How time is encoded

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1. Introduction

The experience of time is fundamental to human cognition and action. Therefore, all languages we know of have developed a rich repertoire of means to encode time. In many languages, the expression of time is even close to mandatory, since it is structurally connnected to the finite verb:

(1) a. Eva was cheerful.
     b. Eva is cheerful.
     c. Eva will be cheerful.

Each of these sentences positions a certain situation, Eva's being cheerful, before, around or after the moment of speech. We must clearly distinguish here between

– the **situation itself**; in 1, it is a sort of state; it could also be a short event, such as the one described by *Eva closed the door* or by a slow process such as *Eva grew older*. Following Comrie (1976), I shall use the word "situation" as an overarching term for all sorts of events, states, processes, actions, etc.

– the **description of the situation**; this description is realised by the non-finite parts of the sentence; I shall mark such a description as […]. In 1, this description is [Eva be cheerful] in all three cases; this does not mean, of course, that the situation itself is the same, nor does it mean that the situation could not be described in some other way.

– the **marking of how the situation is positioned in time**; in 1, this is done by modifications of the verb, here by the choice between *was, is, will be*.

In English, the description of the situation and its positioning in time can normally not be separated. There is no non-finite utterance such as 1d:

(1) d. Eva be cheerful.

Other languages, such as Chinese, do not force their speakers to mark time. This does not mean, of course, that they cannot locate situations in time. They just use other means, in particular adverbials such as *in the past or* in *soon*.

Essentially, there are six types of devices that are regularly used to encode time in language. These are:

1. *Tense*. Tense is a grammatical category of the verb; in its traditional understanding, it serves to locate the situation in relation to the "now" of the speech act. Thus, the difference between *was, is*, and *will be* in 1 reflects different tenses.

2. *Aspect*. Aspect is also a grammatical category of the verb; in its traditional understanding, it serves to "present" a situation from a particular viewpoint, for example as on-going or as completed. Thus, *Eva was closing the door* presents a situation described by [Eva close the door] as on-going, whereas *Eva closed the door* presents a situation described by [Eva close the door] as completed; in both cases, the tense marking positions the situation before the moment of speech.

In principle, tense and aspect should be independent from each other, i.e., the same aspectual contrast could be found in all tenses. In English, this is largely the case (there are a few exceptions). In most languages, however, tense and aspect are combined to a simpler inflectional system – which is mostly called "tense system", rather than "tense-aspect system". In Russian, for example, the pure aspectual contrast between imperfective aspect and perfective aspect only applies to past tense forms (see section 3.3 below).

3. *Aktionsart* ("event types", "lexical aspect"). Aktionsart is traditionally considered to be a subdivision of verb types according to the temporal properties of the situations which they describe.[2] Thus, *to sleep* is used to describe a "state", whereas *to close* is used to describe an "event". The term is also used for more complex verbal expressions, such as *to fall asleep, to sleep for an hour* or *to close three windows*.

4. *Temporal adverbials*. These are by far the richest class of temporal expressions, and in contrast to tense and aspect, they are found in all languages. Temporal adverbials can be simple (*now, soon, often*), morphologi-

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[2]   Note that verbs never **refer** to situations, as is often said (which situation does *to sleep* refer to?). They are used to describe certain properties of situations.

cally compound (*today, rapidly, afterwards*) or syntactially compound (*after the war, long ago, when the saints go marching in*). Functionally, they can describe very different temporal features, such as position on the time line (*now, yesterday, next year*), duration (*for two hours*), frequency (*rarely*), and many others whose precise role is not easy to determine (*still, again*).

5. *Temporal particles*. They are somewhere between temporal adverbials and suffixes or prefixes; well-known examples are the Chinese particles *le*, *zhe* and *guo* which can follow the bare verb stem and which express something like aspect.

6. *Discourse principles*. Very often, temporal relations are not expressed by specific words or constructions but by the way in which sentences are organised into larger stretches of discourse. In ancient rhetoric, for example, there was a principle called "hysteron proteron (i.e., later-earlier)", which, in a nutshell, stated that in the default case, events in a story should be told in the order in which they occur.

There is an extensive research on these devices, their form, their function, and the way in which they interact in a sentence and in a larger piece of text (the best historical survey is still Binnick 1991). But it is perhaps fair to say that the agenda has not been closed on any of them. There are impressive findings, but there are also many gaps and insuffiencies. Overall, the investigation of how time is encoded in natural languages suffers from three substantial shortcomings:

A. It is strongly biased towards certain devices. From Aristotle to present times, there is a steady stream of research on tense and on Aktionsart; in fact, the way in which we think about the expression of time is deeply shaped by what the Greek philosophers thought about it, and thus, by the structure of Greek. In more recent times, this has been matched by studies on aspect. There is much less work on temporal adverbials, particles, and discourse principles. This is somewhat perplexing, because in constrast to the verbal categories tense and aspect, temporal adverbials are not only found in all languages but they also allow a much more differentiated expression of time than any other device. In fact, one wonders whether tense and aspect are not completely superfluous in view of what temporal adverbials allow us to do.

B. It is strongly biased towards certain languages. Most work deals with a few Indoeuropean languages, such as Greek, Latin, English, German or

Russian. Of at least 90% the world's languages, we have only very vague ideas on how they express time, often based on very superficial descriptions by missionaries who tried to find "analogues" to tense and aspect in these languages. Thus, notions such as "imperfective aspect" or "past tense" are somehow transferred to Arrente or Kpelle, although neither form nor meaning are necessarily the same as in English or Russian.

C. It is strongly biased towards certain text types. Most work by far on the expression of time deals with singular events in reality. Other text types, for example instructions, descriptions, laws – if dealt with at all – are analysed against this background. This is often problematic. Tense, the most important temporal category, is supposed to relate the "situation" to the moment of speech. But what is the moment of speech in a novel, a cake recipe, or a law – text types which are surely not exotic?

So, the state of the art on how languages encode time yields a very unbalanced and incomplete picture. A second, no less serious problem may already have become clear above in the informal characterisations of the six types of devices. There is an initial understanding of notions such as tense, aspect, or Aktionsart, shared by most linguists and grammar makers. But on closer inspection, it rapidly turns out that each of these notions is loaded with problems that range from terminological confusion to fundamental unclarities of definition. This will become clear as we now turn to the six devices in more detail. In what follows, the focus will be on the first three devices – tense, aspect, and Aktionsart. As has already been mentioned, this does not do justice to what really happens in human languages – but it mirrors our knowledge about it.

2.   Tense

2.1. The canonical view[3]

In its received understanding, tense is a deictic-relational category of the verb: it indicates a temporal relation between the situation described by the sentence and some deictically given time span; this time span is usually the

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[3]   A very clear treatment, including a discussion of more recent developments, is Comrie (1985). Dahl (1985) and Bybee, Perkins and Pagliuca (1994) are very useful surveys.

moment at which the sentence is uttered – the moment of speech, the utterance time, or the "now". In what follows, I shall mostly speak of "time of utterance" (abbreviated TU) for this deictic anchor. Typically, three temporal relations are distinguished, and hence, it is often assumed that there are three basic tenses:

Past: The time of the situation precedes the utterance time.

Present: The time of the situation is more or less simultaneous to the utterance time.

Future: The time of the situation follows the utterance time.

This idea goes back to the Greek philosophers. With some refinements, it is still found in most descriptive grammars, and also in many treatises on tense. The word itself comes from Latin *tempus* ("time"). In some languages, such as French or Italian, one and the same word is used for time and tense, and in many other languages, the terms "past, present, future" refer equally to the **grammatical tenses** and to the **notions** of past, present, and future. This common origin easily invites the idea that one cannot properly express time without tense. This is, of course, a weird idea. After all, a language which does not inflect its verbs for tense can easily add an adverbial such as *in the past*, *now,* or *in the future,* let alone more differentiated characterisations such *as tomorrow, at this very moment,* or *in seven years from now*. So, tense is not only to be separated from time – it is not even a particularly important for the expression of time. Many languages do not have it at all, and in those languages which do have it, it is largely redundant. Still, it attracted, and probably still attracts, most attention in linguistic research on time. This research has pleased us with many insights. But there are also many problems left; to which I will now turn.

To begin with, there are many terminological confusions. The word "tense" is used in at least three ways: it can refer to

– the grammatical notion tense (as in *Tense is an inflectional category of the verb*),
– a particular form, such as in *The English past tense is marked by …* In this sense, "tense" often links a particular form to a bundle of functions, such as "pastness" and "perfective aspect"
– a particular function, as *This form expresses future tense*. In Russian, for example, the "present tense form" of the perfective aspect has a "future tense meaning".

These terminological confusions could easily be avoided by a more careful choice or wording (for example by distinguishing between "tense form" and "tense meaning", as need arises). In actual fact, however, they often lead to confusions, for example when people speak about the "past tense" in sentences such as *If he arrived before eight, the party could begin in due time.* Another example of this terminological nuisance are the fruitless discussions on "how many tenses" a particular languages has. In German, proposals range from 1 to 12 (see Thieroff 1992 for a discussion), depending on what exactly is meant by "a tense".

