t'''))} \right] \right] \right) \right) \)
ge...t sei- (t'')(t''))]

[\lambda t'' (Lola_{renn-} (t'')))]))

c. [[ Letztes Jahr WAR Lola zweimal gerannt, [als Mika joggen wollte]A ] C (now) = 1

iff there is a time t' such that t' is a subinterval of last year and t' < now and there are two times t'' such that t'' is a subinterval of the time when Mika wanted to run and t'' \subseteq t' and there is a time t''' such that t''' is a subinterval of the time shortly before t'' and t''' \leq t'' and Lola runs at t''.

Because of the past reference requirement imposed on als-clauses, the present perfect in (2-9a) guarantees that the als-clause in this example can only specify the situation time of the embedded VP; this is the only time parameter that can be located in the past.

(2-9) APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.

a. Lola ist geRANNT, als Mika schlief.

Lola has run when Mika slept

= There is a time before now at which Lola ran and Mika slept.

b. \lambda t \left( \exists_T \left[ \lambda t' (C (t') & \text{PRES} (t)(t')) \right] \right)

\left[ \lambda t' \left( \exists_A \left[ \lambda t'' (C (t'') & \text{PERF} (t')(t'')) \right] \right) \right]

\left[ \lambda t'' \left( \exists_P \left[ \lambda t''' (als_{Mika_schlaf-} (t''') & ge...t sei- (t'')(t'')) \right] \right) \right]

[\lambda t''' (Lola_{renn-} (t'')))]))

c. [[ Lola ist gerannt, [als Mika schlief]P ] C (now) = 1

iff there is a time t' such that now \subseteq t' or now < t' and there is a time t'' such that t'' \subseteq t' and there is a time t''' such that t''' is a subinterval of the time when Mika slept and t''' \leq t'' and Lola runs at t'''.

To summarize, it was shown that temporal subclauses introduced by als can apply on various levels of the semantic representation of their matrix clause. They can specify tense times as well as aspect times or, in perfect constructions, the situation time of an embedded VP. As will become clear in the course of this chapter, this holds for temporal subclauses in general.

This result is in clear contrast to assumptions previously favored in the literature. Some authors claim, for instance, that temporal subclauses in general specify the tense time (or reference times, topic times, or Betrachtzeiten, depending on the terminology) of their matrix clause (cf. Partee (1984), Zifonun et al. (1997), van Geenhoven (1999), and others). Other authors assume that temporal subclauses
specify the situation time of the matrix clause (cf. traditional grammars, Rooth (1985),
and others). According to the present proposal, these accounts capture only part of the
picture.

But even accounts that admit for an application of temporal subclauses on two
levels - i.e. the situation time of the VP and the post-state in a perfect clause - (cf.
Herweg (1990), are too simple; the full range of applications of temporal subclauses
includes at least the three options established in this paragraph.

WHAT THE CONJUNCTION CAN APPLY TO IN THE SUBCLAUSE. The conjunction
als can clearly sort out the post-state (2-10b) as well as the situation time of an
embedded VP (2-10c) in a perfect subclause, i.e. it can apply in the subclause on the
aspect level as well as on the participle level. The choice is at least in part determined
by the stress pattern of the clause in the same way as the application of temporal
adverbials is: focus accent on the verb or VP triggers application to the situation time
of the VP, while focus accent on the auxiliary triggers application on the aspect level.

It is less clear whether the conjunction can also apply on the tense level. In order
to decide this, one has to construct a clause that enables one to distinguish the tense
time from the aspect time, i.e. in a perfect clause, the time of the post-state. This can
only be achieved when a tense time contains several aspect times, i.e. in a simple
tense clause, several situation times of the VP as in (2-10a). If letzte Woche ('last
week') in this sentence restricts the tense time of the subclause and als in (2-10a) can
sort out the tense time, then a subinterval of last week functions as the als-interval in
(2-10a), i.e. the sentence expresses something like: "At some time last week, Mika
was writing his book and Lola met with Max eight times." This reading is indeed
available. Note, however, that the sentence is not able to express something like: "At
each of the eight times when Lola met with Max last week, Mika was writing his
book." Under this reading, als would not sort out the tense time, but rather again the
aspect time of the clause. We will come back to this point below.

(2-10) a. APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
Mika schrieb an seinem Buch, als Lola letzte Woche achtmal Max traf.
*Mika wrote at his book when Lola last week eight-times Max met*
= At some time last week, Mika was writing his book and Lola met with
Max eight times.
b. APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
Mika kam, als Lola gegangen WAR.
*Mika came when Lola had left had/ was*
= Mika came when Lola had left already.
c. APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
Mika war gekommen, als Lola geSCHLAFen hatte.
*Mika was/had come when Lola slept had*
= Mika came when Lola was asleep.
To summarize, just as temporal adverbials in general and temporal subclauses in particular can apply as specifiers on all three levels - the tense level, the aspect level, and the participle level - temporal conjunctions can apply on these three levels within their complement clause, too. To my knowledge, these different uses of temporal conjunctions have not yet been adequately distinguished and treated in the literature at all.

THE TEMPORAL RELATION EXPRESSED BY THE CONJUNCTION. The first intuition about als-clauses is that they express some kind of simultaneity between the main clause and the subclause (cf. Zifonun et al. (1997) and others). This view, however, does not seem to be quite right to some authors. Thus, Helbig and Buscha (1989:682), for instance, mention simultaneity readings of als-clauses (2-11a) as well as anteriority readings, where the VP-situation contained in the subclause takes place before the VP-situation of the matrix clause (2-11b). While the anteriority effect in (2-11b) can be attributed to the presence of the past perfect in the subclause as will be explained shortly, there appear to be related examples with anteriority or posteriority readings that do not contain perfect constructions: thus, the situation described by the matrix clauses in (2-11c, d, and f) is most likely located shortly after the situation of the als-clause; in (2-11e), it is most likely located before it; the analogous reading is also available for (2-11g). Such effects arise especially when als-clauses contain achievements or accomplishments.5

(2-11) a. Ich habe ihn besucht, als ich neulich in Dresden war.
   I have him visited when I recently in Dresden was
b. Der Anruf kam, als sie das Haus verlassen hatte.
   the call came when she the house left had
c. Als Maria Hans erblickte, erschrak sie.
   when Maria Hans discovered alarmed she
d. Als Hans sich ein Bein brach, fuhr Maria ihn ins Krankenhaus.
   when Hans himself a leg broke drove Maria him into-the hospital
e. Als Maria ihr neues Geschäft eröffnete, lud sie auch Hans ein.
   when Maria her new shop opened invited she also Hans in
f. Als ich meine Frau und das Kind nicht zu Hause fand... hab ich mir hier
   when I my wife and the child not at home found... have I myself here
   einen Ritz beigebracht.
   a cut inflicted

g. Als sie vor die Haustür traten, gab Reinhard ihr den Arm, ...
   when they before the frontdoor stepped gave Reinhard her the arm

5 The examples in (c), (d), and (e) are taken or adapted from Herweg (1990:271); (f) is taken from Alfred Döblin (1929): Berlin Alexanderplatz. DigWö, sentence 1273; (g) is taken from Theodor Storm (1850): Immensee. Digbib, p29.
(2-11c) is most likely understood as expressing that Maria was alarmed short after
discovering Hans. Similarly, in (2-11d) Maria most likely took Hans to the hospital
shortly after he had broken his leg. And the cut mentioned in (2-11f) most likely
happened after the discovery that the wife and the child were not at home. Maria's
invitation of Hans in (2-11e), however, most likely took place before she opened the
store. And Reinhard's gesture in (2-11g) may have happened as a kind of preparation
for leaving the house.

How can these phenomena be captured in the semantics of *als*? - Traditional
grammars usually just list three different uses of *als*, expressing either simultaneity,
anteriority, or posteriority (cf. Helbig and Buscha (1989: 454), Duden-Grammatik
(p396), and others). This, however, is not a satisfactory solution. Moreover, as will
become clear shortly, the examples in (2-11) display two different types of
phenomena. First, the difference between the examples in (2-11a, b) arises because
temporal conjunctions ultimately can establish temporal relationships between either
the tense time, the aspect time, or - in the case of perfect constructions - the participle
time of their clausal complement on the one hand and either the tense time, the aspect
time, or - in the case of perfect constructions - the participle time of their matrix
clause on the other hand. Second, the differences between the examples in (2-11c-e)
are mainly due to the fact that *als*-clauses can specify tense times and the fact that
tense times can provide more or less large time frames for the aspect times of their
clauses. - Let us now consider the former case in detail.

Considering the results from above - that an *als*-clause can apply on at three
different levels of its matrix clause and that the conjunction *als* itself can apply on
three different levels of its clausal complement, too - it is not surprising that the
semantics of an *als*-clause (and of temporal subordinate clauses in general) is
somewhat confusing and that it is all but clear what the precise semantic contribution
of the conjunction *als* is. This is so especially because the intuitions of many authors
concerning the temporal relation established by *als* between the subclause and its
matrix clause are formulated in terms of the VP-situation times of the clauses (cf.
Helbig and Buscha (1989)). But the crucial temporal relation is in fact not necessarily
established between the VP-situation times. Rather it can be established between any
one of the various time parameters of the matrix clause and any one of the various
time parameters of the subclause.

Thus, the facts are pretty complicated. When the temporal conjunction can apply
on three levels, and the subclause as a whole can apply on three levels, too, then nine
pairs of arguments of the temporal relation are logically possible. Even for a simple
uniform lexical entry, this predicts a considerable variety of readings.

Moreover, recall that the tense time, the post-state, and the situation time of the
VP involved in a perfect clause can be temporally related to each other in different
ways. Let me briefly recapitulate the essential possibilities, as outlined in chapters I
and II.

1. The aspect time - i.e. in perfect clauses, the contextually relevant part of the post-
state - that is located by the perfective default aspect within the tense time can be a
proper part of the tense time or take up the whole tense time (cf. chapter I and chapter II).
2. The situation time of the embedded VP in a perfect clause can be located completely before the tense time and be distant to it or touch the tense time or reach into the tense time or even beyond the tense time into its relative future. Hence, contextually irrelevant parts of the post-state can be located before the tense time or the post-state can begin within the tense time (cf. chapter II).
3. Differences between atelic and telic VP-situations cause fundamentally different relationships between VP-situation times and their post-states: with atelic VP-situations, the post-state starts right after the beginning of the respective situation, i.e. in this case largely overlaps with the VP-situation time; the post-states of telic VP-situations, however, immediately follow the VP-situation time but never intersect with it (cf. chapter II).
4. Among post-state intervals, typical post-states and target-states can play a special role and consequently blur the picture regarding the temporal location of the post-state interval (cf. chapter II).
5. If temporal subclauses only locate a truth-interval of the matrix clause situation they specify instead of whole situations, then this causes even more possibilities of how the subclause and the matrix clause situations can be temporally related to each other.

In (2-12), I sketch some time schemata that will be used below in order to illustrate possible temporal relationships between matrix clauses and subclauses. The four pictures in (2-12) concern matrix clauses and subclauses containing perfect constructions. They illustrate simple time schemata of atelic matrix clauses, atelic subclauses, telic matrix clauses, and telic subclauses, respectively, where the tense times (TT) are chosen in each case to not touch the VP-situation time (VP). The contextually relevant part of the post-state (PS) within the tense time interval is not marked separately from the tense time. I assume below that it is basically just as long as the marked tense time itself. The time schemata of the matrix clauses are sketched above their time arrow, the time schemata of the matrix clauses below their time arrow, so that the schemata of matrix clauses and subclauses can be easily combined in the graphics below. (Keep in mind, though, that these are by no means the only possible time schemata connected with perfect clauses; each of them shows only one particular constellation of tense time, post-state, and VP-situation time. The post-states are in fact infinite on their right side, of course.)
Let us now consider the case of *als* - what options for temporal relations between matrix clauses and subclauses are predicted to occur according to what was said above?

Suppose *als* expresses that a truth-interval of the time specified by the *als*-clause in its matrix clause is located within the interval provided by the time *als* applies to in its clausal complement (We will somewhat revise this view below, but for the moment it seems adequate enough.). Then the present framework predicts for combinations of atelic situations in both the matrix clause and the *als*-clause the options illustrated by the time schemata in (2-13). In each of the pictures, several options for the subclauses that satisfy the meaning contribution of *als* in the particular case are indicated. These options are due to the assumption that temporal clauses locate only truth-intervals of matrix clause situations but not whole matrix clause situations. Note that a further assumption made in (2-13) is that the aspect time is just as large as the tense time; as a consequence of this assumption, some pictures below are basically identical in principle and hence, are shown only once. Constellations that are shown in pictures are further illustrated by examples.
(2-13) a. *Als* relates to the tense time of its clausal complement; the subclause applies on the tense time level.

\[\text{matrix clause} \quad \begin{array}{c}
\text{VP} \\
\text{PS} \\
\text{TT}
\end{array}\quad \begin{array}{c}
\text{VP} \\
\text{PS} \\
\text{subclause} \\
\text{TT}
\end{array}\quad \begin{array}{c}
\text{VP} \\
\text{PS} \\
\text{subclause} \\
\text{TT}
\end{array}\quad \begin{array}{c}
\text{VP} \\
\text{PS} \\
\text{subclause} \\
\text{TT}
\end{array}\]

\[\text{a'}. \quad \text{Als Lola letzte Woche achtmal gerannt WAR, HATte Mika drei Bände "Harry Potter" gelesen.} \]

\[\text{when Lola last week eight-times run had had Mika three volumes "Harry Potter" read} \]

\[= \text{There is a subinterval of the time of last week, during which Lola was in the post-state of running eight times, at which Mika had finished reading three volumes of "Harry Potter".} \]

(2-13) b. *Als* relates to the tense time of its clausal complement; the subclause applies on the aspect time level.

\[\text{[In principle, same picture as in (a).]} \]

(2-13) c. *Als* relates to the tense time of its clausal complement; the subclause applies on the participle time level.

\[\text{c'}. \quad \text{Als Lola letzte Woche achtmal gerannt HATte, hatte Mika "Harry Potter" gelesen.} \]

\[\text{when Lola last week eight times ran had Mika "Harry Potter" read} \]
There is a subinterval of the time last week when Lola was in the post-state of running eight times such that Mika was reading "Harry Potter" at that time.

(2-13) d. \textit{Als} relates to the aspect time of its clausal complement; the subclause applies on the tense time level.

[In principle, same picture as in (a).]

(2-13) e. \textit{Als} relates to the aspect time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (a).]

(2-13) f. \textit{Als} relates to the aspect time of its clausal complement; the subclause applies on the participle time level.

[In principle, same picture as in (c).]

(2-13) g. \textit{Als} relates to the participle time of its clausal complement; the subclause applies on the tense time level.

\textsc{musan: temporal subordinate clauses}

\begin{itemize}
  \item g'. Als Mika in Paris gewohnt hatte, WAR Lola zweimal beim Frühstück zur- run
\end{itemize}
There is a subinterval of the time when Mika lived in Paris at which it was twice the case that Lola had already run [shortly before the breakfast].

(2-13) h. *Als* relates to the participle time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (g).]

(2-13) i. *Als* relates to the participle time of its clausal complement; the subclause applies on the participle time level.

\[ \text{Als Mika geSCHLAfen hat, ist Lola geRANNT.} \]

\[ \text{when Mika slept has is/has Lola run} \]

= There is a subinterval of the time when Mika slept such that Lola ran at that time.

At this point, it should be at least clear that the VP-situation times of an *als*-clause and its matrix clause are predicted to be able to realize all kinds of possible temporal relations: the VP-situation time of the matrix clause can be located (partially) before ((2-13a, iii), (2-13g), (2-13i, ii)) or after ((2-13a, i), (2-13c), (2-13i, i)) the VP-situation time of the *als*-clause or be simultaneous with it ((2-13a, ii), (2-13i, ii)).

But how about simple tense clauses? Since they do not involve post-states, they display fewer possible relation types, of course. Consider the picture in (2-14a). It involves only a tense time and the situation time of the VP; the aspect time of perfective clauses is a contextually relevant part of this situation time that is contained within the tense time. If *als*-expresses that a truth-interval of the time parameter the *als*-clause specifies in the matrix clause is located within the time interval provided by the time parameter *als* applies to in its clausal complement, then the variety of possible constellations between the matrix clause and the subclause are as indicated in the picture.
(2-14) a. *Als* relates to the tense time of its clausal complement; the subclause applies on the tense time level.

![Diagram](image)

(2-14) b. *Als* relates to the tense time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (a).]

(2-13) d. *Als* relates to the aspect time of its clausal complement; the subclause applies on the tense time level.

[In principle, same picture as in (a).]

(2-14) e. *Als* relates to the aspect time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (a).]

