true, as the examples below indicate:

(69) Rex has been buying vintage cars in a remote country district, and was delighted with his purchases. Several cars had not left the garage in 30 years.

[Several x: CAR(x)] [The y: GARAGE(y)] \( \sim \) LEAVE(x, y)

(70) When the car-hire firm was wound up, several cars had not left the garage in 30 years.

[The x: GARAGE(x)] [Several y: CAR(y)] \( \sim \) LEAVE(y, x)

In (69), each car introduces a sub-domain in which there is a unique garage, and the quantifier is interpreted as picking out the unique garage for each car. In (70), the garage is interpreted from the context or the preceding discourse, and the sentence is interpreted as being about the car-hire firm's large commercial garage. As the formulae show, the difference can be represented as a difference in scope of the two quantifier determiners, the and several, as well as the different extra information added by implicature.

The most important types of scopal ambiguity with the do not involve another quantifier, like the examples here. They involve interactions between definite descriptions and modal expressions or certain kinds of verbs, which fall under the rubric of referential opacity, addressed in Chapter 7.

6.9 Quantifiers and negative polarity items

Negative Polarity Items (NPIs or negpols for short) are expressions which only occur in special contexts, including contexts which are in some sense in the scope of negation. Idiomatic NPIs include budge an inch and lift a finger, as illustrated in (71). The negative expression is underlined.

(71) a. Nobody lifted a finger to stop him.
   b. #Several people lifted a finger to stop him.
   c. I don't suppose they'll lift a finger to help.
   d. I suppose they'll lift a finger to help.
   e. He won't budge an inch on this issue.
   f. He might budge an inch on this issue.
   g. For all their efforts the trailer never budged an inch.
   h. #After all their efforts at last the trailer budged an inch.

The commonest NPIs are any (anyone, anything) and ever.

(72) a. Sue won't ever go there again.
   b. #Sue will ever go there again.
   c. The office hasn't notified anyone.
   d. #The office has notified anyone.

Despite their name, NPIs are not actually confined to negative contexts, and occur with some quantifier determiners (in addition to no). As the examples in (73) and (74) show, the NPI may appear in N' (the a examples) or in VP (the b examples) or in both:

(73) every
   a. [Everyone who has ever been to Belltree Island] will want to go back.
   b. #[Everyone who has been to Belltree Island] will ever want to go back.

(74) no
   a. [No one who has ever been to Belltree Island] will want to go back.
   b. [No one who has been to Belltree Island] will ever want to go back.

(75) few (weak few)
   a. [Few people who have ever been to Belltree Island] will want to go back.
   b. [Few people who have been to Belltree Island] will ever want to go back.

(76) some
   a. #[Someone who has ever been to Belltree Island] will want to go back.
   b. #[Someone who has been to Belltree Island] will ever want to go back.

(77) four
   a. #[Four people who have ever been to Belltree Island] will want to go back.
   b. #[Four people who have been to Belltree Island] will ever want to go back.

These examples show that the NPI ever is licensed in N' with every, no and few, but not with some or four, and is licensed in VP with no and few, but not with every, some or four. The results are summarized in (78):

(78) ever in N'  ever in VP
   every    yes     no
   no       yes     no
   few      yes     yes
   some     no      no
   four     no      no

Ladusaw (1980) identified the contexts which license NPIs as downward-entailing environments. (When A entails B, if A is true then B must also be true -- B is an entailment of A.) The entailing environments of interest in Ladusaw's analysis are N' and VP. In a sentence Det Fs are G, N' denotes the F
set and VP denotes the G set. Whether an N' or VP is downward-entailing or upward-entailing depends on the determiner.

The N' environment can be tested with the frames in (79):

(79) a. If ‘Det Fs are G’ entails ‘Det Es are G’ and E ⊆ F, then F is downward-entailing. The entailment is towards the subset.
   b. If ‘Det Fs are G’ entails ‘Det Es are G’ and F ⊇ E, then F is upward-entailing. The entailment is towards the superset.

Given that the set of large dogs is a subset of the set of dogs, we can use the test sentences Det dogs are white and Det large dogs are white. Entailment from the dogs sentence to the large dogs sentence is entailment towards the subset, and is a downward entailment. Entailment from the large dogs sentence to the dogs sentence is an entailment towards the superset, and is an upward entailment.

