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LINGUISTICS
AN INTRODUCTION

SECOND EDITION

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Linguistics

Written by a team based at one of the world's leading centres for linguistic teaching and research, the second edition of this highly successful textbook offers a unified approach to language, viewed from a range of perspectives essential for students' understanding of the subject. A language is a complex structure represented in the minds of its speakers, and this textbook provides the tools necessary for understanding this structure. Using clear explanations throughout, the book is divided into three main parts: sounds, words and sentences. In each, the foundational concepts are introduced, along with their application to the fields of child language acquisition, psycholinguistics, language disorders and sociolinguistics, giving the book a unique yet simple structure that helps students to engage with the subject more easily than other textbooks on the market. This edition includes a completely new section on sentence use, including an introduction and discussion of core areas of pragmatics and conversational analysis; new coverage of sociolinguistic topics, introducing communities of practice; a new subsection introducing the student to Optimality Theory; a wealth of new exercise material and updated further reading.

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Linguistics
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Preface to the second edition

The overall structure of the book is unaltered from the first edition. Our justification for this is set out in the note for course organisers from the first edition that immediately follows this preface. We have, however, made a number of significant modifications.

As far as changes in content are concerned, we have introduced a whole new section on sentence use (section 27), including introduction and discussion of core areas of pragmatics and conversational analysis. Additionally, section 23 on sentence meaning has been modified so that it is not exclusively concerned with quantified expressions in Logical Form and now contains a short discussion of thematic roles with linked exercises. Finally, individual authors have taken the opportunity to update the sections for which they have been primarily responsible, when this seemed appropriate. Thus, all sections in part III (sentences) have been updated to reflect the change in the theoretical approach we favour here, whereby Tense replaces Inflection as a clausal head. There have been numerous other small changes in these sections to reflect recent theoretical developments. New sociolinguistic material in section 3 introduces communities of practice, and section 5 now contains a short introduction to Optimality Theory, an increasingly popular approach to the understanding of phonological structure. We have, of course, also attempted to correct errors that appeared in the first edition.

Turning to the exercises that follow each section, in many cases, these are a complete replacement for those appearing in the first edition. In other cases, we have retained some or all of the original exercises, but supplemented them with new material. For some sections, the set of exercises contains a model answer. At one stage, our intention was to provide this for all sets of exercises, but it became apparent that this was not always appropriate. Accordingly, individual authors have taken their own decision on this matter, and we now believe that the imposition of a one-size-fits-all format in this connection would not be appropriate, sometimes leading to rather pointless exemplification.

Finally, we have updated recommended further reading throughout and included bibliographical information for this alongside new materials referred to in the text and in the exercises.

A note for course organisers and class teachers

There are a number of points which teachers can usefully bear in mind when considering how to use this book.

Firstly, the division into three major parts (sounds, words and sentences), with the foundational concepts *and* the 'hyphenated' disciplines being covered in each part, provides some options which are not readily available in the context of more conventional structures. Specifically, the distribution of competence for small-group teaching becomes a more manageable problem within this structure. The graduate student in phonology can take classes linked to sounds and give way to the morphologist when the course moves onto words, and the situation where hard-pressed assistants have to spend valuable time reacquiring basic material remote from their own research area is avoided. Additionally, as the three parts of the book are largely self-contained, each could be integrated as the introductory segment of more specialised courses in phonology, morphology or syntax. This might be particularly appropriate for students who have followed an introductory course which is at a somewhat lower level than what we are aiming at here.

Secondly, the book contains extensive exercise material at the end of each section, and it is intended that this should be helpful for small-group teaching. We have distributed references to the exercises throughout the text, the idea being that when an exercise is referenced, students should be in a position to undertake it with profit. On occasions, these references cluster at the end of a section, indicating that the whole section must be covered before students can fruitfully tackle the exercises. Obviously, this gives class teachers some flexibility in deciding what proportion of a section will be required reading, and while this might be seen as disrupting the uniformity of the structure of the book, we believe that its pedagogical justification is clear.

Thirdly, we should mention a couple of points about conventions. We have attempted to use bold face on the introduction of any technical or specialised vocabulary and thereafter use ordinary typeface unless particular emphasis justifies italics. There is always room for disagreement on what counts as technical or specialised and on the good sense of repeating bold-face references, at least on some occasions. We wouldn't wish to say we've got it right, but we have thought about it!

Finally, at the end of each of the major parts of the book, we have included some bibliographical material. The purpose of this is twofold: we provide guidance on further reading for the topics covered in the book and we also give references for the research on which we rely in our discussions. Usually, although not always, these latter works are not appropriate for a student's next step in the discipline, but providing references in this way gives us a means of acknowledging the work of the many colleagues whose ideas have influenced us. Throughout these sections, we use the author–date system, and at the end of the book full details of both types of publication – further reading and original research – can be found in a conventional bibliography.

Introduction

The major perspective we adopt in this book regards a language as a *cognitive* system which is part of any normal human being's mental or psychological structure. An alternative to which we shall also give some attention emphasises the *social* nature of language, for instance studying the relationships between social structure and different dialects or varieties of a language.

The cognitive view has been greatly influenced over the past five decades by the ideas of the American linguist and political commentator Noam Chomsky. The central proposal which guides Chomsky's approach to the study of language is that when we assert that Tom is a speaker of English, we are ascribing to Tom a certain mental structure. This structure is somehow represented in Tom's brain, so we are also implicitly saying that Tom's brain is in a certain state. If Clare is also a speaker of English, it is reasonable to suppose that Clare's linguistic cognitive system is *similar* to Tom's. By contrast, Jacques, a speaker of French, has a cognitive system which is *different* in important respects from those of Tom and Clare, and different again to that of Guo, a speaker of Chinese. This proposal raises four fundamental research questions:

(1) What is the nature of the cognitive system which we identify with knowing a language?

(2) How do we acquire such a system?

(3) How is this system used in our production and comprehension of speech?

(4) How is this system represented in the brain?

Pursuit of these questions defines four areas of enquiry: linguistics itself, developmental linguistics, psycholinguistics and neurolinguistics.

At the outset, it is important to be clear that an answer to question (1) is *logically* prior to answers to questions (2), (3) and (4); unless we have a view on the nature of the relevant cognitive system, it makes no sense to enquire into its acquisition, its use in production and comprehension and its representation in the brain.

Question (1), with its reference to a *cognitive* system, looks as if it ought to fall in the domain of the cognitive psychologist. However, the Chomskian approach maintains that we can formulate and evaluate proposals about the nature of the human mind by *doing linguistics*, and much of this book is intended to establish the plausibility of this view. In order to do linguistics, we usually rely on native speakers of a language who act as informants and provide us with data; and it is with respect to such data that we test our hypotheses about native speakers' linguistic cognitive systems. Often, linguists, as native speakers of some language or other, rely on themselves as informants. Linguists (as opposed to psycholinguists, see below) do not conduct controlled experiments on large numbers of subjects under laboratory conditions. This is a major *methodological* difference between linguists and cognitive psychologists in their study of the human mind, and some critics might see it as making linguistics unscientific or subjective. However, it is important to point out that the data with which linguists work (supplied by themselves or by other native speakers) usually have such clear properties as to render controlled experimentation pointless. For instance, consider the examples in (5):

(5) a. The dog chased the cat
b. *Cat the dog chased the

A native speaker of English will tell us that (5a) is a possible sentence of English but (5b) is not (the * is conventionally used to indicate this latter judgement). Of course, we could design experiments with large numbers of native speakers to establish the reliability of these claims, but there is no reason to believe that such experiments would be anything other than a colossal waste of time. Native speakers have vast amounts of data readily available to them, and it would be perverse for linguists not to take advantage of this. Notice that above we said that the data supplied by native speakers *usually* have very clear properties. When this is not the case (and an example will arise in our discussion of psycholinguistics below), we proceed with more caution, trying to understand the source of difficulty.

The logical priority of question (1) should not lead to the conclusion that we must have a *complete* answer to this question before considering our other questions. Although question (2) requires some view on the cognitive linguistic system, there is no reason why acquisition studies of small children should not themselves lead to modifications in this view. In such a case, pursuit of question (2) will be contributing towards answering question (1), and similar possibilities exist for (3) and (4). In practice, many linguists, developmental linguists, psycholinguists and neurolinguists are familiar with each other's work, and there is a constant interchange of ideas between those working on our four questions.

Our questions foster different approaches to linguistic issues, and in this introduction we shall first take a preliminary look at these. Having done this, we shall turn to the social perspective mentioned at the outset and offer some initial remarks on how this is pursued.

Linguistics

To begin to answer question (1), Chomsky identifies knowing a language with having a mentally represented **grammar**. This grammar constitutes the native speaker's **competence** in that language, and on this view, the key to understanding what it means to know a language is to understand the nature of such a grammar. Competence is contrasted with **performance**, the perception and production of speech, the study of which falls under psycholinguistics (see below). Since this is a fundamental distinction that underlies a great deal of what we shall be discussing, it is worth trying to get a clear grasp of it as early as possible. Consider the situation of a native speaker of English who suffers a blow to the head and, as a consequence, loses the ability to speak, write, read and understand English. In fortunate cases, such a loss of ability can be short-lived, and the ability to use English in the familiar ways reappears quite rapidly. What cognitive functions are impaired during the time when there is no use of language? Obviously, the ability to use language, i.e. to perform in various ways, is not available through this period, but what about knowledge of English, i.e. linguistic competence? If we suppose that this is lost, then we would expect to see a long period corresponding to the initial acquisition of language as it is regained, rather than the rapid re-emergence which sometimes occurs. It makes more sense to suppose that knowledge of language remains intact throughout such an episode; the problem is one of accessing this knowledge and putting it to use in speaking, etc. As soon as this problem is overcome, full knowledge of English is available, and the various abilities are rapidly reinstated.

What does a grammar consist of? The traditional view is that a grammar tells us how to combine words to form phrases and sentences. For example, by combining a word like *to* with a word like *Paris* we form the phrase *to Paris*, which can be used as a reply to the question asked by speaker A in the dialogue below:

(6) SPEAKER A: Where have you been?
SPEAKER B: *To Paris*.

By combining the phrase *to Paris* with the word *flown* we form the larger phrase *flown to Paris*, which can serve as a reply to the question asked by speaker A in (7):

(7) SPEAKER A: What's he done?
SPEAKER B: *Flown to Paris*.

And by combining the phrase *flown to Paris* with words like *has* and *he*, we can form the sentence in (8):

(8) He has flown to Paris

On this view, a grammar of a language specifies how to combine words to form phrases and sentences, and it seems entirely appropriate to suggest that native speakers of English and of other languages have access to cognitive systems which somehow specify these possibilities for combination (***exercise 1***). A very important aspect of this way of looking at things is that it enables us to make sense of how a cognitive system (necessarily *finite*, since it is represented in a brain) can somehow characterise an *infinite* set of objects (the phrases and sentences in a natural language). That natural languages are infinite in this sense is easy to see by considering examples such as those in (9):

(9) a. Smith believes that the earth is flat
b. Brown believes that Smith believes that the earth is flat
c. Smith believes that Brown believes that Smith believes that the earth is flat
d. Brown believes that Smith believes that Brown believes that Smith believes that the earth is flat

A native speaker of English will recognise that such a sequence of sentences could be indefinitely extended, and the same point can be made in connection with a variety of other constructions in English and other languages (***exercise 2***). But the infinite nature of the set of English sentences, exemplified by those in (9), does not entail that the *principles of combination* used in constructing these sentences are also infinite; and it is these principles which form part of a grammar.

The view we have introduced above implies that a grammar contains two components: (i) a **lexicon** (or dictionary), which lists all the words found in the language, and (ii) a **syntactic component**, which specifies how to combine words together to form phrases and sentences. Each **lexical entry** (i.e. each item listed in the lexicon) will tell us about the linguistic properties of a word. For example, the entry for the word *man* will specify its **phonological** (= sound) properties (namely that it is pronounced /man/ – for the significance of the slashes, see section 5), its **grammatical** properties (e.g. that it can function as a noun and that when it does, it has the irregular plural form *men*) and its **semantic** (i.e. meaning) properties (namely that it denotes an adult male human being). The linguistic properties of words, including the nature of lexical entries, form the subject matter of part II of this book, while syntax (i.e. the study of how words are combined together to form phrases and sentences) provides the focus for part III. A grammar can be said to **generate** (i.e. specify how to form) a set of phrases and sentences, and using this terminology, we can view the task of the linguist as that of developing a theory of **generative grammar** (i.e. a theory about how phrases and sentences are formed).

Careful reflection shows that a grammar must contain more than just a lexicon and a syntax. One reason for this is based on the observation that many words change their **phonetic form** (i.e. the way they are pronounced) in connected speech, such sound changes being determined by the nature of neighbouring sounds within a word, phrase or sentence. These changes are effected by native speakers in a perfectly natural and unreflective way, suggesting that whatever principles determine them must be part of the relevant system of mental representation (i.e. grammar). We can illustrate what we mean here by considering examples of changes which result from the operation of regular **phonological processes**. One such process is **elision**, whereby a sound in a particular position can be dropped and hence not pronounced. For instance, the 'f' in the word *of* (which is pronounced /v/) can be elided in colloquial speech before a word beginning with a consonant (but not before a word beginning with a vowel): hence we say 'pint o' milk' (sometimes written *pinta milk*) eliding /v/ before the /m/ of the word *milk*, but 'pint of ale' (not 'pint o' ale') where the /v/ can't be elided because the word *ale* begins with a vowel. A second regular phonological process is **assimilation**, a process by which one sound takes on some or all the characteristics of a neighbouring sound. For example, in colloquial speech styles, the final 'd' of a word like *bad* is assimilated to the initial sound of an immediately following word beginning with a consonant: hence, *bad boy* is pronounced as if it were written *bab boy* and *bad girl* as if it were written *bag girl* (***exercise 3***).

The fact that there are regular phonological processes such as those briefly described above suggests that in addition to a lexicon and a syntactic component, a grammar must also contain a **phonological component**: since this determines the phonetic form (= PF) of words in connected speech, it is also referred to as the **PF component**. **Phonology**, the study of sound systems and processes affecting the way words are pronounced, forms the subject matter of part I of this book.

So far, then, we have proposed that a grammar of a language contains three components, but it is easy to see that a fourth component must be added, as native speakers not only have the ability to *form* sentences, but also the ability to *interpret* (i.e. assign meaning to) them. Accordingly, a grammar of a language should also answer the question 'How are the meanings of sentences determined?' A commonsense answer would be that the meaning of a sentence is derived by combining the meanings of the words which it contains. However, there's clearly more involved than this, as we see from the fact that sentence (10) below is ambiguous (i.e. has more than one interpretation):

(10) She loves me more than you

Specifically, (10) has the two interpretations paraphrased in (11a, b):

(11) a. She loves me more than you love me
b. She loves me more than she loves you

The ambiguity in (10) is not due to the meanings of the individual words in the sentence. In this respect, it contrasts with (12):

(12) He has lost the match

In (12), the word *match* is itself ambiguous, referring either to a sporting encounter or a small piece of wood tipped with easily ignitable material, and this observation is sufficient to account for the fact that (12) also has two interpretations. But (10) contains no such ambiguous word, and to understand the ambiguity here, we need to have some way of representing the logical (i.e. meaning) relations between the words in the sentence. The ambiguity of (10) resides in the relationship between the words *you* and *loves*; to get the interpretation in (11a), *you* must be seen as the **logical subject** of *loves* (representing the person giving love), whereas for (11b), it must function as the **logical object** of *loves* (representing the person receiving love). On the basis of such observations, we can say that a grammar must also contain a component which determines the **logical form** (= LF) of sentences in the language. For obvious reasons, this component is referred to as the **LF component**, and this is a topic which is discussed in section 23 of this book (***exercise 4***).

Our discussion has led us to the conclusion that a grammar of a language comprises (at least) four components: a lexicon, a syntactic component, a PF component and an LF component. A major task for the linguist is to discover the nature of such grammars.

However, there is an additional concern for the linguist. Suppose grammars are produced for a variety of languages by specifying the components introduced above. Naturally, we would expect these grammars to exhibit certain differences (a grammar of English will be different to a grammar of Japanese), but we might also discover that they have some properties in common. If these properties appear in grammars for a wide range of languages, standard scientific practice leads us to hypothesise that they are common to the grammars of *all* natural languages, and this means that an additional goal for the linguist is the development of a theory of **Universal Grammar (UG)**. A great deal of contemporary linguistic theory can be viewed as testing hypotheses about UG on an ever-wider class of languages.

As described above, UG is viewed as emerging from the linguist's study of individual grammars, but there is a different way to introduce this concept which affords it a much more important and fundamental position in the work of linguists. To appreciate this, we need to turn to the second of our questions, namely, 'How do we acquire a grammar?'

Developmental linguistics

Readers familiar with small children will know that they generally produce their first recognisable word (e.g. *Dada* or *Mama*) round about their first birthday; from then until the age of about one year, six months, children's speech consists largely of single words spoken in isolation (e.g. a child wanting an apple will typically say 'Apple'). At this point, children start to form elementary phrases and sentences, so that a child wanting an apple at this stage might say 'Want apple'. From then on, we see a rapid growth in children's grammatical development, so that by the age of two years, six months, most children are able to produce adult-like sentences such as 'Can I have an apple?'

From this rough characterisation of development, a number of tasks emerge for the developmental linguist. Firstly, it is necessary to *describe* the child's development in terms of a sequence of grammars. After all, we know that children become adults, and we are supposing that, as adults, they are native speakers who have access to a mentally represented grammar. The natural assumption is that they move towards this grammar through a sequence of 'incomplete' or 'immature' grammars. Secondly, it is important to try to *explain* how it is that after a period of a year and a half in which there is no obvious sign of children being able to form sentences, between one-and-a-half and two-and-a-half years of age there is a 'spurt' as children start to form more and more complex sentences, and a phenomenal growth in children's grammatical development. This uniformity and (once the 'spurt' has started) rapidity in the pattern of children's linguistic development are central facts which a theory of language acquisition must seek to explain. But how?

Chomsky maintains that the most plausible explanation for the uniformity and rapidity of first language acquisition is to posit that the course of acquisition is determined by a biologically endowed innate **language faculty** (or *language acquisition program*, to borrow a computer software metaphor) within the human brain. This provides children with a genetically transmitted set of procedures for developing a grammar which enables them to produce and understand sentences in the language they are acquiring on the basis of their *linguistic experience* (i.e. on the basis of the speech input they receive). The way in which Chomsky visualises the acquisition process can be represented schematically as in (13) below (where L is the language being acquired):

(13) experience of L → $\boxed{\text{language faculty}}$ → grammar of L

Children acquiring a language will observe people around them using the language, and the set of expressions in the language which the child hears (and the contexts in which they are used) in the course of acquiring the language constitute the child's linguistic experience of the language. This experience serves as input to the child's language faculty, which provides the child with a set of procedures for analysing the experience in such a way as to devise a grammar of the language being acquired. Chomsky's hypothesis that the course of language acquisition is determined by an innate language faculty is known popularly as the **innateness hypothesis**.

Invocation of an innate language faculty becoming available to the child only at some genetically determined point may constitute a plausible approach to the questions of uniformity and rapidity, but there is an additional observation which suggests that some version of the innateness hypothesis *must be correct*. This is that the knowledge of a language represented by an adult grammar appears *to go beyond anything supplied by the child's linguistic experience*. A simple demonstration of this is provided by the fact that adult native speakers are not only capable of combining words and phrases in acceptable ways but also of recognising unacceptable combinations (see 5b above and exercise 1). The interesting question this raises is: where does this ability come from? An obvious answer to this question is: that the child's linguistic experience provides information on unacceptable combinations of words and phrases. But this is incorrect. Why do we assert this with such confidence?

Obviously, when people speak, they do make mistakes (although research has shown that language addressed to children is *almost* completely free of such mistakes). However, when this happens, there is no clear signal to the child indicating that an adult utterance contains a mistake, that is, as far as the child is concerned, an utterance containing a mistake is just another piece of linguistic experience to be treated on a par with error-free utterances. Furthermore, it has been shown that adults' 'corrections' of children's own speech do not take systematic account of whether children are producing syntactically acceptable or unacceptable combinations of words and phrases; parents do 'correct' their children, but when they do this, it is to ensure that children speak *truthfully*; grammatical correctness is not their target. Overall, there is compelling evidence that children do *not* receive systematic exposure to information about unacceptable sequences, and it follows that in this respect the child's linguistic experience is *not sufficient* to justify the adult grammar. From this **poverty of the stimulus** argument it follows that something must supplement linguistic experience and the innate language faculty fulfils this role (***exercise 5***).

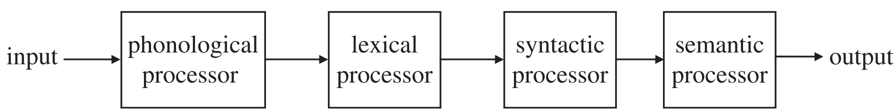
Now, it is important to underline the fact that children have the ability to acquire *any* natural language, given appropriate experience of the language: for example, a British child born of monolingual English-speaking parents and brought up by monolingual Japanese-speaking parents in a Japanese-speaking community will acquire Japanese as a native language. From this it follows that the contents of the language faculty *must not be specific to any one human language*: if the language faculty accounts for the uniformity and rapidity of the acquisition of English, it must also account for the uniformity and rapidity of the acquisition of Japanese, Russian, Swahili, etc.; and if the language faculty makes up for the insufficiency of a child's experience of English in acquiring a grammar of English, it must also make up for the insufficiency of a child's experience of Japanese in acquiring a grammar of Japanese, for the insufficiency of a child's experience of Russian in acquiring a grammar of Russian, for the insufficiency of a child's experience of Swahili in acquiring a grammar of Swahili, etc. This entails, then, that the language faculty must incorporate a set of **UG principles** (i.e. principles of Universal Grammar) which enable the child to form and interpret sentences in any natural language. Thus, we see an important convergence of the interests of the linguist and the developmental linguist, with the former seeking to formulate UG principles on the basis of the detailed study of the grammars of adult languages and the latter aiming to uncover such principles by examining children's grammars and the conditions under which they emerge.

In the previous paragraph, we have preceded 'language' with the modifier 'human', and genetic transmission suggests that a similar modifier is appropriate for 'language faculty'. The language faculty is *species-specific* and the ability to develop a grammar of a language is *unique to human beings*. This ability distinguishes us from even our nearest primate cousins, the great apes such as chimpanzees and gorillas, and in studying it we are therefore focusing attention on one of the defining characteristics of what it means to be a human being. There have been numerous attempts to teach language to other species, and success in this area would seriously challenge the assertion we have just made. Indeed, it has proved possible to teach chimpanzees a number of signs similar to those employed in the Sign Languages used as native languages by the deaf, and it has been reported that pigmy chimpanzees can understand some words of spoken English, and even follow a number of simple commands. Such research arouses strong emotions, and, of course, we are not in a position to assert that it will *never* produce dramatic results. At the moment, however, we can maintain that all attempts, however intensive, to teach grammatical knowledge to apes have been spectacular failures when the apes' accomplishments are set alongside those of a normal three-year-old child. As things stand, the evidence is firmly in favour of the species-specificity of the language faculty.

Psycholinguistics

As noted above, the psycholinguist addresses the question of how the mentally represented grammar (linguistic competence) is employed in the production and comprehension of speech (linguistic performance). The most direct way to approach this relationship is to adopt the hypothesis that a generative grammar can simply be regarded as itself providing an account of how we understand and produce sentences in real time. From the point of view of language comprehension, this gives rise to the following (highly simplified) model, where the input is a stretch of spoken or written language such as a particular sentence:

(14)



In terms of this rather crude model, the first step in language comprehension is to use the *phonological processor* to identify the sounds (or written symbols) occurring in the input. Then, the *lexical processor* identifies the component words. The next step is for the *syntactic processor* (also called the *parser*, and incorporating the syntactic component of the grammar) to provide a syntactic representation of the sentence (i.e. a representation of how the sentence is structured out of phrases and the phrases out of words). The last step is for the semantic processor to compute a meaning representation for the sentence, on the basis of the syntactic and lexical information supplied by earlier stages in the process. The relevant meaning representation serves as the output of the model: once this has been computed, we have understood the sentence.

An important characteristic of (14), as of all models of psycholinguistic processing, is that its various stages are to be viewed as taking place in real time, and a consequence of this is that psycholinguists can utilise their experimental techniques to try to measure the duration of specific parts of the process and link these measurements to levels of complexity as defined by the grammar itself. In fact, it is fairly easy to see that the idea that the grammar can, without any additional considerations, serve as a model of sentence comprehension is implausible. A sentence such as (15) is known as a **garden-path sentence**:

(15) The soldiers marched across the parade ground are a disgrace

A common reaction to (15) from native speakers of English is that it is *not* an acceptable sentence. However, this reaction can often be modified by asking native speakers to consider the sentences in (16) (recall our observation that not all linguistic data have immediately obvious properties):

(16) a. The soldiers who were driven across the parade ground are a disgrace
b. The soldiers driven across the parade ground are a disgrace
c. The soldiers who were marched across the parade ground are a disgrace

Sentence (16a) should be regarded as entirely straightforward, and we can view (16b) as 'derived' from it by deleting the sequence of words *who were*. Now, if we delete *who were* from sentence (16c), which should also be recognised as an acceptable English sentence, we 'derive' (15), and at this point many readers are likely to change their reaction to (15): it *is* an acceptable English sentence, so long as it is interpreted with the phrase *the soldiers* as the logical object of *marched* (see p. 5 above). When we read (15) for the first time, we immediately interpret *the soldiers* as the logical subject of *marched* – the soldiers are marching rather than being marched; as a consequence, the sequence *the soldiers marched across the parade ground* is interpreted as a complete sentence and the sentence processor doesn't know what to do with *are a disgrace*. The sentence processor has been 'garden-pathed', i.e. sent down the wrong analysis route (***exercise 6***).

What is important about garden-path sentences is that they show that sentence comprehension *must* involve something in addition to the grammar. As far as the grammar is concerned, (15) is an acceptable structure with only one interpretation. However, it appears that this structure and interpretation are not readily available in sentence processing, suggesting that the parser must rely (to its detriment in this case) on something beyond the principles which determine acceptable combinations of words and phrases.

There are other aspects of (14) which are controversial and have given rise to large numbers of experimental psycholinguistic studies. For instance, there is no place in (14) for *non-linguistic general knowledge about the world*; according to (14), interpretations are computed entirely on the basis of linguistic properties of expressions without taking any account of their plausibility, and an alternative would allow encyclopaedic general knowledge to 'penetrate' sentence perception and guide it to more likely interpretations. A further assumption in (14) is that the different sub-components are *serially ordered* (in that the first stage is phonological processing which does its job before handing on to lexical processing, etc.) An alternative would allow syntactic and semantic factors to influence phonological and lexical processing, for semantic factors to influence syntactic processing, etc. These issues, along with several others, will be discussed in sections 14 and 26.

Neurolinguistics

The neurolinguist addresses the fourth of our research questions: how is linguistic knowledge represented in the brain? It is easy to sympathise with the fundamental nature of this question, since we firmly believe that cognitive capacities are the product of structures in the brain. However, the direct study of the human brain is fraught with difficulties. Most obvious among these is the fact that ethical considerations forbid intrusive experimentation on human brains. Such considerations are not extended to non-humans, with the consequence that the neuroanatomy and neurophysiology of non-human, primate *visual* systems, similar in their capacities to that of humans, are already understood in some detail. For language, however, we have to rely on less controlled methods of investigation, for example, by studying brain-damaged patients who suffer from language disorders. In these circumstances, the extent and precise nature of the damage is not known, a factor which inevitably contributes to the tentativeness of conclusions.

The brain is an extremely complex organ, consisting of several 'layers'. The layer which has evolved most recently and is most characteristic of higher primates such as ourselves is the **cerebral cortex**, the folded surface of the **cerebral hemispheres**, which contains what is often referred to as **grey matter**. This is where the higher intellectual functions, including language, are located. There are various ways in which the cerebral cortex can be damaged. For instance, it may suffer injury from a blow to the head or through some other type of wound. Alternatively, it may suffer internal damage due to disease or a blockage in a blood vessel (an embolism or thrombosis), which results in disruption of the blood supply and the death of cortical cells. Areas of damage are generally referred to as **lesions**.

The study of patients with various types of brain damage has revealed that different parts of the brain are associated with (i.e. control) different functions. In other words, it is possible to **localise** different functions in the brain as indicated in figure 1.

A language disorder resulting from brain damage is called **aphasia**, and a notable point is that this sort of brain damage almost always occurs in the left side of the brain (the left hemisphere). Damage to similar areas in the right hemisphere usually gives rise to entirely different deficits that have little to do with language. Aphasics who lose their language completely are said to suffer from **global aphasia**, and while in many cases the brain damage is extensive enough to affect other intellectual functions, sometimes patients retain a good many of the cognitive capacities they had before the injury. In particular, although these patients are unable to produce or understand language, they can often solve intellectual puzzles which don't rely on language.

As we have seen, Chomsky claims that linguistic competence is the product of a species-specific innate language faculty, and it is further maintained that this faculty is *independent* of other cognitive capacities. Of course, the **selective impairment** of language with other faculties remaining intact, which we have just described, is exactly what we might expect on the supposition that the language faculty is an autonomous and innate cognitive capacity.