Suppose now that the matrix clause and the subclause do not involve atelic situations but telic ones, say achievements. As the picture (2-15a) shows, which corresponds to (2-14) but involves telic situations, then in the case where the tense times are related to each other by *als*, all kinds of sequences between the VP-situation times of the matrix clause and the subclause can arise.
(2-15) a. *Als* relates to the tense time of its clausal complement; the subclause applies on the tense time level; the situations referred to are achievements.

Hence, also in simple tense clauses, the VP-situation times of an *als*-clause and its matrix clause are predicted to be able to realize all kinds of possible temporal relations: the VP-situation time of the matrix clause can be located (partially) before or after the VP-situation time of the *als*-clause or be simultaneous with it.

Let us now consider how one may deal with the differences between sentences such as (2-11c-e), repeated here as (2-16).

(2-16) a. Als Maria Hans erblickte, erschrak sie.
   *when Maria Hans discovered alarmed she*

   b. Als Hans sich ein Bein brach, fuhr Maria ihn ins Krankenhaus.
   *when Hans himself a leg broke drove Maria him into-the hospital*

   c. Als Maria ihr neues Geschäft eröffnete, lud sie auch Hans ein.
   *when Maria her new shop opened invited she also Hans in*

How can the apparent different temporal relationships in these and many similar sentences be captured?

Heinämäki (1978:27) proposes two separate truth-conditions for English *when*-clauses for the cases of simultaneity with atelic clauses and sequencing with telic clauses. This, however, is not a desirable solution. If possible, one wants a single lexical entry of *als* (or *wenn*) that applies uniformly across situation types expressed in the *als*-clause.

Hinrichs (1986) proposes that an *als*-clause (like other temporal subclauses in his account) introduces a new reference time that is located after the time of the last mentioned event. In this respect, *als*-clauses are similar to matrix clauses. Telic situations in the matrix clause are then located in, atelic situations around the new reference time. When both the matrix clause and the subclause are atelic, both the situation introduced by the matrix clause and the situation introduced by the subclause are located within the new reference time, where the precise relation between the two situation times remains semantically unspecified. - This approach, however, does not seem anymore desirable than Heinämäki's: as we saw above, *als*-clauses can specify tense times as well as aspect times and (in perfect clauses) participle times, and the
conjunction can apply to each of the three time parameters in the subclause as well; hence, an account taking only reference times into account is not tenable.

Herweg (1990:270) proposes to capture the temporal relation expressed by *als* as vague simultaneity in the sense of Kamp (1979), a relation that takes the cognitive restrictedness of human beings into account insofar as the determination of precise relations between times during the perception of events is concerned. Herweg proposes that the situation introduced by an *als*-clause and the situation it specifies in the matrix clause just have to overlap (similarly Zifonun et al. (1997), and de Swart (1999) for the English conjunction *when*). But beyond this, he proposes that overlapping captures only the canonical interpretation of *als*-clauses. Sequential interpretations can arise because of extralinguistic considerations - namely, when assumptions of knowledge concerning the temporal relation between matrix clause situation and subclause situation exclude their overlapping (p276). Note, however, that overlapping is by no means excluded in the sentences in (2-16). Rather, it does not seem particularly likely because of knowledge concerning typical sequences of situations or typical causal connections between situations.

The same observations have led some authors to the view that *als* is semantically neutral with regard to temporal location; apparently expressed temporal relations are due to world knowledge concerning factors like causality or typical sequences of events of particular types (e.g. Bäuerle (1995); also Hinrichs (1986) account is a variant of this view).

Finally, Wunderlich (1970) and Partee (1984) try to capture the sequencing case as a relation of immediate adjacency or as not being separated by a third, contextually relevant, situation.

Which of these different hypotheses is most adequate? And why is there such a remarkable uncertainty about the meaning of *als* (and, to some extent, other temporal conjunctions, as will become clear in the remainder of this chapter)?

As I said above, the differences between the examples in (2-16) are mainly due to the fact that *als*-clauses can specify tense times and the fact that tense times can provide more or less large time frames for the aspect times of their clauses. I will argue that even though *als* locates a truth interval of the relevant matrix clause time within the relevant time of the *als*-clause, the VP-situations can be sequential. Let us have a closer look at the examples in order to show this.

Consider (2-16b). In (2-16b), as in (2-16a), the VP-situations described in the *als*-clause and in the matrix clause are not simultaneous. Rather, the situation of the matrix clause is located after the situation of the *als*-clause. Why is this possible? - Suppose the relevant time parameter selected by *als* under the most likely reading of the sentence is the tense time of the *als*-clause. And the *als*-clause specifies the aspect time of its matrix clause. The tense time can be characterized as something like "the time relevant with regard to Hans' accident" or "the time around Hans' accident"; when the tense time is characterized in these terms, it may be relatively long and include, for instance, Hans' whole skiing vacation as well as Hans' recovering time after the accident. Then the following picture can easily arise, where Hans' accident is, of course, located within the tense time of the *als*-clause and the driving to the
hospital is located within the tense time. It is clear that under these conditions, there is no problem with the accident and the driving to the hospital being sequential. (For reasons of simplicity, I assume that the tense time of the embedded clause and the one of the matrix clause are identical. This is not necessarily so, of course.)

Similarly, the VP-situation of the matrix clause could in principle be located before the VP-situation. This is the case under the most likely reading of (2-16c), illustrated in the picture in (2-18). Again, we may assume that the tense time of the als-clause is something like "the time relevant with regard to Maria's opening her new shop"; this time may in fact be quite long and include all kinds of activities of Maria - like deciding to open the shop, taking care of the financial side, renting space, planning the opening party, and surviving the first months with the new shop.

As became clear in the discussion of the data and relevant literature at the beginning of this paragraph, our account predicts that simultaneity as well as various sequencings of the VP-situation times between matrix clause and als-clause can occur. Thus, the present framework is appropriate for capturing and explaining the remarkable variety of temporal relationships established by als, even under the assumption of the simple meaning contribution of als that we adopted here: at least a truth-interval of the time parameter specified by the als-clause in its matrix clause is located within the interval provided by the time parameter als applies to in its clausal complement. We will discuss this semantics further in section 2.4.

THE TENSES IN MATRIX CLAUSE AND SUBCLAUSE. Since als is past-oriented, it can only be combined with tense constructions in the subclause that can express past meanings, e.g. past tense, past perfect, and present perfect, and present tense under a historical present tense reading. Since als expresses overlapping of the matrix clause situation and the subclause situation, the tense constructions in matrix clause and subclause often agree; generally speaking, they must be able to locate the respective
situations in such a way that they are able to overlap. (2-19) lists some illustrating examples.

(2-19) a. Maria ist spazieren gegangen, als Hans schlief.
   Maria is/has walking gone when Hans slept
b. Maria ging spazieren, als Hans schlief.
   Maria went walking when Hans slept
c. Maria ging spazieren, als Hans geschlafen hat.
   Maria went walking when Hans slept
d. Maria ist spazieren gegangen, als Hans geschlafen hat.
   Maria is/has walking gone when Hans slept has
e. Maria war spazieren gegangen, als Hans geschlafen hatte.
   Maria was/had walking gone when Hans slept had

LEXICAL ENTRY. The results concerning the temporal relation expressed by als are summarized in the lexical entry in (2-20). The conjunction is treated here as a function of type \(<i, t>, <i, t>\).

(2-20) \([\text{als}]^{c} = \text{the function } f: D_{<i, t>} \rightarrow D_{<i, t}>\)
such that for any \(g \in D_{<i, t>}, t \in D_{i}, f (g) (t) = 1\)
iff there is a \(t^{*} \in D_{i}\) such that \(g (t^{*}) = 1\) and \(t\) is a subinterval of \(t^{*}\).

Als can head only clauses that refer to a specific event in the past.

We will now show how the semantics of temporal subordinate clauses introduced by the conjunction als - and, analogously, the semantics of other temporal subordinate clauses - is, on the basis of lexical entries as in (2-20), integrated into the present formal semantic framework.

INTEGRATION INTO THE FORMAL SEMANTIC FRAMEWORK. Any temporal subclause as well as any matrix clause contains an independent temporal structure of its own. Thus, the tenses contained in temporal subclauses receive an interpretation which depends on their local evaluation time - in most cases, the time of utterance. Moreover, temporal subclauses, like matrix clauses, establish tense times on their own, etc. Roughly speaking, temporal subclauses are constructed of propositions by the addition of temporal conjunctions.

Depending on the choice of the conjunction, temporal clauses can correspond to position or to duration adverbials. The former type is realized by conjunctions like als ('when'), bevor ('before'), and nachdem ('after'), for instance, while the latter type is realized by conjunctions like bis ('until') and solange ('as long as'), for instance. As we have seen in this section and will see in the sections on other temporal conjunctions, they are - regardless of their positional or durational nature and regardless of their concrete semantic contribution - able to form temporal predicates of type \(<i, t>\) on the basis of different time parameters in their clausal complement, sorting thus out either the tense time of their clausal complement or its aspect time or,
in case of perfect constructions, its participle time, i.e. the VP-situation time of the clause.

In order to perform this task, the relevant time variable contained in the subclause is not bound by the usual adverb of quantification embedded in the clause structure but by a lambda-abstractor that is located below the conjunction and forms a temporal predicate of type \langle i, t \rangle.\(^6\)

Since the adverb of quantification is missing in the structure, it cannot form a tripartite structure consisting of a quantifier, its restrictive clause, and its nuclear scope. Hence, the material constituting the restrictive clause and the nuclear scope in quantificational structures is by default conjunctively interpreted.

This semantics of temporal subclauses predicts that the occurrence of an overt adverb of quantification on a particular level of the semantic representation of a temporal subclause, e.g. on its aspect level, blocks the sorting out of the respective time parameter by the conjunction because it binds the time variable so that it cannot be bound by the lambda-abstractor below the conjunction. This prediction is indeed borne out: recall the interpretation of (2-10a); as was mentioned above, (2-10a) cannot have a reading expressing something like: "At each of the eight times when Lola met with Max last week, Mika was writing his book," where the quantificational adverbial \(achtmal\) ('eight times') applies on the aspect level. If the presence of the quantificational adverbial did not block the sorting out of the aspect time, then this reading should be available.

The temporal conjunction is of type \(<<i, t>, <i, t>>\). Thus, it takes the temporal predicate it \(c\)-commands and delivers another temporal predicate that applies to a time variable whose value is determined by its position within the matrix clause.

In the remainder of this section, we will illustrate these ideas for the example in (2-21a). In order to keep the illustration as simple as possible, the sentence in (2-21a) contains a simple tense matrix clause as well as a simple tense subclause. The interpretation of perfect clauses works analogously; it only differs from the one of simple tense clauses insofar as it contains the participle level of the semantic

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\(^6\) Interestingly, several temporal conjunctions appear to be morphologically constructed out of a preposition and the optional or obligatory addition of an element that sometimes, but not always, looks like a determiner, cf. \(nach\ - nachdem, vor\ - bevor, seit\ - seit(dem), während\ - während(dem/dessen)\). In the cases where this conjunction appendix is optionally added, the interpretations with or without the appendix do not seem to differ. (Note that the addition of \(dass\) ('that') as in \(Nachdem dass er sie betrogen hatte...\) ('after (that) he had cheated on her...') or \(...bis dass der Tod euch scheide...\) ('...until (that) death will separate you...') is an independent phenomenon.) I propose that this conjunction appendix is a kind of overt marker of the lambda-abstractor that sorts out a time parameter from within the subclause. According to this view, the conjunction appendix is similar to overt scope markers like \(was\) ('what') in sentences like (A).

(A)What believe you whom Hans met has

Was in (A) can be analyzed as an item that indicates that the scope of the \(wh\)-word \(wen\) is wider than the embedded clause in which it occurs (cf. Stechow and Sternewald (1988:290)).
representation in addition to the tense and the aspect level in simple tense clauses. Note that here we will not be concerned with the fact that temporal subclauses in German, like most other subclauses in this language, are usually extraposed to the sentence-final position so that their interpretation also involves a step of reconstruction or interpretation of the trace left by the extraposed subclause.

(2-21b) shows the LF-representation constructed for the example in (2-21a) under the reading where *als* abstracts over the aspect time variable in its clausal complement and where the *als*-clause as a whole applies on the tense time level of its matrix clause. As in many representations above, irrelevant contextual restrictions of the (implicit) quantificational adverbs are omitted. The part of the representation that concerns the temporal subclause is printed bold.

(2-21) a. Hans schlief, als Lola rannte.
   *Hans slept when Lola ran*

b. \[ \lambda t \left( \exists_T \left( \lambda t^* \left( \lambda t_3 \left( \lambda t_a \left( \exists_T \left( \lambda t_1 \left( \text{PAST} \left( (t_1)(t_a) \right) \right) \right) \right) \left( \text{PAST} \left( (t^*)(t_a) \right) \right) \right) \left( \text{PERF} \left( (t_1)(t_a) \right) \right) \left( \text{Lola_renn} \left( (t_a) \right) \right) \right) \right) \right) \]

Under these assumptions, the calculation of truth conditions for the example in (2-21a) works as follows. (Note that in the calculation below, procedures of \( \lambda \)-conversion and applications of variable assignments are performed in one step.)

\[
[[\text{Hans schlief, [als}_{T} \text{ Lola rannte}_{T}]_{T}]_{T}^{c} \text{ (now)} = 1
\]

iff (by 4 Tripartite Structure Constructions)

\[
[[\lambda t \left( \exists_T \left( \lambda t^* \left( \lambda t_3 \left( \lambda t_a \left( \exists_T \left( \lambda t_1 \left( \text{PAST} \left( (t_1)(t_a) \right) \right) \right) \right) \right) \left( \text{PAST} \left( (t^*)(t_a) \right) \right) \right) \right) \right)]]_{T}^{c} \text{ (now)} = 1
\]

iff (by \( \lambda \)-Conversion/vbl. ass.)

\[
[[\exists_T \left( \lambda t^* \left( \lambda t_3 \left( \lambda t_a \left( \exists_T \left( \lambda t_1 \left( \text{PAST} \left( (\text{now})(t_1) \right) \right) \right) \right) \right) \right)]]_{T}^{c} \text{ (now)}
\]
iff (by the lexical entry of \( \exists T \), by Predicate Modification applied to the RC of \( \exists T \), and by \( \lambda \)-Conversion/vbl. ass.)

there is a time \( t'' \) such that

\[
[[ \lambda t_a (\exists T [\lambda t_1 (PAST (now)(t_1))] [\lambda t_1 (PERF(t_1)(t_a) & Lola_renn- (t_a))])(t_3))] \land \\
[PAST (now)(t*)] \land \\
[\lambda t_2 (\exists A [\lambda t_2 ** (PERF (t_3)(t_2 **))][\lambda t_2 ** (Hans schlaf- (t_2 **))])]]^c = 1
\]

iff (by the lexical entry of \( als \), by the lexical entry of \( PAST \), by the lexical entry of \( \exists A \), by Predicate Modification applied to the RC of \( \exists A \), and by \( \lambda \)-Conversion/vbl. ass.)

there is a time \( t'' \) such that

\[
[[ \lambda t_a (\exists T [\lambda t_1 (PAST (now)(t_1))] [\lambda t_1 (PERF(t_1)(t_a) & Lola_renn- (t_a))])(t_3))] \land \\
[PAST (now)(t*)] \land \\
[\lambda t_2 (\exists A [\lambda t_2 ** (PERF (t_3)(t_2 **))][\lambda t_2 ** (Hans schlaf- (t_2 **))])]]^c = 1
\]
and

\( t'' \) is located within/intersects with \( t^\wedge \)
and
\( t'' < \text{now} \)
and
there is a time \( t^* \) such that \( t^* \subseteq t'' \) and Hans sleeps at \( t^* \).

iff (by the lexical entry of \( \exists_T \), by Predicate Modification applied to the RC of \( \exists_T \), and by 2 \( \lambda \)-Conversion/vbl. ass)

there is a time \( t'' \) such that

there is a \( t^\wedge \) such that

there is a \( t' \) such that

\[ \text{PAST (now)(t')} \] \( c = 1 \)
and

\[ [\text{PERF} (t')(t^\wedge) \& \text{Lola_renn-} (t^\wedge)] \] \( c = 1 \)
and

\( t'' \) intersects with \( t^\wedge \)
and
\( t'' < \text{now} \)
and
there is a time \( t^* \) such that \( t^* \subseteq t'' \) and Hans sleeps at \( t^* \).

iff (by the interpretation of conjunction and by the remaining lexical entries)

there is a time \( t'' \) such that

there is a \( t^\wedge \) such that

there is a \( t' \) such that

\( t' < \text{now} \)
and \( t^\wedge \subseteq t' \)
and Lola runs at \( t^\wedge \)
and \( t'' \) is a subinterval of \( t^\wedge \)
and \( t'' < \text{now} \)
and there is a time \( t^* \) such that \( t^* \subseteq t'' \) and Hans sleeps at \( t^* \).