More serious, however, are four fundamental problems with the classical notion of tense: there are more than three "tenses", the classical definition is often wrong, the temporal anchor need not be the moment of speech, and there are many "non-canonical" uses. We will now look at these four problems.

2.1. There are more "tenses" than past, present and future

Under its simplest definition, tense marks past, present, and future: the situation is before TU, it is at TU, it is after TU. Now, even in Greek, for which this idea was originally invented, there are more than three "tenses" (in the sense of tense forms). So, how can we capture the meaning of these forms, if is not just the bare distinction between past, present and future?

Over the centuries, several ways to overcome this problems have been developed, in particular the following three:

A. *More differentiated temporal relations*. There is not just a relation "before", but relations such as "long before", "shortly before" or "before but on the same day" vs "before but not on the same day". There are indeed some languages which seem to have such refined temporal notions (Dahl 1985).

B. *Additional time spans*. Past tense, present tense and future tense in the classical sense express a relation between two time spans – the time of the situation and the time of the utterance. It could be that there is a "third time", which is, for example, between these two. Implicitly, this idea is found already in the traditional understanding of tense forms such as the plusquamperfect of the second future of Latin. It was more systematically elaborated in the course of the 19th century. Hermann Paul (1882: 273f.), for instance, stated that there is a special "vantage point", from which the situation is seen. This vantage point may precede or follow the time of utterance, and it may precede or follow the time of the situation, thus giving

rise to more compound relations. Half a century later, this idea was taken up by the philosopher Hans Reichenbach (Reichenbach 1947), who dubbed the three "points" S, E, and R, respectively. S corresponds to the time of utterance, E to the time of the situation, and R is the "point of reference", which corresponds to Paul's vantage point. He applied them to the English tense system. Reichenbach's labels were taken up by many other authors, although mostly with the understanding that they do not refer to "time points" but to "time intervals". This type of analysis has become very popular, although it suffers a bit from the fact that Reichenbach never bothered to explain what he meant by "point of reference" (see, e.g., Hamann 1987, Klein 1992).

C. *Combination of temporal relation and other temporal function.* A "tense form" may not just express how the situation is related to the TU but also invoke a certain perspective on the situation. This may apply to the two English "past tenses" *He was sleeping* and *He slept.*, or to the three French "past tenses": *Il parla, il parlait, il a parlé.*

D. *Non-temporal functions of "tense forms".* In German, the so-called future tense is ambigouous between a temporal reading and a modal reading. Thus, *Hans wird schlafen* "Hans will sleep" can mean: "He will sleep at some time after now", but it can also mean: "It is likely that he is sleeping now". In English, the "past tense" may express pastness, but also irreality, as in *If they were here, …*

All of these possibilities are indeed observed in the tense systems of various languages. This fact does not speak against the idea that tense expresses a temporal relationship between a situation and the time of utterance; but it shows that the picture is much more complex than the classical notion of past, present, and future would suggest.

2.2. Relation between what?

Let us now ignore these complications and return to a very simply case, such as 1a, *Eva was cheerful.* Under the classical understanding of tense, the past form of the verb *was* indicates that a situation described by [Eva be cheerful] is before TU, whereas *Eva is cheerful* says that a situation described by [Eva be cheerful] it more or less simultaneous with TU. It is easy to see that this cannot be correct. If *Eva was cheerful* is true, then this does not exclude at all that she is still cheerful at TU. If *Eva's cat was dead*

is true (let's hope it is not!), we can be quite certain that the cat is still dead at the moment of speech. So, if the time of the situation is that time at which the situation obtains or happens, then the classical definition of tense is bluntly false in very elementary sentences.

When someone asserts *Eva's cat was dead*, then he asserts something about some time span in the past – the time talked about, the assertion time, or the **topic time**, as I shall say. This time can, but need not, be the time at which the situation obtains or happens. In *Eva's cat was dead*, the topic time is most likely a subinterval of the time of the situation, that is, the time at which the cat is dead. So, even in elementary tense forms, three time spans come into play:

- the time of utterance; this is the time at which the utterance is expressed
- the topic time; this is the time about which something is asserted (or asked)
- the time of the situation; this is the time at which the situation obtains or occurs

What tense does, is to express a relation between the time of utterance and the topic time – the time about which the speaker wants to say – for example to assert – something. This topic time in turn is temporally related to the time of the situation: it can be contained in it, it can contain it, it may follow or precede it, it may also be fully simultaneous to it. In this latter case, the classical notion of tense is correct: it marks just a relation between between the time of the situation and the time of utterance. In all other cases, there is only a "mediated relation" between these two times.

2.3. The temporal anchor need not be the time of utterance

Under the classical understanding, the temporal anchor is deictically given: it is the "now", the 'moment of speech', or the 'time of utterance' TU. This idea, firmly established as it is, reflects the various biases which characterise the research tradition on tense (see the discussion at the end of section 1). As soon as we go beyond the conventional diet of examples, it faces at least four problems.

First, it often does not work for subordinate clauses. In many languages with tense marking, the present tense of sentences like 2 can refer to John's thinking time – which is in the past – or to the time at which the sentence itself is uttered:

(2)   John thought that Mary is in the kitchen.

Under the "matrix clause anchoring", the situation of the subordinate clause is in the past, and under the "deictic anchoring", it is in the present. This ambiguity was already noted in antique grammar: *verba dicendi vel sentiendi* "verbs of speaking and thinking" can create their own temporal anchor. This problem is perhaps of limited interest, since it keeps the main idea of temporal anchoring in relation to the speaker's (or thinker's) "now". A tense which related the situation to some anaphorically given time span, as in this example, is sometimes called "relative tense", in contrast to "absolute tenses", in which the temporal anchor is deictic (Comrie 1985)..

Second, the speech event itself takes time. How long is the speech time – is it the time it takes to utter the sentence? Or the clause, if the sentence is complex? Many deictic words require a speech time shorter than that time. Consider, for example, the utterance *From now, it is precisely three seconds to now*. (see Kratzer 1978 for this and similar examples). Does it have one or two moments of speech? The conclusion seems obvious: We must distinguish a speech time that is decisive for the tense marking of some sentence from several speech times that are decisive for deictic adverbials within the same sentence.

A third problem shows up, as we consider longer stretches of discourse. Does each sentence in a text, for example a in personal narrative, have its own speech time? Many texts follow the 'principle of natural order', which says 'Unless marked otherwise, order of mention corresponds to order of events'. It is this principle which explains why sequences such as *He fell asleep and turned the light off* are slightly odd. Now, such a principle only makes sense under the assumption that there is a sequence of speech times WITHIN a text, none of which needs to be the actual time at which these sentences are uttered. Hence, it appears that we have to replace the simple notion of 'speech time' by something like a 'structure of speech times', i.e., a set of temporally related time spans which are characterised by particular properties, for example the property that someone says something, or writes something, or hears something.

A fourth problem with the notion of speech time has to do with this characteristic property. It is not always the property that someone says (or writes or hears or reads) something at that time. Consider a sentence such as the following one, taken from the German penal law:

(3)   § 9. [Ort der Tat] (1) Eine Tat ist an jenem Ort begangen, an dem der
         Täter gehandelt hat oder im Falle des Unterlassens hätte handeln

> müssen oder an dem der zum Tatbestand gehörende Erfolg ein-
> getreten ist oder nach der Vorstellung des Täters eintreten sollte.
>
> [approximately: Place of deed. (1) A deed has been committed
> at that place at which the doer has acted or, in case of omission,
> should have acted, or at which the result belonging to the defini-
> tion of the deed has occurred or should have occurred according
> to the plan of the doer]

This sentence contains many tense forms, *ist begangen, gehandelt hat, hätte handeln müssen, eingetreten ist, eintreten sollte* ('has been committed, has acted, should have acted, has occurred, should have occurred'). What is the temporal anchor of this sentence? It is surely not the time at which the law, or this particular sentence, was (or is?) issued, or at which the reader reads it. Still, such usages of tense forms are by no means exotic (see, for example, the examination of tense in varying text types in Hennig 2000). Hence, the notion of speech time – if this notion is meant to be the time at which the sentence is uttered – is only a special case of how events can be hooked up in time.

These considerations suggest that the notion of "time of utterance" should be replaced by the more general notion of a CLAUSE-EXTERNAL TEMPORAL STRUCTURE, to which situations described by a sentence can be linked. It consists of a set of clause-external times that can be characterised in different ways. Such a clause-external time can be the time at which the entire utterance or a part of it (as in the case of *now)* is uttered or heard; it can also be some other contextually given time. In subordinate clauses, for example, it can be the time of a matrix verb, especially if this verb is a *verbum sentiendi vel dicendi*. Then, ambiguities may arise because there are several possible clause-external times, to which the event can be linked. The interpretation of the 'clause-external time(s)' may vary from sentence to sentence, from text type to text type, and from language to language. Familiar notions such as "moment of speech" or "time of the utterance" are only a special case of such an external temporal structure: it is that type of external temporal structure which we normally use when we talk about single events in reality.