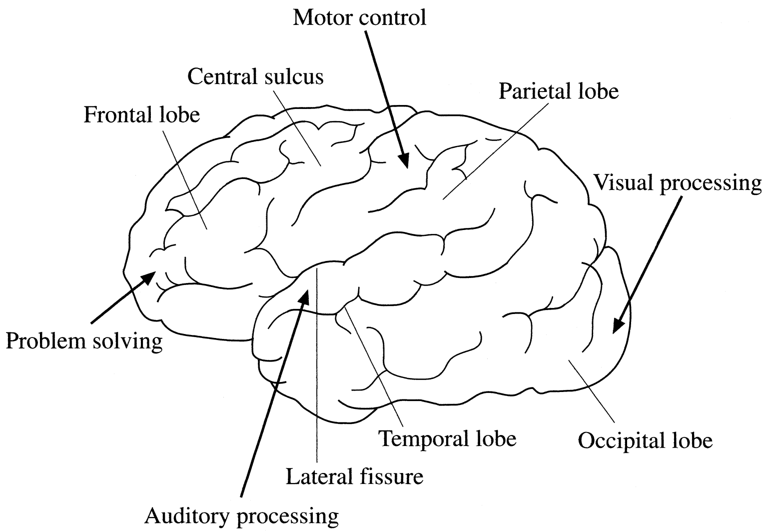


Figure 1 *The human cerebral cortex, with the functions of some areas indicated*

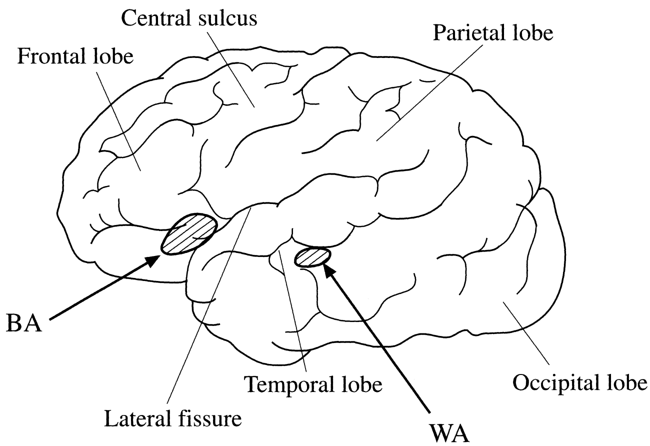


Figure 2 *The human cerebral cortex, with Broca's Area (BA) and Wernicke's Area (WA) indicated*

As well as language being adversely affected while other aspects of cognitive functioning remain intact, it is possible for *specific* types of language function to be impaired, depending on where in the cortex the lesion occurs. In 1861 a French neurologist, Paul Broca, described a patient who had suffered a stroke and who could say only one word. After the patient's death, Broca studied his brain and discovered a large lesion in the frontal lobe of the left hemisphere, the area BA in figure 2.

Broca concluded that this was the area of the brain responsible for controlling the *production* of speech, which has since come to be known as **Broca's area**.

Later research revealed that there is a second group of aphasic patients who have considerable difficulty in *understanding* language. In many cases, such patients appear to produce language reasonably fluently, but close examination reveals that they often speak in a garbled fashion. This pattern of deficit is often referred to as Wernicke's aphasia, in acknowledgement of Carl Wernicke, a German neurologist who first described it in detail in the 1870s. Wernicke's aphasia is associated with damage to another area of the left hemisphere known as **Wernicke's area** (WA in figure 2).

However, the initial view that language can be thought of as located in the left hemisphere and specifically in Broca's and Wernicke's areas has had to be refined. As more research has been done, it has become clear that several different areas of the brain are involved in performing linguistic tasks. This does not mean that the language faculty cannot be located in the brain, but it does entail that complex distributed representations are involved which require more sophisticated experimental procedures for their study. In recent years, new techniques have been developed for studying the activity of the brain as it performs a specific linguistic task. These so-called **imaging techniques** such as EEG (electroencephalography), MEG (magnetoencephalography) and fMRI (functional magnetic resonance imaging) provide images of the brain 'at work' and have led to a growth in our knowledge about the physiological mechanisms underlying the knowledge of language. Studies using these techniques have found, for example, that the brain areas dealing with grammar are not all in Broca's area and that the areas involved in semantics are not all in Wernicke's area. Instead, more recent brain-imaging research on language suggests that each of the different components of the language system (phonology, syntax, semantics, etc.) consists of subparts and these subparts are localised in different parts of the brain. Some of these are within the traditional language areas (Broca's and Wernicke's) and some outside, even in the right hemisphere. However, while we may hope that this research will ultimately lead to a brain map for language and language processing, it is still in a preliminary state, and in the relevant sections that follow (15 and 26), we shall restrict ourselves to discussing the linguistic characteristics of patients who have suffered brain damage and who exhibit particular syndromes (***exercise** 7*).

Of course, the brain is a biological organ, and above we have noted another aspect of the biological foundations of language: the claim that the language faculty is a product of human *genetic* endowment. Species-specificity is consistent with such a claim, but we might ask how we could obtain additional empirical evidence for it. One source of such evidence may be provided by the study of genetically caused disorders of language. If the availability of the language faculty (and the consequent ability to acquire a grammar) is indeed genetically controlled, then we would expect failures of this genetic control to result in language disorders. It is, therefore, of considerable interest that there is a group of language-impaired people who suffer from **Specific Language Impairment (SLI)**, a language disorder which must be clearly distinguished from the disorders introduced above, which are *acquired* as the result of damage to the brain. This group provides us with the chance of studying the effects of what is probably a genetically determined deficit in the acquisition of language. The specificity of SLI is indicated by the fact that SLI subjects have normal non-verbal IQs, no hearing deficits and no obvious emotional or behavioural difficulties. Its likely genetic source is suggested by the fact that it occurs in families, it is more frequent in boys than in girls and it affects both members of a pair of identical twins more frequently than it affects both members of a pair of fraternal twins. The nature of the impairment displayed by SLI subjects seems to be fairly narrow in scope, affecting aspects of grammatical inflection and certain complex syntactic processes. From this it might follow that if there is a 'language gene', its effects are rather specific and much of what is customarily regarded as language is not controlled by it. More research on SLI will be necessary before we can fully evaluate its consequences for this issue, but we shall provide some additional discussion of these matters in sections 15 and 26 (***exercise 8***).

Up to now, we have focused on the four research questions raised by Chomsky's programme and tried to give some idea of how we might begin to approach them. The idea of a grammar as a cognitive (ultimately, neurological) structure is common to each of these fields, which also share an emphasis on the *individual*. At no point have we raised questions of language as a means of communication with others, or as a tool for expressing membership in a group, or as indicative of geographical origins. These are intriguing issues and the sociolinguistic perspective addresses this omission.

Sociolinguistics

Sociolinguistics is the study of the relationship between **language use** and the **structure of society**. It takes into account such factors as *the social backgrounds of both the speaker and the addressee* (i.e. their age, sex, social class, ethnic background, degree of integration into their neighbourhood, etc.), *the relationship between speaker and addressee* (good friends, employer–employee, teacher–pupil, grandmother–grandchild, etc.) and *the context and manner of the interaction* (in bed, in the supermarket, in a TV studio, in church, loudly, whispering, over the phone, by fax, etc.), maintaining that they are crucial to an understanding of both the structure and function of the language used in a situation. Because of the emphasis placed on language *use*, a sociolinguistically adequate analysis of language is typically based on (sound or video) recordings of everyday interactions (e.g. dinner-time conversations with friends, doctor–patient consultations, TV discussion programmes, etc.).

Recordings of language use, as described above, can be analysed in a number of different ways depending on the aims of the research. For instance, the sociolinguist may be interested in producing an analysis of **regional** or **social dialects** in order to investigate whether different social groups speak differently and to discover whether language change is in progress. Rather different is research into the form and function of **politeness** in everyday interaction, an interest which will lead to a search for markers of politeness in conversations and how these are related to social dimensions such as those enumerated above. Alternatively, the focus may be on so-called **minimal responses** (such as *mmm*, *yeah* and *right*) or **discourse markers** (such as *well*, *you know* and *actually*).

In addition to phenomena which arise in interactions between individuals or small groups, sociolinguistics is concerned with larger-scale interactions between language and society as a whole. One such interaction is **language shift**. Here, in a multilingual setting, one language becomes increasingly dominant over the other languages, taking over more and more of the domains in which these other languages were once used. Understanding the conditions which facilitate language shift and the dynamics of the process itself is properly viewed as a sociolinguistic task. It would, of course, be possible to raise many other research topics in the study of language which share a *social* focus, but because it will play a central role in much of our subsequent discussion, we shall close this introduction by going into a little more detail on the contemporary study of **language variation and change**.

The views of lay people about language are often quite simplistic. One illustration of this concerns the relationship between the so-called **standard** languages and the **non-standard** dialects associated with those languages. Standard French and Standard English, for example, are varieties of French and English that have written grammar books, pronunciation and spelling conventions, are promoted by the media and other public institutions such as the education system and are considered by a majority of people to be the 'correct' way to speak these two languages. Non-standard varieties (sometimes called 'dialects') are often considered to be lazy, ungrammatical forms, which betray a lack of both educational training and discipline in learning. Linguists strongly disagree with this view. The study of language use has shown not only that non-standard varieties exhibit grammatical regularity and consistent pronunciation patterns in the same way that standard varieties do, but also that a vast majority of people will use non-standard features *at least some of the time* in their speech. Sociolinguistic research has demonstrated that the speech of most people is, at least in some respects, **variable**, combining, for example, both standard and non-standard sounds, words or grammatical structures. The study of **language variation** involves the search for consistent patterns in such variable linguistic behaviour.

Another area where language variation plays a crucial role is in the study of **language change**. It is the principal concern of **historical linguistics** to investigate how languages change over time, and until recently, historical linguists have studied language change by relying exclusively on **diachronic** methods. These involve analysing the structure of language from a succession of dates in the past and highlighting those structural features (phonological, morphological or syntactic) that appear to have changed over that period of time. For obvious reasons, if we are considering a form of a language from many years ago, we do not have access to native speakers of the language; as a consequence, historical linguists have had to rely largely on manuscripts from the past as evidence of how languages may once have been spoken, but such evidence is of variable quality, particularly when we take account of the fact that very few people were able to write in the pre-modern era. In these circumstances, it is difficult to judge just how representative surviving manuscripts are of the way ordinary people actually spoke.

As an alternative to diachronic methods and aided by the invention of the tape recorder allowing the collection of a permanent record of someone's speech, William Labov has pioneered a **synchronic** approach to studying language change. Whereas diachronic techniques demand language data from different periods in time, Labov's synchronic, so-called **apparent-time**, approach requires data to be collected at only one point in time. Crucially, the data collected within the same community are from people of different ages and social groups. Labov reasoned that if the speech of young people within a particular social group is different from that of old people in the same group, then it is very likely that language change is taking place. This technique has a number of advantages over the traditional historical method. Firstly, the recorded language data constitute a considerably more representative sample of the speech patterns of a community than do the manuscript data of traditional historical linguistics. Secondly, it allows the linguist to study language change as it is actually taking place – traditionally, historical linguists had believed this to be impossible. Finally, it allows the linguist to study how language changes spread through society, answering questions such as, Which social groups tend to lead language changes? How do language changes spread from one social group to another? (***exercises 9*** and ***10***).

Labov's apparent-time model assumes that a difference between young and old with respect to a certain linguistic feature *may* be due to linguistic change. Not all variable linguistic features that are sensitive to age variation are necessarily indicative of language changes in progress, however. Slang words, for example, are often adopted by youngsters, but then abandoned when middle age is reached. Similarly, some phonological and grammatical features, such as the use of multiple negation (e.g. *I haven't got none nowhere*), seem to be **stable** yet **age-graded**, i.e. not undergoing change, but associated with a particular age group, generation after generation.

This brief introduction to the methods and concerns of sociolinguistics may seem to suggest that these are far removed from those of other types of linguist. However, in studying variable patterns of language behaviour and the language change that this variation may reveal, the sociolinguist seeks to uncover universal properties of language, attempting to address questions such as, Do all languages change in the same way? We have already met this preoccupation with universals in our earlier discussion, so we can see that at this level, sociolinguistics exhibits important affinities with other approaches to the study of language. However, a fundamental difference remains: the sociolinguist's questions about universals require answers in which the structure of society plays an integral part. In this regard, they differ from the questions with which we opened this introduction, but there is no conflict here. Taken together, the various emphases we pursue in this book present a comprehensive picture of the complex and many-faceted phenomena which the study of language engages.

Exercises

1. Indicate which of the following are acceptable or unacceptable sentences in English. Taking particular account of the *meanings* of the words in the examples, how do you think you know that the unacceptable sentences are unacceptable?
   (a) John must leave now
   (b) John must to leave now
   (c) John has to leave now
   (d) John has leave now
   (e) It is likely that John will overeat
   (f) John is likely to overeat
   (g) It is possible that John will overeat
   (h) John is possible to overeat

2. Find further examples of sets of phrases or sentences from English or other languages with the characteristics of (9) in the text. This is *very, very* easy! If we extend the sequence in (9), with the sentences becoming *longer and longer and longer* (!), we get to a point where we might be convinced that no one would ever use such a sentence. What reasons can you think of for use being restricted in this way? Is it possible to specify with confidence the point in the sequence at which there is no likelihood of a sentence being used? Do these concerns have anything to do with the theory of language?

3. In an English dictionary, turn to words beginning with the prefixes *im-* (e.g. *impossible*, *impolite*) and *in-* (e.g. *indelicate*, *intolerant*). What generalisations, if any, can you formulate about the first sound of the words to which *im-* and *in-* are prefixed? How might your generalisations be described in terms of *assimilation*?

4. Each of the following sentences is ambiguous. Provide paraphrases for the two (or more) interpretations in each case:
   (a) John's picture hangs in the Tate
   (b) John loves his dog and Bill does too
   (c) What John became was horrible
   (d) Bill always eats in the best restaurant in town
   (e) Do Americans call cushions what the British call pillows?
   (f) John introduced himself to everyone that Mary did

5. A further argument for an innate language faculty based on the insufficiency of children's linguistic experience to account for the characteristics of their mature grammars is provided by ambiguity. Consider again the examples in exercise 4 and, supposing that you

have succeeded in identifying their ambiguous interpretations, try to conceptualise what it would mean for *your* linguistic experience to have been sufficient to account for this knowledge. What conclusions do you draw from these efforts?

6. Two of the sentences below are *globally* ambiguous, i.e. they have more than one interpretation. The other is a garden-path sentence, which is *temporarily* ambiguous, but, in fact, has just one interpretation.

   Identify the garden-path sentence and describe what might cause the garden-path effect. For the globally ambiguous sentences, identify your preferred interpretation, i.e. the first one that comes to your mind. Then, taking account of the additional interpretations the sentences may have, describe the strategy that may have led you to your preferred interpretation.

   (a) Someone shot the servant of the actress who was on the balcony
   (b) I put the book that you were reading in the library into my briefcase
   (c) Mary painted the chair in the kitchen

7. In a brain-imaging study, Kim, Relkin, Lee and Hirsch (1997) examined two groups of bilinguals (group 1 had learned their second language as children, group 2 as adults). The study showed that both groups used the same part of Wernicke's area in their two languages. However, while group 1 used the same part of Broca's area for L1 and L2 processing, group 2 used a part of Broca's area next to the L1 processing area when processing their L2. What does this finding tell us about the development of language areas in the brain?

8. Analyse the following utterances produced by Ruth, a ten-year-old with language problems (from Chiat 2000). How do her sentences differ from those of normal adult speakers?

	Ruth's utterances	Reconstruction of targets
(a)	Me borrow mum camera	I'll borrow mum's camera
(b)	I ring you last time	I rang you last time
(c)	We walk up	We walked up
(d)	You and me getting married	You and me are getting married
(e)	Us going on Friday	We are going on Friday

9. One of the foundational studies in sociolinguistics which investigated language variation and change was carried out in the early 1960s by the American linguist William Labov on the island of Martha's Vineyard in Massachusetts, USA. Martha's Vineyard was (and still is) a very popular summer holiday destination for (particularly wealthy) Americans and many bought summer homes there. During

the holiday period, the tourist population totally swamped the numbers of resident islanders – in 1960, for example, there were just over 5,000 islanders, and over 40,000 'summer people'. Especially loyal to the island's traditional ways were the fishermen from Chilmark in the rural west, who were clinging on to their maritime livelihoods in the face of pressure to sell up to outsiders. The more urbanised east of the island was already the summer home to many of the visitors.

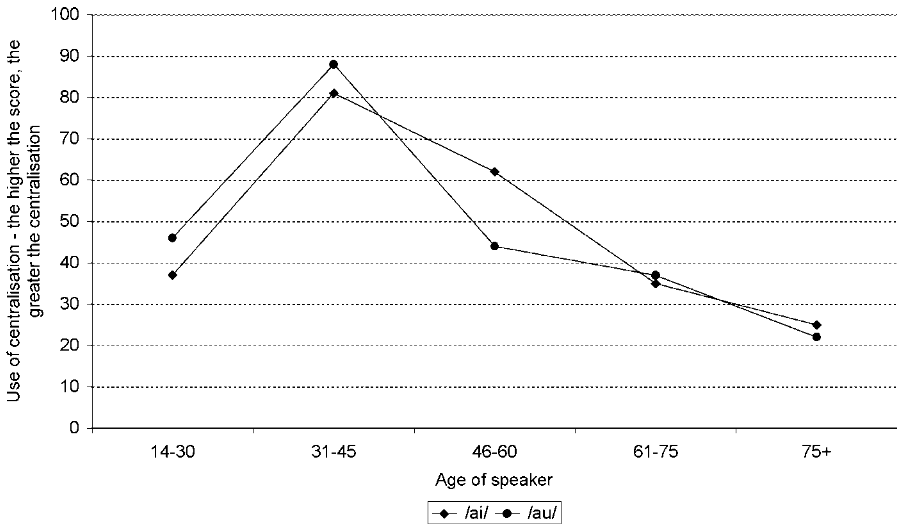


Figure 3a *Centralisation and age on Martha's Vineyard (from Labov 1972: 22). Reprinted with permission of the University of Pennsylvania Press.*

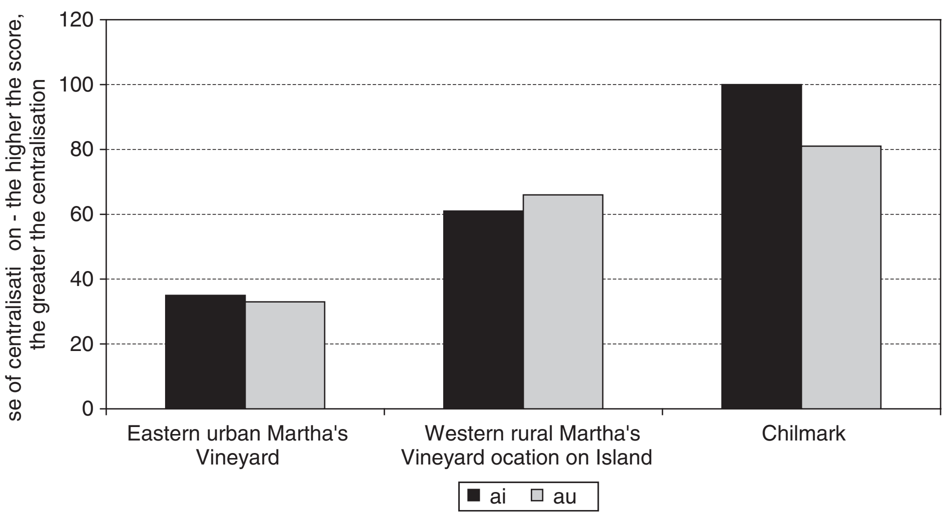


Figure 3b *Location and centralisation on Martha's Vineyard (based on Labov 1972: 25). Reprinted with permission of the University of Pennsylvania Press.*

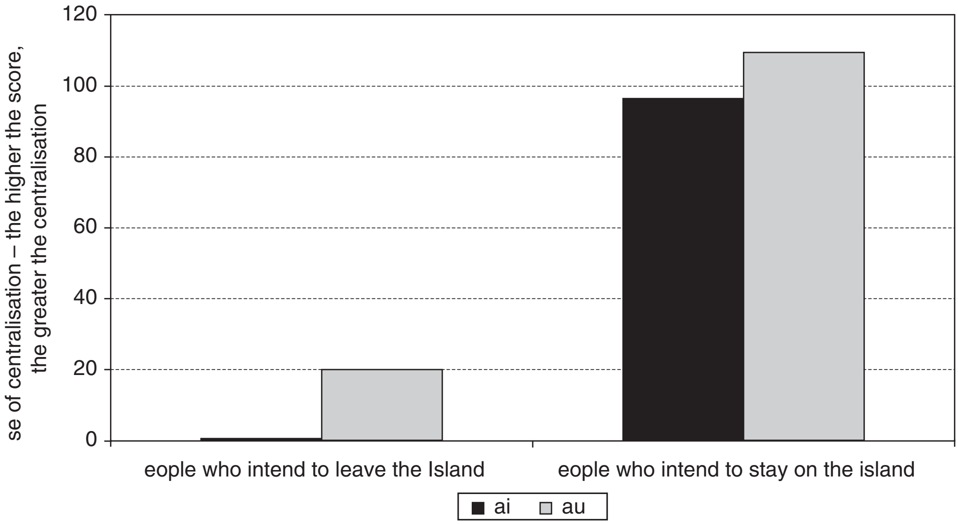


Figure 3c *Leavers and stayers on Martha's Vineyard (from Labov 1972: 32). Reprinted with permission of the University of Pennsylvania Press.*

Labov investigated the way that many people on Martha's Vineyard pronounced the /ai/ and /au/ sounds in words like RIGHT and MOUTH respectively – see sections 2 and 3 for the notation used here. On Martha's Vineyard, many people pronounced these words with rather traditional centralised vowels rather than with the more open vowels that you'd expect from more standardised accents of North American English. Figures 3a, b and c (derived from data in Labov 1972), show the results of Labov's analysis of the conversational speech of Martha's Vineyarders. How would you account for Labov's findings in each of the three figures?

10. Others, as well as Labov, who have conducted apparent-time studies have demonstrated the success of their techniques by returning to the communities they had earlier studied and repeating their research to see if a real-time diachronic study supported their apparent-time findings. One such follow-up study, by Meredith Josey, was a repeat of the Martha's Vineyard survey, forty years after the original research. Summer visitors (88,000 in 1995) continue to vastly outnumber the local population (14,000). The initially strong and resilient local fishing industry has largely been swallowed up by large conglomerates, and the fishermen have had to join these large corporations, change career or diversify. Josey specifically analysed the locality of Chilmark, the place where Labov had found the greatest degree of centralisation back in the 1960s, and found that the levels of centralisation of /ai/ had dropped, from a score of 100 in 1962 to a score of 78 in 2003. Why do you think levels of centralisation may have dropped?

Further reading and references

Chomsky's ideas on the nature of language and linguistic enquiry have been developed in a number of non-technical publications since first being clearly formulated in chapter 1 of Chomsky (1965). These include Chomsky (1966, 1972, 1975, 1980, 1986, 1988, 1995a, 2002). Despite being non-technical, all of these works are difficult for the beginner. A comprehensive and approachable account, locating Chomsky's approach within a biological framework, is Pinker (1995). Smith (1999) is an excellent attempt to provide an overview of Chomsky's linguistic, philosophical, psychological and political ideas. A well-written introduction, paying particular attention to such issues as innateness and species-specificity is Aitchison (1998), and an intriguing, but difficult, debate of these issues is conducted in Hauser, Chomsky and Fitch (2002) and Pinker and Jackendoff (2005).

For language acquisition, a wide-ranging survey of traditional and modern studies is Ingram (1989), but an introduction which is closer to the emphases we adopt in this book is Goodluck (1991). Atkinson (1992) is narrower in scope and much more technical. O'Grady (1997) and Guasti (2002) are more recent (but technical) introductions. Leonard (1998) provides a comprehensive and readable introduction to Specific Language Impairment.

Garman (1990) is a good overview of psycholinguistics and also contains a discussion of language disorders. For more detailed discussions of the topics we pursue, Harley (2001) is a good source for psycholinguistics and Field (2004) is a comprehensive survey of the major concepts, terms and theories in this area. Field (2003) is a good recent overview of psycholinguistics and also contains some material on neurolinguistics. Caplan (1992) is a good source for language disorders and neurolinguistics and more recent detailed introductions to this field are Ahlsén (2006) and Ingram (2007). The view that the language system might constitute an independent 'module' of the mind is a theme throughout much of Chomsky's writing mentioned above and is defended from a slightly different perspective by Fodor (1983), a very important but difficult book.

There are a number of excellent introductory sociolinguistics texts. Trudgill (2000) is a very approachable entry point to the subject, and Holmes (2008) and Mesthrie, Swann, Deumart and Leap (1999) can be recommended. Meyerhoff (2006) is an excellent more advanced textbook. More specifically on the subject of language variation and change, Chambers (2002) and Bayley and Lucas (2007) are well-written introductions, while Chambers, Trudgill and Schilling-Estes

(2002) is a state-of-the-art handbook. Trudgill (2003) and Swann, Mesthrie, Deumart and Lillis (2004) are useful sociolinguistic dictionaries. The survey of Martha's Vineyard is now a classic in sociolinguistics and more can be read about it in Labov (1963) and chapter 1 of Labov (1972). There have now been two real-time restudies of the island – Blake and Josey (2003) and Pope, Meyerhoff and Ladd (2007).

PART I

Sounds

1 Introduction

With the exception of the Sign Languages used by the deaf, and written languages, the languages with which most of us are familiar rely on the medium of sound. Sign Languages are extremely interesting, exhibiting all the complexities of spoken languages, but their serious study requires the introduction of a considerable amount of specialised terminology for which we do not have space in an introductory book of this kind. As for written languages, they too have many fascinating features, but they are regarded as secondary to spoken languages for a number of reasons. For instance, children are explicitly taught to read and write sometime after they acquire a spoken language, and many cultures have never employed writing systems. Thus, a focus on sounds is entirely appropriate, and this part of the book is devoted to discussion of the way in which the sound systems of languages are organised and the role of such systems in the acquisition and processing of languages. We will also consider the ways in which sound systems differ from one dialect or variety of a given language to another and the changes that we can identify in the sound system of a given language over time.

Before we can discuss any aspect of the sound system of a language, we need a systematic way of describing and transcribing speech sounds, and in section 2 we introduce a standard transcription system, while explaining how the more important speech sounds are produced. It is important to be clear that the purpose of this section is to introduce *terminology* that enables us to talk about speech sounds with some precision, this being a prerequisite to our discussing any of the issues raised in our main introduction. Once our transcription system is in place, the most straightforward way to put it to use is in connection with sociolinguistic issues. Therefore, in section 3, we focus on the ways that sound systems vary across dialects, social groups, etc. We shall see that one dialect differs from another in systematic ways, i.e. that so-called 'substandard deviations' are quite regular and governed by social, contextual and linguistic principles. Section 4 examines how sound systems change over time to give rise to new dialects and ultimately new languages. Once more, we shall see that such changes are neither random nor due to 'sloppiness' on the part of speakers; rather, they are subject to coherent principles. Moreover, we shall discover that there is a close relationship between *variation* in a given language at any point in time and historical *change*.

In section 5, we begin to introduce some of the more abstract concepts that are important in understanding the phonological component of a grammar. Among these concepts is that of the phoneme, a unit of phonological analysis, and we will also touch upon the structure of the syllable, a particularly important unit in sound systems. Phonological processes have already received a brief introduction (pp. 4f.), and in this section we shall consider some of these in more detail, introducing the important concept of **alternation**, such as we can observe in connection with the ‘a’ vowels in *Japan* and *Japanese*. The word *Japanese* clearly consists of *Japan* followed by the ending -*ese*, and native speakers of English will readily agree that the two ‘a’ vowels of *Japan* are different; the first is like the ‘a’of *about* whereas the second is like the ‘a’ of *pan*. However, in the word *Japanese* each of the two ‘a’ vowels has the opposite quality and we say that they **alternate** – it seems as if the addition of -*ese* causes a change in the vowels of *Japan*. This difference is a systematic property of the language and, unlike the examples mentioned in the main introduction, it does not depend on whether we are speaking carefully or not; much of this section is devoted to such phenomena, and we will show how they can be described in terms of processes.

In the last two sections of this part of the book, we examine some of the developmental and psycholinguistic issues that arise in connection with sound systems. Section 6 discusses how phonology can throw light on the acquisition of pronunciation patterns by children learning their first language. Additionally, it illustrates the interaction between approaches alluded to in the main introduction, in that we will see that aspects of child phonology require theoretical notions which also find a role in the formulation of adult grammars. Finally, in section 7, we will consider selected aspects of speech perception, along with common everyday errors in speech production (so-called slips of the tongue). This section concludes with a brief discussion of the role of phonology in understanding certain aspects of poetic systems and the way that writing systems have developed. Overall, the section seeks to establish the importance of some of the theoretical notions introduced in section 5 for the understanding of phenomena with which some readers will already be familiar.

2 Sounds and suprasegmentals

How many sounds are there in English? This seems like a reasonable enough question, but in fact it is difficult to answer, for several reasons. A major problem is that the spelling system of English (its **orthography**) is irregular and doesn't represent sounds in a completely consistent way. Sometimes one sound can be spelled in several ways as with the first sound of *Kathy* (or is it *Cathy*?), but worse, we find that some sounds just aren't given their own symbol at all. There is a difference between the first sounds of *shock* and *sock*, but the first of these sounds is represented by two symbols *s* and *h*, each of which corresponds to a sound that is different to the first sound of *shock*. Moreover, although most speakers of English will distinguish the middle sounds in *put* 'to place' and *putt* 'to strike a golf ball while it is on the green', this distinction is never made in the writing system.

We also need to be careful about what we mean by 'English', as pronunciation differs from one dialect to another. In the North of England, for instance, both *put* and *putt* are often pronounced like *put*, and dialects in the United States differ as to which (if any) of the sounds in bold face in the words *m**e**rry*, *m**a**rry* and *M**a**ry* they distinguish. These are systematic differences and not just caprice on the part of speakers, an issue that will be discussed in more detail in section 3. In the present context, however, such observations indicate a clear need for some way of writing down sounds which bypasses traditional orthography.