The VP environment can be tested with the frames in (80):

(80) a. If ‘Det Fs are G’ entails ‘Det Fs are H’ and H ⊆ G, then G is downward-entailing. The entailment is towards the subset.
   b. If ‘Det Fs are G’ entails ‘Det Fs are H’ and G ⊇ H, then G is upward-entailing. The entailment is towards the superset.

Given that the set of people whistling loudly is a subset of the set of people whistling, the VP test sentences can be Det N is/are whistling and Det N is/are whistling loudly. An entailment from the whistling sentence to the whistling loudly sentence is a downward entailment, and an entailment from the whistling loudly sentence to the whistling sentence is an upward entailment.

The tests for the different determiners are shown below. Note that few in (83) is weak few.

(81) Every in N': DOWNWARD
   a. Every dog is white entails Every large dog is white.
   b. Every large dog is white does not entail Every dog is white.

   Every in VP: UPWARD
   c. Everyone is whistling does not entail Everyone is whistling loudly.
   d. Everyone is whistling loudly entails Everyone is whistling.

(82) No in N': DOWNWARD
   a. No dogs are white entails No large dogs are white.
   b. No large dogs are white does not entail No dogs are white.

   No in VP: DOWNWARD
   c. No one is whistling entails No one is whistling loudly.
   d. No one is whistling loudly does not entail No one is whistling.

(83) Few in N': DOWNWARD
   a. Few dogs are white entails Few large dogs are white.
   b. Few large dogs are white does not entail Few dogs are white.

The downward and upward entailments are summarized in (86):

(86) N' VP
    every  down  up
    no     down  down
    few    down  up
    some   up    up
    four   up    up

The environments which allow negative polarity items were listed in (78), repeated here in (87). As we see, the NPI licensing environments are exactly the downward-entailing environments, as predicted.

(87) ever in N' ever in VP
    every yes no
    no     yes yes
    few    yes yes
    some   no  no
    four   no  no

6.10 Generalized quantifiers as lambda functions

Given that a quantifier determiner expresses a relation between sets, it is a function that takes two predicates to form a proposition. The two arguments to the determiner are the predicate expressed by N', which is of type ±<e, t>.
9.1 Introduction

Both tense and aspect convey temporal information about a described event or state of affairs. Tense locates the whole event or situation on the timeline, in the past, present or future.

(1) past time of utterance future

There are two kinds of aspect (though they interact), lexical or predicate aspect and morphological or viewpoint aspect. Lexical or predicate aspect (see Chapter 8) is a property of a basic uninflected predicate such as realize the truth, believe in fairies, and blink, which describe events or states of affairs of different temporal forms, or aktionsarten. Here we consider morphological aspect which is expressed in the morphology of the verb. Unlike tense, aspect does not locate the event on the timeline, and is combined with a separate expression of tense. Rather, aspect can be said to present the reported event or state of affairs as if viewed either from inside the event ('in progress') or outside the event ('as a whole'). Before proceeding to discussion of semantic analysis, the next two sections provide a descriptive review of tense and aspect verb forms, and the range of interpretations of some of the forms in English.

9.2 The English verb group

The English verb group contains the main verb, and may also contain a modal auxiliary and forms of the auxiliary verbs have and be. A verb group containing all these elements together is illustrated in (2):

(2) On the original timetable for this project, by this time the reports would have been being printed.

Example (2) shows the order in which the different verbs always appear, and also illustrates how auxiliary have and both auxiliary verbs be determine the form of the verb immediately following.

<table>
<thead>
<tr>
<th>(3) modal</th>
<th>(4) have</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>would</td>
<td>would</td>
<td>be</td>
<td>June</td>
</tr>
<tr>
<td>progressive</td>
<td>have</td>
<td>+en</td>
<td>laughs</td>
</tr>
<tr>
<td>be + -en</td>
<td>(+ -en →)</td>
<td>(+ -ing →)</td>
<td>June laughed</td>
</tr>
<tr>
<td>Progressive aspect</td>
<td>present tense</td>
<td>past tense</td>
<td>will future</td>
</tr>
<tr>
<td>June is laughing</td>
<td>June was laughing</td>
<td>June will be laughing</td>
<td></td>
</tr>
</tbody>
</table>

The verb following a modal verb is in the stem form.