2.4. Non-canonical usages

Tense forms are often used in a way which clearly goes against their "nor-mal" meaning, for example when a present tense form is used to describe

events that are clearly in the past. Some of these usages have given rise to extensive discussions, in particular those which are found in narrative fiction; others are less known. Here is a list of such "non-canonical" usages.

A. Narrative present

(4)   Two days ago, I walked down the Hauptstrasse in Heidelberg. All of a sudden, a young man looks at me, grins and says: "Hey, don't you remember me?!"

In the narrative present, the whole action is in the past – here indicated by the temporal adverbial *two days ago* -, but that at least some of situations are presented "as if they were present". There are two common interpretations of this use: the situations are "felt to be present" at the time of utterance, or the speaker imagines himself to be present in the situations. Under the first interpretation, the situations are somehow "shifted in time", and under the second interpretation, the deictic anchoring is shifted.

B. Time travel

(5)   We are in the year of 2040. The whole world is under the control of three gigantic oil companies. Everybody who counts lives in peace and great luxury.

Here, the first sentence locates the entire action in the future. In other cases, the "time travel" may also go into the real past or a hypothetic past. But the finite verb is marked for present tense. There is no accepted term for this tense use, although it is often found in literary as well as in non-literary texts. Obviously, it is quite different from "narrative present" in the sense of 1. above: there is no particularly vivid presentation of the events or feelings of those who participate.

C. "Imagine prefixing"

(6)   Imagine you are in a desert. It is very hot, no water around, no oasis in sight. All of a sudden, you hear someone say: "How about a glass of Montrachet?"

This is another type of fictitious discourse. Whereas the "time travel" use pretends to be real and explicitly specifies the time by a calendaric information, this is not the case here: the hypothetical nature of what is said is explicitly marked in the first utterance, a marking which then extends over all

subsequent utterances. All of them are in the present, although the first sentence does not necessarily mean *Imagine you are in the desert right now*. In fact, it is very difficult to relate the situations, as described in the text, to the time of utterance.

D. Praesens tabulare

(7)   In 1819, Goethe publishes "Die Wahlverwandschaften". They are completely ignored by the critics. He is deeply disappointed and almost decides to give up literary work.

In this use, a series of historical facts is simply registered, and it is clearly stated when these facts happened – and they are in the past. There is no mental "moving", no fiction nor any vivid narration whatsoever, quite to the opposite: It is a sober presentation of situations in the past.

E. Epic preterite

Since this case seems more common in German than in English, I give a German example here:

(8)   Er wanderte durch die stillen Strassen. Morgen war Weihnachten. Niemand würde ihn erwarten, niemand würde ihn vermissen.
['He was wandering through the quiet streets. Tomorrow was Christmas. No one would wait for him, no one would miss him.']

The most typical tense of literary narration is the preterite. But the situations are not "really" in the past. They are in some hypothetical time. Moreover, it is not very clear what the "time of utterance" of, say, a novel is. Some authors have concluded that the tense form in this case does not express a tense relation but a discourse type (Hamburger 1956).

F. Re-telling

(9)   In the next scene, Charlie looks around everywhere. Then, he discovers an old shed and begins to walk there.

This is a common although not the only possible tense use in re-telling a movie (or a story). The action is clearly not in the present. In fact, it is not very clear how the action can be related to TU at all. It is a movie, and what happens in the movie is not part of the chain of events or states which eventually lead to the present and the talking about them. But the action is presented as if it is just seen at the time of speaking.

G. Past in pictures

(10) This is Eva when she was four years old. And here, she just got this little bike. She looks very cheerful, doesn't she. This was in 2002.

The picture shows an action which is long ago (or was long ago). But it is shown right now, and it is apparently this time which the speaker chooses to talk about, rather than the time at which the action really happened. He need not choose this "time of picture looking" as topic time, as the subordinate clause in the first utterance, the second and the last utterance show. But he can, and he may switch even in such a short stretch of discourse.

H. Backchecking

This use is normally not observed in longer stretches of discourse but in short questions in some situations, for example:

(11) a. (Waiter): Who got the Chardonnay?
      b. (To visitor): Sorry, what was your name?

Here, the use of the past tense form surely does not refer to the past of the relevant situation.

This list of "non-canonical usages" is not exhaustive. But it suffices to show that the idea of a stable relation between, for example, pastness marking and pastness is a bit of an illusion.

2.5.   Summary

The old idea that tense is the main device which languages use to encode time is the result of several strong biases. The classical definition, under which tense indicates whether the situation described by a sentence is in the past, the present, or in the future – in other words, whether it precedes, is simultaneous to, or follows the speech event – works only in special cases, and many languages have no tense marking on the verb at all. This does not mean that tense is unimportant; but its role for the expression of time may be a bit overrated in the research tradition.

3. Aspect[4]

3.1. The general idea[5]

Like tense, aspect is an inflectional category of the verb; unlike tense, it does not assumed to express a temporal relation but a particular "viewpoint" on the situation which is described by the sentence. The speaker may present the time-course of the situation in different ways. The most common distinction is between an "imperfective" aspect and a "perfective" aspect. In the first case, the situation is presented as on-going, as in English *Mary was opening the window*; it need not have come to an end. In the latter case, it is presented as completed, as in *Mary closed the door*. There are other possible viewpoints (see, e.g., Comrie 1976), but perfective and imperfective are by far the most important. The term comes from the French translation *aspect* of the Russian word *vid'* "view" (Reiff 1828/9). Russian, as most Slavic languages, has a very salient marking of two such "views" in the verbal system, and in the early 19th century, linguists realised that the conventional description in terms of tense alone does not do justice to the facts. Although Russian may not be the most typical case of a language with such a grammaticalised view (see Dahl 1985), the notion and also the basic distinction between perfective and imperfective made their way into the analysis of many other languages.

During this process, many attempts were made to render the idea of different temporal views on a situation more precise. Numerous characterisations are found in the literature; they can be grouped into three types:

(12) A. The situation is presented "from outside" versus the situation is presented "from inside".

  B. The situation is presented as "completed" versus the situation is presented as "non-completed" or "on-going".

  C. The situation as presented "with its boundaries" versus the situation is presented "without its boundaries".

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4 The term "aspect" is also used as a label for situation types, such as states, processes, events, sometimes with the qualification "lexical aspect" (in contrast to "grammatical aspect" or "situation aspect" in contrast to "viewpoint aspect" (Smith 1997). In order to avoid terminological confusions, I will use it here only in the classical sense.

5 A very clear introduction is still Comrie (1975). Dahl (2000) and Ebert and Zuniga (2001) are very useful reviews of aspect systems in European and Non-european languages, respectively.

It is easy to see that these characterisations are not necessarily exclusive; they are somehow variations on the same underlying theme, and they are not entirely clear. Before coming to various problems connected with them, it will be useful to have a brief look at two well-investigated cases, English and Russian. They exemplify different ways to encode aspect and to combine it with tense.

3.2. The case of English

The English system is remarkably regular in both respects. Suppose the situation is described by [Eva sleep]. Then, this situation can be related to the time of utterance TU[6] ("tense") and presented under different viewpoints ("aspect") in the following ways:

	perfective	*imperfective*
before TU	Eva slept	Eva was sleeping
at TU	Eva sleeps	Eva was sleeping
after TU	Eva will sleep	Eva will be sleeping
before TU	Eva has slept	Eva has been sleeping

Transparent as this system is – it still raises some smaller and at least two major problems. A few verbs (*to need*) do not tolerate the *be -ing*-form, or they only tolerate it in a special meaning (*to love*). These verbs are typically stative; but in the course of development, most stative verbs came to take the progressive (Denison 1993). While tense and aspect are in principle orthogonal, there are some restrictions on the use of forms such as *Eva sleeps*. These restrictions may have to do with the precise meaning of this tense-aspect combination, and thus with the first major problem: what exactly is the meaning of these forms? This concerns the tense side as well as the aspect side. There are two "tenses" which place the situation before the time of utterance – the simple past *slept* and the present perfect *has slept*. The difference is clearly felt, and it is manifest in facts such as that in the present perfect, the time of the location cannot be specified by an adverbial (**Eva has slept yesterday at four*). But it is not easy to pin down this difference in terms of tense and aspect. In both cases, the situation is in the past, so, they

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6   Since this is only for the sake of illustration, the many complications with tense discussed in the preceding section are ignored here.

both should be past tenses. They both occur in both aspects, so, the difference cannot be in terms of "imperfective" and "perfective". It could, of course, be that there is a third viewpoint, call it "perfect". This idea is supported by the fact that on closer inspection, the perfect forms constitue a tense system on their own, based on the auxiliary marking:

	perfective	*perfective*
before TU	Eva had slept	Eva had been sleeping
at TU	Eva has slept	Eva has been sleeping
after TU	Eva will have slept	Eva will have been be sleeping

But if the perfect is also an aspect, it cannot be on a par with the perfective and the imperfective aspect, because these are found **within** the perfect; these latter would, so to speak, be viewpoints within a viewpoint. There is a very rich literature on the English perfect (see Fenn 1987; McCoard 1978; Klein 1994; Comrie 1985; Portner 2003; and for comparisons to other "perfects" Musan 2002 and the contributions in Alexiadou et al. 2003), but one cannot say that there is a generally accepted analysis.