Moving away from English, as noted already, there are a great many languages which have never had a writing system of their own and which until recently have never been written down (hitherto undiscovered languages are still encountered in some parts of the world). For such cases, it is essential that linguists can rely on a system of writing which can be applied to any human language, even one which is completely unknown to the investigator.

For these reasons, linguists have developed systems of **phonetic transcription** in which each sound is represented by just one symbol and each symbol represents just one sound. Unfortunately, there are several such systems in use. In this book, we will use the transcription system of the International Phonetics Association, which is generally referred to as the IPA. This system, commonly used in Britain, derives from one developed in the 1920s by Daniel Jones and his colleagues at London University, one of whose aims was to provide writing systems for the unwritten languages of Africa and elsewhere.

One advantage of the IPA is that it is accompanied by a well-defined method of describing sounds in terms of the way in which they are produced. An understanding

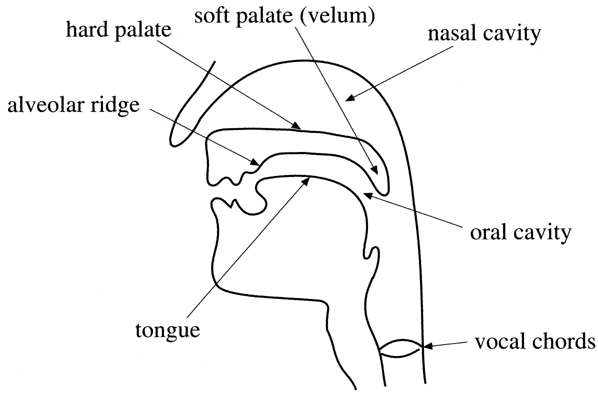


Figure 4 *Cross-section of the human vocal tract*

of how speech sounds are produced is a prerequisite for being able to transcribe them, so our introduction of the various symbols employed in the IPA will be accompanied by an account of the mechanisms of speech production.

Any sound is a series of vibrations moving through air, water or some other material. To create these vibrations, a **sound source** is needed and these come in various types. On a guitar, for instance, the sound source is the strings, which vibrate when plucked. By themselves, these produce relatively little noise, but the body of the instrument is basically a wooden box which amplifies the sounds by picking up their vibrations and **resonating**, that is, vibrating in the same way, but more loudly. If you strum more than one string on a guitar, the pattern of resonance becomes very complex, with several sets of vibrations resonating at once. Speech sounds are produced in basically the same way, with bands of tissue called the **vocal cords** or **vocal folds** corresponding to the guitar strings. These are situated in the **larynx** or **voice box**, a structure in the throat (see figure 4). When air is forced out of the lungs, it causes the vocal cords to vibrate. Corresponding to the body of a guitar and functioning as a resonating chamber is the mouth and nose cavity above the larynx. Taken together, all these structures are called the **vocal tract**. The major difference between a guitar and the vocal tract is that we can make different sounds by changing the shape of the latter, by moving the tongue, the lips and even the larynx.

Consonants

Given the apparatus described above, there are several ways of producing speech sounds. Firstly, we can simply set the vocal cords vibrating and maintain a steady sound such as ‘aaaah’ or ‘ooooh.’ Or we can produce a very short-lived explosive sound such as ‘p’ or ‘t’, and another important type of sound is illustrated by ‘f’ or ‘s’, when we force air through a narrow opening to cause a

Table 1 *IPA transcription for the English consonants*

pay	[p]	*far*	[f]
boy	[b]	*vie*	[v]
		thin	[θ]
		though	[ð]
tea	[t]	*sew*	[s]
do	[d]	*zip*	[z]
chair	[ʧ]	*show*	[ʃ]
jar	[ʤ]	*pleasure*	[ʒ]
cow	[k]		
go	[g]		
		her	[h]
me	[m]	*war*	[w]
now	[n]	*low*	[l]
		ray	[ɹ]
		you	[j]
hang	[ŋ]		

hissing sound. Sounds such as ‘p’, ‘t’, ‘f’ and ‘s’ are called **consonants**, while those like ‘aaaah’ or ‘ooooh’ are **vowels**. The basic list (or inventory) of consonants in English is given in table 1. In all cases except for [ŋ] in *hang* and [ʒ] in *pleasure*, the consonant is at the beginning of the accompanying word – [ŋ] and [ʒ] do not occur word-initially in English. As will be apparent, in many cases the IPA symbol, written between square brackets, is identical to the ordinary printed symbol. The reasons for laying out the table in this manner will become clear from the subsequent discussion.

Let’s begin by considering the sounds [p] and [f]. These differ from each other in their **manner of articulation**. The [p] sound is produced in three phases. Firstly, we shut off the vocal tract completely by closing the lips. Then, we try to force air out of the lungs. However, this air is prevented from escaping because of the closure and this causes a build up of pressure inside the mouth. Then, we suddenly open the lips releasing this pressure, and the result is an explosive sound that lasts for a very short time. Such sounds are called **plosives**, and the English plosives are [p b t d k g]. The production of [f] is quite different. Here we allow a small gap between the top teeth and the bottom lip and then force air through this gap. When air at high pressure is forced through a narrow opening, it sets up friction which causes a noise. Sounds produced in this way are therefore called **fricatives**. The English fricatives are [f v θ ð s z ʃ ʒ h]. The initial consonants of *chair* and *judge* are complex sounds, which begin as plosives and end as fricatives. They are known as **affricates** and the IPA symbols [ʧ] and [ʤ] make their complex character clear.

The remaining sounds in table 1 fall into two groups. Firstly, consider the sounds [m n ŋ]. These are produced by allowing the nasal cavity to resonate. Normally, the nasal passages are separated from the mouth and throat by a small piece of flesh, the **velum** (also sometimes called the **soft palate**), which is the backward continuation of the roof of the mouth (see figure 4). When the velum is lowered, air can pass through the nose. For instance, if we close the lips as if to produce a [b] and then lower the velum, the air from the lungs will no longer be trapped but will pass through the nose and set up vibrations there. This is how [m] is produced, and sounds such as [m n ŋ] are called **nasals**. The other remaining group of sounds is [l ɹ w j] and we shall describe how they are produced after we have looked at the other sounds in more detail.

Consonants are distinguished by more than just their manner of articulation. The sounds represented by [p t k] are all plosives, but these symbols represent different sounds. To understand the relevant distinctions here, we need to know something about the internal shape of the vocal tract, and figure 5 contains a cross-sectional view showing the way in which [m] is produced – for [p, b], the velum would be raised. The three sounds [p, b, m] are all formed by bringing the lips together, and they are referred to as **bilabial** sounds. By contrast, the sounds [t d n] are made by placing the tip of the tongue against the gum ridge behind the upper teeth; this ridge is called the alveolus or the alveolar ridge and so [t d n] are called **alveolar** sounds. This articulation is illustrated for [n] in figure 6. Many

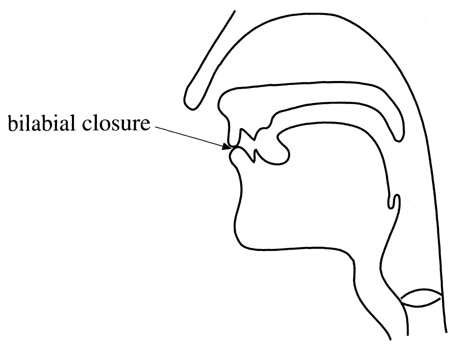


Figure 5 *Cross-section of the vocal tract, illustrating the articulation of [m]*

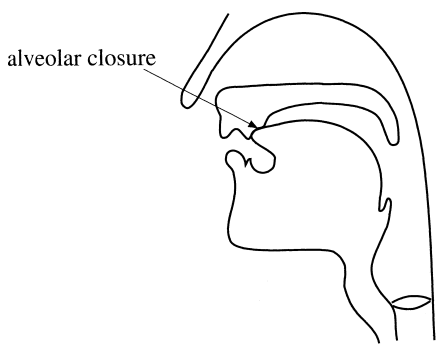


Figure 6 *Cross-section of the vocal tract, illustrating the articulation of [n]*

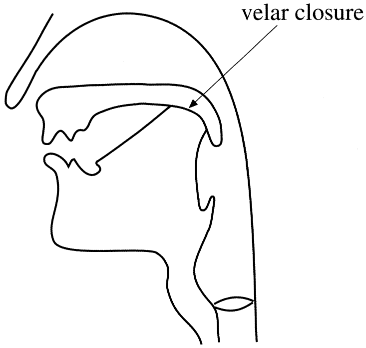


Figure 7 *Cross-section of the vocal tract, illustrating the articulation of [ŋ]*

languages (e.g. French, Spanish, Russian) use sounds which are slightly different to the [t d n] we find in English. Speakers of these languages place the tip of the tongue against the upper teeth themselves rather than the alveolar ridge and this produces a **dental** sound. If we need to distinguish dentals from alveolars, we can use special IPA symbols [t̪ d̪ n̪] to refer to the dentals. Different again are [k g ŋ]. To produce these, we use a different part of the tongue, the **body** or **dorsum**, which is brought against the velum as illustrated for [ŋ] in figure 7. These sounds are known as **velars** and the descriptions we have introduced here give us the **place of articulation** of the sound.

A place of articulation usually involves two types of articulator. One is a passive structure such as the alveolar ridge or the teeth; the other is the active articulator which is moved. For the alveolar, dental and velar sounds described above, the active articulator is part of the tongue. For bilabial sounds, we have an odd situation in which both lips can be regarded as simultaneously the active and passive articulators.

So far, in our discussion of place of articulation, we have mentioned only plosives. Turning now to fricatives, [s z] have the same place of articulation as [t d]; thus, [s] is an alveolar fricative, whereas [t] is an alveolar plosive. The sounds [θ ð] are made by bringing the blade of the tongue against the upper teeth or even between the teeth (so that the tongue tip protrudes slightly). These sounds are therefore dentals, although they are sometimes also called **interdentals** (figure 8). As already noted, the production of [f] (and [v]) involves moving the lower lip into close proximity with the upper teeth. These are therefore known as **labiodental** sounds (figure 9).

Before considering [ʃ ʒ], let's briefly look at [j], one of the sounds in the group we set aside above. The production of this sound involves raising the tongue blade towards the roof of the mouth (although not far enough to produce friction, see below). The roof of the mouth is called the **palate** (sometimes **hard palate**), and for this reason [j] is called a **palatal** sound (figure 10). Now, for [ʃ ʒ], we bring the tongue blade forward from the palate but not as far forward as for an alveolar sound. The place of articulation for [ʃ ʒ] is midway between the places of articulation for palatals and alveolars, and for this reason [ʃ ʒ] are referred to as

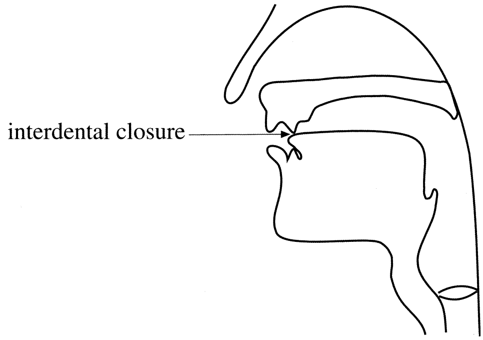


Figure 8 *Cross-section of the vocal tract, illustrating the articulation of interdental sounds*

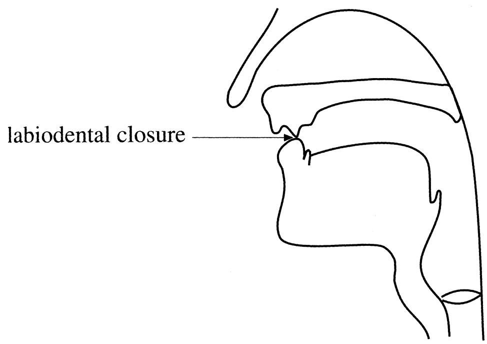


Figure 9 *Cross-section of the vocal tract, illustrating the articulation of labiodental sounds*

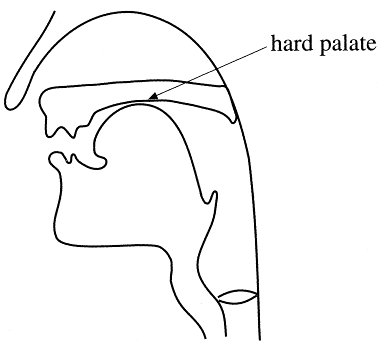


Figure 10 *Cross-section of the vocal tract, illustrating the articulation of [j]*

palato-alveolar or **alveopalatal** fricatives. The affricates [ʧ ʤ] are made in the same place (figure 11).

There is one English fricative with which we have not yet dealt, [h]. Formation of this sound does not involve the tongue or lips; rather, it is made simply by

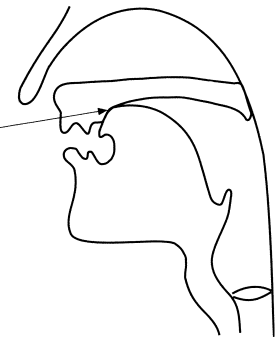


Figure 11 *Cross-section of the vocal tract, illustrating the articulation of palato-alveolar sounds*

passing air through the vocal cords. The part of the larynx containing the vocal cords is called the **glottis**, so we often refer to [h] as a **glottal** fricative. Equally, since it is made in the larynx, we may call it a **laryngeal** fricative.

We can now return to [l ɹ w j]. Above, we have noted that while [j] is palatal, its articulation does not involve moving the blade of the tongue sufficiently close to the hard palate to produce friction. Therefore, it is not a fricative, and it is necessary to recognise another manner of articulation. For each of the sounds in the set [l ɹ w j], the distance between the active and passive articulators is insufficient to cause friction, and such sounds are referred to as **approximants**. Thus, we can refer to [j] as a palatal approximant. Next, consider [w]. Production of this sound involves bringing the lips together, but again not close enough to cause complete closure or friction; it is a bilabial approximant. With the two remaining sounds, there are additional factors to take into account, although it remains convenient to continue to refer to them as approximants. Take [l] first. This is produced by placing the tongue tip against the alveolar ridge. However, unlike in the case of [t d], we do not create a *complete* obstruction; rather, we give the air an escape hatch by allowing it to pass around one side of the tongue. For this reason, [l] is called a **lateral** sound. The [ɹ] sound is produced by curling the tip of the tongue towards the alveolar ridge (or sometimes as far back as the hard palate), but again without getting close enough to cause an obstruction or create a frictional airflow. Sounds made by curling the tongue tip in this way are called **retroflex**. In fact, there is considerable variation in the way that ‘r’ type sounds are pronounced in English (as in many other languages). Thus, in many dialects we have a trilled ‘r’ [r], in which the tongue tip is brought near to the alveolar ridge and is caused to flap rapidly against it several times by air passing through the centre of the mouth. Traditionally, the sounds [l ɹ] are often referred to as **liquids** with [w j] being called **glides**. We will see an interesting connection between glides and vowels presently.

There is one final distinction we need before our description of English consonants is complete. We need to understand what distinguishes [p] from [b], [t] from [d], [s] from [z], [θ] from [ð], etc. Taking [p] and [b], we have seen that both of these are bilabial plosives, but they are different sounds. So, what is the nature of the difference between them? The answer to this question is most easily grasped for a pair of fricatives such as [s z]. Try saying these sounds one after the other and you will notice that the difference between them is that for [s] the vocal cords are not vibrating (the effect is stronger if you put your fingers in your ears). In other words, [s] doesn't seem to require any sound source. This may seem rather odd, until we realise that, as a fricative, [s] produces its own frictional noise. To produce [z], however, vocal cord vibration is also necessary. This gives rise to a difference in **voicing**, with sounds such as [b v ð z] being **voiced** while [p f θ s] are **unvoiced**. All the English nasals and approximants are normally voiced.

The three attributes of voicing, place of articulation and manner of articulation provide a convenient **three-term description** for many sounds. Thus, [ʤ] is a voiced palato-alveolar affricate, [f] is a voiceless labiodental fricative, [ŋ] is a voiced velar nasal and so on. However, for [l ɹ], we need a slightly more detailed description: [l] is a voiced alveolar lateral approximant and [ɹ] is a voiced alveolar non-lateral or retroflex approximant. All these sounds and a number of others are shown in the IPA chart reproduced in appendix 1. It is also convenient to use more general terms for some groupings of sounds. Thus, the bilabial and labiodental sounds all involve the lips, so these are called **labials**. The dentals, alveolars, palato-alveolars and palatals all involve the tip or the blade of the tongue (i.e. the front part of the tongue, which excludes the dorsum). These sounds are all **coronals**, while the sounds that involve the dorsum are **dorsals**. In addition, it is useful to distinguish the plosives, affricates and fricatives, which usually come in voiced/voiceless pairs, from the nasals and approximants, which are intrinsically voiced. The former are called **obstruents** (because their production obstructs the airflow) and the latter are called **sonorants** (because they involve a greater degree of resonance).

While the sounds in table 1 are standardly regarded as the English consonants, there are a number of other consonantal sounds that are important in understanding the way English is pronounced. Consider the final sound of *cat* when the word is spoken in a relaxed and unemphatic manner. In many dialects, this is pronounced without any intervention of the tongue, and comes out as a 'catch' in the larynx. This is formed by bringing together the vocal cords, building up pressure behind them as for a plosive and then releasing the vocal cords. The result is, in fact, a plosive but one produced at the glottis, hence its name **glottal plosive** (or, more commonly, **glottal stop**) [ʔ]. This sound is a very common replacement for certain occurrences of [t] in many British dialects, most famously in London Cockney, where *cat* and *butter* would be pronounced [kaʔ] and [bʌʔə] – we shall come to the vowel sounds appearing here shortly.

The [t] in words such as *butter* is, in fact, subject to further variation. For instance, in many varieties of American English, it is pronounced a bit like a 'd'. More precisely, the sound in question is a little shorter than [d] and is produced by very quickly flapping the tip of the tongue against the alveolar ridge (or the front of the hard palate). Such a sound is called a **flap** (or a **tap**) and its IPA symbol is [ɾ].

Finally, we must mention an important aspect of English pronunciation that is quite hard to discern. If you listen carefully to the pronunciation of ‘p’ in *pit* and *spit*, you should be able to hear that the ‘p’ of *pit* is followed by a puff of breath that is absent in *spit*. This puff of breath is called **aspiration**, and you can detect it by holding your hand in front of your mouth as you say the words. The same difference is observed in the ‘t’ of *tar/star* and the ‘k’ of *car/scar*; ‘t’ and ‘k’ are aspirated in *tar* and *car* but not in *star* and *scar*. We transcribe aspiration by means of a raised ‘h’: [p^h t^h k^h]. If we wish to make it clear that a given sound is unaspirated, we use a raised ‘equals’ sign, as in [$p^=$ $t^=$ $k^=$], though when there is no possibility of confusion, it is customary to omit this. Transcriptions for *pit* and *spit* including this difference in aspiration are thus [p^hɪt] and [s$p^=$ɪt]. In transcriptions, additional symbols such as the raised ‘h’ or ‘equals’, added to a basic symbol to create another symbol for a related sound are called **diacritics**. There are a good many diacritics used by phoneticians (see the IPA chart on p. 411 for additional examples).

So far, we have restricted our attention to English consonants, but of course other languages use additional consonantal sounds. In table 2, we see the English consonants from table 1 along with various other IPA symbols for sounds which occur in other languages:

As we can see, it is possible to fill a good many of the cells in table 2 with symbols representing sounds in the world’s languages. Without special training, you won’t be able to pronounce many of these sounds, but you should have some idea of how they are produced. For instance, a retroflex ‘l’ [ɭ] is made in the same place as the English retroflex [ɹ] but with the lateral manner of articulation characteristic of [l]. Retroflex sounds are found in a large number of languages of the Indian subcontinent and in Australia amongst other places. Uvular and pharyngeal sounds are made with places of articulation not found in English. Uvular sounds are like velars, except that the tongue body moves further back and a little lower to articulate against the uvula. Pharyngeal sounds are common in Arabic (although they are encountered in languages throughout the world). They are made by bringing the tongue root back towards the back of the throat, often with constriction of the throat (***exercises 1***, ***2*** and ***3***).

Table 2 *Consonantal sounds arranged by place and manner of articulation*

PLACE MANNER	bilabial	labio- dental	inter- dental	alveolar	palato- alveolar	palatal	retroflex	velar	uvular	pharyngeal
plosive	p b			t d		c	ʈ ɖ	k g	q ɢ	
fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ç ʝ	ʂ ʐ	x ɣ	χ ʀ	ħ ʕ
affricate					ʧ ʤ		tʂ dʐ			
nasal	m	ɱ		n		ɲ	ɳ	ŋ	ɴ	
liquid				l r		ʎ	ɭ ɹ		ʁ	
glide	w	ʋ				j		ɰ		

Vowels

Having considered consonants, we now turn to vowels. Here the description is a little more complex because the dialects of a language tend to differ most in their vowel sounds, and this is certainly true for English. Indeed, even within one country where English is spoken such as Britain, the United States or Australia, there are considerable differences in vowel sounds. We will present a description of the basic system found in standard British English, making some observations about other varieties, most notably General American, as we proceed. You may find that your own pronunciation differs in interesting ways from what is described below.

Firstly we will introduce some symbols used for transcribing English vowels, then we will ask how the vowels are produced. We'll start with the vowels appearing, with their accompanying transcriptions, in the words in (17) (the reason for the words being arranged in this way will soon become apparent):

(17)	p**i**t				p**u**t
	[pɪt]				[pʊt]
		p**e**t		pitt**a**	p**u**tt
		[pɛt]		[pɪtə]	[pʌt]
			p**a**t		p**o**t
			[pæt]		[pɒt]

We will refer to these vowels as **short vowels**. The final vowel in *pitta* [ə], which is also found as the first vowel in a word like *apart*, is often called **schwa**.

How are these short vowels produced? There are two main articulators used in the production of vowel sounds, the tongue body and the lips. Of these, the tongue body is the more important. By pulling the body of the tongue *back* towards the velar region of the mouth, we get the vowels [ʊ ʌ ɒ]. These are **back vowels**. Alternatively, by raising the tongue body and pushing it *forward* to the palatal region (where we produce [j]), we get the vowels [ɪ ɛ æ]. These are **front vowels**. With the tongue body in an intermediate position on the front/back axis, we produce the **central vowel** [ə]. Another central vowel is [a], which is the usual pronunciation of the vowel in *pat* for many British speakers of English, the [æ] which appears in (17) being a feature of a conservative variety of British English, so-called Received Pronunciation (RP), and of General American. Now, as well as considering the position of the body of the tongue in terms of whether it is forward or backward in the mouth, we can also consider its *relative height*. The vowels [ɪ ʊ] are formed with the tongue body relatively high in the mouth and they are therefore called **high vowels**; for the **low vowels** [æ ɒ], the tongue body is relatively low, and for the **mid vowels** [ɛ ə ʌ], it is in an intermediate position on the high/low axis. We can represent these positions in a quadrilateral, as in figure 12.

Figure 12 is based entirely on the position of the body of the tongue, but there is an important difference between the sounds [ʊ ɒ] and all the others in this figure. They are accompanied by a **rounding** of the lips, whereas [ɪ ɛ æ ə ʌ] are all made

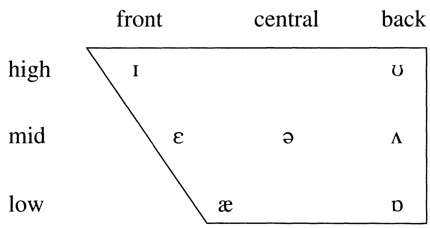


Figure 12 *The vowel quadrilateral (including only short vowels)*

without such lip rounding, and, as noted above, the lips are the second articulator involved in the production of vowels. In most English dialects, there are no sounds which are distinguished by lip rounding and nothing else, but there are many languages in which this is not the case. We shall return to this presently.

The next set of vowels to consider appears with accompanying transcriptions in the words in (18):

(18)	m**e**			m**oo**
	[miː]			[muː]
		m**a**re	myrrh	m**o**re
		[mɛː]	[məː]	[mɔː]
				m**a**r
				[mɑː]

One thing to note immediately about these transcriptions is that there is nothing corresponding to the ‘r’ in *mare*, *myrrh*, *more* and *mar*. In fact, for a good many speakers of British, Australian or New Zealand English, such occurrences of ‘r’ are *not* pronounced, although this is not the case for most speakers of North American English and some speakers of British English. Dialects in which the ‘r’ is pronounced are called **rhotic** dialects; those in which it is not are **non-rhotic**. We shall ignore this ‘r’-colouring or rhoticity for now, adopting the transcriptions in (18) (but see below).

The vowels in (18) are different from those in (17) in two ways. Firstly, they are *longer*, a difference in **quantity**. Secondly, most of them differ in **quality**, with the tongue adopting a slightly different position for the vowels in, for example, *pit* and *me*. In some languages, such as Czech, Japanese or Yoruba, vowels can differ purely in length without any concomitant change in quality. In English, however, this is not always the case. The IPA symbol for ‘long vowel’ is ː placed after the vowel symbol, and adding the long vowels to our vowel quadrilateral we get figure 13. This figure also shows the British English [a] vowel mentioned above:

In figure 13, we can also see that different symbols have been used for some pairs of short and long vowels. For instance, the long ‘i’ vowel is written with the symbol [iː], not [ɪː], and the long ‘a’ vowel is written [ɑː] rather than [ɒː]. These differences correspond to differences in the sound of the vowel itself irrespective of its length – they signal differences in vowel quality. A further distinction which it is useful to make is that between short [i u] vowels (not represented in figure 13) and short [ɪ ʊ]

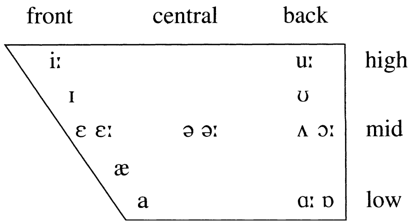


Figure 13 *The vowel quadrilateral (with long vowels)*

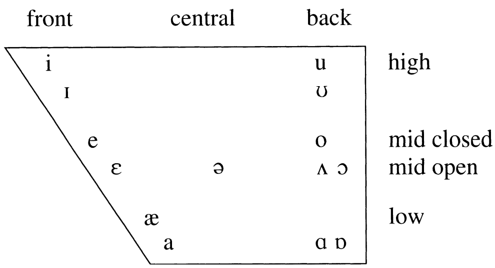


Figure 14 *The vowel quadrilateral, including mid-closed vowels*

vowels. The [i u] vowels are made with a 'tenser' articulation than are [ɪ ʊ], i.e. the position of the tongue is further from its rest or neutral position for the former pair of vowels. Because of this, we call [i u] **tense** vowels and [ɪ ʊ] **lax** vowels.

Each of the vowels we have considered up to now has a single constant quality. This is not so for the vowels in the words in (19):

(19)	b**ay**	b**uy**	b**ough**	[rain]b**ow**	b**oy**
	[beɪ]	[baɪ]	[baʊ]	[bou]	[bɔɪ]

In each of these words, the vowel starts off with one quality and changes to a different quality. This is indicated in the transcriptions in (19), each of which includes two vowel symbols. Furthermore, the transcriptions for *bay* [beɪ] and *bow* [bou] include two symbols, [e o], which though familiar from English orthography, have not yet been introduced as IPA symbols. These are similar to the [ɛ ɔ] vowels but are slightly higher and tenser. We describe this difference by saying that [e o] are **mid closed** vowels while [ɛ ɔ] are **mid open** vowels. Alternatively, linguists often refer to [e o] as tense (mid) vowels and [ɛ ɔ] as lax (mid) vowels. Thus, we can contrast the set of tense vowels [i e u o] with the set of lax vowels [ɪ ʊ ɛ ɔ]. We can represent the position of these new vowels in the quadrilateral in figure 14 (note that we do not represent vowel length in this quadrilateral).

Where a vowel consists of two components, as in the examples in (19), it is called a **diphthong** (from the Greek meaning 'two sounds'). The single, pure vowels in (17) and (18) are then called **monophthongs**. Some varieties of English are particularly rich in diphthongs, and diphthongs are also very common in totally unrelated languages such as Cambodian and Estonian. However, some languages lack true diphthongs altogether (e.g. Russian, Hungarian, Japanese).

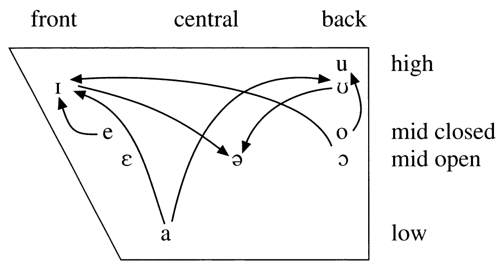


Figure 15 *The diphthongs of English*

Finally, we come to another set of English diphthongs, mainly found in non-rhotic dialects. They are illustrated by the words in (20):

(20)	peer	poor
	[pɪə]	[pʊə]

For many speakers, words such as *pear/pair* and *mare* would belong here – note that in (18) we have regarded *mare* as containing a pure vowel – and would be transcribed [peə] or [pɛə] and [meə] or [mɛə], respectively. In figure 15 we have shown the 'trajectory' involved in the formation of each of the diphthongs we have introduced.

The description of vowels we have offered so far is sufficient for many varieties of English. However, some dialects use different vowel sounds. For instance, in conservative RP, you might hear *go* pronounced as [gəʊ]; and for many US speakers some of these diphthongs are long monophthongs (e.g. *day* [deː]). It should be noted that lip rounding, which was observed above as a feature of the English vowels [ʊ ɒ] is also a characteristic of [u o ɔ]. The vowel quadrilaterals we have examined do *not* explicitly indicate whether a vowel is accompanied by rounding or not.