The verb following progressive have is the past participle, which is the -en form of the verb. Although -en is the symbol for all past participle forms, the actual forms may vary, as illustrated in (4):

(4) be + en
we have been
go + en
we have gone
look + en
we have looked
break + en
day has broken
sing + en
we have sung

The verb following progressive be is always the -ing form, which is the present participle.

In any verb group, formal tense is marked only once, and always appears on the first verb in the sequence. English has only two formal tenses, present and past. The future is most commonly expressed by will, which is a modal verb and not a formal tense. In (3) above the modal verb would is the past tense form of will, and none of the other verbs has a tense marking. The tense forms of the modal verbs are listed in (5):

(5) Present will can shall may must Past would could should might

The separate components of the verb group combined with the two formal tenses and the will future are illustrated in (6):
Perfect Aspect
present tense                June has laughed
past tense                  June had laughed
will future                 June will have laughed

The passive voice, marked by passive be and the past participle, contrasts with the active voice, which is the more basic form of the sentence. In the passive voice, the NP which is the subject of the corresponding active sentence either is missing or appears in an optional by-phrase, and the NP which is the object of the corresponding active sentence appears in the subject position. Voice is quite distinct from tense and aspect - voice affects the syntactic argument structure of the verb (see Chapter 2 and Chapter 10) and has no time-related interpretation.

The main interpretations of the perfect and progressive aspects are described in the next section.

9.3 Interpretations of present, past, progressive and perfect

9.3.1 Interpretations of the present tense

The interpretation of present tense forms varies according to the classification of the eventuality (see Chapter 8 for detailed discussion of eventuality types) that the verb form describes. The main difference at issue here is the contrast between events and states.

States include psychological states such as believing and knowing, physical locations, permanent characteristics, and some perceptual states such as seeing and hearing. With verbs describing states the present tense has a present time reading.

(7) a. I see the trucks coming.
   b. Listen! I hear voices.
   c. He believes this rubbish.
   d. She knows where we are.
   e. All those cupboards contain expensive equipment.
   f. The house stands on a bluff overlooking the upper harbour.
   g. Koalas live on eucalyptus shoots and leaves.

The present time reading of the present tense is vague in itself, and depends on the particular verb to give a 'right now' reading, as in (7a, b), or a more long-term reading including the time of speaking, as in (7c, f). Sentences like (7g) are classed as generic statements and are also sometimes considered to be semantically timeless, but even generic sentences may have some limitations in time - compare The dodo was flightless, which is a generic sentence appropriately expressed in the past tense.

Events are all the kinds of happenings which are not states, including actions. Event verbs in the present tense are most commonly interpreted as habitual. The habitual reading denotes not only habits, but any activity which is repeated from time to time or regularly, as illustrated in (8):

(8) a. Heath bikes to work.
   b. Barry feeds the dogs.
   c. She writes with a fountain pen.
   d. She eats peas but she won't eat silver beet.

The present habitual does not describe an event occurring at the time of speaking - for example, (8a) does not mean that Heath is on his bike at the time of speaking.

For certain kinds of pre-determined event the simple present tense can also have a future time reading, as in (9):

(9) The sun sets tomorrow at 6.03.
    I leave for Wellington this afternoon.

It isn't quite clear what fixes this use of the present tense, but it seems that the event must be either the result of some definite arrangement or fixed as a natural event. Being certain that the event will take place isn't sufficient to allow the use of the future reading of the present tense. For example, suppose a chess championship is in progress, and there have been a number of cancellations in the preliminary matches. The weakest player has gone forward to the semi-final without any matches and tomorrow will play Sonja, the champion of the previous five years. It seems certain that Sonja will win tomorrow, but a present tense statement cannot be used to predict this:

(10) a. #Sonja wins tomorrow.
    b. Sonja will win tomorrow.

Sonja’s certain win can be predicted with (10b), but (10a) suggests that the match has been rigged.

The present tense with action verbs has a present event reading in commentaries such as sports commentaries or the commentary on a cooking programme.