This corresponds exactly to the intuitions concerning the meaning of (2-16a).

\[ \text{2.2. Wenn (‘when’)} \]

It is well-known that the conjunction \textit{wenn} exhibits a number of different readings. First, it can function as a genuine temporal conjunction with reference to a specific time interval (2-22a). Second, it can trigger a habitual-generic reading as in (2-22b), which may be viewed as a temporal use with a generic time interpretation. Third,
Wenn can receive a quantificational reading (2-22c); fourth, it can trigger a conditional reading (2-22d).

(2-22) a. Wenn Eva nachher wach ist, gehe ich mit ihr Eis essen.
   when Eva soon awake is, go I with her ice-cream eat
b. ... ja ein fallendes geschmolzenes Blei, wenn es Zeit hat, völlig zu
   yes a falling melted lead, when it time has, completely to
   erstarren, kommt unten in Gestalt einer Kugel an
   solidify, comes below in form of-a ball PARTICLE
c. ... sie weiß vieles und recht gut; nur wenn man sie fragt, scheint sie
   she knows much and relatively well; only when one her asks, seems she
   nichts zu wissen.
   nothing to know
d. Hier siehst du... wie wenig eigentlich ein Dritter fruchtet, wenn es
   here see you... how little actually a third is-of-use, when it
   zwischen zwei nah verbundenen Personen nicht ganz im Gleichgewicht
   between two near connected people not completely in-the balance
   steht.
   stands

In what follows, we will focus on temporally specific readings, such as in (2-22a) and on temporally quantificational readings and only marginally refer to generic readings, too. It should be noted, however, that the various readings are often difficult to keep apart, in particular when nontemporal components come into play; this is also true, though perhaps less so, for other conjunctions, such as bevor, nachdem, and während (see below).

These readings are closely connected to the meaning of the conjunction als (definite, past-oriented 'when'), which was discussed above. According to Wunderlich (1970), Steube (1980), Herweg (1990:268), and others, als and wenn are synonymous with regard to the temporal relation they establish between the matrix clause and the subclause. Temporal wenn, however, is - largely but, to my mind, not always - future-oriented, while als is past-oriented. Since a great deal of what has been said for als also applies to wenn, the following discussion can be shorter.

RESTRICTIONS ON THE MATRIX CLAUSE. Wenn does not impose any specific restrictions on the situation type of its matrix clause. This is illustrated in (2-23).

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7 The examples in (b)-(d) are taken from Johann Wolfgang von Goethe (1809): Die Wahlverwandtschaften. Tübingen: Cotta. Digibib, p40, p52, and p25.
8 The examples are taken from Alfred Döblin (1929): Berlin Alexanderplatz. DigWö, sentences 3168, 5066, 2107, 5616.
MUSAN: TEMPORAL SUBORDINATE CLAUSES

(2-23) a. ... wenn er spät nach Hause kommt, dann liegt die alte Frau wach ...  
when he late to home comes, then lays the old woman awake
b. ... morgen früh, wenn Reinhold weg ist, gehst du zu seine Trude und redst  
tomorrow early, when Reinhold away is, go-you to his Trude and talk
mit ihr.  
with her
c. In der Elsasser Straße die Brüder lachen sich schief, wenn er  
in the Elsasser Straße the brothers laugh themselves crooked when he
mittags antritt in der Kneipe...  
at-noon arrives in the bar
d. Hier geben Sie die Karte ab, nachher, wenn Sie nach Hause gehen, ...  
here give you the card PARTICLE, later, when you to home go

RESTRICTIONS ON THE SUBCLAUSE. Wenn does not impose any specific restrictions on the situation type of its clausal complement. This is illustrated with states, processes, accomplishments, and achievements in (2-24).9

(2-24) a. ... morgen früh, wenn Reinhold weg ist, gehst du zu seine Trude und redst  
tomorrow early, when Reinhold away is, go-you to his Trude and talk
mit ihr.  
with her
b. ... eigentlich wirkt alles vergänglich und bedeutungslos, wenn man ihn  
actually seems everything transient and meaningless, when one him
sieht.  
sees
c. ... wenn einer erkrankt ..., kommt der Arzt gelaufen.  
when one falls-ill... comes the physician run
d. In der Elsasser Straße die Brüder lachen sich schief, wenn er  
in the Elsasser Straße the brothers laugh themselves crooked when he
mittags antritt in der Kneipe...  
at-noon arrives in the bar

WHAT THE TEMPORAL CLAUSE CAN APPLY TO IN THE MATRIX CLAUSE. (2-25) - (2-27) illustrate that wenn-clauses can in principle apply on the tense level as well as the aspect level and the participle level. The application on the participle level seems to be easily available preferably with nonspecific time interpretations; hence, (2-27) is constructed with the quantificational adverbial immer (‘always’) on the participle level in order to be easily comprehensible.

9 The examples are taken from Alfred Döblin (1929): Berlin Alexanderplatz. DigWö, sentences 5066, 2185, 3536, 2107.
(2-25) APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
   a. Wenn Mika weg ist, wird Lola zweimal beim Frühstück gerannt SEIN.
      when Mika away is will Lola twice at-the breakfast run have/be
      = There is a subinterval of the time when Mika will be away at which it will
      be twice the case that Lola will already have run [shortly before the
      breakfast].
   b. \( \lambda t \left( \exists T \left[ \lambda t' \left( \text{Wenn_Mika_weg_sei-} (t') \& \text{FUT} (t(t')) \right) \right] \right) \)
      \( \left[ \lambda t' \left( \text{ZWEIMAL} \_A \ [\lambda t'' \left( \text{beim_Frühstück} (t'') \& \text{PERF} (t'(t'')) \right) \right] \right) \)
      \( \left[ \lambda t'' \left( \exists P \left[ \lambda t''' \left( \text{shortly_before_t''} (t''' \& \text{ge...t_sei-} (t''')(t''')) \right) \right] \right) \)
      \( \left[ \lambda t''' \left( \text{Lola_renn} - (t''') \right) \right] \right) \]
   c. \( \left[ \left[ \text{Wenn Mika weg ist} \right] \_T \text{ wird Lola zweimal beim Frühstück gerannt SEIN} \right] \_C^{(\text{now})} = 1 \)
      iff there is a time \( t' \) such that \( t' \) is a subinterval of the time when Mika is
      away and now > \( t' \) and there are two times \( t'' \) such that \( t'' \) is a subinterval of
      the breakfast time and \( t'' \subseteq t' \) and there is a time \( t''' \) such that \( t''' \) is a
      subinterval of the time shortly before \( t'' \) and \( t''' \leq t'' \) and Lola runs at \( t''' \).

(2-26) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
   a. Letztes Jahr WAR Lola zweimal gerannt, wenn Mika kam.
      Last year was/had Lola twice run when Mika came
      = Within last year, there were two times at which Mika came and at which
      Lola was in a post-state of having run [shortly before].
   b. \( \lambda t \left( \exists T \left[ \lambda t' \left( \text{Letztes_Jahr} (t') \& \text{PAST} (t(t')) \right) \right] \right) \)
      \( \left[ \lambda t' \left( \text{ZWEIMAL} \_A \ [\lambda t'' \left( \text{Wenn_Mika_komm-} (t'') \& \text{PERF} (t'(t'')) \right) \right] \right) \)
      \( \left[ \lambda t'' \left( \exists P \left[ \lambda t''' \left( \text{shortly_before_t''} (t''' \& \text{ge...t_sei-} (t''')(t''')) \right) \right] \right) \)
      \( \left[ \lambda t''' \left( \text{Lola_renn} - (t''') \right) \right] \right) \]
   c. \( \left[ \left[ \text{Letztes Jahr WAR Lola zweimal gerannt}, \text{ wenn Mika kam} \right] \_A \right] \_C^{(\text{now})} = 1 \)
      iff there is a time \( t' \) such that \( t' \) is a subinterval of last year and \( t' < \text{now} \)
      and there are two times \( t'' \) such that \( t'' \) is a subinterval of a time when Mika
      comes and \( t'' \subseteq t' \) and there is a time \( t''' \) such that \( t''' \) is a subinterval of
      the time shortly before \( t'' \) and \( t''' \leq t'' \) and Lola runs at \( t''' \).

(2-27) APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
a. Lola ist immer gerannt, wenn Mika einschlief.
   *Lola is/has always run when Mika fell-asleep*
   = For all times before now at which Mika fell asleep, Lola ran.

b. \[ \lambda t (\exists_T [\lambda t' (C(t') \& \text{PRES}(t'(t'))]) \]
   \[\quad [\lambda t' (\exists_A [\lambda t'' (C(t'') \& \text{PERF}(t'(t'')))]) \]
   \[\quad \quad [\lambda t'' (\text{IMMER}P \ [\lambda t''' (\text{wenn}_Mika\_einschlaf- (t''') \& \text{ge...t sei- (t''')(t''')))]) \]
   \[\quad \quad \quad [\lambda t''' (\text{Lola}_\text{renn-} (t'''(t''')))])])]) \]

c. \[[ [\text{Lola ist immer gerannt}, [\text{wenn Mika einschlief}]_P]]^C (\text{now}) = 1 \]
   iff there is a time t' such that now \( \subseteq t' \) or now \( < t' \) and there is a time t'' such that t'' \( \subseteq t' \) and for all times t''' such that t''' \( \leq t'' \) and Mika falls asleep and t'''' \( \leq t'' \) and Lola runs at t''''.

WHAT THE CONJUNCTION CAN APPLY TO IN THE SUBCLAUSE. As can be seen in (2-28), *wenn* can sort out the tense time and the post-state as well as the situation time of an embedded VP in a perfect subclause.

(2-28) a. APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
   Mika schreibt an seinem Buch, wenn Lola heute achtmal Max trifft
   *Mika writes at his book when Lola today eight-times Max meets*
   = When Lola meets with Max eight times today, Mika is writing his book.

b. APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
   Mika kam, wenn Lola gegangen WAR.
   *Mika came when Lola left had/was*
   = Mika came when Lola had left already.

c. APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
   Mika kam, wenn Lola geSCHLAFen hat.
   *Mika came when Lola slept has*
   = Mika came when Lola was asleep.

THE TEMPORAL RELATION EXPRESSED BY THE CONJUNCTION. As was mentioned above, we assume that *wenn* expresses the same temporal relation as *als*. Note that just like *als*-clauses (cf. (2-11)), *wenn*-clauses can deviate from simultaneity, resulting in various sequencings of the situations in the matrix clause and in the subclause.

THE TENSES IN MATRIX CLAUSE AND SUBCLAUSE. To the extent that temporal *wenn* is future-oriented, it can only be combined with tense constructions in the subclause that can express future meanings, e.g. future tense, future perfect, present tense, and present perfect.
LEXICAL ENTRY. The temporal relation established by *wenn* between the matrix clause and the subclause is integrated in the lexical entry of *wenn* below.

\[(2-29) \; [[\textit{wenn}]]^{\mathcal{E}} = \text{the function } f: D_{<i,t>} \rightarrow D_{<i,t>}\]

such that for any \(g \in D_{<i,t>}, t \in D_i, f(g)(t) = 1\)

iff there is a \(t^* \in D_i\) such that \(g(t^*) = 1\) and \(t\) is a subinterval of \(t^*\).

*Wenn* prefers to head clauses that are present or future related.

### 2.3. *Während* ('while')

*Während* is another conjunction that expresses some kind of simultaneity between its clausal complement and its matrix clause. As will become clear below, however, it differs from *als* and *wenn* in being stricter with regard to simultaneity.

RESTRICTIONS ON THE MATRIX CLAUSE. Matrix clauses modified by a *während*-clause are not subject to any specific constraints concerning their situation type. This is shown in (2-30).\(^\text{10}\)

\[(2-30)\]

\(\begin{align*}
\text{a.} & \quad \text{Die kleine Clara... saß mit einer Strickerei vorm Nähtisch am} \\
& \quad \text{the little Clara... sat with a knitting in-front-of-the sewing-table at the} \\
& \quad \text{Fenster, während Klothilde... den Sofaplatz neben der Konsulin innehatte.} \\
\text{\quad window, while Klothilde... the couchseat next-to- the Konsulin obtained} \\
\text{b.} & \quad \text{... während dann die kleine und die große Glocke fröhlich und würdevoll} \\
& \quad \text{while then the small and the big bell happily and dignified} \\
& \quad \text{erzählten, daß es vier Uhr sei, schallte auch drunten die Glocke der} \\
& \quad \text{told, that it four o'clock be, sounded also below the bell of-the} \\
& \quad \text{Windfangtür gellend über die große Diele, ...} \\
& \quad \text{frontdoor shrill across the big hall} \\
\text{c.} & \quad \text{Und während der Pastor ihm munter zunickte, nötigte Konsul} \\
& \quad \text{and while the pastor him vividly nodded-to, urged Konsul} \\
& \quad \text{Buddenbrook die alte Dame ins Landschaftszimmer zurück und zum} \\
& \quad \text{Buddenbrook the old lady into-the landscape-room back and to-the} \\
& \quad \text{Fenster.} \\
\text{\quad window} \\
\text{d.} & \quad \text{... als der Augenblick gekommen war, da Pastor Wunderlich sich erhob} \\
& \quad \text{when the moment come had, at-which Pastor Wunderlich himself rised} \\
& \quad \text{und, während das Gespräch verstummte,... in angenehmen Wendungen} \\
& \quad \text{and, while the conversation grew-silent... in pleasant expressions} \\
& \quad \text{zu toasten begann.}
\end{align*}\)

\(^{\text{10}}\) The examples are taken from Thomas Mann (1901): *Buddenbrooks*. DigWö, sentences 3878, 120, 197, 524.
RESTRICTIONS ON THE SUBCLAUSE. Herweg (1990:255) argues that the clausal complement of the temporal conjunction während is always atelic. Wunderlich (1970:250f), Steube (1980:51f), and Heinämäki (1978:35) accept states, processes, and accomplishments as complements of während or the English conjunction while, respectively, because these situation types are atelic or contain durative intervals. In agreement with Lutzeier (1981:8), it seems to me, however, that there is no general restriction on the situation type provided by a während-clause, i.e. in principle all situation types can occur in a während-clause.  

(2-31) a. Die kleine Clara... saß mit einer Strickerei vorm Nähtisch am window, while Klothilde... den Sofaplatz neben der Konsulin innehatte. the sewing-table at the couchseat next-to- the Konsulin obtained  
b. ... während dann die kleine und die große Glocke fröhlich und würdevoll while then the small and the big bell happily and dignified erzählen, daß es vier Uhr sei, schallte auch drunten die Glocke der told, that it four o'clock be, sounded also below the bell of-the Windfangtür gellend über die große Diele, ... frontdoor shrill across the big hall  
c. "Eine Carambolage, Herr Senator?" fragte der Konsul, während er die a carambolage, Mister Senator? asked the Konsul, while he the Queues aus den Gestellen nahm. queues out-of the racks took  
d. Das Paar ging mit Konsul Kröger und seiner Familie gegen den Fluß the couple went with Konsul Kröger and his family to the river hinunter, während Senator Langhals, Doktor Grabow und Jean Jacques down, while Senator Langhals, Doktor Grabow and Jean Jacques Hoffstede die entgegengesetzte Richtung einschlugen. Hoffstede the opposite direction took  

There is a slight deviation with achievement situations as in (2-31d), though. Perhaps this deviation arises because the complement clause preferably provides a time interval of some length which provides a time frame clearly able to include a truth-interval of the matrix clause situation (Wolfgang Klein, pc).  

WHAT THE TEMPORAL CLAUSE CAN APPLY TO IN THE MATRIX CLAUSE. As (2-32) - (2-34) illustrate, während-clauses can in principle apply on the tense level as well as the aspect level and the participle level.

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11 The examples are taken from Thomas Mann (1901): Buddenbrooks. DigWö, sentences 3878, 120, 679, 786.
(2-32) APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.

a. Während Mika weg war, WAR Lola zweimal beim Frühstück gerannt.
   
   
   = There is a subinterval of the time while Mika was away at which it was
   twice the case that Lola had already run [shortly before the breakfast].

b. \( \lambda t \left( \exists_T \left[ \lambda t' (\text{während_Mika_weg_sei-} \ (t') \ & \ \text{PAST} \ (t)(t')) \right] \right. \)
   
   \( \left. \left[ \lambda t' \ (\text{ZWEIMAL}_A \ \left[ \lambda t'' (\text{beim_Frühstück} \ (t'') \ & \ \text{PERF} \ (t')(t'')) \right] \right) \right. \)
   
   \( \left. \left[ \lambda t'' \left( \exists_P \left[ \lambda t''' \ (\text{shortly_before}_t\ (t'') \ & \ \text{ge...t_sei-} \ (t'')(t''')) \right] \right) \right. \)
   
   \( \left. \left. \left[ \lambda t''' \ (\text{Lola_renn-} \ (t''')) \right] \right) \right) \right) \)

(2-33) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.

a. Letztes Jahr WAR Lola zweimal gerannt, während Mika kam.
   