There is one final feature of the transcription of English vowel sounds worth mentioning here. As already observed, unlike many varieties of British English, most dialects of American English have vowels with an 'r'-colouring to them, as in *b**ir**d*, *f**ear***, *c**ar**d*, *m**ore***, ***air***, *m**ur**d**er***. It is produced by retracting the tongue as if to produce the sound [ɹ] as in *run* during the production of the vowel sound. Where greater accuracy isn't essential, it is often transcribed by just adding [r] after the vowel, e.g. *murder* [mərdər]. However, where we need more precise transcriptions, we use special symbols such as [ɚ ɛ˞]. Thus, we can transcribe *murder* as [mɚdɚ] and *air* as [ɛ˞ː]. The little hook on [ɚ] and [ɛ˞] can be thought of as a diacritic.

We conclude this survey of basic sounds by briefly looking at vowel sounds which do not occur in standard varieties of English. Focusing on lip rounding, there is a strong tendency in the world's languages for back vowels which are not low to be rounded and for front vowels and low vowels to be unrounded. However, we do find vowels which are exceptions to this tendency, and some of the more common correspondences are shown in (21):

(21)

front		back	
unrounded	rounded	rounded	unrounded
i	y	u	ɯ
ɪ	ʏ		
e	ø	o	ɤ
ɛ	œ	ɔ	ʌ
		ɒ	ɑ

Thus, [y ʏ ø œ] sound like [i ɪ e ɛ], except that in producing them, the lips are rounded. On the other hand, the sounds [ɯ ɤ] correspond to [u o] but are produced with spread lips.

With two exceptions, all the vowels discussed so far have been placed close to the right or left edge of the vowel quadrilateral, and generally with a little practice, we can feel confident about locating such vowels. However, we observed that the sound schwa [ə] and the vowel [a] occupy a central position on the front/back axis, and vowels such as these are generally less easy to be sure about. From this, it does not follow that such vowels do not exist, and a number of central vowels are shown in figure 16 along with the rounded and unrounded vowels from (21).

The four new vowels in figure 16 [ɨ ʉ ɜ ɐ] are all unrounded except for [ʉ], a central high rounded vowel.

Finally, it should be noted that the 'r'-colouring of American vowels mentioned above is not the only sort of colouring that vowels can undergo. Another colouring that vowels often receive is **nasalisation**. This is the result of allowing air to pass through the nasal passage, as though for a nasal consonant such as [n], while still letting the air flow through the mouth. A nasal vowel is indicated by a diacritic symbol placed over the vowel, e.g. [õ, ɛ̃, ɑ̃]. In languages such as French, Polish, Yoruba (one of the main languages of Nigeria) and many others, nasal vowels play an important role. Here are some words of Yoruba in transcription:

(22)

oral vowels		nasal vowels	
[ka]	'to be placed on'	[kã]	'to touch'
[ku]	'to remain'	[kũ]	'to apply paint'
[si]	'and'	[sĩ]	'to accompany'

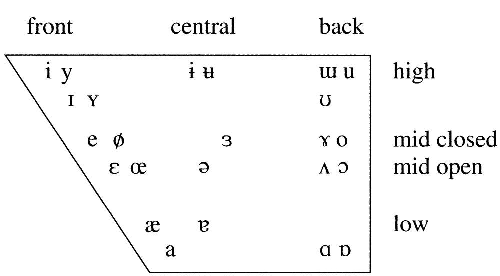


Figure 16 *The vowel quadrilateral, including central vowels*

Nasal vowels are also heard in many varieties of English. A typical pronunciation of the word *can't*, in American English especially, is, in fact, [kæ̃ːt], with the sequence [æn] being replaced by a long nasalised vowel (***exercises 4***, ***5*** and ***6***).

Suprasegmentals

So far in this section, we have examined **segments**, that is individual sounds and their pronunciations. However, pronunciation involves far more than just stringing together individual sounds. We shall now examine the level of organisation that exists above the level of the segment, the **suprasegmental level**.

All words can be divided into one or more **syllables**. Although most of us can easily recognise syllables (including small children, see section 6), it is rather difficult to give a strict definition of the term. One way of determining the number of syllables in a word is to try singing it; each syllable is sung on a separate note (though not necessarily on a different pitch, of course). We shall be considering the structure of syllables in detail in section 5; here we will just consider their basic shape.

A syllable typically contains a consonant or set of consonants followed by a vowel followed by another consonant or set of consonants, e.g. *cat* [kæt] or *springs* [spɹɪŋz]. A string of more than one consonant such as [spr] or [ŋz] is called a **cluster** (or, more precisely, a **consonant cluster**). However, either set of consonants may be missing from a syllable as, for example, in *spray* [spɹeɪ] (no final consonant), *imps* [ɪmps] (no initial consonants) or *eye* [aɪ] (no consonants at all). Words with one syllable (*springs*, *cat*) are **monosyllabic**, while words with more than one syllable are **polysyllabic**. From this, we might conclude that the only obligatory part of a syllable is the vowel, but this is not quite correct. What a syllable must have is a **nucleus** or **peak**, and characteristically this is a vowel. However, in restricted cases, it is possible for the nucleus of a syllable to be a consonant. For instance, the word *table* is disyllabic (has two syllables), containing the syllables [teɪ] and [bl̩]. There is no vowel in the second syllable, and its nucleus is the consonant [l̩], a **syllabic consonant**. In transcription we represent a syllabic consonant by a mark placed beneath it. In English [m n] can also be syllabic, as in *bottom* [bɒtm̩] and *button* [bʌtn̩]. It is sometimes useful to mark the division between syllables in transcription. This is done by placing a dot between syllables, e.g. *polysyllabic* [pɒ.lɪ.sɪ.la.bɪk].

Next, we consider the devices involving changes in loudness or the pitch of sounds that languages use to convey meaning. These are stress, tone and intonation, which collectively are called **prosodic** phenomena. We begin with stress.

If we compare the words *transport* in *means of transport* and *to transport goods*, we can hear an important difference in pronunciation. In *means of transport* the first syllable, *tran-*, gets greater emphasis than the second, *-sport*, while in *to transport goods* it's the second syllable which gets the greater emphasis. This emphasis is called **stress**, and we say that in *means of TRANsport* the first syllable bears stress, while in *to tranSPORT* the second syllable is stressed. The other syllable remains unstressed. Physically, a stressed syllable tends to be louder and often a little longer than an unstressed one. In the official IPA system, stress is indicated by means of the sign ˈ placed before the stressed syllable: [ˈtranspɔːt] TRANsport (noun) v. [tranˈspɔːt] tranSPORT (verb). However, many linguists prefer to indicate main stress by means of an acute accent over the stressed vowel: [tránspɔːt] (noun) v. [transpɔ́ːt] (verb).

Some syllables have a degree of stress intermediate between full stress and no stress. Consider the word *photographic*. The main stress falls on the third syllable in [fou.tə.gra.fɪk]. The second and fourth syllables are unstressed. However, the first syllable has some stress, though not as much as the third. This is called **secondary stress**. In IPA it is transcribed with the mark ˌ : [ˌfoutəˈgrafɪk]. An alternative is to indicate secondary stress by a grave accent placed over the vowel: [fòutəgráfɪk].

The type of stress which distinguishes words such as [´transpɔːt] from [trans´pɔːt] is known as **lexical stress** or **word stress**. There is another type of stress in which certain words within phrases are given more emphasis than others. Consider (23):

(23) Tom builds houses

In a neutral pronunciation, each word receives an even amount of emphasis, though slightly more falls on the stressed syllable of *houses*: *Tom builds HOUSes*. This is a natural answer to a question such as ‘What does Tom do?’ or ‘What does Tom build?’ However, if we put more emphasis on *builds* to get *Tom BUILDS houses*, then this can only be a natural answer to a question like ‘What does Tom do with houses?’, or more likely a correction to someone who thinks that Tom repairs houses or sells them. Finally, in *TOM builds houses* we have a reply to the question ‘Who builds houses?’ This type of stress is often called **phrasal stress**. (Many linguists also refer to it as **accent**, though this mustn’t be confused with the term ‘accent’ meaning the particular type of pronunciation associated with a given dialect.) It can often be important in disambiguating sentences which are ambiguous in the purely written form.

Turning to our second prosodic phenomenon, the pitch of the voice is very important in language, and all languages make use of it for some purpose. In some languages different words are distinguished from each other by means of pitch. Here are some more Yoruba words:

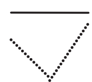
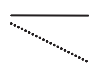
(24)	high tone		mid tone		low tone	
	tí	‘that, which’	ti	‘property of’	tì	‘to push’
	ʃé	‘isn’t it? etc.’	ʃe	‘to do’	ʃè	‘to offend’
	ɔkɔ́	‘hoe’	ɔkɔ	‘husband’	ɔkɔ̀	‘canoe’

The word *tí* with the mark ´ over the vowel is pronounced at a higher pitch than the word *ti*, which in turn is pronounced at a higher pitch than *tì*. These different pitches are called **tones**. We say that *tí* has **high tone**, *ti* has **mid tone** and *tì* has **low tone**. Notice that one of the systems for transcribing stress uses the same symbols for primary and secondary stress as are used here for high and low tone. In most cases, this doesn't cause any confusion, though languages do exist which have both independent tone and independent stress. In such cases, we can use the IPA symbols for stress and use the grave and acute accents for tone.

Some languages distinguish only two levels of tone, while others distinguish up to four levels. When a language distinguishes words from each other using pitch in this way we say that it has **lexical tone**.

The words *stvari* 'things' and *stvari* '(in) a thing' in Serbian-Croatian are distinguished by tone, though in a different way from the Yoruba examples we have just described. In the word meaning 'things' the pitch falls from high to low during the course of the vowel [a], while in the word meaning '(in) a thing' the pitch rises from low to high on that vowel. Tones of this sort, where the pitch changes during the course of the syllable are called **contour tones**, as opposed to the tones of Yoruba, which are called **level tones**. In some languages, we get more complex contour tones in which the tone first rises then falls or vice versa. The classic example is Mandarin Chinese. In (25) we see four words which are distinguished solely by their tones, with the broken lines indicating pitch and the unbroken lines being reference pitches (the words appear in the standard Pinyin transcription, the official romanisation of the language in the People's Republic of China, and correspond to IPA [ji]):

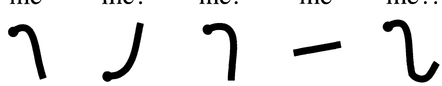
(25)

word	meaning	tone	
yī	'one'		high level
yí	'lose'		rising
yǐ	'already'		fall rise
yì	'idea'		falling

Both level tones and contour tones qualify a language as having lexical tone, i.e. as being a **tone language**. English is not a tone language, but, like all spoken languages, it uses pitch extensively. The uses of pitch with which we are familiar in English are uses of our final prosodic phenomenon, intonation. Consider the instances of the word *me* in (26), where the pitch is represented graphically:

(26)

a.	b.	c.	d.	e.
me	me?	me!	me	me?!



The pitches applied to these words are very similar to the contour tones of languages like Chinese. However, in English such changes do not produce completely different meanings; each of (26a) to (26e) involves a reference to the speaker, but by changing the 'tone' over the word the speaker changes the *attitude* he or she is expressing. Thus, we move from a simple statement (26a) to a question (26b), to a strong assertion (26c), to a matter of fact assertion (26d) and in (26e), to an expression of disbelief. Unlike in Chinese, however, these tones cannot be regarded as an inherent part of a single word. If the utterance consists of more than one syllable, as in (27), then we find the tone is spread over the whole of that utterance and gives rise to the same range of attitudes as we saw in (26):

(27)	a.	b.	c.	d.	e.
	eat peas	eat peas?	eat peas!	eat peas	eat peas?!

As observed already, all spoken languages make use of **intonation** (including those like Chinese, Serbo-Croatian or Yoruba that have lexical tone), though the exact use differs greatly from one language to another and from one dialect to another. Knowing intonation patterns is an important though often neglected part of speaking a foreign language, and many intonation patterns which sound polite in one language or dialect sound rude or funny in another. It is said that the British regard Americans as rude and pushy in part because neutral, polite American intonation sounds peremptory to a British speaker, while Americans often feel that Britons are overweening or fawning because what is neutral for British intonation sounds over the top to the American ear.

This section has provided a basic description of the sounds of language. In the next section we'll see how different varieties of one and the same language can be distinguished by the types of sounds they use and the ways in which they use them (***exercises 7***, ***8*** and ***9***).

Exercises

1. Using the IPA chart, give a phonetic characterisation of the following consonants:

   (a) ʒ, (b) ŋ, (c) h, (d) ɬ

Model answer for (1a)

As regards manner, [ʒ] is a fricative as its production does not involve complete closure of the vocal tract, but the articulators do come closely enough together to produce friction. In terms of its place of articulation, this consonant requires the blade of the tongue to approach an area between the hard palate and the alveolar ridge – it is a palato-alveolar. As a palato-alveolar fricative, it is paired with [ʃ], but whereas the latter is unvoiced, [ʒ] is voiced. Thus, it is a voiced palato-alveolar fricative. It occurs in English in such words as *leisure*, *pleasure* and some pronunciations of *garage*.

2. Using the IPA chart, give a description of the following sounds:

   (a) ɣ, (b) ɮ, (c) ɸ, (d) ʐ, (e) χ, (f) ɳ, (g) ɴ, (h) tç, (i) ɦ

3. Give the IPA symbol for each of the following consonants:
   (a) voiced uvular nasal stop
   (b) alveolar implosive stop
   (c) voiced retroflex lateral approximant
   (d) voiceless palatal affricate
   (e) voiced labiodental nasal stop

4. Give a phonetic characterisation of the following vowels:

   (a) ɪ, (b) õ, (c) ø, (d) ɒ

Model Answer for (4a):

In terms of height, [ɪ] is a high vowel, although not as high as [i]. However, the distinction between these two vowels is not usually described in terms of height. Instead, [i] is characterised as tense, whereas [ɪ] is lax. This distinction is analogous to that between [u] (tense) and [ʊ], but [i] and [ɪ] are front vowels, whereas [u] and [ʊ] are back vowels. Furthermore, [i] and [ɪ], in common with most front vowels, are unrounded, whereas [u] and [ʊ] are rounded. Finally, [ɪ] is an oral vowel and does not exhibit nasalisation. Thus, we have the conclusion that [ɪ] is a high front unrounded lax oral vowel. It occurs in such English words as *bid* and *pit*.

5. Using the IPA chart, give a description of the following vowels:

   (a) œ, (b) ɯ, (c) ʌ, (d) ə, (e) ɐ, (f) ã (g) y, (h) ʉ, (i) ɛ, (j) œ̃, (k) ɨ

6. Give the IPA symbol for each of the following vowels:
   (a) high tense back rounded
   (b) open (lax) mid front rounded
   (c) central mid unrounded
   (d) central low unrounded
   (e) high tense front rounded
   (f) high lax back rounded

7. This is a text in IPA transcription of a short passage as it would be spoken by a speaker with a British accent. Rewrite this in ordinary orthography.

ðə nɔːθ wɪnd ənd ðə sʌn wə dɪspjuːtɪŋ wɪʧ wəz ðə stɹɒŋgə, wɛn ə tɹavlə keɪm əlɒŋ ɹapt ɪn ə wɔːm klouk. ðeɪ əgɹiːd ðət ðə wɒn huː fəːst səksiːdəd ɪn meɪkɪŋ ðə travlə teɪk hɪz klouk ɒf ʃʊd bɪ kənsɪdəd stɹɒŋgə ðən ðɪ ʌðə. ðɛn ðə nɔːθ wɪnd bluː əz hɑːd əz hiː kʊd, bʌt ðə mɔː hɪ bluː ðə mɔː klouslɪ dɪd ðə travlə fould hɪz klouk əɹaund hɪm; ənd ət lɑːst ðə nɔːθ wɪnd geɪv ʌp ðɪ ətɛmpt. ðɛn ðə sʌn ʃɒn aut wɔːmlɪ, ənd ɪmiːdjətlɪ ðə tɹavlə tʊk ɒf hɪz klouk. ənd sou ðə nɔːθ wɪnd wəz əblaɪʤd tə kənfɛs ðət ðə sʌn wəz ðə stɹɒŋgəɹ əv ðə tuː.

8. The following is a text transcribed as it might be read by a British speaker and an American speaker. Rewrite the text in orthography and then comment on the differences in the two accents.

British version

jouhan səbastɪən bɑːk sɪkstiːn eɪtɪ faɪv tʊ sɛvn̩tiːn fɪftɪ keɪm frəm ə famlɪ wɪʧ pɹəʤuːst ouvə naɪntɪ pɹəfɛʃn̩l̩ mjuːzɪʃn̩z bɑːks aʊtpʊt wəz ɪmɛns kʌvɹɪŋ nɪəlɪ ɔːl ðə meɪʤə mjuːzɪkl̩ ʒɒnɹəz əv hɪz ɪəɹə ʧeɪmbə wəːks ɔːkɛstɹəl swɪːts n̩ kn̩tʃɛːtouz piːsəz fə hɑːpsɪkɔːd n̩d ɔːgən ənd ən ɪnɔːməs əmaunt əv kɔːɹəl mjuːzɪk fə ðə ʧəːʧ ðiː ounlɪ taɪp əv wəːk hiː dɪdn̩t kəmpouz wəz ɒpɹə ðou sʌm wʊd seɪ ðət hɪz məʤɛstɪk sɛtɪŋ əv ðə sn̩t maθjuː paʃn̩ ɪz ɪn fakt wɒn əv ðə greɪtɪst mɑːstəpiːsəz əv ɔːl ɒpəɹatɪk lɪtrəʧə

American version

jouhæn səbæstɪən bɑːk sɪkstiːn eɪɾɪ faɪv tə sevn̩tiːn fɪfɾɪ keɪm frəm ə fæmlɪ wɪʧ pɹəduːst ouvə naɪnɾɪ pɹəfeʃn̩l̩ mjuːzɪʃn̩z bɑːks aʊtpʊt wəz ɪmens kʌvɹɪŋ nɪəlɪ ɔːl ðə meɪʤə mjuːzɪkl̩ ʒanɹəz əv hɪz ɛɹə – ʧeɪmbə wəks ɔkɛstɹəl swɪːts n̩ kn̩tʃɛɾouz piːsəz fə hɑpsɪkɔd n̩d ɔgən ənd ən ɪnɔməs əmaunɾ əv kɔɹəl mjuːzɪk fə ðə ʧəːʧ ðɪ ounlɪ taɪp əv kampəziʃn hɪ dɪdn̩t raɪt wəz apɹə, ðou sʌm wʊd seɪ ðət hɪz məʤɛstɪk sɛɾɪŋ əv ðə sn̩t mæθjuː pæʃn̩ ɪz ɪn fækt wan əv ðə greɪɾəst mæstəpiːsəz əv ɔːl apəɹæɾɪk lɪɾɹəʧə

9. Transcribe the text below into IPA following your native accent as closely as you can, indicating lexical stress on polysyllabic items. Note that in some cases there might be several alternative ways of pronouncing a given sound or sound sequence.

For some, Britain and the United States are two countries divided by a common language, and the same could be said of other places where English is spoken, such as Canada, Australia, New Zealand or South Africa. Nonetheless, on the whole English speakers tend to communicate with each other somehow. Nor should we jump to the conclusion that it's just across national boundaries that accent and dialect differences occur. The differences in the speech of Americans from New England and those from the Deep South can be at least as great as the differences between New Englanders and British speakers, or between Australians and New Zealanders.

3 Sound variation

In our main introduction, we observed that language varies across both time and space. If we compare the English spoken in the cities of Perth, Pittsburgh, Port Elizabeth and Plymouth, we can point not only to differences between these four cities, but also to historical differences which distinguish these varieties today from those spoken in these locations 150 years ago. This important study of historical and geographical variation has been a preoccupation of linguists for well over a century now, and continues to be a strong focus of research in dialectology and historical linguistics. It is only in recent times, however, that linguists have begun to investigate linguistic variation *within* communities. The French spoken in Marseilles may be different from that spoken in Montreal, but what about the use of language *within* these cities? Does everyone in Montreal speak an identical variety of French? Clearly not, we might suppose, but it was not until the 1960s that linguists began to take this view seriously and study variation within villages, towns and cities.

In this section we will examine **phonological variation** – the variability in language that affects those features which have been introduced in the previous section: sounds, syllables, stress and intonation. Because of the nature of existing research, our discussion will be concerned exclusively with sounds.

Linguistic variables and sociological variables

So what is phonological variation? A reasonable definition might be that it is the existence within the speech of a single community of more than one possible realisation (or **variant**) of a particular sound. A simple introductory example is the variable loss of the glottal fricative [h] in the northern English city of Bradford, with words like *hammer* being pronounced [hamə] or [amə]. Table 3 shows how often different social class groups in Bradford use the two different possibilities [h] or Ø (i.e. nothing):

We can see clearly in this table that there are class differences in the use of [h] – the higher someone's social class, the more likely they are to use [h]. This class difference is interesting, but more important is the fact that everybody in this Bradford research used *both* forms at least some of the time. Even the lower-working-class speakers occasionally used [h] and the middle middle-class speakers sometimes omitted it. The variation within this community, then, is relative.

Table 3 *The omission of [h] in Bradford*

Social class	Percentage of the number of occurrences of [h] that were *omitted*, i.e. Ø
lower working class	93
middle working class	89
upper working class	67
lower middle class	28
middle middle class	12

Different groups use different *proportions* of the two variants, and this is typical of variation. *Absolute* differences, situations where one group within the community uses a particular form *all of the time* in contrast with other groups which *never* use that form, occur less frequently (***exercise 1***).

In order to describe this quantitative variation, linguists have devised the notion of the **linguistic variable**, an analytical construct which enables them to contrast people's use of different variants. A variable is a linguistic unit which has two or more variants that are used in different proportions either by different sections of the community or in different linguistic or contextual circumstances. Variables can be concerned with phonological factors, the topic of this section, and also with word structure, word meaning and syntax. For the example above, we say that the variable (h) – variables are normally put in round brackets – has two variants [h] and Ø, the use of which relates to a person's social class.

The procedure for analysing the use of a variable in a particular community is as follows:

1. Recordings are made of conversational speech from people belonging to different groups in the community.
2. Researchers listen to these recordings, noting down the pronunciation of a representative number of instances of each variable. Normally, they analyse at least thirty examples of each variable for each person they record.
3. Each person's relative use of the different variants is calculated. The results of this are often presented as percentages, showing that a particular speaker used x% of one variant and y% of the other.
4. It is then possible to amalgamate these results to produce group scores. So, for example, the researcher may calculate an average of the scores of all the working-class speakers and compare this figure with the averaged scores of middle-class speakers, or an average for middle-aged men to compare with the average for middle-aged women.

We have seen for the example of (h) in Bradford that there appears to be a relationship between **social class** and language use. Such a relationship has been found in many westernised speech communities around the world – from Chicago to Copenhagen, from Brisbane to Berlin. Outside western societies, however, the notion

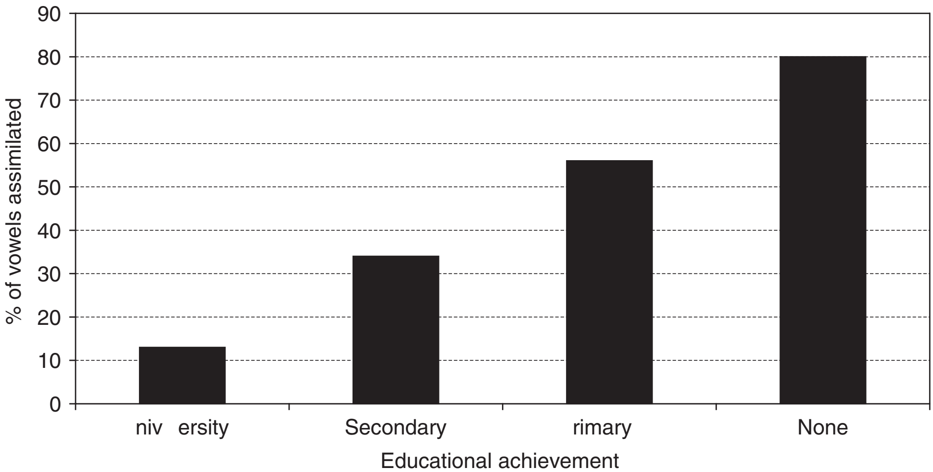


Figure 17 *Sound variation and speaker educational achievement: vowel assimilation in Tehran Farsi (from Hudson 1996)*

of social class is less easy to apply. Most research of this type in non-western societies has used **education level** as a means to measure socioeconomic divisions when correlating language use to social structure. An example is provided by the occurrence of *vowel assimilation* by Farsi (Persian) speakers in Tehran. Assimilation was briefly mentioned in the introduction (pp. 4–5), and we can illustrate its role in Tehran Farsi using the Farsi verb meaning 'do'. The standard pronunciation of this verb is [bekon], but the vowel in the first syllable may assimilate to the second vowel, giving the variant [bokon]. Figure 17 shows that the *higher* the educational achievement of speakers, the *less* likely they are to assimilate vowels.

Whether we rely on social class or education, what appears common to all societies is that *social structure is reflected in linguistic structure* in some way. We should expect, therefore, that, besides the socioeconomic characteristics of speakers, other social factors will also affect and structure linguistic variability.

This certainly appears to be the case if we consider the **gender** of the speaker. The relationship between language variation and speaker gender is probably the most extensively studied in sociolinguistic research. One of the consistent findings is that, all other things being equal, women use proportionately more standard variants than men for linguistic variables not undergoing change. Again, examples can be found from many very different societies around the world and an illustration, based on the work of Peter Trudgill, appears in figure 18, where we can see that women in each social class group are using more of the standard variants – [ɪŋ] as opposed to the non-standard [ən] – in the British city of Norwich (***exercise 2***).

The **ethnic group** to which a speaker belongs has also been found to have an effect on language variation. In the data from Wellington, presented in figure 19 and based on the work of Janet Holmes, the ethnic (Maori or Pakeha, i.e. White European) identity of New Zealanders is seen to be relevant to the use of a range of different phonological variables:

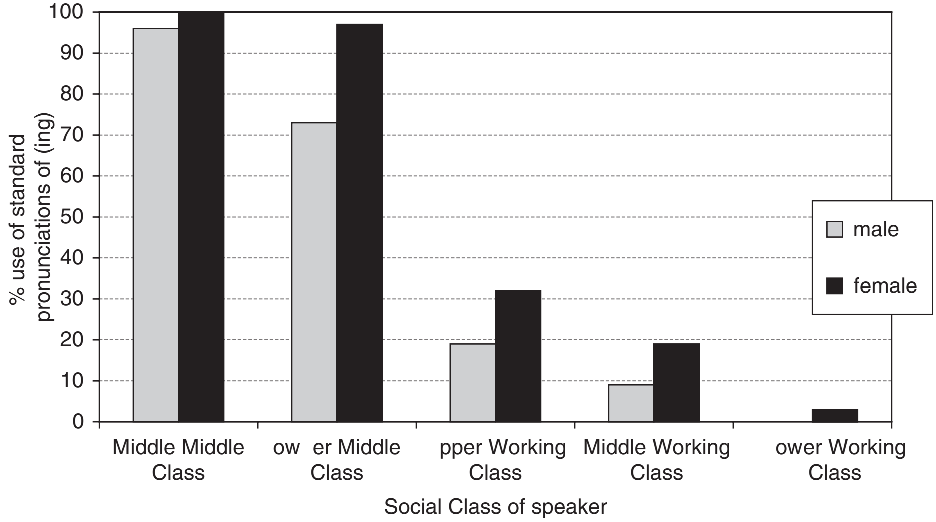


Figure 18 *The use of standard pronunciations of (ing) and speaker sex and social class (based on Trudgill 1974: 94)*

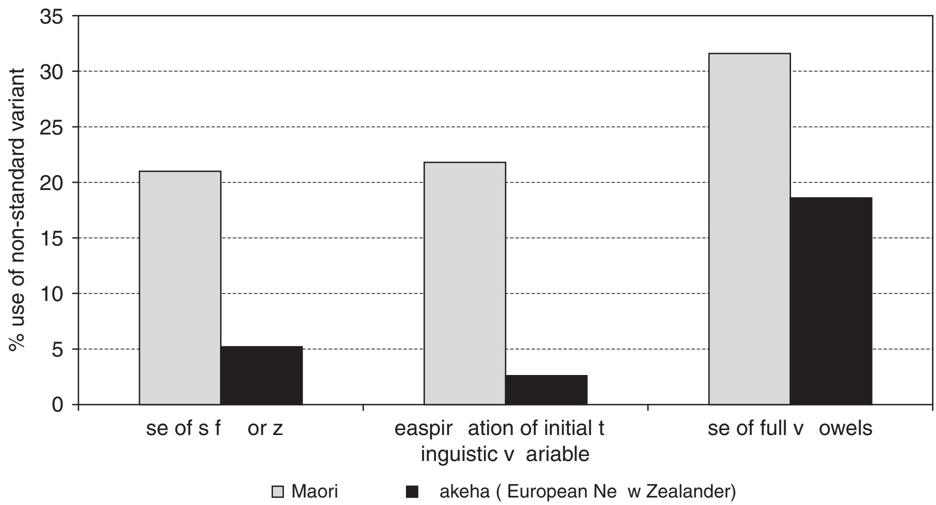


Figure 19 *Ethnic variation in New Zealand English (based on Holmes 1997: 79, 85, 91)*

- The devoicing of /z/ to [s], so that ‘was’ becomes [wɒs] instead of [wɒz]
- The deaspiration of word-initial /t/, so that ‘tip’ becomes [t$^{=}$əp] instead of [t^{h}əp] (note that /ɪ/ in New Zealand English is pronounced [ə])
- The use of full vowels in unstressed syllables, so that ‘run to school’ becomes [ɹʌn tuː skuːl] instead of [ɹʌn tə skuːl].

Here, for each variable, it is the indigenous Polynesian Maori community that uses more of the non-standard variants.