(11) a. Pitama passes to Haggerdoorn, Haggerdoorn passes to Jones, and he nearly misses –
    b. Now I just add a few drops of water and beat the eggs...

These uses of the simple present tense may be somehow related to the habitual interpretation, as the present tense sounds awkward in the commentary context if it is used to describe something which isn’t a normal part of the routine, such
as the game or recipe, as in (12). The italicized verbs in (12a, b) would sound more natural in the progressive forms as in (12c, d):

(12) a. ?... now the crowd moves onto the field...
    b. ?... and I stir the sauce continually while it thickens, and it sticks a little so I take it off the heat for a minute...
    c. ... now the crowd is moving onto the field...
    d. ... it's sticking a little so I'm taking it off the heat...

Finally, the present tense also has a use called the narrative or historic present, with a past time interpretation, as in (13):

(13) So just last week I'm going down Cashel St and this guy comes up to me...

9.3.2 Interpretations of the past tense

The basic use of the past tense is to indicate past time, as in (14):

(14) a. Barry fed the dogs (yesterday).
    b. In those days I could eat anything.
        (cf. These days I can eat anything.)

The past tense form is also used to show conditionality, as in (15). In a conditional sentence the past tense may be used of future times.

(15) About next week - if we left early we could see the movie.

The contrast between present tense may and past tense might is also used to mark different kinds of modality, as mentioned in Section 5.1.2, although this distinction seems to be weakening. The contrast is illustrated in the examples in (16):

(16) a. She may have fallen down the cliff - we're still waiting for the rescue team's report.
    b. She might have fallen down the cliff - thank goodness the safety harness held.

9.3.3 Other forms for future and habitual

The verb forms in the examples below are other common ways of expressing semantic tense, as marked:

(17) present progressive with future interpretation
    She is leaving tomorrow.

(18) be going to with future interpretation
    She is going to leave tomorrow.

(19) idiomatic used to with past habitual interpretation
    He used to paint watercolours years ago.

To sum up so far, the present and past tenses are not uniformly interpreted as their corresponding semantic tenses. The past tense frequently has past time meaning but it also conveys conditionality. The present tense has a range of interpretations and is compatible in different forms with past, present and future times.

9.3.4 Interpretations of the progressive

The canonical reading of the progressive was described by Jespersen (1932: 178–80) as a temporal frame: the progressive reports the time of an event or situation as a temporal frame containing another time. Another way of describing the reading is to say that the progressive takes us inside the duration of a reported event to where the event is in progress. The examples in (20)–(22) show the progressive forms for each tense contrasted with the non-progressive forms:

(20) a. Alice reads the Mail.
    b. Alice is reading the Mail.

(21) a. When you arrive John will make coffee.
    b. When you arrive John will be making coffee.

(22) a. When Alice arrived John made coffee.
    b. When Alice arrived John was making coffee.

(20a) has the habitual reading as in (8) above. The progressive in (20b) has the 'right now' reading — that is, the time of reading the paper is a frame around the time of speech. In (21b) and (22b) the progressive form of make coffee presents the time of the coffee-making event as a frame around the time of arrival, or in other words, the progressive takes us inside the coffee-making event to where it is in progress. In contrast, (21a) and (22a) are interpreted as reporting a sequence of events in which the coffee-making follows the arrival. These interpretations are diagrammed in (23):

(23) --------------------------- coffee-making
                      ↑
    (20b) time of utterance
    (22b), (23b) time of arrival

The temporal frame reading is typical of the progressive with event verbs. Some state verbs do not take the progressive at all, as discussed at the end of Section 8.5. With a number of state verbs, however, the progressive form suggests a shortened duration for the state, or suggests temporariness. These points are illustrated in (24): (24a) is ill-formed, and (24c) suggests a comparatively short or temporary state of affairs compared to (24b).
(24) a. #Jones is owning an old Jaguar.
b. We live in London.
c. We are living in London.

9.3.5 Interpretations of the present perfect
The English present perfect is one of the most semantically complex verb forms, and is the subject of considerable debate. Most of the more recent discussion centres on the complex time reference of the present perfect, which appears to span both past and present. Another characteristic of the present perfect is that it generally refers to an unidentified event time which is not contextually familiar – I will return to this point in Section 9.5.