   = Within last year, there were two times at which Mika came and at which
   Lola was in a post-state of having run [shortly before].

b. \( \lambda t \left( \exists_T \left[ \lambda t' (\text{letztes_Jahr} \ (t') \ & \ \text{PAST} \ (t)(t')) \right] \right. \)
   
   \( \left. \left[ \lambda t' \ (\text{ZWEIMAL}_A \ \left[ \lambda t'' (\text{während_Mika_komm-} \ (t') \ & \ \text{PERF} \ (t')(t'')) \right] \right) \right. \)
   
   \( \left. \left[ \lambda t'' \left( \exists_P \left[ \lambda t''' \ (\text{shortly_before}_t\ (t'') \ & \ \text{ge...t_sei-} \ (t'')(t''')) \right] \right) \right. \)
   
   \( \left. \left. \left[ \lambda t''' \ (\text{Lola_renn-} \ (t''')) \right] \right) \right) \right) \)

c. \( [[\text{Letztes Jahr WAR Lola zweimal gerannt, [während Mika kam]_A }]] \) \( ^c \)
   
   (now) = 1

   = If there is a time t' such that t' is a subinterval of last year and t' < now and
   there are two times t'' such that t'' is a subinterval of a time at which Mika
   comes and t'' \( \subseteq \) t' and there is a time t''' such that t''' is a subinterval of the
   time shortly before t'' and t''' \( \leq \) t'' and Lola runs at t'''.
(2-34) APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
   a. Lola ist geRANNT, während Mika einschlief.
      \textit{Lola has run while Mika fell-asleep}
      = There is a time before now at which Mika fell asleep and at which Lola ran.
   b. $\lambda t \left( \exists t' \left[ \lambda t'' (C (t'') \& \text{PERF} (t')(t'')) \right] \right)$
      $\left( \exists A \left[ \lambda t'' (während\_Mika\_einschlaf\- (t'')) \& \text{ge...t sei-} (t'')(t'')) \right] \right)$
      $\left( \lambda t''' (\text{Lola\_renn-} (t'''))(t''')) \right)$
   c. $[[ \lambda t (C (t') \& \text{PRES} (t)(t'))] \left( \exists t' \left[ \lambda t'' (während\_Mika\_einschlaf\- (t'')) \& \text{ge...t sei-} (t'')(t'')) \right] \right)$
      iff there is a time t' such that now $\subseteq t'$ or now < t' and there is a time t'' such that t' $\subseteq t'$ and there is a time t''' such that t''' is a subinterval of the time at which Mika falls asleep and t''' $\leq t''$ and Lola runs at t'''.

WHAT THE CONJUNCTION CAN APPLY TO IN THE SUBCLAUSE. As can be seen in (2-35), \textit{während} can sort out the tense time and the post-state as well as the situation time of an embedded VP in a perfect subclause. Reference to the tense time, however, appears to me to be slightly more marked than reference to the aspect time or to the VP-situation time.

(2-35) a. APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
   Mika schrieb an seinem Buch, während Lola letzte Woche achtmal Max
   \textit{Mika wrote at his book while Lola last week eight-times Max}
   traf.
   \textit{met}
   = While Lola met with Max eight times last week, Mika was writing his book.
   b. APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
   Mika kam, während Lola gegangen WAR.
   \textit{Mika came while Lola left had/was}
   = Mika came when Lola had left already.
   c. APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
   Mika war gekommen, während Lola geSCHLAfen hatte.
   \textit{Mika was/had come while Lola slept had}
   = Mika came while Lola was asleep.

THE TEMPORAL RELATION EXPRESSED BY THE CONJUNCTION. According to Helbig and Buscha (1989:471, 681), \textit{während} expresses strict simultaneity insofar as
the situations expressed by matrix clause and subclause have the same duration and thus, während-clauses appear to be durative. They cite examples like (2-36).

(2-36) Während die Sonne schien, lagen wir am Strand.

while the sun shone lay we at-the beach

Many of the examples cited earlier above, however, show that während-clauses are not duration but position adverbials - an analysis Herweg (1990:211), for instance, agrees with. Evidence for this analysis is provided by the fact that the situation times of the main clause and of the subordinate clause in (2-36) may just overlap without an inclusive relation. Thus, the sunshine in (2-36) may have lasted longer than the beach time. (2-37a, b) shows cases where this comes out even clearer. Moreover, these examples illustrate that both the situation described in the main clause can be shorter than the one in the subclause and the other way round.

(2-37)a. Während Hans in Hamburg war, schlug der Blitz ein.

while Hans in Hamburg was struck the lightning PARTICLE

b. Während der Blitz einschlug, war Hans in Hamburg.

while the lightning struck was Hans in Hamburg

According to Herweg (1990:254), at least a truth-interval of the situation described by the main clause is contained in the time interval provided by the während-clause. This seems to be basically adequate. Nevertheless, one has to take into account, of course, that the conjunction während is - like als and wenn - able to sort out time parameters on various levels of its clausal complement and that während-clauses can also apply on different levels of their matrix clause. In this regard, Herweg's analysis has to be made more precise.

It seems that all apparent restrictions on the situation type of während-clauses can be derived from the particular relation expressed by während. Specifically, as a consequence of the inclusion relation between matrix clause and subclause, it follows that any situation provided by a während-clause must be temporally long enough so as to be able to contain a truth-interval of the specified matrix clause situation. As long as this basic requirement is fullfilled, in principle all situation types can occur in a während-clause.

The requirement thus predicts that in a sense the situation type of the matrix clause and the situation type of the subclause interact. For example, when the während-clause provides an achievement, then the matrix clause situation must be able to provide an instantaneous truth-interval; i.e. it can be a state or process or achievement (2-38a-c) but not an accomplishment without atelic reinterpretations (2-38d). When the während-clause provides a state or process, however, then the matrix clause can be of any situation type; this is shown in (2-39).
(2-38) a. Während Eva den Teddy entdeckte, schlief Wolfgang.
while Eva the teddy discovered slept Wolfgang
b. Während Eva den Teddy entdeckte, joggte Wolfgang.
while Eva the teddy discovered jogged Wolfgang
c. Während Eva den Teddy entdeckte, schlief Wolfgang ein.
while Eva the teddy discovered slept Wolfgang in
d. ??Während Eva den Teddy entdeckte, baute Wolfgang einen Turm.
while Eva the teddy discovered built Wolfgang a tower

while Eva with the teddy petted slept Wolfgang
b. Während Eva mit dem Teddy schmuste, joggte Wolfgang.
while Eva with the teddy petted jogged Wolfgang
c. Während Eva mit dem Teddy schmuste, schlief Wolfgang ein.
while Eva with the teddy petted slept Wolfgang in
d. Während Eva mit dem Teddy schmuste, baute Wolfgang einen Turm.
while Eva with the teddy petted built Wolfgang a tower

Lutzeier (1981) claims that the standard inclusion relation between matrix clause situation and während-clause situation is reversed in cases like (2-38a, b). It is not necessary to assume such a reversion, however, if one adopts the view that not the whole situation time introduced by the matrix clause is included in the während-interval but only a truth-interval of the matrix clause situation.

THE TENSES IN MATRIX CLAUSE AND SUBCLAUSE. As Herweg (1990:263) points out, the acceptability of tense combinations in während-clauses and their matrix clauses depends on whether the tenses allow for locating a truth-interval of the matrix clause within the time introduced by während. The required relation is generally possible under agreement of the tense constructions in matrix and subclause. Moreover, present perfect and past tense can combine; past perfect and past tense can cooccur when the matrix clause situation is located within the post-state introduced by the past perfect während-clause, and sometimes future tense and present tense under the futurate reading can combine.

(2-40) a. Maria ist spazieren gegangen, während Hans schlief.
Maria is/has walking gone while Hans slept
b. Maria ging spazieren, während Hans geschlafen hat.
Maria went walking while Hans slept has
c. Maria ging spazieren, während Hans aufgewacht war.
Maria went walking while Hans up-woken was
d. Maria wird spazieren gehen, während Hans schläft.
Maria will walking go while Hans sleeps

Other combinations are less acceptable.
LEXICAL ENTRY. The temporal relation established by während between the relevant time parameter of the matrix clause and the one of the subclause is integrated in the lexical entry of während below.

(2-41) [[während]]c = the function f : D<sub<i, t></sub> → D<sub>i, t</sub>
such that for any g ∈ D<sub<i, t></sub>, t ∈ D<sub>i</sub>, f (g) (t) = 1
iff there is a t* ∈ D<sub>i</sub> such that g (t*) = 1 and t is a subinterval of t*.

Während prefers to head clauses that are durative and whose situations are limited on both sides; it is marked when sorting out the tense time of its clausal complement.

Like other temporal conjunctions, also während sometimes receives a nontemporal reading; this nontemporal reading is adversative (cf. Herweg (1990:253)).

2.4. Differences between als, wenn and während

Summarizing the results of the preceding subsections, als and wenn differ mainly insofar as als is restricted to head only past-related subclauses that refer to specific situations. Moreover, the semantics of als and wenn on the one hand side is very similar to the semantics of während. There are, however, some differences between them.

First, even if this is not a completely strict constraint, während in contrast to als or wenn prefers durative complements (cf. (2-31)). Second, unlike als or wenn, während is slightly marked when sorting out the tense time of its clausal complement. Third, in contrast to als (and wenn) (cf. (2-11)), während does not allow for sequential interpretations of the relationship between the VP-situation times of the matrix clause and of the subclause. This is illustrated in (2-42), which shows the während-clauses corresponding to the als-clauses in (2-11).

(2-42) a. Während Maria Hans erblickte, erschrak sie.
   while Maria Hans discovered alarmed she
   
   b. Während Hans sich ein Bein brach, fuhr Maria ihn ins Krankenhaus.
   while Hans himself a leg broke drove Maria him into the hospital
   
   c. Während Maria ihr neues Geschäft eröffnete, lud sie auch Hans ein.
   while Maria her new shop opened invited she also Hans in

(2-42a) does not express that Maria was alarmed shortly after discovering Hans but really at the moment of discovering him. (2-42b) does not allow for an interpretation where Maria took Hans to the hospital shortly after he had broken his leg; rather, it seems to express genuine simultaneity again and hence, appears funny. And Maria's
invitation of Hans in (2-42c) must have taken place at the occasion when she opened the store.

It is clear why während differs from als and wenn in this regard: since it does not easily sort out the tense time of its clausal complement, fewer readings and possible sequencings arise.

3. Time parameters of the main clause before time parameters of the subclause

3.1. Bevor and ehe ('before')

The conjunctions bevor and ehe are synonymous. If there is any difference between them, then it is only of a stilistic nature: ehe belongs to a more distinguished style, while bevor is stilistically neutral. Since there is so little difference between the two conjunctions, I will only consider bevor in this section.

RESTRICTIONS ON THE MATRIX CLAUSE. Bevor-clauses do not impose specific restrictions on the situation type of their matrix clause. Thus, atelic as well as telic main clauses are fully acceptable. This is illustrated in the examples in (3-1).\(^{12}\)

(3-1) a. ... so ist es, bevor einem der Kopf abgeschlagen wird.
   so is it, before one the head off-cut is/becomes
b. Auf einmal klopfte mein Herz, bevor meine Augen die Frau noch erkannt
   at once beat my heart, before my eyes the woman still recognized
   hatten.
   had
c. Obwohl ich nur mit ihm flüsterte, entstand, bevor er mich selbst noch
   although I only with him wispered, arose, before he me self still
   richtig verstanden hatte, ... das Gerücht, ein Billett sei zurückgegeben.
   correctly understood had, ... the rumor, a ticket was back-given
d. Ich glaube kaum, daß das Visum kommt, bevor Sie abreisen.
   I believe hardly, that the visa arrives, before you leave

RESTRICTIONS ON THE SUBCLAUSE. Herweg (1990:236) argues that temporal bevor-clauses must refer to events, i.e. to accomplishments or to achievements; according to him, atelic situations in bevor-clauses obligatorily coerce telic reinterpretations. Thus, while the eventive subclauses in (3-1), repeated as (3-2a, b), are acceptable, the negated clause in (3-2c), which is obligatorily atelic because of the negation, is unacceptable, and the atelic clause in (3-2d) can only be understood as meaning something like "Maria slept before Hans fell asleep", a reading where the clausal complement triggers a telic reinterpretation

\(^{12}\) The examples are taken from Anna Seghers (1943): Transit. DigWö, sentences 3172 (b), 6520(c), 3486 (d), and from Ingeborg Bachmann (1971): Malina. DigWö, sentence 3536 (a).
(3-2)  a. Maria schlief ein, bevor Hans aufwachte.
   *Maria slept PARTICLE before Hans up-woke
b. Maria schlief, bevor Hans aufwachte.
   Maria slept before Hans up-woke
c. *Maria schlief ein, bevor Hans nicht aufwachte.
   *Maria slept PARTICLE before Hans not up-woke
d. Maria schlief, bevor Hans schlief.
   Maria slept before Hans slepte

But, as Herweg himself points out, the telic flavor of (3-2d) could also be the consequence of *bevor* meaning something like 'before the beginning of the situation denoted by the subclause' (p236) or 'before the maximal/complete situation denoted by the subclause'. Moreover, the unacceptability of the negated clause may be due to the fact that it is simply hard to imagine a situation of Hans not-waking up and calculate the time interval before the situation; especially since Hans is involved in situations of not waking up most of his time and since "not waking up" is a rather abstract characterization of situations, it is difficult to go a step further and figure out situations before such 'non-situations'. If this view is right, then *bevor* does not impose any specific restrictions on the situation type of their clausal complement.

Another property of *bevor*-clauses is that they are sometimes non-factual. Consider the example in (3-2e). The sentence can be understood as expressing that Maria went to bed, and her going to bed prevented her fainting. Under this interpretation, the sentence can be true and felicitous without Maria ever having fainted or fainting in her life.

(3-2)  e. Maria ging schlafen, bevor sie ohnmächtig wurde.
   *Maria went sleeping before she fainted became

According to Heinämäki (1974:76ff), the non-factuality of their English equivalents results from a causal implication between the subordinate and the matrix clause. E.g. when understood as sketched above, because of the situation described in the matrix clause, the situation described in the subclause does not take place. In this and similar cases, the non-factuality of the *bevor*-clause is licensed.

WHAT THE TEMPORAL CLAUSE CAN APPLY TO IN THE MATRIX CLAUSE. As (3-3) - (3-5) illustrate, *bevor*-clauses can, like *als*-clauses, in principle apply on the tense level as well as the aspect level and the participle level. Since *bevor*-clauses have to be telic, the examples below are varied accordingly.

(3-3)  APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
   a. Bevor Mika wegzog, WAR Lola zweimal beim Frühstück gerannt.
      *before Mika away-moving was/had Lola twiceat-the breakfast run
= There is a subinterval of the time before Mika moved away at which it was twice the case that Lola had already run [shortly before the breakfast].

b. \( \lambda t \left( \exists T \left[ \lambda t' \left( \text{bevor}_\text{Mika}_\text{wegzieh} \ (t') \ & \ PAST \ (t(t'))) \right] \right) \)
\( \left[ \lambda t' \left( \text{ZWEIMAL}_\text{A} \left[ \lambda t'' \ (\text{beim}_\text{Frühstück} \ (t'') \ & \ PERF \ (t'(t''))) \right] \right) \right) \)
\( \left[ \lambda t'' \left( \exists p \left[ \lambda t''' \ (\text{shortly}_\text{before}_\text{t}'' \ (t'')) \ & \ \text{ge...t sei-} \ (t''(t'''))) \right] \right) \)
\( \left[ \lambda t''' \left( \text{Lola}_\text{renn-} \ (t''') \right) \right] \) [now] = 1
iff there is a time \( t' \) such that \( t' \) is a subinterval of the time before Mika moves away and \( t' < \text{now} \) and there are two times \( t'' \) such that \( t'' \) is a subinterval of the breakfast time and \( t'' \subseteq t' \) and there is a time \( t''' \) such that \( t''' \) is a subinterval of the time shortly before \( t'' \) and \( t''' \leq t'' \) and Lola runs at \( t''' \).