Table 4 *(th) and (ʌ) in the speech of two Belfast residents*

	Percentage use of local Belfast variant of (th)	Percentage use of local Belfast variant of (ʌ)
Hannah	0	0
Paula	58	70

(th) – deletion of [ð] between vowels as in e.g. *mother*
(ʌ) – use of [ʌ] in words such as *pull*, *took*, *foot*

A final example of how social structure has been shown to determine a person's linguistic behaviour is of a different nature from the speaker-defined categories mentioned above. Linguists have established that the quantity and nature of a person's **social network links** within their community may be an important factor in such behaviour. Lesley and James Milroy, who carried out sociolinguistic research in the Northern Irish city of Belfast, measured network strength along two dimensions: firstly, they assessed the extent to which people had close social ties with family, friends and workmates in the neighbourhood, and secondly, they looked at the extent to which these ties were multi-functional, e.g. if a tie to another network member was based on *both* friendship *and* employment, or *both* employment *and* kinship, as opposed to just one of these. People who had many multi-functional social ties were considered to have strong social networks and people who didn't were labelled as having weak networks. It was hypothesised that strong social networks would act as norm-enforcing mechanisms, subtly putting pressure on their members to conform to normal local behaviour, including linguistic behaviour. A number of variables which showed an intimate connection between a person's network strength and their use of local Belfast variants were discovered, and a small sample of the results of this research appears in table 4.

This table compares the use of two salient linguistic variables (th) and (ʌ) by Paula and Hannah, two residents of Belfast. They are both in unskilled jobs, have husbands with unskilled jobs and have a limited educational achievement. Yet their linguistic behaviour is radically different and the explanation for this appears to come from the differing strengths of their social networks. Paula is a member of a strong social network in Belfast – she has a large family living locally, she frequently visits her neighbours, many of whom she works with, and she belongs to a local bingo-playing club. Hannah, however, has fewer local ties. She has no family members in the locality, isn't a member of any local groups and works with people who do not live in her neighbourhood.

More recently, rather than accepting the broad sociological categories of, for example, gender, ethnicity and class as universal and given, sociolinguists have been looking at how social groupings are actually *created* at the local level and examining the relationship between these self-defining groups and linguistic variability. Linguists such as Penelope Eckert, Miriam Meyerhoff and Mary Bucholtz have explored the way in which people actively come together to form groups that engage in a common goal or interest and that, over time, develop practices, including linguistic practices, that are shared and recognised as characteristic of that group. They label such groups 'communities of practice'. The important advance here lies in the fact that communities of practice are developed, maintained and adapted by the very people who created them in the first place. In this respect, they differ markedly from the groups studied in 'traditional' sociolinguistics, which comprise collections of unattached individuals who happen to share a certain social characteristic, such as being male, or Asian or middle class.

A well-known example from the United States demonstrates how such 'communities of practice' develop variable linguistic behaviours that help to define the group. Penelope Eckert spent several years observing teenagers in a Detroit High School. She observed where different groups congregated around the school during breaktimes, how they walked, the width of their jeans, how much they smoked, where they ate, where they hung out and what they did after school, and, later, how they spoke. In this way, she was able to draw a highly detailed picture of the groupings that naturally emerged in the school and how these groupings 'defined' themselves through their everyday practices. There were two polar groupings – the Jocks and the Burnouts – and a large, less clearly polarised, 'in-between' group. Jocks were more likely to buy into the ethos of the school as a stepping-stone into higher education and participate in many of the extracurricular activities which centre around the school, such as sports, the school newspaper, cheerleading and the school council. Burnouts, on the other hand, were much less likely to accept the 'corporate culture' of the school and resented the restrictions it sought to place upon them. Given that they aimed for local vocational employment, they did not feel that the school offered them the sort of training and guidance that would help them and so felt less inclined to participate in the extensive extracurricular activities which were dominated by Jocks. The social world of the Burnouts beyond school hours was directed towards the employment and entertainment offered by the local urban neighbourhood.

Intriguingly, Eckert found that these two polarised groupings also spoke differently. The difference in the linguistic behaviour of the Jocks and Burnouts is demonstrated by the way they pronounced /ʌ/ (the vowel in 'cup' and 'cut'). Eckert highlighted one tendency in her data for /ʌ/ to be pronounced near the back of the mouth (with realisations such as [ɔ] or [ʊ]). Figure 20 shows her results for /ʌ/ *backing*: Clearly /ʌ/ backing is characteristic of Burnouts. As noted above, Eckert's work is important because she demonstrated the power of observing self-forming and self-defining groups of people, rather than simply assigning people to well-known global social categories and observing variation within them (***exercise 3***).

In summary, we have painted a picture of an intimate relationship between a number of **sociological variables** – social class, educational achievement, gender, ethnicity, social network and community of practice – and a range of linguistic variables. It seems quite clear that our position in society can shape certain aspects of our linguistic behaviour. Linguistic variability is not divorced from social conditioning. We now turn to a different type of variation.

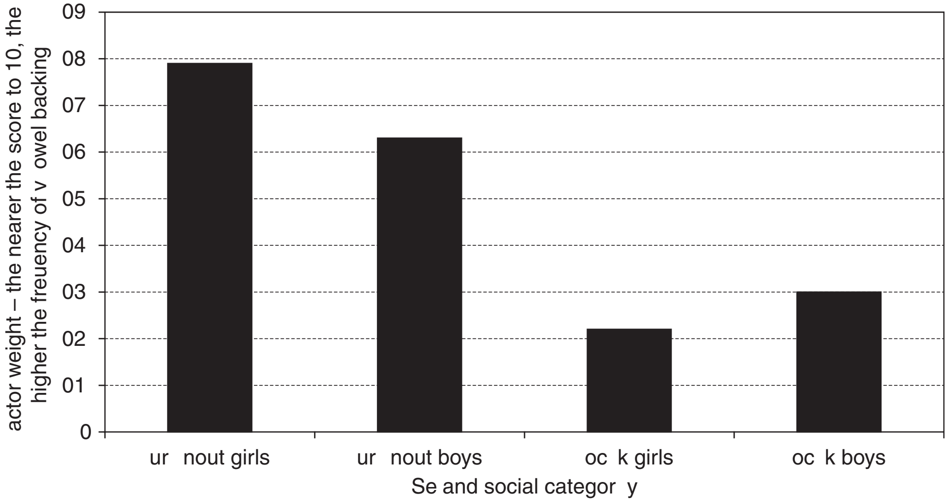


Figure 20 *Degree of backing of /ʌ/ among students at a Detroit high school (based on Eckert 2000: 118). Adapted and reprinted with permission of Wiley/Blackwell Publishing.*

Stylistic variation

We are all probably conscious that we speak differently to a teacher than to our friends over a coffee. We tend on the whole to speak using a more standard dialect with the teacher, and use more non-standard or informal language when having a chat. Similarly, we may find that we speak in a more standard way when discussing some topics – say, politics or linguistics – than when discussing others – yesterday's baseball game, or your neighbour's latest antics. Linguistic variability that is dependent on the social context we find ourselves in or the topic of the conversation we are engaged in is usually termed **stylistic variation**. Allan Bell, a linguist from New Zealand, developed a model for the analysis of stylistic variation known as **audience design**. He claimed that in designing our style of speech at any particular time, we assess the sociolinguistic characteristics of our addressees and adapt the way we speak to conform to these characteristics.

Let's look at an example. Nik Coupland investigated the extent to which an assistant in a travel agency in Cardiff, Wales, shifted her speech to match that of the social class of her clients. One of the variables he studied was the flapping of (t) – i.e. the use of [bʌɾə] instead of [bʌtə], and the results of this part of his study appear in figure 21. These results show how the assistant altered her use of this variable quite radically when speaking to clients of different social classes (***exercise 4***).

The model of audience design helps to explain why people seem, to a non-native ear, to 'pick up' the accent of places they stay in. A British or North American English speaker spending a couple of years in Australia would have a predominantly Australian English speaking audience and would accommodate to that variety so often when conversing that, to non-Australians, they may 'sound

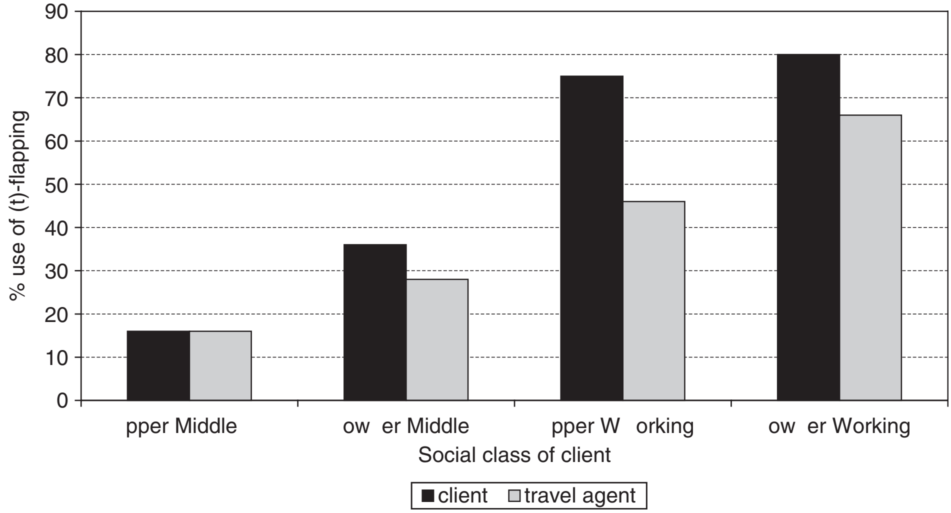


Figure 21 *A travel agent's style shifting to clients: (t)-flapping (from Coupland 1984: 63). Adapted and reprinted with permission of the author and Mouton de Gruyter.*

like an Aussie'. What this indicates, then, is that variation in language is constrained not only by the social characteristics of the speaker, but also by those of the *addressee* in any conversation; variation is also **interactionally** determined.

Linguistically determined variation

We would be wrong to go on from the above to claim that it is *only* social factors that determine the structure of variation within a speech community. Linguistic factors, too, play a considerable role in determining the relative use of different variants of a variable. One variable which appears to behave in a similar way across the English-speaking world is so-called **consonant cluster deletion** or more specifically **-t/-d deletion**. This involves the variable deletion of word-final [t] or [d] when it follows another consonant. So we find examples such as those in (28), where the candidate for deletion appears in bold and the phonetic transcriptions give variant pronunciations depending on whether [t] or [d] delete:

(28) Data set 1:

*bes**t** friend*	→	[bɛst frɛnd] – [bɛs frɛnd]
*col**d** weather*	→	[koʊld wɛðə] – [koʊl wɛðə]

Data set 2:

*he stuffe**d** the turkey*	→	[hiː stʌft ðə tɛːkiː] – [hiː stʌf ðə tɛːkiː]
*she seeme**d** funny*	→	[ʃiː siːmd fʌniː] – [ʃiː siːm fʌniː]

Data set 3:

*mos**t** of the time*	→	[moʊst əv ðə taɪm] – [moʊs ə ðə taɪm]
*groun**d** attack*	→	[graʊnd ətæk] – [graʊn ətæk]

Data set 4:

*he seeme**d** odd*	→	[hiː siːmd ɒd] – [hi siːm ɒd]
*she passe**d** a test*	→	[ʃiː pɑːst ə tɛst] – [ʃiː pɑːs ə tɛst]

(Note that in these examples, we transcribe ‘r’ sounds as [r], a common practice unless more precision is needed.)

As you read this set of data, you will probably feel that the further you go down the sets, the less likely you would be to hear the *second* example in each phonetically transcribed pair, that is the example in which [t] or [d] is deleted. This is because in each set of data the word final [t] and [d] are in different *linguistic* contexts, and it is these contexts which are affecting whether or not deletion of [t] or [d] seems likely. In data sets 1 and 2, [t] and [d] are followed by consonants, whereas in sets 3 and 4 they are followed by vowels. Research has shown that deletion is less likely before vowels than before consonants. In data sets 2 and 4, [t] and [d] are the realisation of the past tense ending *-ed*, whereas they don’t have this function in sets 1 and 3. We would expect, based on evidence from many English-speaking communities around the world, to find less deletion in the *-ed* examples, since *phonetically* the [t] and [d] are the only indication of the tense of the verb. This means that linguistic factors (whether the candidate for deletion precedes a vowel or a consonant and whether it encodes past tense or not) predict most deletion in data set 1 and least in data set 4. Table 5 provides evidence from a number of dialects of English to support this prediction. It is important to note that the ordering predicted on the basis of the linguistic factors is the same in each of the dialects investigated, despite the fact that there are quite considerable differences in the actual figures with the Puerto Rican speakers generally deleting final [t] and [d] much more frequently than speakers of Standard American English. What these differences show, of course, is that social factors as well as linguistic factors are playing a part in this variation.

The pattern that we see in table 5 illustrates what is known as an **implicational scale**. This notion is exemplified in a hypothetical case in table 6. Here ‘+’ signifies that a particular deletion always takes place and ‘–’ that it never takes place. Thus, in Dialect A, final [t] and [d] are always deleted, irrespective of linguistic context and in Dialect D they are always deleted when followed by a consonant so long as they do not encode tense – otherwise they are never deleted in Dialect D. Dialects B and C are intermediate between A and D. Now, we can look at table 6 and formulate the implicational statement in (29):

Table 5 *Deletion of [t] and [d] in English*

	Followed by a consonant		Followed by a vowel	
Language variety	% deletion in non *-ed* clusters	% deletion in *-ed* clusters	% deletion in non *-ed* clusters	% deletion in *-ed* clusters
Standard American English	66	36	12	3
White working-class American English	67	23	19	3
Black working-class American English	97	76	72	34
Puerto Rican working-class English	93	78	63	23

Table 6 *A hypothetical implicational scale*

easy to delete ⟵⟶ hard to delete

Language variety	non *-ed* clusters followed by a consonant	*-ed* clusters followed by a consonant	non *-ed* clusters followed by a vowel	-ed clusters followed by a vowel
Dialect A	+	+	+	+
Dialect B	+	+	+	–
Dialect C	+	+	–	–
Dialect D	+	–	–	–

(29) If a particular dialect deletes final [t] and [d] in a specific linguistic environment, then the same dialect will delete [t] and [d] in all environments that more readily allow for deletion.

In Dialect B, for instance, the most unlikely environment that allows consonant deletion is in non *-ed* clusters followed by a vowel. This implies that it is possible to delete consonants in *all environments to the left* of this one on the grid. In the actual study reported above, we do not find deletion occurring always or never in a particular environment; rather we see different frequencies of deletion. For such a case, then, it is necessary to replace (29) with the implicational statement in (30):

(30) If a particular dialect deletes final [t] and [d] with a certain frequency in a specific linguistic environment, then it will delete final [t] and [d] with a greater frequency in all environments that more readily allow for deletion.

The statement in (30) is true of table 5 because in each row the figures increase as we move from right to left.

To summarise, we can see that variability in language is not free and random but is characterised by what William Labov has called 'orderly heterogeneity' – a set of social, interactional and linguistic factors which have complex effects on the linguistic forms found within a speech community.

Variation and language change

Finally, here, we introduce the vital role that variation plays in language change, the subject of the next section. If a sound *changes* in a particular community, this implies the existence of *sound variation* as an intervening stage in the process of change. A change from an old form to a new one necessarily involves a stage where both the old and new forms coexist, not only in the speech of the community as a whole, but also in the speech of individuals. You do not go to bed one night with an old sound and wake up the next morning with a new sound having completely replaced the old one! The coexistence of old and new forms leads, of course, to language variation.

In order to introduce briefly the intimate relationship between language variation and language change, we present here further research carried out by William Labov (see the main introduction). He had noticed that in New York some people pronounced the ‘r’ following vowels in words such as *car* and *park* and others did not. He proposed that the New York speech community was changing from being ‘r’-less (or non-rhotic, see section 2, p. 37) to being ‘r’-ful (rhotic), and in order to investigate how this change was spreading throughout the community, he carried out an unusual but rather simple investigation. He visited three department stores, one middle-class, expensive store (Saks), one inexpensive store (Klein) and one in between (Macy’s) and asked as many assistants as he could find the whereabouts of a product he knew to be on the fourth floor of each store. The expected answer ‘fourth floor’ was, of course, carefully chosen, as it contains two examples of the ‘r’ he was looking for: in *fourth* the ‘r’ occurs before a consonant, and in *floor* it occurs at the end of the word. Having received the answer ‘fourth floor’, Labov pretended that he hadn’t heard properly, asking the assistant to repeat. He thereby doubled the size of his data set and introduced a further variable into the study, as the assistants’ second replies could be regarded as ‘emphatic’ or ‘careful.’ Having posed his question, which required the answer ‘fourth floor’ to over 250 assistants, he was able to compare the use of (r) across a number of speaker characteristics, contextual styles and linguistic environments, such as those in table 7.

Some of Labov’s results appear in figure 22.

As might be expected from our earlier discussion, Labov found that the different social, contextual and linguistic factors had varying effects on the use of (r). He found, for example, that assistants in Saks were more likely to use [r] than those in the other stores; younger people were more likely to use [r] than older; [r] was more likely to be used in the emphatic second reply; and [r]

Table 7 *Social, contextual and linguistic variables from Labov’s study of (r) in New York department stores*

characteristics of the shop assistants
store (upper-middle-class, lower-middle-class, working-class)
job within store (floorwalker, till operator, shelf filler, etc.)
floor within store (higher floors sell more expensive products)
sex
ethnicity
age
contextual characteristics
first reply given versus emphatic reply given after Labov had pretended not to hear
linguistic environment
(r) before a consonant versus (r) in word-final position

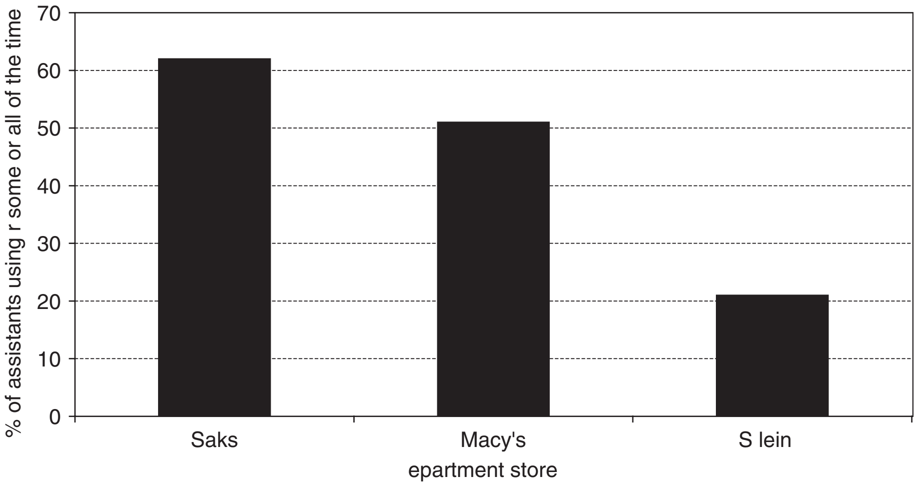


Figure 22a *Percentage of department store assistants using [r] by store (from Labov 1972: 51). Reprinted with permission of the University of Pennsylvania Press.*

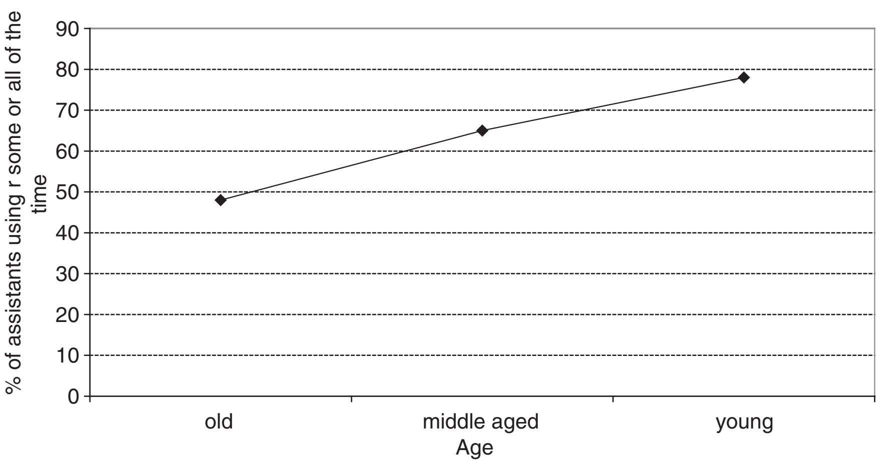


Figure 22b *Percentage of Saks department store assistants using [r] by age (based on Labov 1972: 59). Reprinted with permission of the University of Pennsylvania Press.*

was more likely in the word *floor* than in *fourth*. Particularly important for our discussion of the role of variation in language change, however, is the fact that every stage in the advancing change to [r] could be found in the speech of some of the assistants. Some used virtually no [r] at all, others – who were obviously further ahead in the change – used [r] all the time, but most used it some of the time but not on every occasion. The study thus provided Labov with a convenient snapshot of the progress of this change through the speech of individuals, particular groups and the whole New York speech community (***exercise 5***).

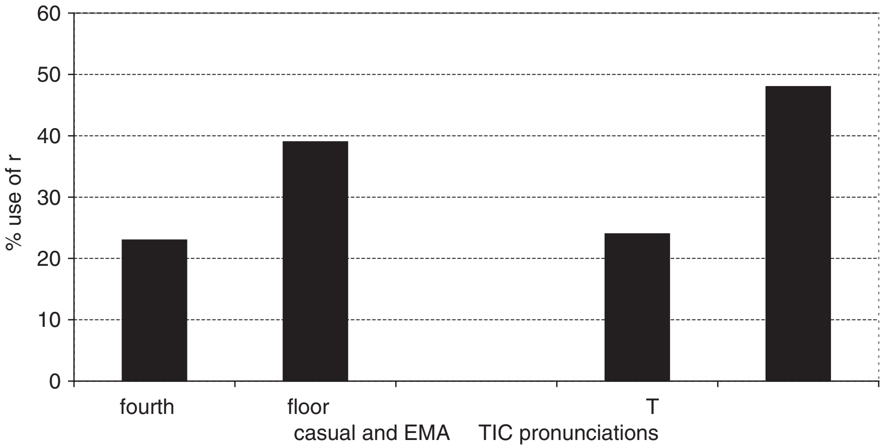


Figure 22c *Casual and emphatic pronunciations of [r] in New York department stores (based on Labov 1972: 66). Reprinted with permission of the University of Pennsylvania Press.*

Exercises

1. If we are able to shift our speech so readily, why do you think that people continue to speak dialects with a low prestige?

2. Design a small linguistic survey appropriate for your own town, city or rural area similar to William Labov's Department Store research. Which variable would you study and why? What question(s) could you ask to ensure that you got a reply that contained your variable? Which groups in your local speech community would you study?

3. Think about the school you went to and how teenagers at the school formed peer groups. Were there groupings like the Jocks and Burnouts in Detroit or did a different system of grouping prevail? What were the characteristics of each group? Did the different groups speak differently? How?

4. In order to demonstrate the effects of audience design, a lecturer was recorded in large lectures, small seminars and in one-to-one meetings with students. Four linguistic variables were analysed: (T), examining levels of /t/ glottalisation; (L), focusing on /l/ vocalisation; (H), looking at whether /h/ was dropped; and (A), investigating whether the /a/ in words such as 'bath' and 'glass' was fronter [aː] or backer [ɑː]. The results are displayed in figure 23.

   How would you explain the findings? Are they what you would expect?

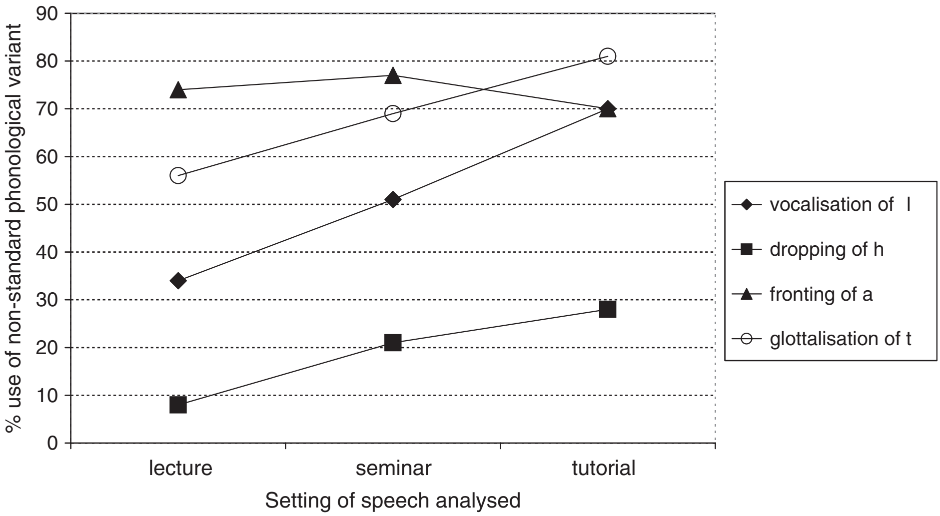


Figure 23 *Stylistic shifts in the speech of a lecturer*

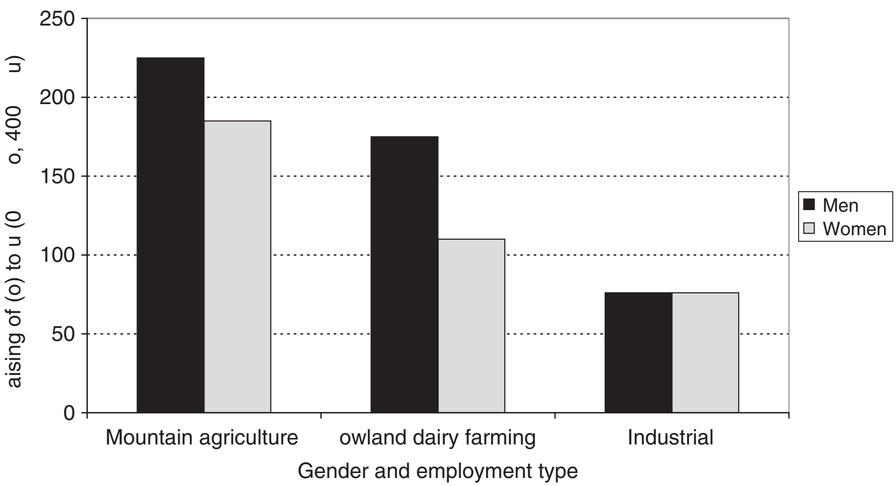


Figure 24 *The pronunciation of (o) in Ucieda Spanish by speaker occupation (from Holmquist 1986)*

5. Jonathan Holmquist examined the pronunciation of Spanish (o) in Ucieda in the Spanish Pyrenees. His research showed that some speakers pronounced this sound as [u] as opposed to the Standard Castillian Spanish [o]. When he examined the occupations of different people in the village and their use of (o), he found the results in figure 24.

How would you explain the differences in the use of (o) by the workers from different employment types? And why do you think there is a gender difference among the agricultural workers and not among the industrial workers?

4 Sound change

Linguistic change is a process which pervades all human languages. The extent of this change can be so radical that the intelligibility of former states of the language can be jeopardised. The language of Shakespeare causes some problems for the early twenty-first-century reader, but these are not insurmountable. However, if we go further back to the writings of Chaucer, we are faced with a much more alien, less easily recognised form of English. If we observe language change on a much smaller timescale, say that of the average life span of a human being, comprehension difficulties such as those confronting the reader of Chaucer do not arise. Languages actually change quite slowly, and hence the ability to communicate successfully with all generations of speakers of our own language variety is maintained. In this section, we will look at how the *sounds* of languages can change over time, both from a diachronic and synchronic perspective. Diachronic research on sound change has enabled us to chart changes that have taken place in earlier historical periods, while synchronic approaches allow us to observe language changes in progress today. In addition, we will examine sound change from the perspective of one of the principal problems of language change, namely the *transition problem* – what is the route by which sounds change?

Consonant change

In section 2, we saw that consonants can be largely classified according to a simple three-term description:

(a) voicing: do the vocal cords vibrate?
(b) place of articulation: where is the flow of air obstructed?
(c) manner of articulation: how is the flow of air obstructed?

Consonant changes often involve a shift in one or more of these terms. One example of a consonant changing from voiceless to voiced is the so-called **flapping** mentioned in section 2 (p. 34) as common in the English spoken in North America – it also occurs frequently in Australasia. It will be recalled that a flap involves tapping the tip of the tongue quickly against the alveolar ridge and it occurs when the ‘t’ sound is surrounded by two vowels. From our point of view, the important thing is that a flap is voiced, whereas [t] is unvoiced, so here we have an instance where a voiceless sound has changed into a voiced sound, i.e. a change with respect to (a) above. Some examples from Australian English appear in (31):

(31)	*litter*:	[lɪtə]	→	[liɾɐ]
	bitter:	[bɪtə]	→	[biɾɐ]
	get off:	[gɛtɒf]	→	[geɾɒf]

(Note: [ɐ] is an unrounded central low vowel, somewhat lower than [ə], cf. figure 16).

There are a number of place of articulation changes currently under way in southern British English. Each of these is a change with respect to (b). One well-known example is the change from [t] to [ʔ], as illustrated in (32):

(32) *butter*: [bʌtə] → [bʌʔə]
plot: [plɒt] → [plɒʔ]

In this example, both the old and the new sounds are voiceless and have the same manner of articulation (they are both plosives). The place of articulation, however, has changed from being alveolar to glottal.

A second example is affecting [ɹ] when it occurs prevocalically. In these contexts, we often hear [ʋ] as in the examples in (33):

(33) *rob*: [ɹɒb] → [ʋɒb]
brown: [bɹaʊn] → [bʋaʊn].

Here, both the old and new sounds are voiced approximants. They differ in that the older [ɹ] is retroflex whereas the newer [ʋ] is labiodental; that is, the new form has the same *place* of articulation as [v], but the *manner* of articulation of [w].