Present time adverbials
Even though the present perfect with an event predicate describes an event which is in the past, it requires time adverbials which denote times or intervals that include the present, so it is incompatible with adverbials like yesterday which denote a completely past time. This is illustrated in (25), where today, this week and since Wednesday identify an interval containing both the reported event and the time of utterance.

(25) a. Have you read the paper today/this week?
b. #Have you read the paper yesterday/last week?

(26) a. Jones has sold three condos since Wednesday.
b. #Jones has sold three condos last week.

(27) a. The mail arrived an hour ago.
b. #The mail has arrived an hour ago.

Current result states
An interval spanning past and present is also evident in the so-called result state reading with event predicates, where the perfect is used to report a past event resulting in a state of affairs which still holds, as illustrated in (28). This is the chief instance of what is generally called the present relevance of the present perfect: a past event is currently relevant because its consequences are still in force. In these examples the state of affairs resulting from the reported event is more pertinent than the event itself.

(28) a. Jill won't need that checkout job, she has won the lottery.
   (Jill is now rich.)
b. Henry can't dance the pas seul, he has pulled a tendon.
   (Henry is now injured.)
c. Kane has broken into our files, so we'll have to whack him.
   (Kane now knows our secrets.)

With typical examples of the result state reading like those in (28), the causing event is understood to be recent, but further examples show that the recency of the event is partly pragmatic. The resulting state for a result state reading can be identified in completely general terms as the state of an event of the kind described having occurred. So in (28b), for example, the result state is the state of an event of Henry's pulling a tendon having occurred. This state will hold indefinitely into the future. From the general state of Henry's having pulled a tendon holding, we can infer other consequences at different times. Given the context suggested in the example, we infer that the injury is still unhealed and therefore that the event is recent, and that we are in the early part of the state of the event's having occurred.

But from a state of Henry's having pulled a tendon holding, we can also infer that Henry knows what the pain of a pulled tendon is like, and this consequence, unlike the injury itself, holds indefinitely. So if we say ‘Henry has pulled a tendon, he knows what it feels like, the recent event inference is missing.

The same effect is found with utterances of I have seen your dog. For example, if the owner is looking for a dog which has wandered off, someone who says I have seen your dog implies that he or she knows roughly where the dog is. Here the inference is that the sighting is very recent. But if the owner is trying to describe the appearance of the dog, a rare breed, the speaker implies that he or she knows what the dog looks like, and for this a sighting at any past time is relevant. In both cases, the state of the dog's having been seen by the speaker is the same state, although its consequences vary at different times.

Another intriguing point about the result state is that it must hold of the subject of the sentence at the time of utterance. Chomsky pointed out the well-known contrast between (29a) and (29b) below:

(29) a. ??Einstein has visited Princeton.
b. Princeton has been visited by Einstein.

Example (29a) is comparatively odd because the result state of having visited Princeton is predicated of Einstein, who is dead. In contrast, Princeton still exists and still has the property of having been visited by Einstein, so (29b) sounds fine.

‘Hot news’ perfect
The so-called ‘hot news’ perfect also shows a recent event effect, as in (30)–(31):

(30) a. Russia has invaded Poland.
b. Krakatoa has blown up.

(31) a. Jones has had an accident.
b. The big tree has fallen over.

The hot news perfect is described as appropriate for reporting what is recent news and somehow currently relevant. The examples in (31) are normally interpreted as reporting recent events, but the examples in (30) are odd from a current perspective because they report distant historical events. The ‘hot news’
effect may not be distinct from the recent event effect with result state readings. Plausibly, the hot news effect in (30a) is tied to the inference that Poland is still occupied by Russian troops, and (30b) suggests that the immediate physical aftermath of a volcanic eruption is still unfolding.

In the light of the examples so far, it seems that the present perfect refers to a temporal structure loosely like that diagrammed in (32):

\[(32) \quad \text{interval spanning past and present } = I^* \]

\[\text{past} \quad \text{time of described event} \quad \text{future} \]

\[\text{time of utterance} (= \text{present}) \]

The result state holds at the interval \(I^*\), and \(I^*\) must be contained within the time expressed by time adverbials which can modify the present perfect (since June, today, this week).