(3-4) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
a. Letztes Jahr WAR Lola zweimal gerannt, bevor Mika kam. 
\( \text{Last year was/had Lola twice run before Mika came} \)
= Within last year, there were two times at which Mika came and at which Lola was in a post-state of having run [shortly before].

b. \( \lambda t \left( \exists T \left[ \lambda t' \left( \text{letztes}_\text{Jahr} \ (t') \ & \ PAST \ (t(t'))) \right] \right) \)
\( \left[ \lambda t' \left( \text{ZWEIMAL}_\text{A} \left[ \lambda t'' \ (\text{bevor}_\text{Mika}_\text{komm} \ (t'') \ & \ PERF \ (t'(t''))) \right] \right) \right) \)
\( \left[ \lambda t'' \left( \exists p \left[ \lambda t''' \ (\text{shortly}_\text{before}_\text{t}'' \ (t'')) \ & \ \text{ge...t sei-} \ (t''(t'''))) \right] \right) \)
\( \left[ \lambda t''' \left( \text{Lola}_\text{renn-} \ (t''') \right) \right] \) [now] = 1
iff there is a time \( t' \) such that \( t' \) is a subinterval of last year and \( t' < \text{now} \) and there are two times \( t'' \) such that \( t'' \) is a subinterval of the time before Mika comes and \( t'' \subseteq t' \) and there is a time \( t''' \) such that \( t''' \) is a subinterval of the time shortly before \( t'' \) and \( t''' \leq t'' \) and Lola runs at \( t''' \).

c. [\([\text{Letztes}_\text{Jahr} \ \text{WAR} \ \text{Lola} \ \text{zweimal} \ \text{gerannt,} \ \text{bevor}_\text{Mika} \ \text{kam}]_{\text{A}} \) \( \text{C} \) (now) = 1
iff there is a time \( t' \) such that \( t' \) is a subinterval of last year and \( t' < \text{now} \) and there are two times \( t'' \) such that \( t'' \) is a subinterval of the time before Mika comes and \( t'' \subseteq t' \) and there is a time \( t''' \) such that \( t''' \) is a subinterval of the time shortly before \( t'' \) and \( t''' \leq t'' \) and Lola runs at \( t''' \).

(3-5) APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
a. Lola ist geRANNT, bevor Mika einschlief. 
\( \text{Lola has run before Mika fell-asleep} \)
= There is a time before now and before Mika fell asleep at which Lola ran.
b. $\lambda t \left( \exists t' \left( \lambda t'' \left( (C(t')) \land \text{PRES}(t(t')) \right) \right) \land \exists A \left( \exists t'' \left( (C(t'')) \land \text{PERF}(t')(t'') \right) \right) \land \exists P \left( \exists t''' \left( \text{bevor_Mika_einschlaf-}(t''') \land \text{ge...t sei-}(t')(t'''') \right) \right) \right)$

c. \[[ \text{Lola ist gerannt}, \left( \text{bevor Mika einschlief}_p \right) ] \land (\text{now} = 1) \]

WHAT THE CONJUNCTION CAN APPLY TO IN THE SUBCLAUSE. As the conjunction als, also bevor can sort out the tense time (3-6a) and the post-state (3-6b) as well as the situation time of an embedded VP (3-6c) in a perfect subclause.

(3-6)

a. APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
Mika schrieb an seinem Buch, bevor Lola letzte Woche achtmal Max traf.

Mika wrote at his book before Lola last week eight-times Max met

= Before last week, in which Lola met with Max eight times, Mika was writing his book.

b. APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
Mika kam, bevor Lola gegangen WAR.

Mika came before Lola left had/was

= Mika came before Lola had left already, i.e. when she was still there.

c. APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
Mika war gekommen, bevor Lola geSCHLAFen hatte.

Mika was/had come before Lola slept had

= Mika came before Lola was asleep.

THE TEMPORAL RELATION EXPRESSED BY THE CONJUNCTION. Herweg (1990:236) states that bevor-clauses establish a posteriority sequencing such that at least a truth-interval of the situation described by the main clause is located before the situation described by the subclause. Thus, Eva's sleeping mentioned in the following example could last from before the ringing of the phone until after the ringing without making the sentence false.

(3-7) Bevor das Telefon klingelte, schlief Eva.

before the phone rang slept Eva

Hence, it seems that a clause bevor p provides a time before the beginning of the time at which p is the case.
Herweg tries to argue that the time provided by a *bevor*-clause must be, due to the semantics of *bevor*, in close temporal proximity to the situation described by the clause, as is suggested by examples like (3-8a). Similar proposals have been made for the English equivalent *before* (cf. van Geenhoven (1999), Stump (1985)). However, examples like (3-8b) suggest that the suggested proximity can hardly be part of the semantics of *bevor*; rather, it seems to be only a pragmatic effect that can easily be overcome by appropriate contexts and that can be explicitly neutralized, e.g. by the addition of adverbials like *lange* ('long'). Similarly, (3-8c) does not suggest that one should write one's last will shortly before dying (this example is due to Wolfgang Klein, pc).

(3-8) a. Maria schaltete das Licht aus, bevor sie ins Bett ging.  
*Maria switched the light off before she into-the bed went*  
= Maria switched off the light immediately before going to bed.

b. Ostern wird gefeiert, (lange) bevor Weihnachten gefeiert wird.  
*Easter becomes celebrated (long) before Christmas celebrated becomes*  
= Easter is celebrated long before Christmas.

c. Bevor man stirbt, sollte man sein Testament machen.  
*before one dies should one ones last-will make*

Let's now have a brief look at *bevor*-clauses that contain perfect constructions. To the extent that these clauses are acceptable at all, it seems to me that a sentence like (3-9) can at least marginally obtain a reading as indicated below, where - due to the accent on the auxiliary - *bevor* relates to the post-state of the perfect construction and seems to trigger a kind of completedness effect: it introduces the time before Eva had finished sleeping. Hence, it locates the situation described in the main clause before the time at which the situation introduced by the embedded VP *Eva schlaf-* is finished and in close proximity to this time.

(3-9) a. Das Telefon klingelte, bevor Eva geschlafen HATte.  
*the phone rang before Eva slept had*  
= The phone rang before Eva had finished sleeping, i.e. was awake again. This is shown in the picture in (3-9b).

(3-9) b.  
[Diagram]

If a clause *bevor p* provides a time before the beginning of the time at which p is the case, as was proposed above, then this is unexpected: what one expects is rather that the *bevor*-clause introduces a time before a post-state of Eva's sleeping starts - and this
can, in the present account, be a time at which Eva has just fallen asleep because the post-state of having slept requires only a single earlier truth-interval of her sleeping. Hence, the situation described by the main clause is expected to be located before a post-state of sleeping and in close proximity to this post-state, e.g. at the time marked in the picture in (3-9c).

\[(3-9)\ c.\]

\[\text{Eva sleeps} \quad \text{Eva awake} \quad \text{TU} \quad \text{post-state of Eva's sleeping} \quad \text{phone rings} \]

Where then does the completedness effect in (3-9a) come from? Why does (3-9a) trigger a reading as illustrated in (3-9b) rather than as in (3-9c)?

It seems likely that the effect comes about because in a situation as shown in (3-9c) the relevance of the connection between the post-state of sleeping and the temporal location of the phone ringing is not clear and the situation could just as well be expressed by other, more appropriate means, e.g. by the use of a temporal clause introduced by \(\text{während}\) ('while') or \(\text{als}\) ('when') as in \(\text{während/als Eva schlief}\) ('while/when Eva slept').

To summarize, what options for temporal relations established by \(\text{bevor}\) between matrix clauses and subclauses are thus predicted to occur according to what was said above?

Suppose \(\text{bevor}\) expresses that at least a truth-interval of the time parameter specified by the \(\text{bevor}\)-clause in its matrix clause is located before the beginning of the interval provided by the time parameter \(\text{bevor}\) applies to in its clausal complement. Then the present framework predicts for combinations of atelic situations in both the matrix clause and the \(\text{bevor}\)-clause the options illustrated by the time schemata in (3-10), which are constructed analogously to the ones concerning the conjunction \(\text{als}\) above (cf. section 2).

\[(3-10)\ a. \ \text{Bevor relates to the tense time of its clausal complement; the subclause applies on the tense time level.}\]
(3-10) b. *Bevor* relates to the tense time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (a).]

(3-10) c. *Bevor* relates to the tense time of its clausal complement; the subclause applies on the participle time level.

(3-10) d. *Bevor* relates to the aspect time of its clausal complement; the subclause applies on the tense time level.

[In principle, same picture as in (a).]

(3-10) e. *Bevor* relates to the aspect time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (a).]

(3-10) f. *Bevor* relates to the aspect time of its clausal complement; the subclause applies on the participle time level.

[In principle, same picture as in (c).]

(3-10) g. *Bevor* relates to the participle time of its clausal complement; the subclause applies on the tense time level.
(3-10) h. *Bevor relates to the participle time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (g).]

(3-10) i. Behor relates to the participle time of its clausal complement; the subclause applies on the participle time level.

THE TENSES IN MATRIX CLAUSE AND SUBCLAUSE. Herweg (1990:242) claims that the tenses of a bevor-clause and its matrix clause must be chosen in agreement with two conditions. First, the situation introduced by the matrix clause must be able to be located before the situation introduced by the bevor-clause. Thus, it would be inadequate to locate the situation of the matrix clause by a future tense and the situation of the bevor-clause by a past tense (3-11a). Combinations that fulfill this condition imposed by the semantics of bevor appear to be generally acceptable (3-11b-e). Note that the examples support the view that the tense in the subclause receives an absolute tense interpretation, i.e. is not - or: not necessarily - calculated back from a time introduced by the matrix clause.

(3-11) a. *Maria wird anrufen, bevor Hans einschlief.
   *Maria will call before Hans fell-asleep
b. Maria wird anrufen, bevor Hans einschlafen wird.
   Maria will call before Hans fell-asleep will
c. Maria rief an, bevor Hans einschlief.
   Maria called at before Hans fell-asleep
d. Maria hat angerufen, bevor Hans einschlief.
   Maria has called before Hans fell-asleep
e. Maria hatte angerufen, bevor Hans einschlief.
   Maria had called before Hans fell-asleep

Second, however, it seems that for some reason, both situations must be located either before or after the local evaluation time, i.e. the time of utterance. Herweg shows this with the example in (3-12a) (p242). As the acceptable variant in (3-12b) shows, however, this does not seem to be a strict part of the semantics of bevor but rather again just a pragmatic effect; the latter view is in accordance with Heinämäki's (1974)
analysis of *before*. The crucial point here is that the matrix clause mentions Hans' past going to bed while the *bevor*-clause refers to Maria's future call.

(3-12) a. *Bevor Maria anruft, ging Hans ins Bett.*
   "Bevor Maria calls went Hans into-the bed"
   b. Hans ging schon ins Bett, noch bevor Maria anruft.
   "Hans went already into-the bed bevor Maria called"

LEXICAL ENTRY. The temporal relation established by *bevor* between the matrix clause and the subclause is integrated in the lexical entry of *bevor* below.

(3-13) \([\text{[bevor]}]c = \text{the function } f: D_{i, t} \rightarrow D_{i, t}\)
   such that for any \(g \in D_{i, t}\), \(t \in D_i\), \(f(g)(t) = 1\)
   iff there is a \(t^* \in D_i\) such that \(g(t^*) = 1\) and \(t\) is a subinterval of the time interval preceding the maximal \(t^*\) satisfying \(g\).

As a consequence of the semantics of *bevor*, its complements are restricted to situations that provide a homogeneous phase with a clear beginning point.\(^{13}\)

3.2. *Bis* (‘until’)

The semantics of the conjunction *bis* is closely connected to the semantics of the preposition *bis*, which was discussed in chapter V. Recall that *bis* is not a TT-dependent preposition, i.e. it does not have to introduce time intervals that use the tense time of the clause for constructing a limit of the *bis*-interval.

RESTRICTIONS ON THE MATRIX CLAUSE. Herweg (1990:295) analyzes *bis*-clauses as duration adverbials. Hence, according to him they can in general only be combined with states or activities in the main clause. He admits, however, that they sometimes except accomplishments or achievements in the matrix clause (p295, fn. 33); but they differ from positional subclauses in at least two respects. First, other than *bevor* and *nachdem*, they make a statement about the whole *bis*-interval. Second, they assert that only one situation, or a particular number of situations of the respective type, occurred within this period of time.

I do not think that these are compelling arguments in favor of a durational account of *bis*-adverbials. As a matter of fact, it is indeed hard to find *bis*-clauses that specify accomplishments or achievements (3-14 c, d) compared to *bis*-clauses that specify states or activities (3-14a, b). Moreover, the status of *bis*-clauses of the former type is often not entirely clear. Thus, the *bis*-clause in (3-14c) is preferably understood as

\(^{13}\) In addition to the temporal reading discussed here, *bevor*-clauses can also have a number of nontemporal readings, i.e. conditional readings, preference readings, likelihood readings, and counterfactual readings. For a discussion of these readings, see Herweg (1990:234).
specifying the target-state of moving to the mother, i.e. it seems to provide the time until when the people talked about will live with the mother. The same applies to (3-14d). Especially (3-14d), however, admits for another reading; according to this reading, the air supply mentioned can be switched of at some time within the time interval until when the motor has reached the adequate temperature. Readings of this type are clearly positional in nature. Hence, I will analyze bis-clauses as position adverbials.14

(3-14) a. ... es dauerte lange, bis er was raushatte...
   *it took long, until he something produced-had*
   
   b. Franz drängt immer, bis er raus hat, wo Reinhold hin will.
   *Franz pushes always, until he out had, where Reinhold to wants*
   
   c. Wir werden wieder zu Mutter ziehen, ... bis er wieder auf freiem Fuß ist.
   *we will/become again to mother move... until he again on free foot is*
   
   d. Bei tiefen Temperaturen kann die Kühlluftzuführung zu den Zylindern
   *at low temperatures can the cold-air-supply to the cylinders*
durch eine einfache Klappe abgeschaltet werden, bis der Motor seine
*by a simple flap switched-of be/become, until the motor his*
richtige Betriebstemperatur erreicht hat.
*adequate working-temperature reached has*

RESTRICTIONS ON THE SUBCLAUSE. According to Herweg, the clausal complements of bis mostly provide telic situations but can sometimes provide atelic situations and especially also perfect constructions. (3-15) shows some illustrations.15

(3-15) a. ...er mußte lange gehen und sitzen, bis alles um ihn ruhig war...
   *he had-to long go and sit, until everything around him steady was*
   
   b. ... so blieb er noch liegen, bis das metallische Dröhnen zum zweitenmal
   *so stayed he still lying, until the metallic roaring to-the second-time*
   anschwoll und sich entfernte.
   *increased and itself removed*
   
   c. ... da braucht es Zeit, bis sich einer auffüllt.
   *then takes it time, until oneself one fills*
   
   d. ... Gott hat gewartet, bis er kommt.
   *God has waited, until he comes*
   
   e. Sie müssen eben warten, bis Ihr Revier geantwortet hat...
   *you must PARTICLE wait, until your district answered has*

---

14 The examples are taken from Alfred Döblin (1929): Berlin Alexanderplatz. DigWö, sentences 4744 (a), 4875 (b); from Thomas Mann (1901): Buddenbrooks. DigWö, sentence 11900 (c); and from Das praktische Autobuch, 1965, DigWö, sentence 3603 (d).

15 The examples are taken from Alfred Döblin (1929): Berlin Alexanderplatz. DigWö, sentences 12423 (a), 12484 (c), 463 (d), 11550 (e), and from Thomas Mann (1924): Der Zauberberg. DigWö, sentence 1623 (b).
According to Herweg (1990:307), however, atelic situations must be reinterpreted so that they are able to provide a clear and definite ending of the *bis*-interval. Hence, the situations in (3-15a, b) are interpreted ingressively. Negated atelic or telic clauses are generally not acceptable, cf. Herweg's examples in (3-16).

(3-16) a. *Maria wartete mit dem Essen, bis Peter nicht am Tisch saß.*
   
   *Maria waited with the eating until Peter not at-the table sat*

b. *Maria wartete mit dem Essen, bis Peter nicht kam.*
   
   *Maria waited with the eating until Peter not came*

However, similarly as with regard to Herweg's (1990:236) analysis of *bevor* (cf. the discussion in the preceding subsection concerning the examples in (3-2)), this effect may again be caused by *bis* meaning something like 'before the maximal/complete situation denoted by the subclause'. And the unacceptability of the negated clause may again be due to the difficulties of using a situation of Peter not coming as the basis of the interpretation of the clause. Hence, I conclude that like *bevor* also *bis* does not impose any specific restrictions on the situation type of their clausal complement.

**WHAT THE TEMPORAL CLAUSE CAN APPLY TO IN THE MATRIX CLAUSE.** In (3-17) - (3-19) it is shown that *bis*-clauses can, like *bevor*-clauses, in principle apply on the tense level as well as the aspect level and the participle level.

(3-17) **APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.**

a. Bis Mika wegzog, WAR Lola zweimal beim Frühstück gerannt.
   