A final example illustrating a change in place of articulation concerns the loss, in certain environments, of the interdental fricatives /θ/ and /ð/, which are merging with the labiodental fricatives /f/ and /v/ respectively. Examples illustrating these changes appear in (34) and (35). The change in (35) applies only to non-initial /ð/:

(34) *thumb*: [θʌm] → [fʌm]
nothing: [nʌθɪŋ] → [nʌfɪŋ]

(35) *bother*: [bɒðə] → [bɒvə]
breathe: [briːð] → [briːv]

Again, there is no change in voicing – [θ] and [f] are both voiceless, while [ð] and [v] are both voiced – and no change in manner of articulation – old and new sounds are fricatives. What has changed is the place of articulation, from interdental to labiodental.

It is also possible to identify changes in manner of articulation. Included in this category is the process of **spirantisation** – a change from plosive to fricative (‘spirant’ was the nineteenth-century term for ‘fricative’, which today survives only in the form ‘spirantisation’, showing that even linguistic jargon undergoes historical change!). A classic example of spirantisation can be found in the accent

Table 8 *Spirantisation in Liverpool*

	bilabial	alveolar	velar
voiceless	*pepper*	*better*	*locker*
	[pɛpə] → [pɛɸə]	[bɛtə] → [bɛsə]	[lɒkə] → [lɒxə]
voiced	*baby*	*steady*	*haggle*
	[bɛɪbi] → [bɛɪβi]	[stedi] → [stezi]	[hagl̩] → [haɣl̩]

of the English city of Liverpool, where the voiceless stops [p t k] have become the voiceless fricatives [ɸ s x] respectively, and the voiced stops [b d g] have become the voiced fricatives [β z ɣ] respectively, in non-word-initial positions. In each case, the new sound retains its original place of articulation and its voicing characteristics, but by turning from a stop into a fricative, it has undergone a change in manner of articulation, i.e. it illustrates a change in (c) in our three-term description of consonants. Table 8 includes examples of each of the six changes.

Notice that most of the consonant changes discussed above do not result in the language having fewer or more sounds. However, the change exemplified in (34) does have this consequence, since [θ] is being replaced by [f] in all linguistic contexts – word initial (*three*, *think*), word medial (*ether*) and word final (*moth*, *pith*) – the conclusion of this process will be a variety of English which lacks [θ] entirely.

Sometimes changes can involve consonants being completely lost rather than replaced by others. We can point to examples such as the loss of [h] in words such as those in (36):

(36) *hand*: [hand] → [and]
house: [haus] → [aus]
Harry: [haɹɪ] → [aɹɪ]

In twentieth-century Britain, this change appeared to be spreading, but recently evidence has suggested it may well be on the decline in some parts of the country. It has certainly been receding in Australasia and is not known in North America.

Another example is the loss of the glide [j] before [uː] in words such as *tune*, *duke*, *new*, *enthusiasm*, *resume*, *solution*, etc., a change commonly known as **yod-dropping**. So, in some varieties of American English we find changes such as those in (37):

(37) *New Zealand*: [njuːziːlənd] → [nuːziːlənd]
student: [stjuːdənt] → [stuːdənt]
avenue: [ævənjuː] → [ævənuː]

Some dialects – for example those spoken in eastern England – have gone further than others in this change, dropping the [j] in words such as *beautiful* [buːʔəfəɫ] and *cute* [kuːʔ].

It is also possible for a consonant to be inserted where one previously didn't exist. A well-known example of this is provided by the dialects which have inserted [p] in the emphatic forms of the words *yes* and *no*:

(38) *yeah*: [je] → [jep] 'yep'
no: [nʌʊ] → [nʌʊp] 'nope'

Also familiar from some British and Australasian accents is the insertion of [k] after *-ing* in the words *nothing* and *something*:

(39) *nothing*: [nʌfɪŋ] → [nʌfɪŋk]
something: [sʌmfɪŋ] → [sʌmfɪŋk]

A final example from the history of English involves the insertion of the bilabial stops [p b] in such Middle English words as *shamle* and Old English *bremel* resulting in their contemporary forms [ʃæmbl̩] *shamble* and [bræmbl̩] *bramble*.

Vowel change

What about vowel changes? Section 2 showed that vowels are usually classified with respect to (a) height; (b) front/backness; (c) lip rounding or spreading. As with consonants, changes can affect vowels along each of these dimensions. Some examples appear in table 9.

In addition, it is possible for monophthongs to become diphthongs. An example from Australian English appears in (40):

(40) [iː] → [əɪ]: *eat the peanuts* is pronounced [əɪtðəpəɪnɐts]

Or, in the US city of Philadelphia, we find the change in (41):

(41) [æ] → [eːə]: *mad*, *bad* and *glad* are respectively pronounced as [me:əd], [beːəd] and [ɡleːəd]

The converse process of diphthongs (and **triphthongs** – complex vowels which exhibit three distinct qualities) becoming monophthongs is also attested. The

Table 9 *Vowel changes in contemporary varieties of English*

change in	change from	change to	example	which dialect of English?
height (raising)	[æ]	[ɛ]	*bad* [bæd] → [bɛd]	Southern Hemisphere
front/back (backing)	[ɛ]	[ʌ]	*bell* [bɛl] → [bʌl]	Norwich, England.
lip position (rounding)	[ɜː]	[øː]	*nurse* [nɜːs] → [nøːs]	New Zealand

examples in (42) are from East Anglian English, with the last three involving triphthongs:

(42) *sure*: [ʃʊə] → [ʃɜː]
player: [pleiə] → [plæː]
fire: [faiə] → [fɑː]
tower: [tauə] → [tɑː]

We saw above that for consonants it is possible for a sound change to result in the loss of a particular sound when it is systematically replaced by another which already exists in the language. Similar situations can be identified for vowels (**vowel mergers)**, along with the opposite process where a vowel splits into two distinct sounds **(vowel splits)**. Figure 25 illustrates an example of the latter taking place in London round about 1550 and its consequences for the speech of contemporary Londoners.

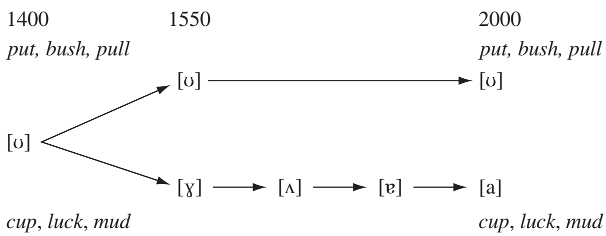


Figure 25 *A vowel split in London*

What we see here is a situation where the high back vowel [ʊ] split. In 1400, all the words *put*, *bush*, *pull*, *cup*, *luck* and *mud* included the vowel [ʊ]. By about 1550, the vowel in *cup*, *luck* and *mud* had lowered to [ɤ], but *put*, *bush* and *pull* retained [ʊ]. Later, in some dialects (most notably in South East England and Australasia), the lowered vowel in *cup*, *luck* and *mud* moved through a number of stages to the front, so as to become [a] in some contemporary dialects. This split occurred both in southern England and Scotland and is found in all the English varieties of North America and the Southern Hemisphere. It did *not* occur in northern England, which retains [ʊ] in such words as *cup*, *luck* and *mud*. There is evidence that some of the present-day [ʊ]-class words are unrounding in many varieties of English, so *book* is being pronounced by some as [bɨk], [ɨ] being a centralised unrounded high vowel.

Mergers are far more common than splits, and examples are easy to find from around the English-speaking world. One instance which was noted in section 2 is the identical pronunciation (as [meriː]) of the words *merry, marry* and *Mary* in parts of the western and central United States. Similar examples are the merger in some dialects, of [ʊə] and [ɔː], so both *sure* and *shore* become [ʃɔː], and the merger in a few rural eastern English dialects of [au] and [ɛə] with the result that *cow* and *care* are pronounced identically as [kɛː].

A slightly more complex case can be identified in New Zealand, the Caribbean and Norfolk, where the diphthongs [iə] and [ɛə] have merged. Interestingly, however, whereas in Norfolk the merger has resulted in [ɛə] taking over in words where [iə] was previously found, in both New Zealand and the Caribbean, a *new* diphthong [eə] has replaced both of the original sounds. Thus, whereas both *bear* and *beer* have come to be pronounced like *bear* in Norfolk, they have both come to be pronounced as [beə] in the other two locations.

Finally, we can note an example of the rural dialect of Norfolk *not* undergoing a merger that has affected most other English varieties. This is the merger of the diphthongs in *toe* and *tow*, which were distinct in Middle English. They began to merge in the seventeenth century, but as the examples from Norfolk English in (43) show, this dialect has not been affected by this process:

(43)	*toe* [tʊu]	*tow* [tʌu]
	rose [ɹʊuz]	*rows* [ɹʌuz]
	moan [mʊun]	*mown* [mʌun]

So far, we have looked at a number of essentially *independent* sound changes. In the case of many vowels, however, linguists have noticed that a change to one vowel can have a knock-on effect for others in the neighbouring area of phonetic space, where we understand this notion in terms of the vowel quadrilaterals from section 2. Sometimes cases arise in which one vowel will change and leave a ‘space’ into which a second vowel moves. It is not uncommon for several vowels to be linked together in this way in a series of changes known as a **chain shift**.

As we saw briefly in the main introduction, while our knowledge of the linguistic changes that have occurred over time is largely based on *diachronic* research – a detailed analysis of the gradual historical development of a particular linguistic feature – methods which can accurately chart language changes *as they take place within a community of speakers* have recently been introduced. These so-called apparent-time methods involve the simulation of a historical dimension within a synchronic study, and apparent-time researchers collect recordings of the language varieties used within a particular community and compare the speech of people born at different times. By comparing the speech of those born in 1920 with that of those born in 1970, it is claimed, we are comparing the language acquired by children at two distinct points in the history of the language. The language of the older speakers should therefore reflect an earlier stage in the development of the language than the varieties spoken by the younger age groups.

Apparent-time studies have enabled linguists to observe some quite complex examples of chain shifting in progress. For example, William Labov and his colleagues have carried out extensive research on a series of vowel shifts, known as the Northern Cities Chain Shift, which is under way in American cities such as Chicago, Detroit and Buffalo. Some shifts in the chain are almost complete and others are in their infancy, but overall the chain forms a complete ‘loop’ in phonetic space. The oldest change in the chain is the raising of [æ] in words

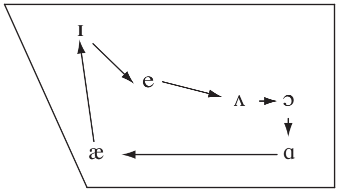


Figure 26 *The Northern Cities Chain Shift*

such as *hat*, *pack*, *last*, *bath* and *man*. In these words, the vowel is shifting from [æ] to [eᵊ] or [ɪᵊ] (the raised [ᵊ] indicates a very weak second component to a diphthong). The space left by [æ], a low front vowel, has been filled by a fronting of [ɑ] (in words such as *got*, *not* and *pop*) to [æ]. Similarly, the space vacated by [ɑ], a low back vowel, has been filled by the lowering of [ɔ] to [ɑ] in words such as *caught*, *talk* and *taught*. We thus see a sequence of changes with vowels taking over the 'space' vacated by other vowels. Furthermore, something like the converse of what we have just described has also occurred as part of the Northern Cities Chain Shift. Specifically, the change of [æ] to [eᵊ] or [ɪᵊ] produced a 'congested' area of mid closed/high front vowels. As a result, these have also begun to move. In particular, [ɪ] (in words such as *pip*, *tin* and *sit*) is moving from [ɪ] to [e], and [e] (in words such as *pet*, *lend* and *spell*) is moving back to the position of [ʌ]. Finally, [ʌ] – in *cup*, *butter*, *luck*, etc. – is moving slightly further back and rounding, to fill the position vacated earlier in the process by /ɔ/.

From the above description and figure 26, it should be clear that the chain involves a series of changes which constitute a closed 'loop' in phonetic space.

Now notice that some of the changes in this chain have been caused by one vowel moving and *pulling* other vowels behind it. This is the case with the [æ] – [ɑ] – [ɔ] chain: [æ] moved first and the others 'followed'. Such chain shifts are called **drag-chains**. Sometimes, however, a vowel may move *towards* the position of another vowel, causing that vowel to move itself. This is the case with the [ɪ] – [e] – [ʌ] part of the chain: [ɪ] lowered to the position of [e], which backed into the position of [ʌ] which, consequently, had to move back itself. This sort of shift is called a **push-chain** (***exercise 1***).

The transition problem: regular sound change versus lexical diffusion

Having observed a number of different types of sound change, we can turn to the question of how, more precisely, these changes affect the words in which they occur. Does a sound change affect every word which contains that sound at the same time, or are some words affected before others? Are vowel changes phonetically gradual, taking small steps in phonetic space on their route to the new vowel, or are they abrupt, 'jumping' from one vowel to another without going through intermediate phonetic stages?

Two hypotheses have been put forward to account for the way sounds change. The first was initially proposed in the nineteenth century by the Neogrammarian group of historical linguists and it regards sound change as *regular*. Two important principles underlie this hypothesis. The first of these is that if a sound change takes place, it will take place in *all* words with similar environments *at the same time*. There will be no exceptions. The outcome of this is that sound changes must be *phonetically gradual*, but *lexically abrupt*. A vowel shift, adhering to this principle, would move through phonetic space towards its new destination in small steps, rather than in one step, and the change would apply to every word in which that vowel occurred. If, for instance, we take the change from [ɛ] to [e] in the Southern Hemisphere varieties of English of Australia, New Zealand and South Africa, we would expect to find (a) small phonetic changes to gradually shift [ɛ] to [e]; and (b) *every* word which contained [ɛ] to move to [e]. In the case of South African English, this appears to be correct with all words with [ɛ] passing through a stage where they had a vowel intermediate between [ɛ] and [e].

The second Neogrammarian principle elaborates on the notion of 'similar environment' which appears in the first principle. Specifically, it states that if a sound change takes place, the *only* factors that can affect that change in any way are *phonetic* ones, such as the phonetic characteristics of the segments which surround the feature undergoing change. These changes, then, may be phonetically conditioned: the changing sound in some of the words may shift faster than in others because it is surrounded by a phonetic environment which particularly favours the change. Conversely, in some words the phonetic environment may hinder and slow down the change. However, according to the Neogrammarians, it is impossible for a sound change to operate, say, in nouns but not in verbs, since this would be an example of a change being subject to non-phonetic conditioning (i.e. grammatical category membership). An example which appears to be consistent with this emphasis on phonetic environment appears in Labov's studies of the Northern Cities Chain Shift, which we have just described. He found that the change from [æ] to [ɪᵊ] was most favoured when the vowel preceded a nasal consonant, as in *aunt*, *dance* and *hand*, but hindered when the vowel preceded a velar consonant, such as in *black* and *track*.

Despite the predictive success of Neogrammarian principles in some cases, a number of historical linguists, particularly those working on dialects of Chinese, became unhappy with the hypothesis that sound change always displayed regularity. This was because they discovered examples of changes which did not conform to the expected neat and regular patterns. Instead, they found instances of what has come to be known as **lexical diffusion**. Taking its name from such instances, the lexical diffusion hypothesis also depends on two principles, which are directly opposed to the principles of the Neogrammarians. This hypothesis maintains that (a) rather than being phonetically gradual, sound changes are

Table 10 *[ɑː] and [æ] in Standard British English (RP)*

following phonetic environment	RP [ɑː]	RP [æ]
_f#	*l**a**ugh, st**a**ff, h**a**lf*	*g**a**ffe, f**a**ff, n**a**ff*
_fC	*cr**a**ft, **a**fter, sh**a**ft, d**a**ft*	*f**a**ffed*
_θ	*p**a**th, b**a**th*	*m**a**th(s), C**a**thie*
_st	*l**a**st, p**a**st, n**a**sty*	*enthusi**a**st, **a**ster*
_sp	*cl**a**sp, gr**a**sp*	***a**sp*
_sk	***a**sk, fl**a**sk, b**a**sket*	*g**a**sket, m**a**scot*
_sl	*c**a**stle*	*t**a**ssel, h**a**ssle*
_ns	*d**a**nce, ch**a**nce, Fr**a**nce*	*rom**a**nce, c**a**ncer, f**a**ncy*
_nt	***au**nt, gr**a**nt, sl**a**nt*	*r**a**nt, **a**nt, c**a**nter*
_n(t)ʃ	*br**a**nch, bl**a**nch*	*m**a**nsion, exp**a**nsion*
_mpl	*ex**a**mple, s**a**mple*	***a**mple, tr**a**mple*
_nd	*dem**a**nd, rem**a**nd*	*st**a**nd, gr**a**nd, p**a**nda*

(# indicates a word boundary and C any consonant in the top two entries of the left hand column in this table; the crucial vowel is in bold throughout)

phonetically discrete, 'jumping' from the old sound to the new one without passing through any intermediate phonetic stages; and (b) rather than the whole lexicon undergoing the sound change at the same time, individual words change from the old form to the new one in a manner which is not phonetically predictable in a neat way.

One often-cited example of lexical diffusion in English is a sound split which took place in southern British English and is sometimes known as the TRAP–BATH split. In the latter part of the seventeenth century, the [æ] in some but not all words which contained it began to *lengthen*, and then *move back*, ultimately to [ɑː]. Currently, in Standard British English we have the pattern in table 10 (remember that RP is Received Pronunciation, a rather conservative variety of British English):

Notice that the change charted in table 10 is *not* altogether phonetically regular. There are some tendencies: most words with following /f/ have undergone the change – there are only a few rarely occurring exceptions. Overall, however, from a phonetic perspective, we have a picture of a rather messy and irregular change. Since it has not taken place in a phonetically regular way but has seen individual words change independently of any precise phonetic conditioning, it provides an example of lexical diffusion (***exercise 2***).

The change from [æ] to [ɑː] appears to be most advanced in Standard British English and other southern British English dialects but has most notably *not* taken place in northern England. Between the north and the south we have a mixed picture, and we can search for more evidence of the lexical nature of the shift by looking at a dialect which has not yet advanced quite as far as Standard British English in the reallocation of words from [æ] to [ɑː]. Such a dialect is that of the small urban centre of Wisbech, a town located between those areas of England where the shift has or has not taken place, that is, roughly the south and the north.

There are two findings about the Wisbech dialect that are notable here. Firstly, younger residents of the town are more likely to have acquired or almost acquired the Standard British English system than the older ones – a good, though not totally reliable indication that change is still under way. Secondly, there does not seem to be a 'common route' through the change that all speakers in the community follow. In other words, while some speakers will have, for example, [læst], [plænts] and [kæsl], but [glɑːsəz] and [pɑːθ], others, with very similar social backgrounds, will have [glæsəz] and [plænt], but [lɑːst], [kɑːsl] and [pɑːθ].

Research by William Labov comparing examples of regular sound change with lexical diffusion suggests that regular sound change is most common in vowel shifts (fronting, raising, backing, etc.) and lexical diffusion most widespread in cases of vowel lengthening (such as the TRAP–BATH split) and shortening. It appears to be the case, then, that rather than one of our hypotheses being the universally correct one, each seems to apply to different sorts of change (***exercise 3***).

Suprasegmental change

As well as affecting vowels and consonants, change may also occur among suprasegmental phenomena such as stress and intonation. An example of such a suprasegmental change is the shifting of *stress* in disyllabic words from the second to the first syllable. Particularly interesting are some noun–verb pairs in which the verb is becoming indistinguishable from the noun because of this process. It will be recalled from section 2 (pp. 41–2) that the standard pattern in Modern English is for disyllabic verbs to be stressed on the second syllable, whereas corresponding nouns are stressed on the first syllable. Thus, we have such pairs as (44) and (45):

(44) a. They won the [ˈkɒntɛst] easily (noun)
b. She wanted to [kənˈtɛst] the case in court (verb)

(45) a. She hired an [ˈɛskɔːt] (noun)
b. The bouncer needed to [əsˈkɔːt] the drunkard from the club (verb)

An exception to this pattern is provided by *address* in most varieties of British English, which is stressed on its final syllable, irrespective of whether it is a noun or a verb:

(46) a. Give me your [ədˈrɛs] (UK, noun)
b. She demanded the right to [ədˈrɛs] the audience (UK, verb)

Now, at the beginning of the seventeenth century, many words which could function as either nouns or verbs behaved like *address*. So, for example, *increase*, *protest* and *record* carried stress on their final syllables even when they functioned as nouns. We thus see that there has been a process of shifting stress from the final to the initial syllable in such words when they are used as nouns, a process which has not (yet) taken place in the case of *address* in British English.

Interestingly, *address* has undergone this stress shift in American English:

(47) a. Give me your [ˈædrɛs] (USA, noun)
b. She demanded the right to [ədˈrɛs] the audience (USA, verb)

Furthermore, there is evidence that the stress shift is extending to the *verbal* use of some words in varieties of British English, as illustrated by the examples in (48) and (49):

(48) a. There was a steep [ˈɪŋkriːs] in inflation last month (noun)
b. The government was forced to [ˈɪŋkriːs]/[ɪŋˈkriːs] interest rates yesterday (verb)

(49) a. Bob's [ˈtɹænsfɜː] to the personnel department was proving difficult (noun)
b. She went to the bank to [ˈtɹænsfɜː]/[tɹænsˈfɜː] some money (verb)

What we have, therefore, is a situation where some 400 years ago there was generally no stress-based distinction between our pairs of nouns and verbs. Such a distinction has been introduced in the intervening period, with *address* exceptionally maintaining its original properties in British English. And now, under a general tendency for stress to shift forward from the final syllable, the distinction is beginning to be lost again, even though the pronunciations of both nouns and verbs are different to what they were 400 years ago. The word *envy* offers a final perspective on this process. In 1600, it already exhibited the 'modern' stress-based contrast between its uses as a noun and a verb. However, stress-shift has applied to the verb in the intervening period with the result that today we have only the single pronunciation [ˈɛnvi]. The examples in (48) and (49) suggest that *increase* and *transfer* are embarking on the route which *envy* has already completed.

We conclude this section with an example of intonational change which is affecting the varieties of English spoken in Australia, New Zealand and North America. In these localities, some people are acquiring a rising, question-like intonation contour in *declarative* (i.e. non-questioning) utterances.

Consider the small dialogue in (50), which involves a young New Zealander recounting an experience on a Pacific cruise – italics mark the clauses with rising intonation.

(50) FRANK: These guys I met were in a fairly cheap sort of cabin – all they had was a porthole and I looked out of this porthole *and it was black. And a fish swam past*. [laughs]
HUGH: [laughs]
FRANK: *They were actually that low down*.

Research has shown that these patterns of rising intonation are found most frequently, as in the example above, when telling stories and giving explanations and descriptions, and are found rarely in the expressing of opinions. The change appears to have begun in Australasia just after the Second World War and is now being heard in parts of the UK (***exercises 4*** and ***5***).

Exercises

1. Consider the data in table 11 from a dialect of English. The table shows the pronunciations of a number of changing vowels and provides representative examples of words in which these vowels occur. What can you conclude about the initial stages of the changes that took place? How are they related to each other? What happened subsequently? You may need to look at a vowel chart to help you answer these questions.

Table 11 *Vowel changes in an English dialect*

Word	Pronunciation of the vowel before the change	Pronunciation of the vowel during the change	Pronunciation of the vowel today
time	[iː]	[əɪ]	[aɪ]
sweet	[eː]	[iː]	[iː]
clean	[ɛː]	[eː]	[iː]
name	[aː]	[ɛː]	[ɛɪ]
hope	[ɔː]	[oː]	[ou]
goose	[oː]	[uː]	[ʉː]
south	[uː]	[əu]	[au]

2. Are the following examples of sound changes, discussed in this section, cases of 'regular sound change' or of 'lexical diffusion'? How do you know?
   (a) the ʊ/ʌ split?
   (b) the shift to syllable-initial stress?

3. In many varieties of English, [t] is changing into a glottal stop [ʔ]. The linguistic contexts in which glottalisation can occur differs from place to place, and nowhere has [t] been completely replaced by [ʔ]. Below are some data illustrating the extent of glottalisation in one variety of English. Try to describe phonologically the contexts in which glottalisation can and cannot occur.

Glottalisation possible	**Glottalisation not possible**
data	deter
Peter	pester

let me	left me
let us	left us
bet	best
call tomorrow	call Tony
salt	soft
want	washed /wɒʃt/
button	return
enter	wrapped /ræpt/
bottle	act

4. As well as being spoken in the Netherlands, varieties of Dutch are also used in northern Belgium (where they are often called Flemish). Belgian and Dutch linguists have been researching the extent to which the *standard* varieties of Dutch in the Netherlands and in Belgium are becoming more similar or more different. Figure 27 (based on the work of van de Velde, van Hout and Gerritsen), shows the results of an analysis of radio commentaries on royal and sporting events in Belgium and the Netherlands at regular periods between 1935 and 1993. The feature investigated here is the devoicing of /v/ to [f] in words such as those immediately below
(a) vuur [vyːr] → [fyːr] fire
(b) lever [leˑvər] → [leˑfər] liver
(c) aanval [ˈaˑnval] → [ˈaˑnfal] attack
What has happened to /v/ over the past seventy years? How might we account for the patterns found?

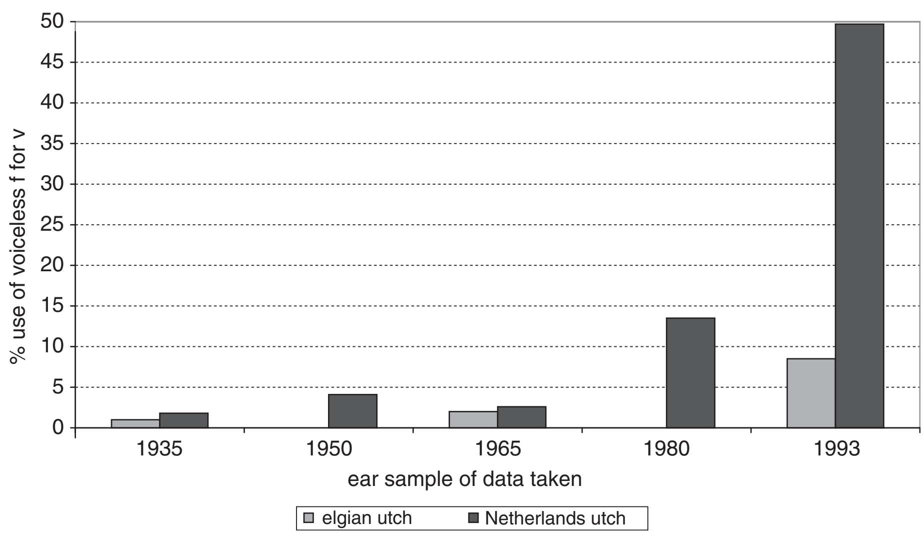


Figure 27 *The devoicing of /v/ to [f] in Netherlands and Belgian Dutch between 1935 and 1993 (no Belgian data in 1950 and 1980) (based on Van de Velde, Van Hout and Gerritsen 1996: 161)*

5. Collecting data on variation and change in language involves understanding the way the speech community is structured socially as well as linguistically. If you were to conduct research in your own neighbourhood, what sociological factors do you think you would need to take into account and why?

5 Phonemes, syllables and phonological processes

We began section 2 by asking how many sounds there are in English, but we found there were various practical difficulties in responding to this question and never arrived at an answer. There is a further reason why the question can't be answered straightforwardly, and understanding this is our first concern in this section. In fact, speech sounds can differ from each other in a non-discrete, continuous fashion. We can see this particularly easily in the vowel system. One of the main differences between the [iː] of *read* [ɹiːd] and the [ɪ] of *rid* [ɹɪd] is length. But just how long is a long vowel? An emphatic pronunciation of *read*, say in a plaintive 'Leave me alone – I'm trying to READ', has a much longer vowel than a non-emphatic pronunciation. The precise length of any vowel will depend on the rate of speaking, degree of emphasis and so on. A similar case is presented by the aspirated plosives. In any dialect, a [pʰ] sound, as in the word *pit*, will be aspirated to a greater or lesser extent depending on the degree of emphasis. We see, therefore, that there is a sense in which sounds form a continuum; from this perspective, there is an *infinite* number of speech sounds in any language.

Phonemes

Fortunately, there is another perspective from which sounds are discrete units or **segments**, and we can come to terms with this by asking what is the difference between the words *pit* and *bit*? From section 2, we can say that *pit* starts with a voiceless bilabial plosive and *bit* starts with a voiced bilabial plosive. Otherwise, the words are identical. A pair of this kind, in which everything except the portion under consideration is identical, is called a **minimal pair**. This pair shows that voicing can distinguish one word from another, and that the pair of sounds [p b] can *distinguish words*. However, when we consider different types of [p], with different degrees of aspiration or no aspiration at all, we get a different picture. There are no words in English which differ solely in whether they contain an unaspirated or an aspirated plosive. That is, English does not have distinct words like, say, [pʰɪt] and [pɪt]. In fact, [pɪt], with totally unaspirated [p], is unpronounceable without explicit training for most English speakers. Conversely, we could never find pairs such as [spɪt] and [spʰɪt] in English – following initial [s], the *only* 'p' sound we find is the unaspirated [p]. The same is true of [t tʰ] and [k kʰ], as in the pairs of words *star*, *tar* and *scar*, *car*. In other words, the **distribution** of the sounds [p p^{h}] is governed by a rule or principle according to which we never find [p] in the positions reserved for [p^{h}] and we never find [p^{h}] in the positions reserved for [p]. This type of patterning is called **complementary distribution** (the positions in which we find the two sounds complement each other).