   This problem leads us immediately to the second major problem of the English tense-aspect system: what exactly is the meaning of the two aspects? The English variant of the imperfective is often called "progressive" or "continuative", and this makes perfect sense in cases such as *Eva was frying two eggs*: we are somehow placed in the midst of the action, it is presented as on-going, as proceeding, with reference to "its inner temporal constituency" (Comrie 1976). In the perfective form *Eva fried two eggs*, we have the impression that the action is somehow completed, that it has reached the end. But this is much less clear in contrasting pairs such as *It was standing on the marked place* vs. *It stood on the market place* or *Soames was hoping for a rapid solution* vs *Soames hoped for a rapid solution*. In neither case is there any progress, any inner temporal constituency. This is just a reflex of a much more general problem – how can the definitions given above under A – C be made precise, and in which way do they vary from language to language? We will come to this in a moment.[7]

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[7]   As an aside, it is not encouraging for the working linguist when even in the best-studied language of the world, such as salient phenomenon like the *-ing*-form is not really understood.

3.3. The case of Russian

Russian shows a much more complicated interlace of tense and aspect. The basic facts can be summed up in seven points (there are a number of exceptions and complications, for example loan words or some special motion verbs that are ignored here; an excellent and comprehensive survey is Forsyth 1970, more generally on Slavic aspect Dickey 2001):

1. Each verb belongs to one of two aspects, the imperfective or the perfective.
2. As a rule, morphologically simple verbs are imperfective, e.g. *pisat'* "to write"; there are about 30 simple verbs which are perfective, e.g. *dat'* "to give"; a few verbs are ambiguous.
3. Attaching a prefix to an imperfective verb makes it perfective, e.g., *na-pisat';* there are about 20 such prefixes.
4. At the same time, this prefix typically modifies the lexical meaning of the verb to some extent, e.g. *na-pisat'* "to write (up)", *pere-pisat'* "to copy". Sometimes, this change is substantial, sometimes, it is minor (or non-existent, as claimed by some authors).
5. Many but by far not all verbs that are made perfective in this way can be made imperfective again by adding a suffix to the stem (so-called secondary imperfectivisation). So, we have the chain *pisat' – **pere**pisat' – perepis**ovat'***. Such a suffix does not change the lexical meaning – it indicates is a bare aspectual contrast.
6. The present tense form of an imperfective verb has present tense meaning; the present tense form of a perfective verb has future tense meaning. The future meaning of an imperfective verb is expressed by an analytic construction: *ja budu pisat' pismo* "I will write (a/the) letter".
7. The past tense meaning of perfective as well as imperfective forms is expressed by attaching a suffix -l to the stem; this suffix is inflected for gender and number (historically, it is a sort of past participle, but there is no remnant of an auxiliary): *ona pisala pismo* "she was writing a letter", *on perepisal pismo* "he copied a/the letter".

It was this system which originally gave rise to the notion of grammatical aspect; but apparently, Russian aspect operates in a very different way than aspect in English. First, there is a somewhat idiosyncratic combination with tense meanings. Second, the way in which aspects are marked is very different. Third, prefixation usually changes the viewpoint as well as the lexical meaning of the verb; this is not true for secondary imperfectives, which

have the same lexical meaning as the perfectives from which they are derived. And fourth – it is not clear what exactly the bare aspectual meaning is. Although characterisations such as given in 11 are used for Russian as well as for English, there are substantial differences. Thus, Russian "imperfectives" often do not indicate on-goingness, and in English, they would have to be translated by the simple form rather than by the progressive. In nutshell: "imperfective" in language A does not mean "imperfective" in language B.

I have chosen these two examples of tense-aspect systems, because they belong to the most-studied of all languages of the world, dead or alive. They demonstrate that "aspect" is neither in form or meaning a homogeneous phenomenon. In what follows, we shall address some of the core problems in more detail. They all have to do, in one way or the other, with the way in which aspect and aspects are is defined.

3.4.   Three problems

3.4.1. *What is a "viewpoint"?*

Characterisations such as in 11 are found everywhere in the literature, and they are very suggestive indeed. But they are entirely metaphorical. What exactly is meant by "to see/view/present a situation in different ways"? The situation itelf is supposed to remain the same when different aspects are chosen: it is only the perspective on it that changes. But it is hard to make precise what this metaphor means. Most languages allow their speakers to express a particular content relative to their position, and thus from their "perspective". A good and clear example is deixis; depending on the position and gaze direction of the speaker, one and the same constellation can be described as *here* or *there*, as being *to the left* or *to the right*. But this is surely not what is indicated by the choice of a particular aspect. In contrast to tense, aspect is not deictic. Situations such as the ones described by [Mary bake a cake] or [Peter sit on an old chair] are not like chicken shacks, which you can "see" from the inside and from the outside.

3.4.2. *On-going when, completed when?*

Under the traditional definitions, aspect is not time-relational: in contrast to tense marking, aspect marking is not supposed to relate the situation to a particular time. But in fact, it is time-relational: on-goingness as well as

completion are always relative to a particular time. Consider, for example, the situation which is described by the English sentence *Eva boiled an egg*. If this sentence is true, then the situation referred to is completed, for example, at 6 o'clock, and it is not completed at 5:45 o'clock. At that time, it may be on-going, or it may not have begun at all. Therefore, a definition like "The perfective aspect presents a situation as completed" makes sense only if it means: "the situation is presented as completed **at some time T**". A speaker who presents some situation as completed does not want to suggest that it was or is completed at any time: It is completed at some time T, as well as at any time thereafter, and is not completed at certain times before T. The notion of completion crucially depends on "the time about which something is said" – for example 5:45 o'clock or 6 o'clock in this example. This time need not be made explicit; in particular, its relation to to the time of utterance need not be expressed. What is this – possibly implicit – time, in relation to what is said to be completed or on-going? Without an appropriate definition of this notion, the entire characterisation as 'presented as completed – not completed' is hanging in the air.

3.4.3. Which boundaries?

The third problem has to do with the notion of boundary, found in many characterisations of aspect. With very few exceptions, all situations have a beginning and an end – an "initial (or left) boundary" and a "final (or right) boundary". This does not mean that the **description** of a situation by the sentence makes these boundaries explicit. The speaker may choose to mention them or to leave them aside, just as he may mention or not mention other features of the situation. On-goingness and completion seem naturaly related to these boundaries, in particular to the "right boundary". Therefore, it is suggestive to assume that aspect is a device to make these boundaries explicit. Take, for example, the following definitions by Carlota Smith, which are particularly clear in this regard: "The perfective viewpoint … presents events with both initial and final endpoints." (Smith 1997: 301) and "The temporal schema of the imperfective viewpoint focusses on part of a situation, excluding its initial and final endpoints." (Smith 1997: 302).

Inutitively, such a view is very appealing; but there are at least two reasons which render it unsatisfactory. Suppose we describe a situation by [Eva sleep from four o'clock to six o'clock]. Then, the boundaries are clearly indicated by the two temporal adverbials. Nevertheless, we are free to present the situation so described in the imperfective and in the perfective aspect: *Eva was sleeping fom six o'clock to eight o'clock* vs *Eva slept from four*

o'clock to six o'clock. So, this choice of aspect seems – at least in these cases – independent of whether initial and final boundary are "visible" or not. The second problem is that the characterisation of different Aktions- arten – states, processes, events – is often based on the presence or non- presence of a boundary. In Vendler's widely used classification, four such "time schemata" (as he calls them) are distinguished: states, activities, ac- complishments and achievements. Verbs (or verb phrases) which describe a state or an activity, such as *to stand* or *to run*, do not involve such a bound- ary, whereas verbs (or verb phrases) which describe an accomplishemt (*to paint a picture*) or an achievement (*to find a solution*) are inherently bounded – bounded due to their lexical meaning. Now, if the semantics of grammatical aspect is defined in terms of boundaries, as well, then the dif- ference between inherent lexical properties of the verb, on the one hand, and aspect, on the other, is entirely confounded. If the perfective aspect somehow involves a boundary, then this boundary must be of a different type that the boundary inherent to the lexical content of the verb. In Russian, verb pairs such as perfective *dat'* and imperfective *davat'* 'to give' or per- fective *perepisat'* and imperfective *perepisyvat'* "to copy" (cf. section 3.3 above) are said to have exactly the same lexical meaning; in Vendler's terms, both would be accomplishments, hence involve some inner boundary. But they differ in aspect. Hence, the perfective aspect should add some other, additional boundary. What is this boundary, and how does it relate to the boundaries of the situation type?

3.5. Summary

Aspects are different ways " to view" or "to present" one and the same situ- ation. Many languages have grammaticalised such a distinction, typically in form of a "perfective" and an "imperfective" aspect; some languages are also claimed to have other types of viewpoints. This notion captures an im- portant intuition about how time is encoded. But it is not very clear. The definitions which are typically used, as the ones in 11, are metaphorical, and they miss important facts, in particular the fact that completion and non- completion are time-relational. This asks for more precise definitions, and in fact, several attempts in this direction have been made in recent years – often in combination with treatments of tense (for example Smith 1997; Klein 1994; Giorgi and Pianesi 1997; Declerck et al. 2006). But by far most de- scriptive work on form and function of aspect in natural languages is based on these intuitive characterisations.