   *until Mika away-moving was/had Lola twice-at-the breakfast run*
   
   = There is a subinterval of the time until Mika moved away at which it was twice the case that Lola had already run [shortly before the breakfast].

b. $\lambda t \left( \exists t' \left( (\lambda t'' \ (bis_{-}Mika_{-}wegzieh- \ (t'')) \ & \ PAST \ (t(t''))) \right) \ & \ \left( \lambda t' \ (ZWEIMAL_{A} \ \left( \lambda t'' \ (beim_{-}Frühstück \ (t'')) \ & \ PERF \ (t'(t''))) \right) \ & \ \left( \lambda t'' \ (\exists p \ \left( \lambda t''' \ (shortly_{-}before-t'' \ (t''')) \ & \ ge...t \ sei- \ (t'(t''))) \right) \ & \ \left( \lambda t''' \ (Lola_{renn-} (t''))) \right) \right) \right)$

  = There is a subinterval of the time until Mika moved away and $t' < now$ and there are two times $t''$ such that $t''$ is a subinterval of the breakfast time and $t'' \subseteq t'$ and there is a time $t'''$ such that $t'''$ is a subinterval of the time shortly before $t''$ and $t''' \leq t''$ and Lola runs at $t'''$.
It seems a bit more difficult to construct an example where a bis-clause clearly applies on the aspect level. Consider (3-18). In order to make sense of the intended reading - that the post-state is located within the time interval counting from some contextually salient time until the time when Mika came - it seems to be crucial to employ the implicature that the post-state ends when Mika arrives. This is made plausible by the use of the verb *essen* ('eat'), which is associated with the typical immediate post-state of not being hungry anymore for a while.

(3-18) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.

a. Letztes Jahr HATte Lola mittags zweimal genug gegessen, bis Mika kam.  
   = Within last year, there were two times at which Lola was in the post-state of having eaten enough until Mika arrived.

b. \[ \lambda t \left( \exists T \left[ \lambda t' \left( \text{letztes}_Jahr \left( t' \right) \& \text{PAST} \left( t(t') \right) \right) \right] \\right. \]
   \[ \left. \lambda t' \left( \text{ZWEIMAL}_A \left[ \lambda t'' \left( \text{mittags} \left( t'' \right) \& \text{bis}_Mika_komm- \left( t'' \right) \& \text{PERF} \left( t(t'') \right) \right) \right] \right. \]
   \[ \left. \lambda t'' \left( \exists P \left[ \lambda t'''' \left( \text{ge...t sei-} \left( t''''(t'') \right) \right) \right] \right. \]
   \[ \left. \left[ \lambda t'''' \left( \text{Lola_renn-} \left( t'''' \right) \right) \right] \right) \]]

c. \[ \left[ \text{[ Letztes Jahr HATte Lola mittags zweimal genug gegessen, [bis Mika kam]}_A \right]_c \text{ (now) } = 1 \]
   iff there is a time t' such that t' is a subinterval of last year t' < now and there are two times t'' such that t'' is located at noon and t''' is a subinterval of the time until Mika comes and t''' ⊆ t' and there is a time t'''' such that t'''' ≤ t'' and Lola eats enough at t''''.

(3-19) APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.

a. Lola ist geRANNT, bis Mika einschlief.  
   = There is a time before now and within the time until Mika fell asleep at which Lola ran.

b. \[ \lambda t \left( \exists T \left[ \lambda t' \left( \text{C} \left( t' \right) \& \text{PRES} \left( t(t') \right) \right) \right] \right. \]
   \[ \left. \lambda t' \left( \exists A \left[ \lambda t'' \left( \text{C} \left( t'' \right) \& \text{PERF} \left( t(t'') \right) \right) \right] \right. \]
   \[ \left. \lambda t'' \left( \exists P \left[ \lambda t'''' \left( \text{bis}_Mika_einschlaf- \left( t'''' \right) \& \text{ge...t sei-} \left( t''''(t'') \right) \right) \right] \right. \]
   \[ \left. \left[ \lambda t'''' \left( \text{Lola_renn-} \left( t'''' \right) \right) \right] \right) \]]

c. \[ \left[ \text{[ Lola ist gerannt, [bis Mika einschlief]}_P \right]_c \text{ (now) } = 1 \]
iff there is a time t' such that now $\subseteq t'$ or now $< t'$ and there is a time t" such that t" $\subseteq t'$ and there is a time t''' such that t''' is a subinterval of the time until Mika falls asleep and t''' $\leq t''$ and Lola runs at t".

WHAT THE CONJUNCTION CAN APPLY TO IN THE SUBCLAUSE. Like bevor, also bis can sort the tense time (3-20a) as well as the post-state (3-20b) and the situation time of an embedded VP (3-20c) in a perfect subclause.

(3-20) a. APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
Mika schrieb an seinem Buch, bis Lola letzte Woche achtimal Max traf.
= Until Lola met with Max eight times last week, Mika was writing his book.

b. APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
Mika kam, bis Lola gegangen WAR.
= Mika came in the time until Lola had left already, i.e. when she was still there.

c. APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
Mika war gekommen, bis Lola EIngeschlafen war.
= Mika came until Lola had fallen asleep.

THE TEMPORAL RELATION EXPRESSED BY THE CONJUNCTION. Bis-clauses fix the minimal duration of the main clause state to a period between a contextually given time and the situation time of the subordinate clause. Like non-clausal bis-adverbials, bis-clauses under certain circumstances imply posteriority.

THE TENSES IN MATRIX CLAUSE AND SUBCLAUSE. The distribution of the tenses works largely as in before-clauses.

LEXICAL ENTRY. The temporal relation established by bis between the matrix clause and the subclause is integrated in the lexical entry of bis below.

(3-21) $[[\text{bis}]]^c = \text{the function } f: D_{<i, t>} \rightarrow D_{<i, t>}$
such that for any $g \in D_{<i, t>}$, $t \in D_i$, $f (g) (t) = 1$
iff there is a $t^* \in D_i$ such that $g (t^*) = 1$ and t is a subinterval of the time interval preceding the maximal $t^*$ satisfying g.
4. Time parameters of the main clause after time parameters of the subclause

4.1. Nachdem ('after')

RESTRICTIONS ON THE MATRIX CLAUSE. Nachdem-clauses do not seem to impose any particular restrictions with regard to the situation type on their matrix clause, i.e. they allow for atelic as well as telic main clauses, as is shown in the following examples.\(^{16}\)

\[(4-1)\]
\[a. \text{Hat der Genius keine ganz schlechte Leibeskonstitution, so lebt er in has the genius no completely bad body constitution, such lives he in}
\text{solcher Weise noch eine gute Weile fort, nachdem er seine Meisterwerke such a way still a good while further, after he his masterpieces}
\text{geliefert. delivered}
\]
\[b. \text{... ich verliebte mich in die kleine Very, nachdem sie schon seit sieben}
\text{Jahren verstorben. years dead}
\]

RESTRICTIONS ON THE SUBCLAUSE. According to many authors (e.g. traditional grammars like Helbig and Buscha (1989:462, 682) and the Duden-Grammatik (p430), Steube (1988), Herweg (1990), Ehrich (1992), and others), nachdem-clauses usually have to contain perfect constructions. \((4-2)\) shows some examples.

\[(4-2)\]
\[a. ??Nachdem Sander lesen gelernt hatte, war er stolz. after Sander reading learned had was he proud
\]
\[b. ??Nachdem Sanders Fußballmannschaft gewonnen hatte, war er stolz. after Sander's soccer - team won had was he proud
\]

Atelic clauses \((4-3a)\) as well as telic clauses \((4-3b)\) that are not constructed with perfect constructions are usually not fully acceptable as complements of nachdem. There are, however, exceptions like \((4-3c)\), taken from the Duden-Grammatik (p770; original source cited: Bild-Zeitung).\(^{17}\)

\[(4-3)\]
\[a. ??Nachdem Sander lesen lernte, war er stolz.
\]


\(^{17}\) The degree of the acceptability of telic non - perfect nachdem - clauses is perhaps less clear: while Steube (1988) and Herweg (1990:223), for instance, accept them only marginally, Steube (1980) finds them acceptable.
after Sander reading learned was he proud
b. ??Nachdem Sanders Fußballmannschaft gewann, war er stolz.

after Sander's soccer-team won was he proud
c. Erst nachdem der Ring am Finger blitze, läßt der Eifer nach.
only after the ring at-the finger blinks decreases the enthusiasm

PARTICLE
To the extent that atelic non-perfect nachdem-clauses are acceptable, they require particular telic reinterpretations (cf. Herweg (1990:219)); the subclause in (4-3a), for instance, is interpreted ingressively, meaning something like "After Sander had learned to read, he was proud." And, as the Duden-Grammatik states, the nachdem-clause in (4-3c) is interpreted as "After the ring started blinking...".

According to Helbig and Buscha (1989:682), nachdem-clauses can characterize either the time of a particular situation in the presence or future (4-4a) or the time of a particular situation in the past (4-4b). However, nachdem-clauses can also express generic statements. They do not have to express actually realized situations (4-4c).

(4-4) a. Nachdem wir den Gipfel erreicht haben, machen wir eine Pause.

after we the peak reached have make we a break
b. Mika kam, nachdem Lola gegangen war.

Mika came after Lola left had/was
c. Schildkröten verschwinden, nachdem sie ihre Eier gelegt haben.

turtles disappear after they their eggs layed have

WHAT THE TEMPORAL CLAUSE CAN APPLY TO IN THE MATRIX CLAUSE. As (4-5) - (4-7) illustrate, nachdem-clauses can in principle apply on the tense level as well as the aspect level and the participle level.

(4-5) APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.

a. Nachdem Mika weg war, WAR Lola zweimal beim Frühstück gerannt.

after Mika away was was/had Lola twice at-the breakfast run

= There is a subinterval of the time after Mika was gone at which it was twice the case that Lola had already run [short] before the breakfast.

b. λt (∃T [λt' (nachdem_Mika_weg_sei- (t') & PAST (t)(t'))]

[λt' (ZWEIMALA [λt'' (beim_Frühstück (t'') & PERF (t')(t''))]]

[λt'' (∃P [λt'''' (shortly_before_t'' (t'') &

ge...t sei- (t'')(t'''))]]

[λt'''' (Lola_renn- (t'')))])})
c. \[\{\text{Nachdem Mika weg war}_T\} \text{ WAR Lola zweimal beim Frühstück gerannt}\}^C \ (\text{now}) = 1\]
iff there is a time \(t'\) such that \(t'\) is a subinterval of the time after Mika is gone and \(t' < \text{now}\) and there are two times \(t''\) such that \(t''\) is a subinterval of the breakfast time and \(t'' \subseteq t'\) and there is a time \(t'''\) such that \(t'''\) is a subinterval of the time shortly before \(t''\) and \(t''' \leq t''\) and Lola runs at \(t''\).

\(4-6\) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.

a. Letztes Jahr \(\text{WAR Lola zweimal gerannt, nachdem Mika weg war.}\)
\(\text{Last year was/had Lola twice run after Mika away was}\)
\(= \text{Within last year, there were two times at which Mika was gone and at which Lola was in a post-state of having run [short] before.}\)

b. \(\lambda t \left( \exists T \left[ \lambda t' \left( \text{C(t')} & \text{PAST(t')(t')} \right) \right] \right) \)
\(\left[ \lambda t' \left( \text{ZWEIMAL}_A \left[ \lambda t'' \left( \text{nachdem_Mika weg_sei- (t'')} & \text{PERF(t')(t'')} \right) \right] \right) \right] \)
\(\left[ \lambda t'' \left( \exists p \left[ \lambda t''' \left( \text{nachdem_Mika weg_sei- (t''')} & \text{ge...t sei- (t'')(t'''')} \right) \right] \right] \)
\(\left[ \lambda t''' \left( \text{Lola_renn- (t'''')} \right) \right] \right) \right) \)

\(4-7\) APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.

a. Lola ist \textit{geRANNT}, nachdem Mika weg war.
\(\text{Lola has run after Mika away was}\)
\(= \text{There is a time before now and after Mika fell asleep at which Lola ran.}\)

b. \(\lambda t \left( \exists T \left[ \lambda t' \left( \text{C(t')} & \text{PRES(t')(t')} \right) \right] \right) \)
\(\left[ \lambda t' \left( \exists A \left[ \lambda t'' \left( \text{C(t'')} & \text{PERF(t')(t'')} \right) \right] \right) \right] \)
\(\left[ \lambda t'' \left( \exists p \left[ \lambda t''' \left( \text{nachdem_Mika weg_sei- (t''')} & \text{ge...t sei- (t'')(t'''')} \right) \right] \right] \)
\(\left[ \lambda t''' \left( \text{Lola_renn- (t'''')} \right) \right] \right) \right) \)
WHAT THE CONJUNCTION CAN APPLY TO IN THE SUBCLAUSE. *Nachdem* is able to sort out the tense time (4-8a) as well as the post-state (4-8b) and the situation time of an embedded VP (4-8c) in a perfect subclause.

It is somewhat difficult to construct an appropriate example for the case of post-state specification: when *Nachdem* relates to the post-state, the *Nachdem*-clause should provide the time after the post-state. Since post-states are neverending, this is not possible in the literal sense. But it is possible to provide the time after a target-state or typical post-state - like being not hungry anymore after having eaten. This is the reading intended in (4-8b); it seems to me to be marginally available, its marginal character presumably being due to the unnatural expression of the idea that Mika came when Lola was hungry again.

(4-8) a. APPLICATION ON THE TENSE TIME (i.e. TENSE LEVEL).
Mika schrieb sein Buch, nachdem Lola letzte Woche achtmal Max

*Mika wrote his book after Lola last week eight-times Max*

*met had*

= After Lola had met with Max eight times last week, Mika wrote his book.

b. APPLICATION ON THE POST-STATE (i.e. ASPECT LEVEL).
Mika kam, nachdem Lola gegessen HATte.

*Mika came after Lola eaten had*

= ?Mika came after Lola had been in the post-state of eating, i.e. when she hungry again.

c. APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
Mika kam, nachdem Lola geGESsen hatte.

*Mika came after Lola eaten had*

= Mika came after Lola's meal.

THE TEMPORAL RELATION EXPRESSED BY THE CONJUNCTION. According to a simplifying view, one may assume that the situation described by a *Nachdem*-clause is located before the situation of the main clause, or: the situation described in the main clause is located after the situation described by the *Nachdem*-clause. According to Herweg (1990:212, 217), however, only a truth-interval of the situation described in the main clause is located after the situation described by the *Nachdem*-clause. Hence, the situation described in the matrix clause can start before the situation described in the subclause. This is illustrated in the following example (4-9): it can be truthfully uttered when Eva starts eating cookies after her bath, during her bath, or before her bath. All that the sentence requires in order to be true is that there be an interval of Eva eating cookies after her bath.
Nachdem Eva gebadet hatte, aß sie Kekse.

*after Eva bathed had ate she cookies*

But how about the claim that it is the situation described by the *nachdem*-clause after which a truth-interval of the main clause is located? - According to the present framework, the situation described by the *nachdem*-clause in (4-9) consists of the post-state of the perfect construction, at least on the level where the perfect construction as a whole is taken into account. But the situation described by the matrix clause does by no means have to be located after the post-state given by the *nachdem*-clause. I.e. in the example above, Eva's eating cookies does not have to be located after the post-state of her bathing; in fact, since post-states in principle last forever, this would be impossible. Rather, (a truth-interval of) Eva's eating cookies is located after the beginning of the post-state provided by the *nachdem*-clause.

Hence, I propose that a clause *nachdem* $p$ provides a time after the beginning of the phase at which $p$ is the case - where the *nachdem*-interval is not limited to the phase at which $p$ is the case. Note, moreover, that *nachdem*-clauses containing perfect constructions do not semantically require that the situation time introduced by the embedded VP is completed. This comes out clearly in (4-10) because the presence of *schon* ('already') supports the indicated interpretation, according to which Eva is still asleep but has started being in a post-state of sleeping at the time when the phone rings.

Nachdem Eva schon geschlafen hatte, klingelte das Telefon.

*after Eva already slept had rang the phone*

= After Eva had already slept for a while, the phone rang.

In order to fulfill its requirements of interpretability, the complement of *nachdem* must provide a homogeneous phase with a clear beginning point. This restricts the class of appropriate complements.

Recall the ingressive reinterpretations of non-perfect *nachdem*-clauses that were mentioned above (cf. (4-3a)). I propose that these reinterpretations should not be viewed as marginal phenomena but rather should be taken seriously because they actually illustrate the requirements of the interpretation of *nachdem*-clauses very clearly. Perfect constructions are optimally constructed so as to provide homogenous phases with clear beginning points.