Things needn't be this way. There are languages in which [p] and [p^{h}] can be used to distinguish words, that is, in some languages [p/p^{h} t/t^{h} k/k^{h}] and similar pairs are **contrastive** sounds. In (51) we show examples from Bengali (or Bangla), spoken in Bangladesh, in which [p] and [p^{h}], [t] and [t^{h}] and [k] and [k^{h}] contrast (and there is also a contrast between [ʧ] and [ʧ^{h}]):

(51)	aspirated		unaspirated	
	[k^{h}al]	'canal'	[kal]	'time'
	[ʧ^{h}ai]	'ashes'	[ʧai]	'I want'
	[t^{h}aka]	'to remain'	[taka]	'to stare'
	[mat^{h}a]	'head'	[mata]	'to be enthusiastic'
	[p^{h}ul]	'flower'	[pul]	'bridge'

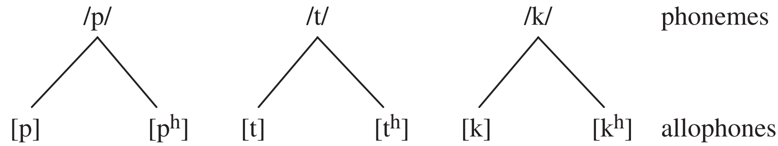
Returning to English, we can simplify our description of the sound inventory by thinking of [p t k] and [p^{h} t^{h} k^{h}] as variants of the 'p', 't' and 'k' sounds. Thus, we can say that there are just the three voiceless plosives, but they have slightly different pronunciations depending on their position in the word. Ignoring other positions, word-initially we get the aspirated variant and after [s] we get the unaspirated variety. Thus, we could transcribe the words *pit*/*spit*, *tar*/*star*, *car*/*scar* as [pit/spɪt], [tɑː/stɑː], [kɑː/skɑː] on the understanding that a general rule will tell us exactly how to pronounce the plosive. It is no accident, then, that this distinction between aspirated and unaspirated sounds is never marked in ordinary English orthography (though it is marked in the spelling system of Bangla). In fact, native speakers of English who have not had some kind of phonetic or linguistic training are usually completely unaware of the distinction.

From the above, it follows that we need to be able to talk about sounds at *two levels*. At one level we must be able to describe the fact that English has aspirated as well as unaspirated plosives. This is necessary simply to capture an important difference between the plosive system of English and those of languages such as French, Spanish, Russian, Samoan, Inuit and many others in which plosives are never aspirated. On the other hand, we also need to be able to capture the idea that in English [p] and [p^{h}] are variants of 'the same sound'. But what sound?

To answer this question, we need another, less concrete, concept of 'sound'. We will call these more abstract sounds **phonemes** and write them between slashes: /p t k/. A transcription into such phonemic symbols is called a **broad transcription**. However, when we want to talk about the precise, concrete sounds which can be detected by phonetic analysis, we will speak about **phones**. These are written between square brackets. Thus, [p p^{h} t t^{h} k k^{h}] represent six phones but in English they correspond to only three phonemes, /p t k/. A transcription which includes phonetic detail about the pronunciation of individual phones, and written in square brackets, is referred to as a **narrow transcription**. There is always some choice as to exactly how much phonetic detail an analyst might include, so the notion of 'narrow transcription' is a relative one.

We will also say that the two variants [p p^h] of the phoneme /p/ are **allophones** of that phoneme. The term 'allophone' is based on a Greek expression meaning 'different sound'. The phenomenon of variation in the pronunciation of phonemes in different positions is called **allophony** or **allophonic variation**, and we can illustrate this diagrammatically for our English voiceless plosives as in (52):

(52)



Note that the transcription at the level of allophones has to be rather approximate, given that we can have different degrees of aspiration – in principle, there is an infinite number of distinctions at this level. However, there is only a fixed number (three) of voiceless plosive phonemes in the language.

If we turn to the vowel system, we have noted that length is a continuous quality, permitting any number of distinctions. Obviously, this is also the case for the front/back and high/low axes introduced in section 2 as playing a major role in the categorisation of vowels. However, we can simplify this complexity by taking some decisions as to what features of the pronunciation are crucial, and hence can be said to belong to the phoneme, and which are less crucial. Different accounts tend to do this in different ways, and we shall do no more than illustrate the issues that arise here. Consider the pairs of vowels [iː uː] and [ɪ ʊ]. Members of the first pair are *longer* than members of the second pair, but there is also a difference in *quality*: [iː uː] are *tense* vowels, whereas [ɪ ʊ] are *lax* (see p. 38). Furthermore, the distinction between the pairs is crucial, since we have such minimal pairs as *beat*/*bit* and *pool*/*pull*. We will assume that vowel length is the important factor in these distinctions. Thus, we can say that [iː uː] are the long vowels corresponding to [ɪ ʊ]. This means that the more lax pronunciation of the short vowels [ɪ ʊ] is secondary to the length distinction. In a broad, phonemic transcription we could thus use just one symbol for each, say /i u/, with an additional indication of length. Thus, the long phoneme /iː/ would be pronounced [iː] and the short phoneme /i/ would be pronounced [ɪ], and similarly for /uː/ (pronounced as [uː]) and /u/ (pronounced as [ʊ]). Likewise, we might want to say that [a ɒ] are short equivalents of [ɑː ɔː]. There is some controversy as to whether this gives a satisfactory answer for English, however (for reasons which go well beyond the scope of an introduction such as this). In addition, it is helpful to get used to the more accurate narrow transcriptional system for vowel sounds, since vowels differ so much from one variety to another. Therefore, we will continue to make more distinctions than may be strictly necessary.

We can now recast our original question as 'How many phonemes are there in English?', and we get the answer given in table 12, where in some cases we

Table 12 The English phoneme inventory

Consonants

	labials		coronals					
	bilabial	labio-dental	inter-dental	alveolar	palato-alveolar	palatal	dorsals velar	gutturals glottal
Plosives	p b			t d	ʧ ʤ		k g	
Fricatives		f v	θ ð	s z	ʃ ʒ			h
Nasals	m			n			ŋ	
Approximants	w			l ɹ		j		

Vowels

Short:				
	ɪ			ʊ
		ɛ	ə	ʌ
			a	ɒ
Long:				
	iː			uː
		ɛ:	əː	ɔː
				ɑː
Diphthongs	eɪ aɪ aʊ ɔɪ ou ɪə ʊə			

(Note that the term *gutturals* is used to refer to the class of uvular, pharyngeal and glottal consonants. English has only /h/ in this class.)

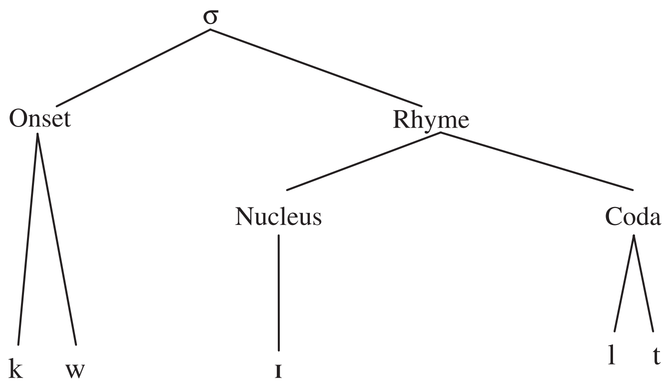
continue to use distinct symbols for the long and short vowels in acknowledgement of the uncertainty to which we have just alluded. This is our first experience of the importance of distinct **levels of analysis** in linguistics, an extremely important notion. In the current context, we have a relatively concrete level, more closely linked to *physical* sound and a more abstract level, related to the organisation of *patterns* of sounds in the grammar of the language (and ultimately in the minds of speakers). Specifically, what we can suggest is that the phonological representation, which appears in the lexicon as part of the lexical entry for a word, is a *phonemic* and not a *phonetic* representation. The manner in which a phonemic representation is converted to a phonetic representation is part of the PF-component of the grammar (see the Introduction, p. 5) and we shall be saying more about this presently (***exercise 1***).

Syllables

When the Japanese borrowed the monosyllabic sporting term *sprint*, it came out as *supurinto* with four syllables. When an English speaker tries to pronounce the Russian name *Mstislav* (two syllables in Russian!), it generally acquires an extra initial syllable to become [əmstɪslav] or [mɪstɪslav]. Speakers of Cantonese Chinese tend to pronounce the words *walk*, *walks* and *walked* identically, as [wɔʔ]. Why is this? The answer is that different languages permit different kinds of syllables, and native speakers of languages bring their knowledge of syllables and syllable structure to their attempts to produce words from other languages. To see what kinds of syllables we find, we need to look at syllable structure more carefully.

Words like *bat*, *cat*, *rat*, *flat*, *spat* and *sprat* are said to rhyme. This is because they have identical pronunciations after the first consonant or consonant cluster. We can divide a syllable therefore into two halves, the **rhyme** (or **rime**) and the **onset**. We have already referred (p. 41) to the vowel in the middle of the syllable as the **nucleus** (or **peak**). The consonant or consonant cluster after the nucleus will be called the **coda**. These terms are illustrated in (53) for the word *quilt*:

(53)



The symbol σ (= Greek letter 'sigma') is often used to represent a syllable.

The order of the consonants in the onset and the coda is interesting here, because some consonant orders yield impossible words. Thus, compare the consonant clusters at the beginnings and ends of the 'words' in (54) and (55). In each case, the illicit sequence (marked with *) is intended to be pronounced as a single syllable:

(54)	nelp	*/nɛpl/
	lump	*/lʌpm/
	hard	*/hadr/
(55)	play	*/lpeɪ/
	pray	*/rpeɪ/
	quick	*/wkɪk/
	cue	*/jkuː/

Returning to (53), a form such as *quilt* /kwɪlt/ is fine but */wkɪtl/ is an impossible form in English. There is a systematic reason for this. We distinguished in section 2 between obstruents (plosives, affricates and fricatives) and sonorants (nasals and approximants). The reason /wkɪtl/ makes a bad syllable perhaps has something to do with the fact that we have a sequence of sonorant (/w/) + obstruent (/k/) in the onset and of obstruent (/t/) + sonorant (/l/) in the coda. The reverse order in each position is, of course, well formed. Why might this be the case? The answer to this question requires us to recognise that *sonority* is not an all-or-nothing property. Thus, while the notion was introduced in section 2 in connection with consonants, it is easy to see that a vowel is more sonorant than any consonant. We can give the following approximate values of the *degree of sonority* of different classes of sound, starting with the least sonorant: plosives – 1, fricatives – 2, nasals – 3, approximants – 4, vowels – 5. In a word such as *quilt* the sonority of each sound gradually rises to a peak at the nucleus and then falls at the coda, as shown in (56):

(56)	5			*		
	4		*		*	
	3					
	2					
	1	*				*
		k	w	ɪ	l	t

However, if we look at the sonority profile we obtain from the non-syllable */wkɪtl/, we get the shape shown in (57):

(57)	5			*		
	4	*				*
	3					
	2					
	1		*		*	
		w	k	ɪ	t	l

This has three separate peaks, and we would normally expect this pattern to yield three syllables.

This type of sonority profile helps explain why certain types of consonant cluster are impossible in onsets or codas. Such restrictions on sound combinations are called **phonotactic constraints**. The notion of the syllable (and its constituents, onset and coda) helps us explain why the sequence *-lp* is possible in *help* but not at the beginning of a word, and why, conversely, the sequence *br-* is fine in *brush* but not at the end of a word: given the **Sonority Principle** (that the sonority profile of a legitimate syllable must rise continuously to a peak and fall continuously after that peak); *-lp* is a possible coda, but not a possible onset, while *br-* is a possible onset but not a possible coda.

Other phonotactic constraints are more subtle. Thus, in English we cannot have an onset consisting of a plosive + a nasal. Hence, *kn-*, *pn-*, *gm-* and so on are excluded. However, plosives are less sonorous than nasals, so we might expect these clusters to be possible, as they are in many languages (check this by sketching a sonority profile for a word like *bnick* /bnɪk/ in the way we did for *quilt*). The grammar of English, it seems, regards the sonority of a nasal as being *too similar* to that of a plosive, however, and so excludes these as possible onsets. The only sounds that combine happily with obstruents to form an onset cluster are the approximants /l r w j/. On the other hand, the reverse order of nasal + plosive is perfectly good as a coda (e.g. *imp*, *ink*).

That the Sonority Principle, refined as outlined above, is part of the grammar of native speakers of English provides us with a ready interpretation of the fact that such speakers can clearly distinguish the non-occurring *blick*, on the one hand, from *bnick* and *nbick*, on the other; the form /blɪk/ is consistent with the Sonority Principle as it applies to English, and so is a *possible*, though non-occurring, form. Put differently, it is an *accident* that *blick* is not in the English lexicon, whereas the absence of *bnick* and *nbick* is determined by the grammar.

Normally, only two consonants are allowed in an onset. However, the phoneme /s/ behaves in an unusual fashion. It can combine with almost any onset to form a cluster of up to three consonants. Thus, we get *spl-*, *str-*, *skw-* and so on. We don't find **sbr-*, **sdw-* or **sgl-*, however, because there is a mismatch between the voicelessness of the first segment and the voiced second segment in these cases. As a result, we can have only an unvoiced obstruent immediately after /s/. However, we can have a voiced sonorant, i.e. nasal or approximant, in this position: *sn-*, *sm-*, *sl-*, *sj-*, *sw-*.

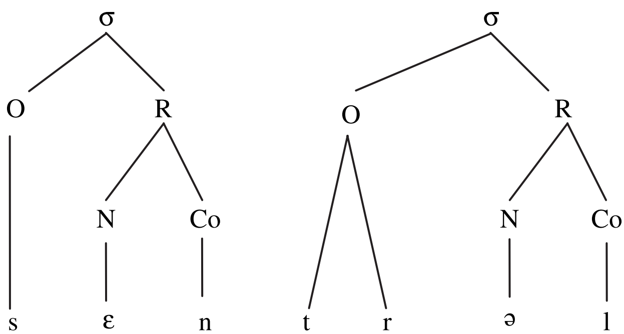
As we might imagine, the difficulty that Japanese or Cantonese speakers have with some types of English word is attributable to the phonotactic principles operating in their native grammars. Japanese disallows almost any type of cluster, especially in an onset, and so a Japanese speaker speaking English resorts to the same strategy as an English speaker confronted with Russian – the insertion of additional syllables. In Cantonese only nasals and the glottal stop are possible codas. Therefore, it is impossible to distinguish codas such as *-k*, *-ks* and *-kt* (***exercise 2***).

Syllabification and the Maximal Onset Principle

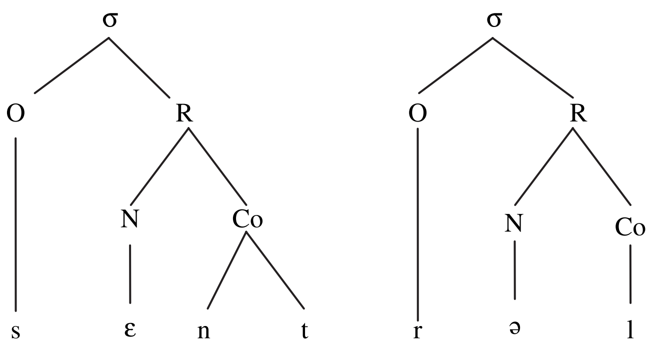
So far we've considered only words of one syllable. When we break a polysyllabic word such as *central* /sɛntrəl/ into syllables, we have a problem with the consonant cluster *-ntr-*. We can't split it as *sɛ . ntrəl* or *sɛntr . əl* because **ntrəl* and **sɛntr* are not permissible syllables in English. However, do we split it as *sɛnt . rəl* or *sɛn . trəl*? Either solution would provide two possible syllables in English.

A clue as to how to answer this question comes from looking at the syllable structures found in the languages of the world. In many languages, codas are highly restricted or even impossible (as in Hawaiian). In many other languages, all syllables must have an onset. This is true, for instance, of the Yawelmani dialect of the Yokuts language of California; and in languages such as German, Czech or Arabic, while it might appear that we can have words beginning with vowels, in fact these are always pronounced with an initial glottal stop. Thus, all syllables in these languages have an onset. Finally, in the Senufo language of Guinea, all syllables consist of exactly an onset and a vowel: onsets are obligatory and codas are excluded. All this demonstrates that onsets have priority over codas cross-linguistically. For this reason, we will assume that where there is indeterminacy, we make sure that a consonant is placed in an onset rather than a coda. In fact, there is evidence from the structure of English syllables that this is the correct solution to the syllabification problem we are considering. Thus, in the dialect of the authors, the 't' at the end of a syllable can be glottalised, so that a phrase such as *mint rock* can be pronounced [mɪnʔrɒk]. This glottalisation is impossible if the 't' comes at the beginning of the syllable. For instance, the 't' of *man trap* can't be glottalised. Now, in this dialect, the 't' of *central* can't be glottalised (i.e. *central* cannot be pronounced [sɛnʔrəl] by the authors), showing that it must be in the onset position. This means that *central* should be syllabified as in (58) rather than as in (59) (where O is onset, R is rhyme, N is nucleus and Co is coda):

(58)



(59)



We can ensure that we get this result by appealing to the **Maximal Onset Principle**. This simply states that when there is a choice as to where to place a consonant, we put it into the onset rather than the coda (***exercises 3*** and ***4***).

Phonological processes

When we combine words with affixes and other words to form larger words and phrases, we often find that the phonemes of the word taken in isolation undergo changes due to the influence of surrounding phonemes (see the example of *Japan* and *Japanese* in section 1). One such set of changes is illustrated in (60) (transcribing standard British pronunciation):

(60) a. *photograph* [fóutəgrɑ̀ːf]
b. *photography* [fətɒ́grəfɪ̀]
c. *photographic* [fòutəgráfɪk]

When we look at the transcriptions (or listen carefully to the pronunciations) of the words in (60), we find that there is a complex *alternation* between the vowels /ou ɑː ɒ a/ on the one hand and schwa /ə/ on the other, though, of course, this is obscured by the orthographic representations (spelling). What is happening is easy to see when we consider the stress patterns. When a syllable has either main or secondary stress, then we get one of /ou ɑː ɒ a/, but when it receives no stress, then we have /ə/ instead.

The pattern illustrated in (60) is a very regular one which speakers of English will readily impose on new words, words borrowed from other languages and so on. Moreover, speakers do this unconsciously. However, it doesn't happen in all languages. Indeed, many languages do not even have the schwa vowel. English speakers, when learning languages such as Spanish, Polish, Navajo or any of the large number of languages which don't show this pattern, tend to impose it anyway, and have to learn to suppress it in order to acquire a good accent in those languages. All this means that the distribution of schwa and the other vowels is governed by a **phonological rule**, part of the grammar of someone who has acquired English as a native language.

A simple way to represent such a rule is as a **phonological process**, in which one sound is changed into another sound under certain circumstances. For our example, there are two straightforward possibilities (we'll ignore the unstraightforward ones!). We could say that /ou/, /ɑː/, /ɒ/, /a/ get turned into /ə/ when they have no stress at all, or we could say that /ə/ gets turned into /ou/, /ɑː/, /ɒ/, or /a/ when it bears some degree of stress. We represent the process by means of an arrow, and the two possibilities appear in (61) and (62):

(61) /ou ɑː ɒ a/ (when unstressed) → [ə]

(62) /ə/ (when stressed) → [ou ɑː ɒ a]

Which of these is correct? It is easy to see that (62) at best offers an incomplete account of the phenomena. If we start out with /ə/ as in (62), then we have to replace it with one of four vowels, *but we don't know which*, and we would need an additional rule or rules to deal with this. However, if we start out with /ou/, /ɒ/, /ɑː/ or /a/ as in (61), then we replace any of these with [ə] just provided they are unstressed, and there is nothing more to say. Adopting this second option, then, we can say that the words *photograph*, *photography* and *photographic* have a basic or **underlying form** (also called an **underlying representation** or **UR**), shown in (63):

(63) a. *photograph* /fóutɒgrɑ̀ːf/
b. *photography* /foutɒ́grɑːfɪ̀/
c. *photographic* /fòutɒgráfɪk/

Rule (61) will now apply to derive the representations in (60). These representations, which show the way the word is actually pronounced, are called **surface forms** or **surface representations** (**SR**s).

It is interesting to consider the analysis we have proposed above in the light of the orthographic representations of our three words. Given that the 'o' can represent the two sounds /ou/ and /ɒ/ (and given that 'ph' can represent /f/), we see that the spelling is closer to the UR than to the SR. This is quite common in English and other languages with a long history of literacy. In earlier forms of the language, there would have been no vowel reduction (or at least much less) and all the vowels now pronounced as schwas would have been pronounced as full vowels. Then, the language changed, and unstressed vowels started getting reduced. However, writing systems are generally very conservative and often don't respond to such changes. Therefore, the spelling system of English often fairly closely represents the pronunciations of about 500 years ago (coinciding with the introduction of printing into England by Caxton).

An important point to be clear about here is that rule (61) works *in conjunction with* the underlying representations that we have proposed for the word *photograph*, etc. If we didn't get the right URs, then we wouldn't be able to figure out the right rule. This means that when writing phonological rules (i.e. when writing the PF-component of a grammar), there is no simple way of computing the correct forms and the correct rules. The procedure we must follow is one of formulating a hypothesis about what the forms might be, trying to construct a set of rules which will give us the appropriate surface representations and then modifying the URs if necessary in order to obtain the correct rule system. This means that grammar writing (and the whole of linguistics) is a *hypothesis-testing activity*: we set up a hypothesis, test that hypothesis against whatever data we have collected and then, if necessary, modify the hypothesis and retest it.

The phonological process we have just been discussing is called **vowel reduction**, and it is very common in the world's languages. The term derives from the intuition that the schwa vowel is not really a 'proper' vowel. In most dialects of English there is some justification for this, in that a short schwa can never be found in a stressed position. More generally, however, schwa can behave like a fully fledged vowel in other languages, and can be stressed (e.g. in Bulgarian).

Vowel reduction is not found universally, so that in each language in which it is found it must be stated as a rule, and children acquiring the language must figure out whether their language does or doesn't have it. We have represented what must be learned as a phonological process in which one sound in the underlying representation is transformed into another. The operation of this process is illustrated in (64):

(64)	//foutɒ́grɑːfì//	UR
	↓ ↓	vowel reduction
	ə ə	
	[fətɒ́grəfì]	SR

Here, we have put the UR between double slashes //…// to distinguish it from a broad IPA transcription between single slashes /…/. However, you will often see URs between single slashes, too, and we ourselves adopted this convention in (63).

In (64) we have a simple example of a phonological **derivation**. We say that the SR is **derived** from the UR by the rule of vowel reduction. In a full grammar, a good many rules might apply to one UR to derive the final form. In section 6, we shall apply this type of analysis to children's speech, and exercise 2 in that section shows that where there are several rules applying to one form, we may need to apply them in a set order. Later in this section, we will see other examples of phonological processes. Next, however, we need to look more carefully at the internal structure of individual speech sounds (***exercises 6*** and *7*).

Phonological features

As we have seen, the IPA system for describing speech sounds divides them up into classes on the basis of a number of properties (place of articulation for consonants, frontness/backness for vowels, etc.). One of these properties is voicing, which serves a particularly important function in distinguishing English obstruents. The voiced sounds /b d g v ð z ʒ ʤ/ are paired with the voiceless sounds /p t k f θ s ʃ ʧ/ on this basis. Where we have classes of this sort in linguistics, we often describe the situation by means of **features**. The crucial feature here is that of voicing and the sounds in question are either voiced or not voiced. For classes of this sort that split into two groups, we need a **binary feature**, which has one of two **values** or **specifications** denoted by '+' and '−'. The feature name itself is written inside square brackets: [voiced]. Voiced sounds are therefore marked [+voiced], while unvoiced sounds are marked [−voiced]. Sometimes, when we wish to name a binary feature such as this, we refer to it as [±voiced] (the symbol '±' is read 'plus or minus') to emphasise that we are speaking about a binary feature.

Voicing is a **distinctive feature** for English obstruents, in that it serves to distinguish one phoneme from another. Sonorants (including vowels) are also voiced sounds, but they don't have any voiceless counterparts in English. This means that sounds such as /l w n ɹ ou/ are all [+voiced]. However, once we know that these sounds are sonorants, we also know they are voiced. Hence, the feature [voiced] is **redundant** for these sounds. When a feature is redundant for a group of sounds in a given language, then by definition it can't form the basis for a phonemic contrast.

We can continue to divide up the sounds of English using such features. The features most commonly used correspond roughly, but not exactly, to the classification in the IPA. Thus, nasals have the specification [+nasal] and all other sounds are [− nasal]. Other binary features are given in appendix 2 at the end of the book (pp. 412f.). One feature appearing there is worth further comment: [continuant]. The continuant sounds are those in which air can pass through the oral tract (i.e. the mouth). This includes the fricatives, the approximants and the vowels. These sounds are all [+continuant]. However, in nasals and plosives the air is prevented from escaping through the mouth; in the case of plosives it is bottled up until the plosive is released, and in the case of nasals it escapes through the nose. These sounds are collectively called **stops** and they bear the specification [−continuant]. Affricates are an intriguing case, because in their articulation they start out as plosives and then turn into fricatives. A convenient way of notating this is to use both specifications for [continuant] and to label them [−/+continuant]. It is important not to confuse the notations [±continuant] and [−/+continuant]: [±continuant] is the *name of the feature*, with an informal indication that the feature has one of two values '+' or '−' (usually!); [−/+continuant] is a special type of *feature value* for an affricate indicating that the sound, in a sense, has both specifications, one after the other.

For place of articulation, the picture in contemporary phonology is a little different. Consonants can't be assigned to pairs of classes; rather, a sound is labial, or coronal, or dorsal, or guttural (cf. table 12). This means that we need to distinguish a feature of Place of Articulation (or [PLACE]) and give it *four* values: [PLACE: Labial], [PLACE: Coronal], [PLACE: Dorsal], [PLACE: Guttural]. Since the names 'Labial', 'Coronal' etc. unambiguously refer to Place features, we often omit specific reference to PLACE. However, we must bear in mind that when we see a sound marked [Labial], this is really a shorthand for [PLACE: Labial].

By using features in this fashion, we can represent all the consonants of English in a distinctive way. For instance, on the basis of what we have considered so far, both /s/ and /ʃ/ are characterised as [−voiced], [−nasal], [+continuant] and [PLACE: Coronal]. However, the feature system in appendix 2 enables us to distinguish /s/from /ʃ/ by appealing to the fact that /s/ is made slightly more forward (more **anterior**) in the mouth than is /ʃ/, that is /s/ is [+anterior], whereas /ʃ/ is [−anterior]; more generally, alveolar and dental sounds are [+anterior], while palato-alveolar, palatal and strongly retroflexed sounds are [−anterior].

The feature values for an inventory of sounds are usually represented as a **feature matrix**. We have given such a matrix for the English consonants as appendix 3 (p. 414) (***exercises 5*** and ***6***).

Features and processes

Our discussion so far has got us to the point where each of the segments in an underlying representation consists of a set of features with appropriate values, and we have also seen that we need to specify how URs are converted to SRs. In (64), we regarded this latter as the replacement of a phoneme by a different segment (various stressed vowels were replaced by [ə]), but if we now have a sequence of sets of features rather than phonemes in URs, we must ask how phonological processes can be formulated. We shall do this by discussing aspiration in English voiceless plosives.

We saw earlier that the sounds /p t k/ have two pronunciations. In words like *par*, *tar*, *car* they are aspirated, while in *spar*, *star*, *scar* they are unaspirated. However, we also know that there are no pairs of phonemes in English distinguished solely by aspiration, i.e. aspiration is not distinctive in English. How are we to represent the difference between unaspirated and aspirated sounds? The simplest way is to appeal to another feature, which we can call [aspirated]. Even though this feature is not a distinctive feature in English, it is necessary to assume such a feature in Universal Grammar (UG). This is because, aspiration *is* a distinctive feature in some languages (e.g. Bengali, see (51), p. 76). However, it is also important in describing the phonetic form (PF) of English words.

The pattern of aspiration of /p t k/ is part of the phonological system of Standard English. This implies that there is a phonological rule which governs the distribution of aspiration. We will present a simplified version of this rule to illustrate how features can be used in formulating rules. We want to account for two things: firstly, the fact that it is precisely the voiceless plosives which have aspirated allophones; and secondly, the fact that the unaspirated allophone is found after *s*- ([sp⁼ɪt]) and the aspirated one is found at the beginning of a word ([p^{h}ɪt]) – in what follows, in the interests of simplicity, we shall assume that aspiration occurs in other contexts too.

The way we will proceed is to assume (adopt the hypothesis) that the underlying representations for words like *pit* and *spit* do *not* specify whether the plosive is aspirated or not. After all, we don't need this information in order to distinguish the two types of word, since aspiration is not a distinctive feature in English. Put differently, aspiration is a completely redundant feature because its distribution can always be predicted, unlike voicing, which serves to distinguish words like *pit* and *bit*. The way we indicate that a feature is redundant is to give it the specification '0': [0aspirated]. We often say that such a sound is **underspecified** for the feature (for the use of a similar notion of underspecification in connection with children's syntax, see section 24, p. 361). However, we can't pronounce an underspecified sound (because we won't know whether to aspirate the sound or not), so ultimately we will need a rule which will specify various occurrences of /p t k/ as [+aspirated] or [−aspirated]. The idea that some features are specified in underlying representations while other features are underspecified is very important because this is the main way of formalising the idea that some feature specifications are contrastive in the language.

The aspiration rule is stated informally (i.e. in ordinary prose) in (65):

(65) a. In /p t k/, [0aspirated] is given the specification [−aspirated] after *s*-.
b. In /p t k/, [0aspirated] is given the specification [+aspirated] in other positions.

'Specification' is a process which we can symbolise using an arrow → (as we did in the case of vowel reduction). The notion 'in a given position' is symbolised by a slash which represents the **environment** or **context** in which the process occurs. Incorporating these two pieces of notation into (65) gives us (66):

(66) a. In /p t k/, [0aspirated] → [−aspirated] /*s*___
b. In /p t k/, [0aspirated] → [+aspirated] / other positions.