4.   Aktionsarten

4.1. Lexical features

Tense and aspect are grammatical categories of the verb. But temporality is also reflected in the lexicon – in the content of verbs and other lexical items which serve to describe situations. Situations themselves vary considerably in their inherent temporal structure. There are rapid events, such as the explosion of a bomb, there are complex actions such as the baking of a cake, there are gradual and slow processes as the melting of an iceberg, there are states such as Eva's being cheerful, and there are even "atemporal" situations such as the fact that 17 is a prime number. These differences can be encoded by the words which describe them, and thus, we have different types of verbs and other expressions. The oldest and perhaps still most-used traditional term for these types is "Aktionsarten" (manners of action), and we will adopt it here; others are "event types", "lexical aspect", "situation aspect".

Aktionsart distinctions are found in all languages. Traditionally, their primary source is the lexical meaning of the verb; there are "event verbs" such as *to explode*, there are action verbs such as *to speak*, and there are state verbs such as *to hope*. But is easy to see that the temporal characteristics of the situation which the sentence describes vary with many other words, for example adverbials or the direct object. Thus, there is a clear difference between *to smoke*, *to smoke for half an hour*, and *to smoke three cigars*. In fact, all words in a sentence can contribute by their lexical meaning to describe the temporal make-up of a situation. In what follows, however, I will concentrate on verbs and verb phrases, since these are the expressions which are normally investigated in this context.

What are the inherent temporal features of these expressions? There are innumerable attempts to answer this question, beginning with Aristotle's distinction between "verbs of kinesis" and "verbs of energeia"[8] to some at-

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[8]   His definition is as follows (Metaphysics, Theta, 6, 1048b): "Thus, you are watching and thereby have watched already, you are thinking and thereby have thought already; by contrast, you are learning (something) and have not learned (it) already, and you are becoming healthy and are not yet healthy. At the same time, we are living well and have lived well, we are happy and have been happy. Otherwise, the process should have ended at some time, like the process of becoming thin. But it has not come to an end at the present moment: we are living, and have lived." (for a discussion of the tradition, see Taylor 1965).

tempts to describe these features in terms of formal semantics, such as Dowty (1979) or Krifka (1989). They range from two or three categories to very complex systems; Noreen (1923), for example, distinguishes 17 Aktionsarten. Nowadays, most researchers use Vendler's (1957) four classes state, activity, accomplishment, achievement, or they develop their own classification, often tuned to the particular language they want to analyse. Different as these systems are, they are all more or less based on the following five temporal features:

(13)   A. Qualitative change: does the content which is expressed involve a change of state or not (non-stative vs. stative VPs)?

B. Boundedness: does the content which is expressed have a beginning and an end, or, as is often said, an initial and a final boundary ("unbounded" vs. "bounded", often contrasted as "processes" vs. "events")?

C. Duration: in the case of "bounded contents", are they short or long in duration ("punctual" vs. "non-punctual" contents)?

D. Inner quantification: do they involve repeated sub-events or sub-states ("iterative", "frequentative", "semelfactive")?

E. Phase: do they focus on a sub-phase of the total content, for example the beginning, the middle, the end ("inchoative", "terminative", "resultative", etc.)?

In what follows, I will not discuss these five temporal features individually but concentrate on two general problems which these features and the classifications based on them raise.

4.2.   Temporal properties of the situation and of its description

The lexical content of a sentence, for example [Eva sleep in the guestbed] or [Eva work in the garden], is a description of a situation (or set of situations). This description is selective: the situation may have many features, temporal or other, that are not part of the description. In reality, almost everything has a beginning and comes to an end, be it a state, a process, a state; there are only a few exceptions, such as (probably) *Seven is a prime number.* Hence, there is hardly any situation which does not have an initial boundary and a final boundary. But this does not mean that each verb or verb phrase must include such a boundary as a part of its lexical meaning. Therefore, a distinction is often made between "unbounded expressions", such as *to stand*

on the table and "bounded" expressions, such as *to put on the table*; the latter somehow involve a terminal point – point at which the "putting" as such is over and the book is on the table. Similarly, it is usually assumed that, while there are no really punctual situations in reality, languages may conceive of situations as having no duration, and thus being punctual. This is assumed to be the case for verbs such as *to find*. It is this sense in which we speak about "punctual verbs".

The distinction seems clear-cut: We do not talk about what is the case in reality but about the way in which languages grasp and encode reality in lexical contents. But this is not so straightforward. Consider, for example, the situations described by (14):

(14)   a. The cup stood on the table.
      b. Eva put the cup on the table.

In the normal course of events, both situations have a beginning, an end, and thus a duration; we do not assume that the cup's standing on the table, as described in (14a), lasts forever, just as little as her putting it on the table lasts forever. What, then, does it mean that a lexical item has a temporal feature like "having duration" or "having a right boundary", if it does not mean that the situations typically described by VPs such as *to stand on the table* or *to put on the table* do have a duration or a right boundary? Any situation described by a "state verb" such as *to lie*, or by an activity verb such as *to snore* takes some time, hence may be long or short; the lexical content of these verbs themselves has no time, there is no watch to measure its duration, and if we imply that it has duration, then only by virtue of the fact that the situation it refers to can be measured by a watch. There is no time at which the lexical content can ever be over, because it has no time at all. What can be over at some point in time, are the situations to which we may refer by means of these words. If we say that a certain lexical item involves boundaries, then it is only by virtue of the fact that this lexical item can be applied to situations which indeed have a duration, or an end. Hence, it seems mysterious that a set of situations should have duration, or an end in reality, but the corresponding lexical contents do not contain such a temporal feature. But if this is true, the distinction between "event VPs" with and "state VPs" without boundaries, or between punctual and non-punctional verbs (or VPs) collapses, because in reality, there are no situations without duration. This, however, means that virtually all known systems of verb classification are on shaky grounds – not for practical but for principled reasons.

4.3. Semantic intuition vs morphosyntactic combinations

Classifications of verbs into various Aktionsarten are usually based on two methods:

A. Semantic intuitions; thus, someone who knows English also "knows" that *to lie on the table* is something static and does not involve a change, whereas *to put on the table* is something dynamic and involves a change: first, the object of putting is not on the table, and then, it is.

B. It can also be based on the way in which verbs are affected by morphological or syntactic operations, for example how they interact with temporal adverbials.

Now, semantic intuitions are often fuzzy, as becomes immediately clear when we run through a series of examples. I shall not illustrate this here but encourage the reader to go through any bit of text and try to determine the temporal properties of each verb (for example the verbs in this sentence). The second method seems more reliable, and has therefore found wide application in the research tradition. The following three types of innerlinguistic tests are often used:

(a) Modification by adverbials: it is tested whether the VP in question can be combined with a specific adverbial, for example *he VP in two hours, he VP for two hours*. A variant of this way is to check whether a specific wh-question is possible, like *How long did it take to VP?*

(b) Aspectual modification: it is tested whether the item in question is accessible to aspect modification. The best-known case is the "*-ing* test" for statives in English. It is argued that stative verbs like *to contain, to belong, to know* do not tolerate the progressive, hence it is easy to test whether a VP is stative or not.

(c) Presuppositions and implications: It is checked whether a sentence containing the crucial form has a certain presupposition or implication. This test was already used by Aristotle (see fn 5). A more recent version was proposed by Garey (1957) in order to distinguish between "telic" and "atelic" verbs: "If someone was V-*ing*, then he V-*ed*" (for example, *If someone was washing the car, then he has washed the car* vs *if someone was living in London, then he has lived in London*); only atelic verbs pass this test. Another example, first suggested by Bennett and Partee (1978), is the test for the sub-interval property: If something is true for some interval t, is it then also true for any sub-interval of t?

All of these methods have been extensively applied, and they are probably the best available diagnostic for verb classes; thus, Vendler's famous classification is entirely based on a combination of (a) and (b): states and activities go with *for two hours*, whereas accomplishments and achievements do not; activities and accomplishments take the *ing*-form, whereas states and achievements do not.

This way to proceed is more satisfactory than a mere appeal to semantic intuitions. But there are also some problems. Consider, for example, aspectual modification. There are, first, many languages in which it cannot be applied, since they have no grammatical aspect; this raises serious questions as to the transferability of, for example, Vendler's four types to other languages (a fact which so far has hardly prevented anyone from transfering them). But even if it can be applied, as in English, its validity hinges on the assumption that stative verbs (or VPs) do not tolerate the imperfective. Now, locative predicates such as *standing on the table* admit the *ing*-form. Therefore, the claim is either circular (if "stative" is **defined** as "not tolerating the imperfective"), or else, it is false. The problems are less obvious with the two other methods; still, there are a number of questions to be asked.