**Continuing state**

State predicates can have a different reading, as shown by the examples in (33), which describe a state of affairs beginning in the past and continuing up to the present. (The habitual reading of *work* in (33b) is a kind of state.) This is the continuing state reading.

\[(33) \quad \begin{align*}
\text{a. } & \text{I have stayed in today. (I am still in.)} \\
\text{b. } & \text{Sheila has worked in the library since December. (Sheila still works in the library.)} \\
\text{c. } & \text{The door has been open for ten minutes. (The door is still open.)}
\end{align*} \]

Here we see that the state denoted by a state predicate fills interval \(I^*\), as shown in (34). As with event predicates in the present perfect, a time adverbial must contain \(I^*\).

\[(34) \quad \text{interval spanning past and present } = I^* \]

\[\text{past} \quad \text{beginning of described state} \quad \text{future} \]

\[\text{time of utterance} (= \text{present}) \]

The continuing state reading for a state predicate apparently depends on the presence of an interval adverbial. Compare the examples in (35) and (36) below. The modified (a) examples with continuing state readings contrast quite sharply with the unmodified (b) examples, which sound somewhat incomplete, and do not readily have the continuing state interpretation: (35b) and (36b) both most saliently describe a completely past state of affairs.

\[(35) \quad \begin{align*}
\text{a. } & \text{They have lived here since 1985.} \\
\text{b. } & \text{They have lived here.}
\end{align*} \]

\[(36) \quad \begin{align*}
\text{a. } & \text{Donna has had a job at Romero's this year.} \\
\text{b. } & \text{Donna has had a job at Romero's.}
\end{align*} \]

On the other hand, a time adverbial does not force the continuing state reading, as (37) shows: both examples describe a completely past state of affairs.

\[(37) \quad \begin{align*}
\text{a. } & \text{They have lived here since 1985, but not recently.} \\
\text{b. } & \text{Donna has had a job at Romero's this year, but not recently.}
\end{align*} \]

The completely past reading for a state perfect is like the result state reading for an event perfect. With an event perfect like *Jones has read *Erewhon*, the result state of Jones having read *Erewhon* holds at the time of speaking, and the reading event is completely in the past. Similarly, on the completely past reading of a state perfect like *Donna has had a job at Romero's*, the result state of Donna's having had a job at Romero's holds at the time of speaking, but the state of affairs of Donna's having the job is past.

### 9.4 Tense as an operator

**Tense logic** (or temporal logic) analyses tense as an operator of a similar kind to modal operators. We have seen (Chapter 5) that the truth condition for a modal statement breaks the statement into its non-modal form and the world or worlds in which the non-modal form is to be evaluated. For example:

\[(38) \quad 'Mozart might not have died young' is true (in the actual world) if and only if there is at least one possible world w such that 'Mozart did not die young' is true in w. \]

Tense logic takes a similar strategy: the tensed statement is broken into the non-tensed statement and the time at which the non-tensed statement is evaluated, for example:

\[(39) \quad 'Mozart died young' is true (at the present time) if and only if there is a time \(t\) earlier than the present time such that 'Mozart die young' is true at \(t\).
\]

As we saw with modality, the operator can be represented with a shorthand symbol. The modal operators \(\square\) and \(\diamond\) are defined in terms of quantification over possible worlds \(w\). The tense operators *Pres*, *Past*, and *Fut* are defined in terms of quantification over times represented by restricted variables \(t\). The symbols and definitions are shown below. The variable \(t^*\) ('t star') represents the contextual 'now', usually the time of utterance. The symbol \(<\) expresses the relation 'is earlier than'.

\[\text{Pres} = \{t : t < \text{utterance}\} \]

\[\text{Past} = \{t : \text{utterance} < t\} \]

\[\text{Fut} = \{t : \text{utterance} > t\} \]
The indefinite time reference with the perfect in (51c) has universal force in the question context (compare Have you ever seen Cats?) The answer in (51c) is anomalous as a response to (51a). In contrast, the simple past tense in (51b) makes reference to a definite time, here the season of a particular production of Cats, and the answer in (51b) is possible. These differences in reference compare directly with the NPs a bike and the bike in (52):

(52) a. Have you ridden a bike?
   b. Have you ridden the bike?
   c. No, but I've ridden a different bike.