In addition to the temporal sequencing of matrix clause situation and subclause situation, Herweg (1990:227f) proposes that the semantics of *nachdem* analogously to the semantics *bevor* requires that the matrix clause situation (or part of it) is located within the temporal proximity of the subclause situation. Similar proposals have been made for the English equivalent *after* (cf. van Geenhoven (1999), Stump (1985)). Consider the examples in (4-11), which are adapted from Herweg (1990:227f). The examples in (4-11a, b) appear to support this assumption; Herweg argues that examples like (4-11c, d) show that 'temporal proximity' is a flexible concept.
(4-11) a. Nachdem Peter sich hingesetzt hatte, nahm er die Zeitung in die Hand.
   after Peter himself down-sat had took he the newspaper in the hand
b. Nachdem Peter beim Skilaufen gestürzt war, verschluckte er viel Schnee.
   after Peter at-the skiing fallen was/had swallowed he much snow
c. Nachdem Peter beim Skilaufen gestürzt war, schmerzte sein Knie tagelang.
   after Peter at-the skiing fallen was/had hurt his knee days-long
d. Nachdem Peter beim Skilaufen gestürzt war, wollte er keinen Skiurlaub mehr machen.
   after Peter at-the skiing fallen was/had wanted he no ski-vacation

To my mind, examples like (4-11c, d) are counterevidence to the 'temporal proximity' hypothesis. They show clearly, that temporal proximity as in (4-11a, b) can only be a consequence of general pragmatic principles that always try to establish a close relation between the matrix clause and the subclause for mere reasons of relevance.

To summarize, what options for temporal relations established by nachdem between matrix clauses and subclauses are thus predicted to occur according to what was said above?

Suppose nachdem expresses that at least a truth-interval of the time parameter specified by the nachdem-clause in its matrix clause is located after the beginning of the interval provided by the time parameter nachdem applies to in its clausal complement. Then the present framework predicts for combinations of atelic situations in both the matrix clause and the nachdem-clause the options illustrated by the time schemata in (4-12), which are constructed analogously to the ones concerning the conjunction als above (cf. section 2).

(4-12) a. Nachdem relates to the tense time of its clausal complement; the subclause applies on the tense time level.

(4-12) b. Nachdem relates to the tense time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (a).]
(4-12) c. *Nachdem* relates to the tense time of its clausal complement; the subclause applies on the participle time level.

(4-12) d. *Nachdem* relates to the aspect time of its clausal complement; the subclause applies on the tense time level.

[In principle, same picture as in (a).]

(4-12) e. *Nachdem* relates to the aspect time of its clausal complement; the subclause applies on the aspect time level.

[In principle, same picture as in (a).]

(4-12) f. *Nachdem* relates to the aspect time of its clausal complement; the subclause applies on the participle time level.

[In principle, same picture as in (c).]

(4-12) g. *Nachdem* relates to the participle time of its clausal complement; the subclause applies on the tense time level.

(4-12) h. *Nachdem* relates to the participle time of its clausal complement; the subclause applies on the aspect time level.
[In principle, same picture as in (g).]

(4-12) i. Nachdem relates to the participle time of its clausal complement; the subclause applies on the participle time level.

THE TENSES IN MATRIX CLAUSE AND SUBCLAUSE. It has often been observed that with nachdem-clauses, specific restrictions apply to the possible combinations of tense constructions in the matrix clause and the subclause (cf. Duden-Grammatik, Herweg (1990), and others). The canonical combinations are listed in (4-13a-c); the combinations in (4-13d, e) are described as less common; however, they seem to be absolutely acceptable.

(4-13) a. Matrix clause: present tense; subclause: present (or, marginally: future) perfect.
   Eva malt Bilder, nachdem sie aufgewacht ist (sein wird).
   *Eva draws pictures after she up-woken is/has (be will)*
b. Matrix clause: past tense; subclause: past perfect.
   Eva malte Bilder, nachdem sie aufgewacht war.
   *Eva drew pictures after she up-woken was/had*
c. Matrix clause: future tense; subclause: future (or present) perfect.
   Eva wird Bilder malen, nachdem sie aufgewacht sein wird (ist).
   *Eva will pictures draw after she up-woken be/have will (is)*
d. Matrix clause: present perfect; subclause: past perfect.
   Eva hat Bilder gemalt, nachdem sie aufgewacht war.
   *Eva has pictures drawn after she up-woken was/had*
e. Matrix clause: past perfect; subclause: past perfect.
   Eva hatte Bilder gemalt, nachdem sie aufgewacht war.
   *Eva has pictures drawn after she up-woken was/had*

The semantics of nachdem naturally explains why the combinations in (4-13) are preferred. First, as was explained above, perfect constructions in the nachdem-clause can optimally support the semantics of nachdem. Second, since the nachdem-clause locates the situation it applies to in the matrix clause after the beginning of the post-state it introduces, the tense that locates the post-state of the nachdem-clause must be compatible with the location in time of the respective matrix clause situation: when it is located in the past - i.e. by the past tense, a present perfect or a past perfect
construction -, then the nachdem-clause must contain a past perfect; when the matrix clause situation is located in the present time, the nachdem-clause must contain a present perfect; and when the matrix clause situation is located in the future, then the nachdem-clause must contain a future perfect or a present perfect because these constructions are able to locate the post-state in the future.

LEXICAL ENTRY. The temporal relation established by nachdem between the matrix clause and the subclause is integrated into the lexical entry of nachdem below.

\[(4-14) \quad [\text{nachdem}] = \text{the function } f : D_{<i, t>} \rightarrow D_{<i, t>}
\]
\[
\quad \text{such that for any } g \in D_{<i, t>}, t \in D_i, f(g)(t) = 1
\]
\[
\quad \text{iff there is a } t^* \in D_i \text{ such that } g(t^*) = 1 \text{ and } t \text{ is a subinterval of the time interval following the beginning of the maximal } t^* \text{ satisfying } g.
\]

As a consequence of the semantics of nachdem, its complements are restricted to situations that provide a homogeneous phase with a clear beginning point.\(^\text{18}\)

Heinämäki (1974) and Herweg (1990:251ff) observe that despite a common belief, before and after, and bevor and nachdem, respectively, do not express converse relations. There are cases of \(p \text{ bevor } q\) that do not entail \(q \text{ nachdem } p\), and vice versa. It is clear why this is so. According to the semantics of bevor and nachdem proposed above, the meanings of the two sentence patterns can be specified as in (4-15a). The picture in (4-15b) schematically shows a situation where the truth conditions of the two sentence patterns diverge. More specifically, it illustrates the invalidity of the implication from \(q \text{ nachdem } p\) to \(p \text{ before } q\): while it is true that a part of \(q\) is located after the beginning of \(p\), it is not true that a part of \(p\) is located before the beginning of \(q\). (4-16) applies this to a concrete example.

\[(4-15) \quad a. \quad p \text{ bevor } q \text{ iff a part of } p \text{ is located before the beginning of } q
\]
\[
\quad q \text{ nachdem } p \text{ iff a part of } q \text{ is located after the beginning of } p
\]

\(^{18}\) Like bevor-clauses, also nachdem-clauses sometimes exhibit nontemporal readings, i.e. causal readings and adversative readings. The following brief dialogue, taken from a detective novel, illustrates that nachdem-clauses sometimes suggest a causal flavor (Richard North Patterson: Das Maß der Schuld. München: Goldmann, 1996, p381).

(A) "Haben Sie Ihre Geschichte nicht abgeändert, nachdem Sie Dr. Sheltons Bericht gehört hatten?" - "Ja, was den Ablauf der Ereignisse betrifft. Aber deshalb habe ich nicht so ausgesagt." - "in-this-way testified"

For a brief discussion of these readings and their relationship to the temporal reading, the reader is referred to Herweg (1990:232ff).
The semantics of the conjunction *seit* or *seitdem*, which are more or less synonymous (cf. Herweg (1990:302)) is closely connected to the semantics of the preposition *seit*, which was discussed in chapter V. Recall that *seit* is an up-to-TT-preposition, i.e. it always introduces a time interval that reaches from the time provided by its complement up to the tense time of the clause.19

RESTRICTIONS ON THE MATRIX CLAUSE. Like *bis*-clauses, Herweg (1990:295) analyzes *seit*-clauses as duration adverbs, too. Hence, according to him they can in general only be combined with atelic situations in the main clause. However, each of the sentences in (4-16) appears fully acceptable, regardless of the situation type employed in the matrix clause. Hence, I will analyze *seit*-clauses as position adverbials.20

(4-16) a. ... es ist völlig bedeutungslos, seit wir mit einander leben; ...
   *it is completely meaningless, since we with each-other live*

b. ... seitdem ich die kenne, zanken sie sich.
   *since I them know, quarrel they themselves*

c. Und zum erstenmal, seitdem er in dieser Kanzlei zu arbeiten angefangen
   **and for-the-first-time, since he in this office to work begun**
   had, ging er an einem unleugbar warmen Frühlingstag zum Fenster und
   **had, went he on a undeniably warm spring-day to-the window and**
   schloß es.
   **closed it**

d. ... seitdem die Konsulin alterte, begann auch sie, an dieser Geistesrichtung
   **since the Konsulin grew-old, began also she, at this mental-attitude**
   Geschmack zu finden.
   **taste to find**

19 Herweg (1990:295) claims that the right edge of a *seit*-interval can be just some other contextually provided time; this, however, clearly seems to me to be inadequate - the right edge always has to be provided by the tense time.

20 The examples are taken from Ingeborg Bachmann (1971): *Malina*. DigWö, sentence 74 (a); from Alfred Döblin (1929): *Berlin Alexanderplatz*. DigWö, sentence 1025 (b); from Joseph Roth (1932): *Radetzkymarsch*. DigWö, sentence 3876 (c); from Thomas Mann (1901): *Buddenbrooks*. DigWö, sentence 5676 (d).
RESTRICTIONS ON THE SUBCLAUSE. Herweg (1990) claims that seit-clauses must in general contain either atelic situations or perfect constructions. This is shown in (4-17).

(4-17) a. Es pochte hartnäckig und vordringlich, sein Herz, wie es das fast
   it beat pertinantly and urgently, his heart, as it that almost
   beständig tat, seitdem er hier oben war.
   constantly did, since he here above was

b. ... seitdem die Konsulin alterte, begann auch sie, an dieser Geistesrichtung
   since the Konsulin grew-old, began also she, at this mental-attitude
   Geschmack zu finden.
   taste to find

c. *Zum erstenmal, seitdem er die Uniform anzog, fühlte er sich
   for-the-first-time, since he the uniform on-put, felt he himself
   leicht, stark und mutig.
   light, strong and courageous

d. *?Und zum erstenmal, seitdem er in dieser Kanzlei zu arbeiten anfang, 
   and for-the-first-time, since he in this office to work began
   ging er an einem unliegbare warmen Frühlingstag zum Fenster und
   went he on a undeniably warm spring-day to-the window and
   schloß es.
   closed it

e. Zum erstenmal, seitdem er die Uniform angezogen hatte, fühlte er sich
   for-the-first-time, since he the uniform on-put had, felt he himself
   leicht, stark und mutig.
   light, strong and courageous

f. Und zum erstenmal, seitdem er in dieser Kanzlei zu arbeiten anfangen
   and for-the-first-time, since he in this office to work begun
   hatte, ging er an einem unliegbare warmen Frühlingstag zum Fenster und
   had, went he on a undeniably warm spring-day to-the window and
   schloß es.
   closed it

The atelic situations in seit-clauses, however, are restricted. First, they must have a definite beginning and before the beginning, there must have been a phase of the opposite state (4-18b). Second, they can hardly be provided by negated clauses (4-18b); this does not hold, however, with negations like nicht mehr (‘no longer’) as in (4-18c). The examples in (4-18a, b) are taken from Herweg (1990:303).

21 The examples are taken from Thomas Mann (1924): Der Zauberberg. DigWö, sentence 3016 (a); from Thomas Mann (1901): Buddenbrooks. DigWö, sentence 5676 (b); from Joseph Roth (1932): Radetzkymarsch. DigWö, sentence 2851 (e); from Joseph Roth (1932): Radetzkymarsch. DigWö, sentence 3876 (f).
A further restriction imposed on the subclause is that *seit*-clauses can hardly refer to situations that are located after the time of utterance, cf. the examples in (4-19), which are due to Herweg (p306).

(4-19) a. *Seitdem er in Köln wohnen wird, ... since he in Köln live will ...

b. *Seitdem Peter morgen in Köln ist, ...

Since Peter tomorrow in Köln is ...

WHAT THE TEMPORAL CLAUSE CAN APPLY TO IN THE MATRIX CLAUSE. (4-20) - (4-22) illustrate that *seit*-clauses can apply on the tense level as well as the aspect level and the participle level, too.

(4-20) APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.

a. Seit Mika weg war, WAR Lola zweimal beim Frühstück gerannt.

Since Mika away was was/had Lola twice at-the breakfast run

= There is a subinterval of the time since Mika was gone at which it was twice the case that Lola had already run [short] before the breakfast.

b. \( \lambda t \left( \exists T \left[ \lambda t' \left( seit_{Mika\_weg\_sei} (t') & PAST (t(t')) \right) \right] \right. \)

\[ \left. \lambda t' \left( ZWEIMAL_{A} \left[ \lambda t'' \left( beim_{Frühstück} (t'') & PERF (t(t'')) \right) \right] \right. \right. \]

\[ \left. \left. \lambda t''' \left( \exists P \left[ \lambda t''' \left( shortly\_before\_t'\_t'' (t''' & \right. \right. \right. \right. \right. \]

\[ \right. \left. ge...t \_sei- (t''')(t'''') \right) \right) \)

\[ \left. \right. \left. \lambda t''' (Lola\_renn- (t''')) \right) \right) \right) \]

A time \( t' \) such that \( t' \) is a subinterval of the time since Mika is gone and \( t' < \) now and there are two times \( t'' \) such that \( t'' \) is a subinterval of the breakfast time and \( t'' \subseteq t' \) and there is a time \( t''' \) such that \( t''' \) is a subinterval of the time shortly before \( t'' \) and \( t''' \leq t'' \) and Lola runs at \( t''' \).
(4-21) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
  a. Letztes Jahr WAR Lola zweimal gerannt, seit Mika weg war.
     Last year was/had Lola twice run since Mika away was
     = Within last year, there were two times located in the time after which
       Mika was gone and at which Lola was in a post-state of having run [short]
       before.
  b. \( \lambda t \left( \exists t' \left[ \lambda t' \left( \text{letztes Jahr (t')} \& \text{PAST (t(t'))} \right) \right] \right)
     \left[ \lambda t' \left( \text{ZWEIMAL}_A \left[ \lambda t'' \left( \text{seit_Mika_weg_sei- (t'')} \& \text{PERF (t(t''))} \right) \right] \right) \right]
     \left[ \lambda t'' \left( \exists t''' \left[ \lambda t''' \left( \text{shortly_before_t'' (t''')} \& \text{ge...t sei- (t''')(t''')} \right) \right] \right) \right]
     \left[ \lambda t''' \left( \text{Lola_renn- (t'''')} \right) \right] \right) \right)
  c. [[ Letztes Jahr WAR Lola zweimal gerannt, [seit Mika weg war]_A ]]^C
     (now) = 1
     iff there is a time t' such that t' is a subinterval of last year and t' < now and
     there are two times t'' such that t'' is a subinterval of the time since Mika is
     gone and t'' \( \subseteq t' \) and there is a time t''' such that t''' is a subinterval of the
     time shortly before t'' and t''' \( \leq t'' \) and Lola runs at t'''.

(4-22) APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
  a. Lola ist geRANNT, seit Mika einschlief.
     Lola has run since Mika fell-asleep
     = There is a time before now and since Mika fell asleep at which Lola ran.
  b. \( \lambda t \left( \exists t' \left[ \lambda t' \left( \text{C (t')} \& \text{PRES (t(t'))} \right) \right] \right)
     \left[ \lambda t' \left( \exists_A \left[ \lambda t'' \left( \text{C (t'')} \& \text{PERF (t(t''))} \right) \right] \right) \right]
     \left[ \lambda t'' \left( \exists_P \left[ \lambda t''' \left( \text{seit_Mika_einschlaf- (t''')} \& \text{ge...t sei- (t''')(t''')} \right) \right] \right) \right]
     \left[ \lambda t''' \left( \text{Lola_renn- (t'''')} \right) \right] \right) \right)
  c. [[ Lola ist gerannt, [seit Mika einschlief]_P ]]^C
     (now) = 1
     iff there is a time t' such that now \( \subseteq t' \) or now < t' and there is a time t'' such
     that t'' \( \subseteq t' \) and there is a time t''' such that t''' such that t''' is a subinterval of the time
     since Mika falls asleep and t''' \( \leq t'' \) and Lola runs at t'''.

WHAT THE CONJUNCTION CAN APPLY TO IN THE SUBCLAUSE. \textit{Seit} can sort out
the tense time (4-23a), the post-state (4-23b) or the situation time of an embedded VP
(4-23c) in a perfect subclause. Note that similarly to the case of \textit{nachdem}, it is also a
bit difficult to construct appropriate examples where *seit* applies to the post-state of a perfect construction in its clausal complement.