The difficulty with (a) is simply that it is very often not clear what is really modified. I will illustrate this with Vendler's "for x time" test, since it is so often used in the literature. Some VPs do not tolerate an adverbial like *for x hours, for ten seconds*, etc, whereas they tolerate modification by *within one hour, within four seconds*. Vendler uses this test to separate "achievements" and "accomplishments", one the one hand, from "states" and "activities", on the other: one can say *He reached the station in one hour*, but not *He reached the station for one hour*. Hence, *to reach the station* is an achievement or accomplishment; for VPs such as *to stand on the table* or *to be in Heidelberg*, it is exactly the other way around. This is a useful test, without any doubt, and in contrast to the aspect change test, it is better transferable to other languages. Now, the exclusion of *for*-adverbials is not absolute; thus, *She opened the window for two hours* is possible – though only, if the adverbial indicates the duration of the resulting state, rather than the duration of the opening-activity. This raises two connected questions: first, what exactly is specified by the adverbial, and second, what is the reason that the duration cannot be specified in some cases? Under the usual analysis of *She opened the window*, there is a right boundary (the point in time at which the window is first open), and it is also clear that it took some time to open the window, say three seconds, one minute, or even half an hour (some windows are hard to open). Hence, the situation lasts for

a while, although perhaps for a short while only; it is not punctual. Why should it then be impossible to use a durational adverb with it, just counting the time of when his opening began until the first moment at which the window was open? Therefore, the constraint exploited by the adverb test seems a complete mystery.

I think the reason is that the lexical content of *to open a window* involves neither a "right boundary" nor punctuality. It simply includes two qualitatively distinct states – a "source state", in which the window is not open, and a "target state", at which it is open; during the first state, there is also some kind of activity on the part of the agent (for example, turning a handle etc). The lexical content does not say anything about the length of these states; all it implies is that there is a transition between the source state and the target state, which may be abrupt or smooth; otherwise, it would not be possible to talk about two qualitatively distinct states. A durational adverbial such as *for two hours* cannot modify both states at the same time, since they are mutually exclusive; at best, it can apply to the "resulting state", and this indeed yields a possible reading of *He opened the window for five minutes*.

This does not speak against an application of such tests – but it speaks against a blind application. In each case, we must consider, what is exactly modified by a particular adverbial, or by some other kind of morphosyntactical operation, and why it can be applied or not.

5.   Temporal adverbials

Across all languages, temporal adverbials consitute the by far most elaborate device to encode time. They vary considerably in form and function. In what follows, we illustrate this for English, which stands here for all Indoeuropean languages.

5.1.   Forms

English has essentially the following three types of temporal adverbials:

A. Simple temporal adverbials: *now, then, soon, often, seldom, always*.
B. Morphologically compound adverbials: *today, afterwards, sometimes, slowly*.
C. Syntactically compound adverbials. This is the richest class, with three main constructions:

a) Bare noun phrases: *last fall, all day long*
b) Prepositional (or postpositional) phrases: *three hours ago, three hours before, after the autopsy, in the past, for seven years, at any moment*.
c) Subordinate clauses: *before he arrived, while I was in China, whenever she called me*.

They often combine to more complex constructions, for example: *soon after the autopsy, at four o'clock on every second Friday in 2004* or *before and sometimes after he was in Riva*.

5.2. Functions

Since they can draw on virtually all lexical and grammatical means of a language, temporal adverbials allow highly differentiated characterisation of all sorts of temporal features. Essentially, four functional types are found.

A. Temporal adverbials of position

In English, these include, for example *now, two days ago, after the riots*. Temporal adverbials of position express a relation such as BEFORE, AFTER, SIMULTANEOUS between two time spans – a time which somehow positioned (the "theme"), and a time which is used as an anchor, in relation to which the theme is positioned (the "relatum"). In *Max will arrive soon*, the adverbial *soon* expresses a temporal relation AFTER between the time of a situation, described by [Max arrive], and the time of utterance. The adverbial *in five minutes* in *Max will arrive in five minutes* expressed the same type of relation: theme AFTER relatum, but it makes the distance between the two times more precise. Note that in both cases, the temporal relation is also indicated by the tense form *will arrive*. This information is here completely redundant.

In this example, the relatum is deictic – it is the time at which the sentence is uttered. There are two other important types of relata – anaphoric and calendaric. Anaphoric relata come from the preceding context, as in *Then/a few minutes later/after the call/after the had closed the shop, he left*. Calendaric relata use some historical event as an anchoring point, such as the birth of Christ: *In 2002, he died*. Note that the relatum itself is not made explicit in this case; what this sentence means, is: "in the year which is 2002 years after the calendaric relatum, he died".

B. Temporal adverbials of duration

The duration can be indicated in a vague way, as in as *He worked for quite a while, The exam lasted forever*. It can also be made very precise, as in *He worked for seven hours and four minutes*; in this case, the theme (the time of the situation whose duration is specified) is related to multiples or fractions of the duration of some other situation, for example the rotation of the earth around its axis or around the sun.

Note that adverbials such as *soon* or *three days ago* also have a durational component. Their primary function is to indicate a temporal relation between two time spans, such as AFTER or BEFORE. In addition, the indicate the duration of the time **between** these two time spans, either in a vague (*soon*) or in a more precise way (*three days*).

C. Temporal adverbials of frequency

They quantify over time spans. As in the case of durational adverbials, this can be done in a relatively vague way, such as *often, sometimes*, *on several occasions*, or more precisely, as *twice a week*, *every Friday*. A particularly intesting case is the adverbial *always*, which seems to quantify over all times; so, it seems to mean "at all times". In actual fact, however, it is normally used to express the idea: "at any relevant time" and thus carries a flavour of subjectivity. Thus, a sentence such as *He always forgets to take his teeth out* does not mean "For all times, it is true that he forgets to take his teeth out" but "At any time when it would be relevant for him to take his teeth out, he forgets it".

D. Temporal adverbials of contrast

All languages we know of also have a type of adverbial that does not specify features such as relative position, duration or frequency but still have a clearly temporal flavour. Typical examples in English are words like *still, already*, and *again*. Their precise function is not easy to pin down. Compare the following four sentences:

(15) a. Eva was in Riva.
      b. Eva was already in Riva.
      c. Eva was still in Riva.
      d. Eva was again in Riva.

The first sentence states that some time T in the past (the "topic time") overlaps with the time of a situation described by [Eva be in Riva]. When

already is added, then this indicates that an earlier but adjacent time also has the property [Eva be in Riva]; so, (15b) means: at some time T, he was in Riva, and at some time immediately before T, he was in Riva, as well. The addition of *still* has a similar effect, except that it "adds" a later (and adjacent) time to T. The meaning contribution of *again* is something like "and this not for the first time". Thus, (17d) means: "At some time T, John was in Riva, and at some time before T – which must not be adjacent –, he was in Riva, as well."

In these examples, it is relatively easy to describe the function of these adverbials. There are, however, many complications. Most of these are due to varying scope. This is particularly clear for *again*. It was often noted that English again can have two readings, as exemplified by (16):

(16)   Eva opened the window again.

This can mean that Eva opened the window, and this not for the first time ("repetitive reading"), or that she opened the window and thereby restored an earlier state [window be open] ("restitutive reading"). As simple way to account for this ambiguity is to assume that verbs such as *to open* include two distinct times: a "source state" at which the agent does something and the window is not open, and a "target state" at which the window is open. An adverbial such as *again* can have scope over both times, and then, the entire action is said to be repeated, or it can have scope only over the "target time", and then, it is said that the target state does not obtain for the first time. In other languages, such as German, there are many other scope possibilities which allow for various types of repetition or continuation (for a discussion, see Fabricius-Hansen 2001; Klein 2001; von Stechow 1996).

This brings us to the next point – the way in which adverbials interact with the remainder of the sentence.

5.3. Interaction

Under a very simple view, temporal adverbials characterise the position, duration and frequency of the entire situation described by the sentence; Thus, the initial adverbial in *Yesterday, Eva left.* indicates that the time of situation described by [Eva leave] is at some time within the day before the day which includes the utterance time. As the example of *again* has shown, the case is much more complicated. Adverbials can be inserted in various ways into the sentence, and accordingy, their effect on the entire meaning can vary considerably. It also varies considerably from language to language.

In what follows, we shall have a look at a few English examples which illustrate this point.

The following sentences have in common that the situation itself, as described by [Eva leave], is always in the past; this is indicated by tense marking, but also by adverbial (I assume that *at five* refers to some time in the past):

(17) a. At five, Eva left.
  b. Eva left at five.
  c. At five, Eva had left.
  d. Eva had left at five.
  e. *At five, Eva has left.
  f. *Eva has left at five.

It is hard to tell the difference between (17a) and (17b); in both cases, we assume that the adverbial *at five* specifies the exact time of her leaving. This is different in (17c) and (17d); if the adverbial is in initial position, it specifies a "posttime" of the leaving situation, and as a consequence, the leaving itself must be earlier, for example at four o'clock. In (17d), the same adverbial gives either the "leaving time" or one of its posttimes; the interpretation depends partly on the intonation: if *at five* carries main stress, it is normally understood to give the leaving time; if *at five* is de-stressed, it gives a posttime. In (17e) and (17f), the adverbial is odd. This makes sense for (17e), because there is a clash between the past adverbial *at five* and the present tense *has*; but it is perplexing why (17f) does not have a reading under which *at five* indicates the time of leaving. This restriction has found some attention under the label of *present perfect paradox* (see, for example Dowty 1979, Klein 1992); but there is no generally accepted answer so far.