The indefinite reference in (52a) has universal force (compare Have you ridden any bike?). (52c) is anomalous as an answer to (52a), but it is a possible answer in response to (52b), which asks a question about a definite identified bike.

The role of a particular, contextually identified time in the interpretation of tenses is a crucial part of the other major tradition in the analysis of tense, which is the analysis by Hans Reichenbach.

9.6 Reichenbach's analysis of tense

We have already seen informally that the interpretation of tense involves calculating with at least two different times, one being the utterance time and the other the time at which the reported state of affairs is located. We have also seen that common uses of the past tense place the reported event at some time which is already familiar, and may serve as a reference point. All three of these kinds of times are used in Reichenbach's analysis, as listed in (53):

(53) Speech Time S
    Event Time E
    Reference Time R

The clearest illustration of the role of the Reference Time R is in the complex tenses which we haven't addressed till now, the past perfect (He had verbed) and future perfect (He will have verbed). I begin with the past perfect.

The past perfect is also sometimes called the past-in-the-past, because the calculation of the time referred to takes two steps back into the past. This is diagrammed in (54) for the past perfect had left.

(54) Tom got there at noon, but Molly [had left] at 10.30. E_R_S

The role of a particular, contextually identified time in the interpretation of tenses is a crucial part of the other major tradition in the analysis of tense, which is the analysis by Hans Reichenbach.
In the complex tenses the auxiliary have expresses a past tense. Because had is also in the morphological past tense (that is, have + past) there are two past tenses expressed in had. The first tense takes us from the S time to the R time, which is identified as the time of the previously reported event, Tom's arrival at noon. The second past tense takes us back from the R time to the time of the event reported in had left, which is the E time at which Molly leaves. (The E time is always the time of the event described by the verb form under analysis, in this case had left.) The shorthand representation for this interpretation is E_R_S.

The future perfect (also called the past-in-the-future) is calculated in two steps in a similar way, with the R time as a stepping stone.

(55) The car can't get to the station until three but Leda [will have arrived] at noon, so she'll have to wait.

\[ S \quad E \quad R \]
\[ \text{past} \quad \text{time of utterance} \quad \text{noon: Leda arrives} \quad \text{3:00: The car gets to the station} \]

In Example (55) the three times S, E and R are in a known order, because of the information in the adverbials. Other orders for S and E are also possible, because the future perfect doesn't fix the order of S and E. This is illustrated in (56), where all the indicated situations are possible contexts (a)-(c) for will have washed any clues away.

(56) Loney says he's going out there, but (when he gets there) the tide [will have washed] any clues away.

\[ \text{past} \quad E_1 \quad E_2 \quad E_3 \quad \text{future} \]
\[ \text{time of utterance} \quad \text{Loney arrives at the beach} \]

a. The high tide peaked two hours ago: E_1 is before S
b. The tide is full now: E_2 overlaps S
c. The high tide is still to come, but will peak before Loney arrives: E_3 is after S

Strictly, the future perfect expresses only E_R & S_R, which can also be shown with a branching notation as in (57):

(57) future perfect \[ S \rightarrow R \rightarrow E \]

Both the complex tenses show how the R time is a time identified from the context, from which we view or locate the reported event, and thus the E time. The R time must be identifiable: compare the examples in (58) which are presented without a context.

(58) a. Did Leah see Harry?
   b. Harry had finished editing the tape.

We have already seen that the simple past tense in a narrative refers to a particular time, and so (58a) can't really be understood until it is known what occasion is to be assumed as the time when Leah might have seen Harry. Similarly, (58b) requires a context in which the R time is known — that is, the past time referred to from which the tape-editing is further in the past.

Reichenbach uses the R time to analyse the difference between the simple past tense and the present perfect. In the previous section I outlined one difference between these forms in terms of definite and indefinite reference to times. In Reichenbach's analysis, the definite time reference of the simple past tense is shown by locating E and R at the same point – we identify E as being the same time as R. In the present perfect, however, the time of the event is not definite, and is only known to be earlier than S. The only known time is actually S, and so S and R are at the same point. Note that two times at the same location on the time line are separated with a comma in the shorthand notation.