(4-23) a. APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
Mika schrieb an seinem Buch, seit Lola letzte Woche achtmal Max traf.
*Mika wrote at his book since Lola last week eight-times Max met*
= Since Lola met with Max eight times last week, Mika was writing his book.

b. APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
Mika schlief, seit Lola gegangen WAR.
*Mika slept since Lola left had/was*
= Mika slept after Lola had left already.

c. APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
Mika las, seit Lola geSCHLAFen hatte.
*Mika read since Lola slept had*
= Mika read since Lola was asleep.

THE TEMPORAL RELATION EXPRESSED BY THE CONJUNCTION. According to Helbig and Buscha (1989:465), *seit(dem)* expresses simultaneity with durative verbs in the present or past tense (4-24a), and anteriority with perfective verbs in present perfect or past perfect constructions (4-24b).

(4-24) a. Seit(dem) ich ihn kenne, ist er Nichtraucher.
*since I him know is he nonsmoker*

b. Seit(dem) seine Frau gestorben war, ging er zu keiner Veranstaltung mehr.
*since his wife died was/had went he to no event more*

This view, however, seems to be based on the assumption that temporal subclauses establish temporal relations between the VP-situation of their matrix clause and the VP-situation of the temporal subclause - a view that is often found in traditional grammars but was shown above to be too simple: temporal conjunctions can sort out time parameters on various levels of their clausal complement, and temporal subclauses can apply on various levels of their matrix clause. According to the present analysis, *seit* in (4-24b) can thus be viewed as sorting out the post-state of the perfect construction in its clausal complement. And this post-state is simultaneous to the situation described in the matrix clause. I.e. the post-state, the being dead of the wife, is simultaneous to his not going to any events anymore. Hence, reference to anteriority is not necessary under this refined analysis.

According to Herweg (1990:304), the complement of *seit* introduces the proximal post-state of some event or the post-state provided by a perfect construction in the *seit*-clause which reaches up to the tense time (according to Herweg: a contextually provided time). In this respect, *seit* and *nachdem* (‘after’) are analogously constructed. Herweg observes, however, that atelic situations are more acceptable with *seit* than with *nachdem* (p305).
THE TENSES IN MATRIX CLAUSE AND SUBCLAUSE. Like the preposition *seit* ('since'), the conjunction *seit(dem)* usually combines with expressions in order to build up-to-TT-adverbials (cf. Schipporeit (1971:32ff)). In order to construct a time interval that starts before the tense time reaches up to it, the conjunction *seit(dem)* has to combine with present tense or present perfect constructions for tense times around or after the time of utterance, and with past tense or past perfect constructions for tense times that are located before the time of utterance. In the case of simple present tense and past tense clauses, the relevant time interval is constructed with the situation time of the (durative) VP of the *since*-clause, in the case of perfect constructions it is constructed with the situation time of the post-state introduced by the present perfect construction. The examples in (4-25), taken from Schipporeit (1971:32, 59f), illustrate this.

(4-25) a. Seit mein Mann an (!) der Pinakothek arbeitet, wohnen wir in München.
   *since my husband at the Pinakothek works live we in Munich*

b. Seit mein Mann sich vom Geschäft zurückgezogen hat, wohnen wir in München.
   *since my husband himself from the business removed has live we in Munich*

c. Seit mein Mann an (!) der Pinakothek arbeitete, wohnten wir in München.
   *since my husband at the Pinakothek worked lived we in Munich*

d. Seit mein Mann sich vom Geschäft zurückgezogen hatte, wohnten wir in München.
   *since my husband himself from the business removed had lived we in Munich*

LEXICAL ENTRY. The temporal relation established by *seit* between the matrix clause and the subclause is shown in the lexical entry of *seit* in (4-26). Note that in contrast to the preposition *seit*, the conjunction has only a positional meaning.

(4-26) [[seit]]\(c\) = the function \(f: D_{<i, t>} \rightarrow D_{<i, t>}
\text{such that for any } g \in D_{<i, t>}, t \in D_i, f (g) (t) = 1
\text{iff there is a } t^* \in D_i \text{ such that } g (t^*) = 1 \text{ and } t \text{ is a subinterval of the time interval that ends at the left or right boundary of the local tense time and that starts at the left or right boundary of } t^*.

5. Durational subclauses: *solange* ('as long as')

RESTRICTIONS ON THE MATRIX CLAUSE. *Solange*-clauses function as duration adverbials in their matrix clause. Herweg (1990:294) notes that durational subclauses are not only durative in the sense that they provide the minimal length of the situation they specify; rather, they also fulfill a locating function because they establish a
coterminous relation between the matrix clause situation and the subclause situation. Hence, they differ, in Herweg's view, from nonclausal duration adverbials. In the present account, however, the locating function of duration adverbials has also been assumed to be part of the semantics of nonclausal duration adverbials - their positional information, however, is mostly left implicit.

Since *solange*-clauses are durative, the situations they specify have to be atelic; *solange*-clauses need to apply to situations that are long enough in order to cover all of the *solange*-interval. Hence, only (5-1a) and (5-1b) with a stative and processive matrix clause are fully acceptable; in the accomplishment clause (5-1c), the *solange*-clause specifies the phase where Wolfgang is busy building the tower; and the *solange*-clause in (5-1d) is unacceptable unless it is understood as specifying the preparatory phase of Wolfgang's falling asleep.

(5-1)  

a. Solange Eva mit dem Teddy schmuste, schlief Wolfgang.  
    *as-long-as Eva with the teddy petted slept Wolfgang*

b. Solange Eva mit dem Teddy schmuste, joggte Wolfgang.  
    *as-long-as Eva with the teddy petted jogged Wolfgang*

c. ??Solange Eva mit dem Teddy schmuste, baute Wolfgang einen Turm.  
    *as-long-as Eva with the teddy petted built Wolfgang a tower*

d. *Solange Eva mit dem Teddy schmuste, schlief Wolfgang ein.  
    *as-long-as Eva with the teddy petted slept Wolfgang in*

Hence, it seems that contrary to the view of Herweg (1990) and others, *solange* is the only true durational conjunction among those discussed in this chapter.

REstrictions on the Subclause. According to Herweg (1990), the clausal complement of *solange* also has to be atelic. This is so because the *solange*-clause has to provide an interval of a certain duration in order to make sense of its being a duration adverbial. Hence, while the stative and processive *solange*-clauses in (5-2a, b) are fully acceptable, the accomplishment in (5-2c) is only acceptable when understood as referring to the preparatory phase of destroying the teddy bear; the same applies to (5-2d), with the difference that it is impossible to separate out an appropriate preparatory phase for the achievement *entdecken*.

(5-2)  

a. Solange Eva leise war, schlief Wolfgang.  
    *as-long-as Eva silent was slept Wolfgang*

b. Solange Eva mit dem Teddy schmuste, schlief Wolfgang.  
    *as-long-as Eva with the teddy petted slept Wolfgang*

c. ??Solange Eva den Teddy kaputt machte, schlief Wolfgang.  
    *as-long-as Eva the teddy broken made slept Wolfgang*

d. *Solange Eva den Tedd*  
    *dy entdeckte, schlief Wolfgang.  
    *as-long-as Eva the teddy discovered slept Wolfgang*
A restriction that holds for the complement of *solange*, however, is the following: it seems to accept only situations that are temporally limited on both sides. Temporal adverbials must quite in general be able to express relevant contrasts to other time intervals at least on one side in order to be acceptable, as is illustrated in (5-3).

(5-3)  a. ??Gestern war 17 eine Primzahl.  
  *yesterday was 17 a prime number*  
  *on the 15th December was Hans unmarried*  
  *on the 17th December was Hans dead*  
  *on the 16th December was Hans sick*  

But *solange*-clauses need relevant contrasts on both sides, cf. (5-4).

(5-4)  a. ??Solange 17 eine Primzahl war, diskutierten alle über Primzahlen.  
  *as-long-as 17 a prime number was discussed all about primes*  
  b. ??Solange Hans tot war, diskutierten alle über Primzahlen.  
  *as-long-as Hans dead was discussed all about primes*  
  c. Solange Hans krank war, diskutierten alle über Primzahlen.  
  *as-long-as Hans sick was discussed all about primes*  

Herweg (1990:299f) integrates this condition into the lexical entry of the conjunction.

**WHAT THE TEMPORAL CLAUSE CAN APPLY TO IN THE MATRIX CLAUSE.** In (5-5) - (5-7) it is shown that *solange*-clauses can in principle apply on the tense level as well as the aspect level and the participle level.

(5-5) APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
  a. Solange Mika weg war, WAR Lola zweimal beim Frühstück gerannt.  
     *as long as Mika away was/had Lola twiceat-the breakfast run*  
     = During the time when Mika was away, it was twice the case that Lola had already run [shortly before as the breakfast].  

b.  \( \lambda t (\exists t_1 \left[ \lambda t' (\text{solange-Mika-weg-sei-} (t') \land \text{PAST} (t)(t')) \right]  
             \left[ \lambda t' (\text{ZWEIMAL}_A \left[ \lambda t'' (\text{beim-Frühstück} (t'') \land \text{PERF} (t')(t'')) \right]  
                   \left[ \lambda t'' (\exists p \left[ \lambda t''' (\text{shortly-before-t''} (t'') \land \text{get...t sei-} (t'')(t'')) \right]  
                       \left[ \lambda t'' (\text{Lola-renn-} (t'')) \right] \right] \right] \right) \)
c. $[[\text{Solange Mika weg war}]_T \ \text{WAR Lola zweimal beim Frühstück gerannt}]^C$

(now) = 1

iff there is a time $t'$ such that $t'$ is the time when Mika was away and $t' < \text{now}$ and there are two times $t''$ such that $t''$ is a subinterval of the breakfast time and $t'' \subseteq t'$ and there is a time $t'''$ such that $t'''$ is a subinterval of the time shortly before $t''$ and $t''' \leq t''$ and Lola runs at $t'''$.

\[\text{(5-6) APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.}\]

a. Letztes Jahr HATte Lola zweimal gegessen, solange Mika weg war.  

$= \text{Within last year, there were two times at which Mika was away and at which Lola was in a post-state of having run [shortly before].}$

b.  

$$\lambda t \ \left( \ \exists_T \ \left[ \lambda t' \ (\text{letztes Jahr} \ (t')) \ \& \ \text{PAST} \ (t'(t')) \right] \ \left[ \lambda t' \ \left( \ ZWEIMAL_\Lambda \ \left[ \lambda t'' \ (\text{solange_Mika_weg_schi-} \ (t'')) \ \& \ \text{PERF} \ (t')(t'')) \right] \ \left[ \lambda t'' \ \left( \ (\exists_p \ \left[ \lambda t''' \ (\text{solange_Mika_weg_schi-} \ (t''')) \ \& \ \text{PRES} \ (t''(t''')) \right] \ \left[ \lambda t''' \ (\text{Lola_ren}} \ (t''')) \right] \right) \right) \right)$$

\[c. \ [\text{Letztes Jahr HATte Lola zweimal gegessen, [solange Mika weg war}]_A ]^C\]

(now) = 1

iff there is a time $t'$ such that $t'$ is a subinterval of last year and $t' < \text{now}$ and there are two times $t''$ such that $t''$ is a time when Mika is away and $t'' \subseteq t'$ and there is a time $t'''$ such that $t'''$ is a subinterval of the time shortly before $t''$ and $t''' \leq t''$ and Lola runs at $t'''$.

\[\text{(5-7) APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.}\]

a. Lola ist geRANNT, solange Mika schlief.

$Lola \ has \ run \ as \ long \ as \ Mika \ slept$

$= \text{There is a time before now at which Mika slept at which Lola ran.}$

b.  

$$\lambda t \ \left( \ \exists_T \ \left[ \lambda t' \ (C \ (t')) \ \& \ \text{PRES} \ (t'(t')) \right] \ \left[ \lambda t' \ \left( \ (\exists_A \ \left[ \lambda t'' \ (C \ (t'')) \ \& \ \text{PERF} \ (t')(t'')) \right] \ \left[ \lambda t'' \ \left( \ (\exists_p \ \left[ \lambda t''' \ (\text{solange_Mika_schlaf-} \ (t''')) \ \& \ \text{PRES} \ (t''(t'''')) \right] \ \left[ \lambda t''' \ (\text{Lola_ren}} \ (t'''')) \right] \right) \right) \right)$$
c. [[Lola ist gerannt, [solange Mika schlief]p ]]c (now) = 1
iff there is a time t' such that now $\subseteq t'$ or now $< t'$ and there is a time t" such that t' $\subseteq t'$ and there is a time t''' such that t''' is a time during which Mika sleeps and t''' $\leq t''$ and Lola runs at t'''

WHAT THE CONJUNCTION CAN APPLY TO IN THE SUBCLAUSE. Solange can sort out the post-state (5-8b) and the situation time of an embedded VP (5-8c) in a perfect subclause. It is not clear, however, whether it can also sort out the tense time (5-8a).

(5-8) a. ??APPLICATION ON THE TENSE TIME (i.e. TENSE) LEVEL.
Mika las, solange Lola letzte Woche acht mal Max traf.
Mika read as long as Lola last week eight times Max met
= ??As long as Lola met with Max eight times last week, Mika read.
b. APPLICATION ON THE POST-STATE (i.e. ASPECT) LEVEL.
Mika las, solange Lola gegangen WAR.
Mika read as long as Lola left had/was
= Mika read as long as Lola had left already, i.e. before she was back.
c. APPLICATION ON THE SITUATION TIME (i.e. PARTICIPLE) LEVEL.
Mika las, solange Lola geSCHLAFen hat.
Mika read as long as Lola slept has
= Mika read as long as Lola was asleep.

THE TEMPORAL RELATION EXPRESSED BY THE CONJUNCTION. According to Herweg (1990), the maximal duration of the situation provided by the subclause determines the minimal duration of the situation expressed by the main clause. In other words, the situation provided by the main clause must be at least as long as the whole situation provided by the subclause.

THE TENSES IN MATRIX CLAUSE AND SUBCLAUSE. Because of the semantics of solange, the tenses employed in matrix clause and subclause must be able to locate the situation provided by the solange-clause and the situation specified in the matrix clause at the same time. Hence, the distribution of the tenses is basically the same as, for instance, in als-clauses (cf. above).

LEXICAL ENTRY. The temporal relation established by solange between the matrix clause and the subclause is integrated in the lexical entry of solange below.22

(5-9) [[solange ]]c = the function f: D<sub>ci</sub>, t$\triangleright$ $\rightarrow$ D<sub>ci</sub>, t$\triangleright$
such that for any g $\in$ D<sub>ci</sub>, t$\triangleright$, t $\in$ D<sub>i</sub>, f (g) (t) = 1
iff there is a t* $\in$ D<sub>i</sub> such that g (t*) = 1 and t is simultaneous to and as long as the maximal t* satisfying g.

22 Like other temporal conjunctions, also solange can have nontemporal readings, especially conditional ones (cf. Herweg (1990:298)).
6. Conclusion

Since subordinate temporal clauses play the role of temporal adverbials in their matrix clause, it is not surprising that they are interpreted like non-clausal temporal adverbials. More specifically, they can function as restrictors on the tense level, on the aspect level, and - in perfect clauses - on the participle level.

Their general option of being restrictors of overt or implicit adverbs of quantification, however, is subject to constraints that have not been discussed in this chapter. Thus, Johnston (1994) observes and van Geenhoven (1999) discusses further that depending on topic-focus structure, matrix clauses as well as temporal subclauses can serve as restrictors or overt adverbs of quantification. The ability of matrix clauses to serve as their restrictors, however, depends on their situation type: it seems that atelic matrix clauses in contrast to telic ones cannot function as restrictors, even when they are nonfocused - a characteristic that otherwise makes them preferable restrictors - and contain a focused subclause, i.e. a preferably non-restrictive subclause. In this case, the subclause must function as the restrictor. Viewed the other way round, subclauses that specify nonfocused atelic matrix clauses cannot be part of the nuclear scope of that particular adverb of quantification but must serve as their restrictors. Since this phenomenon obviously is mainly due to the behavior of matrix clauses, we will not include its discussion in the present study.

The internal interpretation of temporal subclauses works in principle similar to the interpretation of main clauses, with the crucial difference that one of the time parameters of a temporal subclauses is bound by a lambda-abstractor instead of a quantificational adverb. This lambda-abstractor is located below the temporal conjunction and can sort out any time parameter from the three levels of the semantic representation.

Since temporal subclauses can thus fulfill three different functions and their conjunctions can sort out three different time parameters, the temporal relations established by temporal conjunctions are not easy to capture. It was shown that the VP-situation times of the matrix clause and the subclause can, as a result of these two types of variation, often show a variety of possible sequencings.