In (17), the sentence itself is simple; there are more complex cases, for example (18):

(18) a. Miriam appeared to have planned to open the window.

What is "the situation" in this case, and what is "its time"? Obviously, there are many times – the time at which something appears to be the case, the time at which Miriam appears to plan something, the time at which this planning is over, the time of her intended opening, and maybe still others. What happens if an adverbial such as *at five* is inserted in (18)? This is not easy to tell, since intuitions on which positions make sense and on what they imply are shaky:

(18) b. At five, Miriam appeared to have planned to open the window.
　　　c. Miriam appeared at five to have planned to open the window.
　　　d. Miriam appeared to have planned at five to open the window.
　　　e. Miriam appeared to have planned to open the window at five.

In initial position, the adverbial is normally felt to give the "appear-time", possibly also the planning-time, but surely not a posttime of planning, nor the opening time. In (18c), it is also the appear-time that is targetted by at *five*; all other time spans seem more or less excluded. In (18d), it is the planning-time, and in (18e), it is the opening time, and all other times are excluded – more or less.

　　　In all examples so far, the adverbial specifies the position of some interval on the time line (here by the calendaric expression *at five*). We note the same problems with adverbials of duration or of frequency. I will not go through the corresponding sentences but will have a brief look at a somewhat different example:

(19) a. Twice, one of my colleagues bought a house.
　　　b. One of my colleagues twice bought a house.
　　　c. One of my colleagues bought a house twice.

In each case, there are two situations of the type described by [one of my collegues buy a house], as indicated by the adverbial *twice*. But the degree to which these situations are identical varies. In (19a), neither the colleague nor the house must be the same, in (19b), the normal reading is that it is the same colleague but not the same house (although this is not entirely excluded), and in (19c), the normal reading is that the colleague and the house are the same – but there are two "buying actions" at different times. This shows that the position of the adverbial does not only affect which time spans – if there are many – are addressed but also how a particular time span is characterised by the descriptive content of the sentence.

6. Temporal particles

If one were to invent a simple and elegant system to express the classical tense and aspect functions, then one should perhaps form a few simple morphems, say *tu, ti, ta* for "in the past, at present, in the future", respectively, and *le, lo* for "completed, ongoing", respectively. They should have a clearly defined position (say immediately after the verb), and they should not be

mandatory, i.e., leave it to the speaker to express whether something is in the future and whether something is completed; finally, tense and aspect functions should be freely combinable, so we have *tule* for "completed in the past", *talo* for "ongoing in the future", and so on.

In no case has the collective intelligence of all speakers of a language ever created such an elegant system. Human languages are not that functional. But some languages have developed structures which use a bit of this potential. The best-known case is Chinese, which has neither tense nor aspect inflection but uses a few particles which can follow or (in one case) precede the verb. In Mandarin, the most important of these are *le, guo, zhe* and *zai*. Their formal as well as their functional properties are an issue of vivid dispute, but the rough picture is as follows:

A. The particles *le, guo* and *zhe* follow the verb, *zai* precedes it.

B. All four particles express a sort of aspect, in particular:

   (a) *le* indicates perfectivity, independent of the position of the situation on the time line
   (b) *zai* and *zhe* indicate on-goingness, independent of the position on the time line
   (c) *guo* indicates that the situation has been experienced at least once in the past.

C. None of these particles is mandatory, although sentences without them often sound somehow "hanging in the air", that is, they are not really embedded in the communicative context.

There are many complications, but this may suffice to illustrate the general idea (for a more detailled discussion, see Smith 1997; Klein, Li Ping and Hendricks 2000; Xiao and McEnery 2004). Few languages proceed in this way. This is somewhat surprising since such a way to encode temporality – when combined with adverbials – would be simple, versatile, and it would give its speakers a lot of freedom.

7. Discourse principles

At the end of section 1, it was pointed out that research on the expression of time suffers from a one-sided bias towards singular events. But even a singular event has typically a very complex temporal make-up, which cannot

easily be described in a single sentence. Suppose you are asked to report on a car accident that you happen to have witnessed. What you should talk about, is a complex event that took place at a certain time at a certain place and that has a very rich inner temporal structure: it consists of numerous sub-events which take a certain time and which may be more or less simultaneous or sequential. In other words, you must encode an extremely complex web of temporal features. Tense and aspect may help here, but it is easy to see that they are of very limited use. Once it has been said that the accident was in the past – in fact, it probably need not even be said in such a communicative situation -, tense is almost worthless, and aspect does not really allow you to depict the web of temporal relations. Adverbials (*then, while …, before …, for about two seconds*) are more useful, but one of the mightiest devices is to follow certain "strategies" on how to decompose the entire event into smaller sub-events and to report them in a certain order. The report of the car accident includes at least the following tasks on the speaker's part:

A. The entire event must be embedded in time (and space). Typically, this happens by some initial adverbials, often in combination with tense: *Well, all of this happened around four o'clock, and it lasted only a few seconds*.

B. Then, the flow of sub-events is to be presented – typically more or less in the order in which they happened. Adverbials support this order, for example *then, next, just a second later*, etc.

C. Deviation from this order must be explicitly marked, normally by adverbials such as *at the same time, just a bit earlier,* etc.

Communicative strategies of this type were already described in Ancient rhetoric. They have been more systematically studied in personal narratives (Labov 1972; Grimes 1975). But they are also necessary for other text types, whose internal temporal make-up is much less clear, for example to instructions of use, route directions, or simply descriptions. They also exhibit a complex temporal structure, albeit of a different type.

One way to look at how time is encoded in these different verbal tasks is to understand the whole text as an answer to an – explicit or implicit – question, the *Quaestio* (von Stutterheim and Klein 1989; von Stutterheim 1997). Faced with the same knowledge about a complex set of facts, a speaker may approach the task to describe them and their temporal relationships in very different ways. To a large extent, this depends on what the underlying quaestio is: *What happened to you? What did you observe? How do I bake a*

lemon cake? Where is the main station? *What should I do to find a spouse?*
The quaestio, whether implicit or explicitly asked by an interlocutor, im-
poses certain constraints on which parts of the speaker's underlying knowl-
edge are to be put into words, how the information thus selected is packed
into sentences, and how the sentences are arranged one after the other. The
sentences that constitute the whole text are uttered (and heard or read) in a
temporal order, and this temporal order can be used as a device to encode
temporal properties of the "knowledge base". By knowledge base, I mean
the speaker's activated knowledge of whatever he is asked to talk about by
the quaestio. This can be his knowledge about an event that has he wit-
nessed, such as a car accident, it can also be his knowledge about how to
bake a cake, it can be his opinions on whether one should marry. In many
cases, such a knowledge base offers a clear temporal structure, for example
in the case of a car accident. Then, the speaker can linearise his text in ac-
cordance with this inherent temporal structure. This leads to a discourse
strategy which is sometimes called "Principle of chronological order":

(20) PRINCIPLE OF CHRONOLOGICAL ORDER

Unless marked otherwise, the order in which the events are reported
corresponds to the order in which they happened.

But this is only a special case. The knowledge which you activate when
asked *Where is the station?* or *What does your living room look like?*, has
no intrinsic temporal structure. In these cases, speakers normally "invent" a
reasonable structure according to which they linearise the information; they
may follow a gaze tour (Linde and Labov 1975; Ehrich and Koster 1983) or
an imaginary wandering through the streets (Klein 1982). In a way, they
"temporalise" static information. This is much more difficult in other cases,
for example when you have to answer questions like *How does one play
chess?* or *Why should one marry?* In each of these cases, subparts of the
answer – the entire text – may involve temporal relations; but there is no
overarching principle the speaker could follow when organising the text.

8. A new picture

There is a wealth of means to express various aspects of time; but even in
the best-studied languages, these means, their form and their function, are
only partly understood. In the preceding sections, I have tried to give an idea
of the received picture, and I have pointed out a number of problems with

this picture. In this concluding section, I will sketch some ideas about how one could go beyond the traditional views and thus possibly overcome at least some of the difficulties. They do not answer all of these problems; but they suggest a way in which they might be solved.

8.1. Clause-internal and clause-external temporal structures

Basic to this new picture is a sharp distinction between the bare *temporal structure* and the *descriptive properties* which linguistic expressions, words or constructions, associate with this temporal structure. Consider (21):

(21) Eva seemed to have planned to mow the lawn at six.
     (t_0) t_1 t_2 t_3 t_4 t_5

Clearly, there is not just one "situation time" which is related to some other "clause-external time" t_0 but a whole set of time spans which are (a) temporally related to each other, and (b) characterised by certain descriptive properties. Very roughly, we have:

- t_0 is after t_1, the 'time of seeming'
- t_1 overlaps with t_2, the 'posttime of planning'
- t_2 is after t_3, the 'time of planning'
- t_3 is before t_4, the 'time of mowing'
- t_5 is most likely identical with t_4; but other readings are possible (see section 5.3, ex. 18)
- t_1 overlaps with t_2, and t_2 in turn overlaps with t_4.