(59) The sun set.
\[ \text{past} \quad E, R_S \]
\[ \text{time of utterance} \quad S \]

Reichenbach's analysis of the present perfect, with the R time at the present time (= S), also captures the other main property of the English present perfect, which is that it seems to combine simultaneous reference to the past and the present (see Section 9.3.5 above) — although the reported event is in the past, something is also said about the present.

Reichenbach originally proposed two kinds of future tense, one with R = E and one with R = S, to mirror the difference between the simple past tense and the present perfect. Reichenbach assumed that time adverbials always modify the R time, and gave the examples in (61) to illustrate his two kinds of future tense.
In fact Reichenbach's assumption that a time adverbial always modifies R is incorrect, as we have already seen in (54) and (55) above. For example, in *Tom got there at noon but Molly had left at 10.30*, the adverbial at 10.30 modifies the E time of Molly's leaving, not the R time which is noon: If we take *Molly had left at 10.30* out of context the scope of the adverbial is ambiguous. The other available sense is that the adverbial modifies R, and the interpretation is 'By 10.30, Molly had left'.

These examples show that Reichenbach's proposed future tense with the interpretation $S_R E$ cannot be identified by assuming that an adverbial always modifies the reference time. Reichenbach's examples in (61) also suggest that *I shall go tomorrow* and *Now I shall go* should contrast in a way that parallels the present perfect/past tense contrast, but this isn't strongly evident – and in any case, how would we interpret *Now I shall go tomorrow*? A possible alternative candidate for the $S, R_E$ tense is the use of the simple present tense to denote future events with a pre-ordained quality, as in (62), but this is not an established analysis. Although the adverbial modifies E, not R, the pre-ordained quality of the event holds at S.

(62) The sun sets at 7.30 tonight. \[ S, R_E \]

But generally Reichenbach's $S, R_E$ future is not included in theories of English tense, which is analysed along the same lines as the simple past: the reported event happens at a known time and so E and R are at the same point.

(63) The sun will set. \[ S_R, E \]

Reichenbach's analysis has been extremely influential, and most theories of tense draw on his insights or use similar ideas.

9.7 Reference to times in a narrative

A closely related kind of reference time is of central importance in the interpretation of time sequences in a narrative discourse. This is not exactly the same as Reichenbach's R time, and I shall use the lower-case variable $r$ for the discourse-related idea of reference time. The interpretation of times in narrative is chiefly addressed in *Discourse Representation Theory* (DRT), and the following discussion draws on Kamp and Reyle's (1993) introduction to DRT. I have simplified some of the notations for convenience.

In interpreting a narrative, one pragmatic rule of thumb (see Exercise 5, Chapter 2) is that events are normally reported in the order they occur – this rule is strongly borne out by the contrast between *He got on his horse and rode into the sunset* and *He rode into the sunset and got on his horse*. But most narrative is not sequenced in such a simple way – this is illustrated in the extract below. The narrator is a guy called Marlowe. The numbered $r$ variables stand for the times at which the eventuality of the linked verb is understood to hold.

(64) I went up the stairs. The radio I had heard over the telephone was still blatting the baseball game. I read numbers and went up front. Apartment 204 was on the right side and the baseball game was right across the hall from it. I knocked, got no answer and knocked louder. Behind my back three Dodgers struck out against a welt of synthetic crowd noise. I knocked a third time and looked out of the front hall window while I felt in my pocket for the key George Anson Phillips had given me.

Taking the extract out of context, we don't know when this part of the story begins, so we assign it the default value of $r_0$ (reference time = zero – the clock is set to zero). The time $r_0$ is the time of the first event *I went up the stairs*, as indicated by the annotation under the verb *went*. The other verbs in the extract are annotated in the same way to broadly indicate their times of occurrence. A time with a higher number is later than a time with a lower number. Note that forward time movement is not constant in the narrative: $r_2$ is established at *went up front* and persists until $r_3$ at *knocked*. Three Dodgers struck out reports a sequence of three events, indicating the passage of time within $r_6$. Finally $r_8$ is established at *looked out of the front hall window* and persists for *felt in my pocket*.

Raymond Chandler (1943). *The High Window*