Thus, a sufficiently general analysis of temporality must be able to account for quite complex temporal structures, rather than just relating the time of the situation and the moment of speech to each other. In particular, it must answer the following four questions:

A. Which time spans constitute the internal temporal structure of the clause?
B. How are these time spans related to each other?
C. Which **temporal** properties go with the various spans, i.e., properties such as position in relation to some other time span, duration and frequency?
D. Which **descriptive** properties go with the time spans? In 20, there is a time at which something seems to be the case, a time at which someone

apparently plans to do something, a time at which this planning is over, etc. This information is primarily provided by the descriptive content of the various verb forms; it can also stem from context.

Now, (21) is a relatively complex sentence. But essentially the same point can be made for sentences which are much simpler:

(22) Eva mowed the lawn.

Here, we have only one verb form in the past – *mowed*. It merges a finiteness marking (here -*ed*) and a non-finite component (*mow*), which, by virtue of its lexical meaning, provides certain temporal and descriptive properties. Very roughly, we have:

(23) 1. There must be a time t_1 at which Eva is "somehow active", for example swinging a sythe, pulling a lawn-mower, operating with some shears or whatever; the lexical verb leaves this to some extent open.[9]
2. There must be a time t_2, at which the grass is 'upright'.[10]
3. There must be a time t_3, at which the grass is 'on the ground'.
4. Various temporal relations obtain between these times. Thus, t_3 must be after t_2. The time t_1, the time at which Eva is active, must somehow overlap with t_2, i.e., the time at which the tree is upright; it may reach into t_3, but this is irrelevant for sentence 22 to be true.

These conditions do not exhaust the lexical content of the lexical verb *mow*. In particular, there is also a causal, and not just a temporal, connection between the whatever Eva does and and the fact that eventually, the grass is 'on the ground'. But this does not matter for present concerns.

   Two conclusions may be drawn from this brief discussion. First, a clear distinction should be made between the 'temporal structure' itself (the temporal intervals and the temporal relations between them), on the one hand, and the descriptive information which goes with these intervals, on the other. The bare temporal structure would be exactly the same, if the sentence were *Eva left* or *Eva opened the window* – all that is different are the descriptive properties that are assigned to the various intervals. Second, temporal struc-

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[9] The actitity could even consist in an instruction to someone else, as in *Louis IV built Versailles*.

[10] English does not provide us with good basic words for the first state and the second state of the grass; for the second state, we could perhaps best use the participle *mown* – which, of course, is derived.

ture as well as descriptive properties can be "packed" in different ways: they may be distributed over several words, they may also be found in a single verb form, here the word *mowed*.

Whatever this structure is and how it is expressed – it is not related to some time span outside the clause. As was discussed in section 2.3, the temporal anchor of a sentence need not be the moment of speech, and sometimes, it is not just one time span but a more complex structure. This invites the following picture. The expression of time in natural languages relates a CLAUSE-INTERNAL TEMPORAL STRUCTURE to a CLAUSE-EXTERNAL TEMPORAL STRUCTURE. The latter may shrink to a single interval, for example the time at which the sentence is utterared; but this is just a special case. The clause-internal temporal structure may also be very simple – it may be reduced to a single interval without any further differentiation, the "time of the situation"; but if this ever happens, it is only a borderline case. As a rule, the clause-internal temporal structure is much more complex, although the expression may be very simple, as (22) illustrates.

8.2. A few examples

If we want to understand how time is encoded in natural languages, we must first look at how a clause-internal temporal structure is built up in a particular language. The starting point of such an analysis is the lexical content of the verb (or a verb-like construction). This content can already have a rich internal temporal structure, as the example *mow* has illustrated. It is then enriched by all sorts of morphologic and syntactic operations, which yield various more complex forms (for example those in (21)). These operations render the temporal structure more and more complicated, they may also add new descriptive content. Let me illustrate this with a simple example, the (non-finite) verb form *be mowing* (as in [Eva be mowing the lawn]) which, very roughly, can be analysed in three steps:

(24) a. The lexical unit *mow* involves two distinct time spans, a "source time" – this is a time span at which Eva does something and the grass is "not on the ground" – a "target time" at which Eva is no longer active and the grass is "on the ground".[11]

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[11] In Klein 1994, I have called these "source state" and "target state", respectively. This terminology (which was also used in sections 4 and 5 above) is suggestive but also somewhat unfortunate insofar as the notion of "state" merges bare time and descriptive properties.

> b. The morphological operation which yields the form *mowing* adds a third time span which is a subinterval of the source time – it is within the time at which Eva is active and the grass is "not on the ground"; let me call this *ing*-time.
>
> c. The syntactic operation which adds *be* and thus yields the new form *be moving* does not add a new time nor new descriptive properties; it just leads to a different syntactic construction which is then accessible to further operations; in particular, the topmost element can be made finite.

The resulting expression *be mowing* already exhibits a rich temporal structure with accompanying descriptive properties. It is not yet a full sentence; the argument slots must be filled (yielding non-finite [Eva be mowing the lawn]), and it must be made finite. This is done by the appropriate morphological marking of the topmost verbal form, here *be*. In this way, it is related to the clause-external structure, in the simplest case the moment of speech. Various optional elements can be added, for example the temporal adverbial *at six*. The result is the sentence:

(25)   Eva was mowing the lawn at six.

By uttering this sentence, the speaker asserts that at some time in the past, Eva was in the "source time" of some activity in whose "target time" the grass is "on the ground". His assertion is confined to this time; at this "topic time", the properties associated with the target time are not yet the case – the "situation is not completed but on-going". This explains the imperfective flavour of (25). Note, however, that this on-goingness is relative to the time about which the assertion is made – it is related to some time in the past.

Rather than making *be moving* finite, the process of forming complex structures might go on:

(24)   d. The morphological operation which turns *be* into *been* and thus yields the form *been moving* adds a posttime to the *ing*-time; since the ing-time is a subinterval of the source time (the time at which Eva does something), it could still be the case that at this posttime, Eva is still active – but it could also be that her activity is over; it is only required that the new time is after an interval with the source time properties.

> e. The syntactic operation which adds *have* and thus yields the new form *have been moving* does not add a new time nor new descrip-

tive properties; it just leads to a different syntactic construction which is then accessible to further operations; in particular, the topmost element can be made finite.

When this form is made finite, variables are filled and (optionally) an adverbial is added, we get:

(26)   Eva had been mowing the lawn at six.

This says that at the time talked about, Eva had the "posttime properties" of being in the source time of mowing the lawn. If does not imply that at that time, she had finished mowing the lawn (= properties of target time reached). So, in a way, we have an "imperfective" within the perfect. What the perfect does, is therefore to assign "posttime properties"; what these properties are, depends on essentially on the meaning content of the underlying lexical verb and potentially other operations that have been applied to this verb.

   Rather than making *have been moving* finite, we still could go on to form more complex verbal expressions, for example *plan to have been mowing*; this would add a pretime to the time of *have been mowing*, and this pretime is characterised as a "planning time". From there, we could proceed *to have planned to have been moving* or to *seem to have planned to have been mowing*, thus creating increasingly complex clause-internal structure. I will not elaborate on this here.

8.3. Classical notions re-defined

The brief exposition above is, of course, very crude. In particular, I believe that the temporal structure must be relativised with respect to the arguments of the verbs. In telic verbs such as *to open, to kill*, *to mow,* we must distinguish between time spans that are relevant for the subject ("x be active") and time spans that are relevant for the object ("y be not open – y be open", or "y be alive – y be dead"); similarly, the English auxiliary *have* has a slighly more complicated function than assumed in 24. The leads to more refined "time-argument structures" (see Klein (2002): but it does not affect the general idea.

   I believe that an analysis along these lines will allow us to reconstruct classical notions such as tense, aspect and Aktionsart in a systematic and precise way, while keeping the intuitions that underly these notions. Tense,

for example, serves to hook up the topmost verbal element of the clause-internal temporal structure to the clause-external temporal structure. In simple cases, there is only one verbal element, and the clause-external structure is the time of utterance, and this is the constellation which give rise to the classical notion of tense. The notion of grammatical aspect reflects some constellations *within* the clause-internal temporal structure, in particular those which are linked to the time of the top-most verbal element; the time of this element (the "topic time") is, so to speak, the joint between clause-external and clause-internal temporal structure. Aktionsarten are the inherent time-argument structures of verbs or of more complex expressions. This also accounts for the affinity between "grammatical aspect" and "lexical aspect"; they are special cases of the clause-internal temporal structure.

The exact way in which this functions in particular languages varies, of course, with the inherent temporal structure of lexical items, on the one hand, and of the morphosyntactic operations that can be used to form more complex expressions. Therefore, "achievements" in language A are often not like "achievements" in language B, and "imperfective" in language X is often not "imperfective" in language Y. Under the approach sketched here, we may not only be able to give a more precise account of classical notions such as tense and aspect and how they function in particular languages but also a broader picture of the many ways in which time can be encoded in human languages.

Acknowledgements

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