The part of the rule in (66a) says that the phonemes /p t k/ are realised as the unaspirated allophones immediately after /s/, and (66b) says that they are realised as the aspirated allophones elsewhere. The line ___ in (66a) is called the **focus bar**. If the plosives had been aspirated whenever they preceded *s* (in the clusters *-ps, -ts, -ks*), then the focus bar would have come to the left of the *s* in the statement of the appropriate rule. Recalling that we can use the IPA diacritic '$^{=}$' to indicate that a sound is unaspirated, we can say that the two rules in (66) are interpreted as in (67):

(67) The phonemes /p t k/ are realised (pronounced) as
a. the allophones [$p^{=}$ $t^{=}$ $k^{=}$] after *s*
b. the allophones [p^h t^h k^h] elsewhere

Now, we can improve on the formulation in (66) in an important way by making use of distinctive features. Notice that the aspiration affects a specific group of sounds, the voiceless plosives. It isn't an accident that aspiration affects these sounds and not others. For instance, the English aspiration process is a natural process, of a kind we might expect to see in other languages. But we can imagine dozens of other entirely unnatural processes affecting different hypothetical groupings of consonants, such as /p l n/ or /v g s/. However, it is only well-defined groups such as 'voiceless plosives' that undergo phonological processes. Such well-defined groups are called **natural classes**, and one of the most important functions of distinctive features is that they present us with a means of distinguishing natural from unnatural classes.

The set /p t k/ is *exactly* that set of sounds which simultaneously bear the specifications [−voiced, −continuant]. All the other [−continuant] sounds (i.e. stops such as /b/ or /n/) are voiced and all the other voiceless sounds are either continuants (the voiceless fricatives) or affricates (and hence [−/+continuant]). On the other hand, a non-natural class such as /p l n/ can't be represented in such simple terms. Thus, /p l n/ are all consonants, hence, [+consonantal] (see appendix 2 for this feature), but the [+consonantal] class includes all the other consonants too. The feature [−voiced] doesn't apply to the whole set because /l n/ are voiced, but neither does [+voiced] because /p/ is [−voiced]. If you check against the feature matrix in appendix 3, you will see that there are no other features which members of this class have in common. This means that a characterisation of this set in terms of features will be very cumbersome and will have to take the form of (68):

(68) Feature characterisation of /p l n/:

[−voiced, −continuant, Labial] (/p/)

OR

[+lateral] (/l/)

OR

[+nasal, Coronal] (/n/)

This crucially involves the use of the word ‘or’, which means that we have to resort to effectively *listing* the separate phonemes of the set. The set /p l n/ is thus like a set {milk, elephant, violin}: apart from the fact that the members of this latter are all physical objects, they have nothing in common. However, the set /p t k/ is more like the set {violin, viola, cello}, which is a natural grouping characterisable as ‘set of instruments used in forming a string quartet’.

It might be objected that we’ve weighted the scales by selecting an obviously unnatural grouping like /p l n/. But the same will be true of, say, /p t g/, which is at least a set of plosives, with only one member different from our natural class. This, too, however, can’t be described using features without resort to ‘or’, but this time it’s simply because /g/ is [+voiced], while the other two sounds are [−voiced]. Thus, a small change (in this case of one feature specification for one sound) can make all the difference between a natural class and a non-natural class. In a language like English, we wouldn’t expect /p t g/ to be involved in a phonological process to the exclusion of, say, /b d k/. Neither of these is itself a natural class, but /p b t d k g/ is, being *exactly* characterised as [−continuant, −nasal].

To return to aspiration, using the distinctive feature notation, we can rewrite (66) as (69), where we have abbreviated the names of the features in standard ways:

(69) a. [−voiced, −cont, 0asp] → [−voiced, −cont, −asp] /*s*___
b. [−voiced, −cont, 0asp] → [−voiced, −cont, +asp] /other positions

In practice, these rules can be further simplified by virtue of a notational convention which says that we don’t need to mention feature specifications on the right-hand side of the arrow if they don’t undergo a change via application of the rule. This means that we don’t need to mention [–voiced, –cont]. Thus, we have (70):

(70) a. [−voiced, −cont, 0asp] → [−asp] /*s*___
b. [−voiced, −cont, 0asp] → [+asp] /other positions.

Finally, we now employ a further notational convention which allows us to collapse the left-hand sides of the two subparts of (70). There are only two possible values for the feature [aspirated], so there are two subrules telling us how a voiceless plosive is pronounced, as shown in (71):

$$\text{(71)}\quad \begin{array}{l} \text{a.} \\ \text{b.} \end{array} \quad [-\text{voiced}, -\text{cont}, 0\text{asp}] \rightarrow \left\{ \begin{array}{l} [-\text{asp}]\ /s\_\_\_ \\ [+\text{asp}] \end{array} \right\}$$

These two subrules are interpreted as follows: when we encounter a voiceless plosive which has no specification for [aspiration], we first look to see if it is preceded by /s/. If it is, then it is marked [−asp]. Under any other circumstances, it is marked [+asp]. This means that we *must* apply subrule (71a) before subrule (71b), because if (71b) applied first, it would incorrectly aspirate the voiceless plosive in a word like *spit*. However, there is a very important principle in linguistics which means that we don’t have to stipulate that (71b) follows (71a). This is known as the **Elsewhere Condition**, and it states that where two rules could apply to the same input and produce different outputs, then the rule which applies in the *more specific* set of contexts applies first, thereby preventing application of the second rule. In the present case, (71a) applies only when the plosive is preceded by /s/, whereas (71b) is written to apply anywhere. Thus, (71a) is obviously the more specific rule and will apply in preference to (71b) wherever its conditions are met. Subrule (71b) is called the 'Elsewhere case', or more generally the **default** case. It states that the default specification of [aspiration] for voiceless plosives is [+aspiration] so that a voiceless plosive will be aspirated by default (i.e. other things being equal). The Elsewhere Condition with its associated notion of a default is an important component of UG, and its consequence in this case is that a child acquiring English does not have to learn that (71a) must be applied before (71b) (***exercises 7*** and ***8***).

Constraints in phonology

We have characterised phonological alternations in terms of a basic (sometimes rather abstract) underlying form which undergoes various operations or processes to emerge as a surface form. This way of thinking about phonology has been very influential (and continues to be), but it's not the only way to think of the organisation of a language's sound system. Over the past decade, phonologists have developed an approach to phonology based on the idea that phonological representations have to respect a certain set of constraints. For instance, instead of a process which deaspirates an underlying voiceless plosive after /s/, we could propose two **constraints**. The first would say 'voiceless plosives are always aspirated' (we can call this AspPlos), while the second would say 'no sound is ever aspirated immediately after /s/' (we can call this NoAsp(s)).

As they are stated, our two constraints clearly conflict with each other: when applied to a sequence such as /sp/, the constraint AspPlos would require the output /sp^h/, while the constraint NoAsp(s) would require the output /sp/. In an approach to phonology known as Optimality Theory, this kind of conflict is resolved by allowing one of the conflicting constraints to *outrank* or override the other. In English, the constraint NoAsp(s) wins out over AspPlos, and we can impose the ranking NoAsp(s) << AspPlos. On the other hand, in French, say, there are no aspirated sounds. We can therefore assume that there is another constraint, NoAsp, which says 'never aspirate a sound'. This is a more general case of NoAsp(s). For French, therefore, we would assume that NoAsp wins out over AspPlos.

In Optimality Theory, we assume that all phonological patterning is the result of ranked constraints. Moreover, we assume that all the constraints are available to all languages. For instance, in French we would assume that the constraint AspPlos is valid, even though its effects will never be visible because of the

Input /pin/

Candidates	Other constraints	NoAsp(s)	AspPlos	NoAsp
p$^{=}$in			*	
☞p^{h}in				*
sp$^{=}$in	*		*	
sp^{h}in	*	*		*
in	*			
dog	***			

Figure 28 *An Optimality Theory tableau for the input /pin/ in English*

precedence given to NoAsp in that language. When we wish to account for the pronunciation of a particular form, we assume that, in principle, *any* possible change can take place, but that, in fact, the ranking of constraints operative in the language ensures that only one output is permitted. This is the output that satisfies the set of constraints *better than any other*. This is the *optimal* candidate (hence the term 'Optimality Theory'). An example for English, where the input is /pin/, appears in figure 28 (such figures are referred to as *tableaux*).

Consider first the 'wild' outputs /in/ and /dog/ (there are, of course, any number of these, but the considerations raised here apply to all of them). Amongst the highly ranked constraints are so-called 'Faithfulness constraints' (in figure 28, these would fall under other constraints), which essentially say 'don't add or remove sounds gratuitously'. With /in/ we have gratuitously removed the first consonant, while with /dog/ we've gratuitously changed all the sounds to something else. Therefore, /in/ and /dog/ obviously violate such constraints to differing degrees, and such violations are marked by an asterisk in the appropriate column in a tableau. The candidates /sp$^{=}$in/ and /sp^{h}in/, while perhaps slightly less bizarre, involve the gratuitous addition of /s/, so they also violate the Faithfulness constraints that we are assuming are highly ranked in all languages. So, we see that each of these candidates has one or more asterisks in the column corresponding to the highly ranked Faithfulness constraints.

The interesting cases are the candidates /p$^{=}$in/ and /p^{h}in/, neither of which violates Faithfulness. However, both of them do violate one constraint, but we are supposing that in English AspPlos outranks NoAsp. Thus, /p$^{=}$in/ is less optimal than /p^{h}in/ as it violates a more highly ranked constraint. In a complete tableau, the best (optimal) candidate is the one that violates the least highly ranked constraint (if any), and so /p^{h}in/ emerges as the successful candidate (as shown by the pointing finger in the tableau) (***exercise 9***).

Exercises

1. The sounds [ç h s] are in complementary distribution in native words in the Olsk dialect of Even, a Tungusic language spoken in Yakutia, Siberia. By examining the following Even words, decide what governs this distribution ([ie] and [iæ] are diphthongs consisting of [i] + [e]/[æ])

bead	nɪsɑ	*blows*	huːn	*bottom*	hɛr	*cave*	hor
foundation	hat	*his skill*	hɔːn	*hot*	hoːksi	*knife*	çɪrqan
knows	hɑːn	*pocket*	çiep	*poplar*	hʊl	*rotted*	çiævʊs
sad	bʊlʊs	*sole*	hɛssə	*soup*	çilʲ	*Soviet*	hɔvʲɛːt
spectacles	bʊsqʲɪ	*star*	ɔsɪqam	*vein*	hula	*weapon*	us

2. List all the theoretically possible combinations of two consonants in English, then investigate how many of these could be onsets. Which of the impossible combinations can be explained in terms of their sonority profile?

3. Recall that the symbol ⁼ means an unaspirated consonant and the symbol ʰ means aspiration. Show how the pattern of data below can be explained by the Maximal Onset Principle. Assume that separate words are syllabified separately. (Note that it will be necessary for you to generalise the text discussion of aspiration so as to take account of the position of plosives in *syllables*.)

   (a) i. *stub* [st⁼ʌb]
   ii. *this tub* [ðɪs tʰʌb]
   iii. *disturb* [dɪst⁼əːb]

   (b) i. *spare* [sp⁼ɛː]
   ii. *this pear* [ðɪs pʰɛː]
   iii. *despair* [dɪsp⁼ɛː]

   (c) i. *scar* [sk⁼ɑː]
   ii. *this car* [ðɪs kʰɑː]
   iii. *discard* [dɪsk⁼ɑːd]

4. Break the following words into syllables, and, applying the Maximal Onset Principle, identify the onsets, nuclei and codas by providing a diagram such as that in (58). Some of these words may have more than one acceptable pronunciation, usually depending on rate of speech, so there may be more than one correct answer for a given item.
   (a) *comfortable*; (b) *confessional*; (c) *secretary*; (d) *cooperative*; (e) *existentialism*.

5. In General American English, *photograph*, *photography* would be pronounced [ˈfouɾəˌgræːf], [fəˈtɑgɹəˌfiː] where [ɾ] represents the ‘flap’ or

'tap'. Here we see that the sound written 't' represents two sounds [t ɾ]. Assume that one of the two is the basic, underlying form. Then, using the data below, formulate a rule which will account for the distribution of these two sounds. Justify your choice of the underlying form for [t ɾ].

sit	[sɪ́t]
sitting	[sɪ́ɾɪŋ]
sitter	[sɪ́ɾɚ]
satire	[sǽtaɪ̀ɹ]
satirical	[sətɪ́ɹɪkl̩]
tone	[toún]
atone	[ətoún]
teatime	[tíːtaɪ̀m]

6. We can describe vowels using distinctive features, too. Here is one common way of doing this (you may find other systems of features in the research literature):

back	[+back]	front	[−back]
low	[+low]	mid or high	[−low]
high	[+high]	mid or low	[−high]
rounded	[+round]	unrounded	[−round]

Notice that in this system a mid vowel is defined as one which is neither high (i.e. it is [−high]) nor low (i.e. it is [−low]). This allows us to characterise a reasonably large set of vowels using the feature matrix in table 13 (this is essentially the vowel system of Finnish),

Enumerate all the vowels from those in table 13 which have the following feature characterisations:

(a) [−high, +round]
(b) [−low, +round]
(c) [+high, −back, +round]
(d) [−low, −back, +round]
(e) [+back, –low, –round]

Table 13 *A distinctive feature matrix for some common vowels*

	i	y	e	ø	a	ɑ	o	u
high	+	+	−	−	−	−	−	+
back	−	−	−	−	−	+	+	+
low	−	−	−	−	+	+	−	−
round	−	+	−	+	−	−	+	+

(Hint: the last example is a trick question!)

Model answer for (6a)

In order to determine this class, we simply examine table 13, seeking vowels that have a − in the row labelled high and a plus in the row labelled round. There are several vowels that are [−high], but of these, only two are also [+round]. These are [ø o]

7. A: Enumerate all the vowels in table 13 which have the following feature characterisations:
   (a) [+high, −round]
   (b) [−high, +back, −low, +round]
   (c) [+back, +low, +round]
   (d) [+high, −back, +low, −round]
   (e) [−back, −round]
   (f) [+back, −low]
   (g) [+back, +round]

   B. In certain cases there may be no vowels corresponding to the particular feature set. When is this an accident of the language and when is there a principled reason for it?

   C. The feature set given in table 13 fails to provide a description for the following types of vowel contrasts: tense v. lax, long v. short, nasal v. oral, central vs. front/back. What is the simplest way of enriching the feature system so as to be able to describe all these vowel types?

8. Using the vowel matrix in table 13, identify which of the following sets constitute natural classes and give a feature characterisation for those that are natural classes. Be careful to ensure that your feature characterisation includes all the vowels in the given set and, especially, that it excludes any sounds not in the set:
   (a) i e æ
   (b) ø o u
   (c) i y e ø
   (d) æ ɑ o u
   (e) i y e ø æ ɑ o

9. The following examples illustrate a common phonological process in English. Firstly, write as accurate a phonetic transcription of these phrases as you can. Try to transcribe the way they would be pronounced in ordinary casual conversation, rather than in carefully enunciated speech. Then, identify what the phonological process consists of and determine what conditions the change. (Pay particular attention to the end of the first word of each phrase. Not all the examples illustrate a change as such – some are included in order to help you figure out the basic form of the first word.)

in April
in May
in September
in November
in December
in Britain
in Paris
in Europe
in July
on course
on paper
on beta-blockers
on trust
on average
thin cakes
thin girls
thin boys
thin material
thin dress
thin excuse

10. (a) Produce a tableau which correctly identifies /sp⁼in/ as the only possible pronunciation of the word *spin* in English.
(b) In French, the words *sport* 'sport' and *port* 'port' are both pronounced with unaspirated /p/, namely as /sp⁼ɔʁ/, /p⁼ɔʁ/ respectively. Account for this by modifying figure 28 in the appropriate fashion.

6 Child phonology

One of the tasks facing a child learning his or her language is to figure out the sound system. This involves learning how to distinguish all the linguistically important differences, and also how to produce them. It's rather easier to record what small children say than to determine what they understand, so most systematic research has examined production. At the same time, it is widely believed that children's phonological perception runs ahead of their productive abilities, and this mismatch between perception and production will take on considerable significance as our discussion proceeds. Because most of the relevant research has been conducted on English-speaking children, we shall restrict ourselves to the acquisition of English.

Early achievements

It is remarkable that children seem to be innately disposed to perceive the sounds of language. In an ingenious series of experiments, Peter Eimas and his colleagues have shown that very young babies can hear the sorts of distinctions that are often used in languages and to which we have given some attention in the previous section. The techniques revolve around one idea: a baby quickly gets bored unless something different happens in its environment. Experimenters therefore play a series of identical sounds to a baby, say the syllable [pa]. At first the baby is interested and turns its head to the sound. As the sounds are repeated, it loses interest and stops turning its head. But when a slightly different sound, say [ba] or [p^{h}a], is presented, the baby notices this difference and turns its head to the sound. In other experiments, the baby's heart rate is measured, or the baby starts sucking on a dummy (pacifier). In each case, perceptual sensitivity to what are phonemic distinctions in many languages has been established for children as young as four days old.

Children are also innately disposed towards producing speech sounds. In the early months babies babble, that is, they produce a whole series of speech-like noises. These often contain a host of sounds which are not part of the language surrounding the baby. Moreover, it is clear that the child isn't learning to produce these sounds from the speaking population surrounding it. Babies born profoundly deaf also go through a normal period of babbling.

A little later, usually towards the end of the first year of life, a child will start to try to use sounds meaningfully. Often the child will apparently invent its own little 'language' at this stage. The British linguist Michael Halliday has described in detail how between the ages of nine and fifteen months his son Nigel used quite specific vocalisations in particular contexts with identifiable communicative intents. These vocalisations were not related in any obvious way to the adult language spoken around the child. However, this was quickly superseded by attempts to produce adult words. In the case of Nigel, this seems to have started very abruptly during the course of just one day, when a whole host of adult-like utterances were recorded. It's very hard to generalise about exactly when a child will start trying to produce the adult system, but a typical picture would be for the first words to appear any time between ten and fifteen months (if the child is learning more than one language, this onset may be later). Sometimes, there is a great deal of variation in the pronunciation of these early words, though on occasions the child may pronounce words very accurately. A famous case of the latter from the research literature is that of Hildegard Leopold, who was studied by her linguist father as she learnt English and German. Her first English word was *pretty*, pronounced more or less as in adult English.

Phonological processes in acquisition

After the child has acquired fifty or so words, a sudden change often takes place. Children simplify their pronunciations and at the same time start acquiring a great many new words extremely quickly. Words which may have been pronounced correctly at first suffer this simplification: Hildegard's *pretty* is again an appropriate illustration. During this period, her near adult form gave way to [pɪtɪ] and then [bɪdɪ]. By the age of about four or five, however, children have mastered all but the trickiest articulations in their language (such as English [θ]). What route children take towards this remarkably quick mastery and how they navigate their route are interesting questions.

As already noted, it appears that children generally *know more than they can say*. Thus, one little boy, Amahl Smith, whose development between the ages of two and four was studied by his father, at one stage pronounced both *mouth* and *mouse* as [maʊs]. However, in perception he didn't confuse the two words, as indicated by the fact that he reliably identified pictures of a mouth or a mouse when asked to do so by his father. In fact, Amahl provided more subtle *production* evidence for this claim: at an earlier stage, he couldn't pronounce [θ ð s z] and these came out as [t d]. Thus, he pronounced *mouth* and *mouse* as [maʊt]. At this stage, he was also learning how to pluralise nouns. Given his phonological system, a word like *cats* was pronounced as [kæt] – the plural /s/ became [t] and the resulting sequence [tt] in [kætt] was simplified to [t]. However, his plural for *mouse* was [maʊtɪd], not [maʊt]. This is understandable if we assume that he knew that *mouse* really ended in /s/ and not /t/ and that words ending in /s/ normally form their plural by the addition of [ɪz] (cf. *bus*/*buses*, *kiss*/*kisses*, etc.). Interestingly, this sort of example (which is far from unique) also shows that the child can't have been just imitating plural forms: the child will not have heard a form *mouses* to imitate. We shall return to this mismatch between perception and production below.

An influential theory about the way children learn articulation is based on the **generative theory of phonology** introduced in section 5. There we saw that phonologists relate underlying representations (URs) to surface representations (SRs) by means of phonological rules, which are a way of referring to phonological processes. We can use this idea to account for aspects of child phonology by assuming that the child perceives and stores the adult forms of words more or less correctly (the evidence cited in the previous paragraph is consistent with this in the case of Amahl), and then imposes a set of phonological rules to simplify those pronunciations. The forms actually pronounced by the child are therefore equivalent to surface representations. This is an appealing model because a good many of the distortions introduced into children's speech seem to be regular, and in many cases can be regarded as the consequence of phonological processes rather similar to those observed in adult languages (see below for illustration). As the child develops, the simplifying processes will be altered, to permit a greater variety of output forms, or lost altogether (so that the child's form is the same as the adult's).

For instance, to account for Hildegard Leopold's form /pɪtɪ/ for *pretty* on this model, we can assume that she imposed a process of *consonant cluster simplification* onto adult forms, the effect of which is to transform the sequence /pr/ into /p/. This process is shown schematically in (72), where C stands for any consonant:

(72) $\quad$ C C $\rightarrow$ C

The schematic picture emerging from this way of looking at things is represented in figure 29.

Other common types of phonological process for which children present evidence are illustrated in the speech of Amahl Smith. At the age of two, he simplified almost all consonant clusters to a single consonant, e.g. *stamp* → [dap], *drink* → [gɪk], *socks* → [gɔk], *scales* → [geil], *crumb* → [gʌm], *bring* → [bɪŋ],

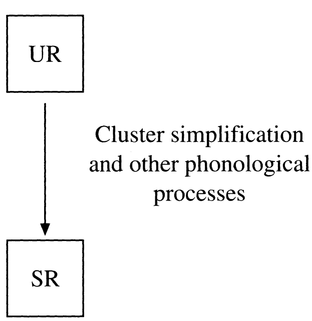


Figure 29 *Preliminary model of child phonology*

spoon → [buːn]. The only clusters he produced were in words such as *camera* → [gæmdə], *bandage* → [bændɪt], *cheque-book* → [gɛkbʊk], but this is easy to understand once we recognise that the most complex type of syllable Amahl was able to pronounce was of the form consonant + vowel + consonant (CVC). If a word (for him) had two syllables, such as *bandage*, then this would give rise to a cluster in the middle of the word, provided the two syllables were individually pronounceable, hence [gɛk] + [bʊk] to give [gɛk.bʊk] and so on.

Notice that in the examples we have cited here, at the beginning of a word the consonant is voiced, even if the adult word has a voiceless consonant or consonants in this position. Thus voiceless /s/ gives rise to voiced [g] in *sock*, voiceless /st/ becomes voiced [d] in *stamp*, etc. Voiceless sounds immediately followed by a vowel are very frequently voiced in early child speech, a phenomenon known as **Prevocalic Voicing**. It is not very common to find Prevocalic Voicing in adult phonologies, though there is a rather similar phenomenon in a large number of languages in which a voiceless sound is voiced if it occurs between two vowels.

Also illustrated in some of the above words is a very common process in child phonology, often know as **Stopping**, in which a fricative such as [f z ʃ] or an affricate [ʧ, ʤ] is simplified to the corresponding stop consonant, i.e. [p d t] or [t d]. This kind of process could not be found in this form in adult phonologies, because it takes *all* fricatives and affricates and turns them into stops. Thus, if it were to occur in an adult phonology we would never know, because we would never see any fricatives or affricates in the language in the first place. Prevocalic Voicing is a process which occurs in a specific environment or context, and such a process is called **context-sensitive**. Most of the phonological rules of adult phonologies (including that discussed in the previous section which determines whether a plosive is aspirated or not), are of this kind. On the other hand, Stopping is a process which occurs in *all* contexts or environments and therefore is called **context-free**.

Still another process apparent from Amahl's forms is one in which a velar sound [k g ŋ] *at the end of a word* appears to influence a coronal sound, such as [s t d ʧ], *at the beginning of that word*. Thus, the /d/ of *drink* becomes [g] in the context of the following /k/. Now, this phenomenon is rather reminiscent of phonological processes found in a variety of languages, and which are termed **harmony** processes. The process just illustrated is therefore often called **velar harmony**. In adult languages, harmony processes tend to affect vowels rather than consonants, i.e. **vowel harmony** is more widely attested than is **consonant harmony**. Thus, in Finnish, Hungarian, Turkish and a variety of other languages, essentially all the vowels of a word have to be either front vowels (such as [i e œ y]) or back (such as [u o ɔ ɑ]). If an ending is added to a word containing front vowels, then the vowels of the ending will be [–back], but if the same ending is added to a word containing back vowels, then the vowels of the ending will be [+back]. For instance, the plural ending in Turkish is *-ler* (with a front vowel) when added to the words *ev* 'house', or *ip* 'rope' (which contain front vowels), so we get *evler* 'houses', *ipler* 'ropes'. However, it is *-lar* (with a back vowel) when added to the words *oda* 'room', or *pul* 'stamp' (which contain back vowels), giving *odalar* 'rooms', *pullar* 'stamps'.

Vowel and consonant harmony are themselves examples of **assimilation** processes (see Introduction, p. 5). In such a process, one set of sounds, the **target** of the assimilation, becomes more similar to another set of sounds, the **trigger** for the assimilation, by acquiring a specification for some feature or set of features from the trigger. Thus, in the vowel harmony of Turkish, endings acquire the specification [–back] from words with [–back] vowels and the specification [+back] from words with [+back] vowels. In general, the target of an assimilation process only acquires some of its features from the trigger, giving **partial assimilation**. Thus, the Turkish plural ending alternates only with respect to the feature [back], it doesn't become **-lir* after *ip* or **-lur* after *pul*, which would be the case if it were also taking on the height and rounding characteristics of the preceding vowel. There are cases of assimilation in other languages, though, in which the trigger does become identical to the target, in which case we speak of **total assimilation**.

We can also see instances in Amahl's speech where more than one process applies. Thus, in *socks*, pronounced as [gɔk], the initial /s/ is stopped to [t] and it also harmonises with the following /k/ to give [k]. In addition, it is voiced to [g]. Sometimes, a sequence of processes acting in this way can give rise to sounds or sound sequences that are not found in English. Thus, Amahl's pronunciation of the word *snake* was [ŋeɪk], and we have already observed that [ŋ] never occurs initially in an English word. Work out which two processes of those mentioned above give rise to this form (***exercises 1***, ***2*** and ***3***).

Perception, production and a dual-lexicon model

While the simple model in figure 29 can account for a wide range of data and also acknowledges the discrepancy between child perception and production (URs correspond to what is perceived, whereas SRs correspond to what is produced), there are acquisition phenomena which suggest that it must be elaborated. We shall now consider one such phenomenon in some detail.

A very frequent production problem for children is the pronunciation of the approximants [w l r j] (because of its familiarity, throughout this discussion, we will use [r] for the English 'r' sound, although, as observed in section 2, it would be more accurate to use [ɹ]). Amahl Smith, for instance, couldn't pronounce [r j] if there was an [l] elsewhere in the word. Thus, *yoyo* was pronounced [joujou] but *yellow* and *lorry* were pronounced [lɛlou] and [lɒlɪ], and there was no distinction between his pronunciations of *lorry* and *lolly* – both were pronounced [lɒlɪ]. However, he could distinguish *red* and *led* in his production even at a time when he pronounced *lorry* and *lolly* identically. How can we account for this set of observations?

From section 2, we know that the sounds involved can all be described as coronal approximants. We also know that a characteristic distinguishing [l] from [r j] is that it is produced by passing air round the side of the tongue, i.e. it is a lateral sound, a distinction which is captured by the feature [±lat] in the feature system of appendix 2. Thus, [l] is [+lat] while [r j] are [–lat]. What happens in Amahl's pronunciation is that the non-lateral sounds come to share the same feature specification for the lateral feature as the neighbouring /l/ sound. Of course, this is just another example of harmony, so we can call Amahl's process **lateral harmony**.

A consequence of the existence of lateral harmony is that there can be no contrast between /l/ and either /r/ or /j/ when there is already an occurrence of /l/ in the word. This means that the feature [±lat] cannot be *distinctive* in such a word. In section 5, we said that when a feature is never distinctive, as in the case of the feature [aspirated] in English, we give that feature a specification of zero in the UR. This means that we ought to give the feature lateral a zero specification ([0lat]) in words like *lorry* for Amahl. Indeed, this is a common way of handling such harmony processes in adult grammars. However, we must also acknowledge that both the /l/ and the /r/ of adult *lorry* are pronounced by the child as [l]. Hence, while we wish to maintain that these segments are [0lat] in the child's UR, we must somehow also ensure that they are [+lat] in the SR.

At first sight, it might appear that the obvious way to approach this problem is to treat it like the cases of velar harmony mentioned above. There we suggested that initial coronals harmonise with final velars, and it is easy to see how this could be expressed as a rule along the lines of (73):

(73) [Coronal] → [Dorsal]/ # __ V [Dorsal]#

(Here, the symbol # indicates a word boundary)

Recall that what appears after the slash is a specification of the context in which the rule applies, so (73) says that the place feature [Coronal] is changed to [Dorsal] when it occurs initially and precedes an arbitrary vowel (V) and a final sound with the place feature [Dorsal]. In order to be effective, (73) requires the presence of the place feature value [Dorsal] in a word's UR, and we can immediately see an important difference between this situation and the case of lateral harmony we are considering. For the latter, we are supposing that *both* crucial segments are [0lat] in the relevant representation of *lorry*, i.e. there is *no* lateral segment in this representation to trigger the harmony, since [lat] is not distinctive in such words for Amahl at this stage in his development.

A way of dealing with this is to say that the UR of *lorry* has a 'floating' feature [+lat], which in a sense *is a property of the whole word*. This [+lat] feature is then anchored to specific segments, namely those which correspond to non-labial approximants, /r j l/ in the adult words. This is achieved by **spreading** the [+lateral] feature to those segments, as illustrated for *yellow* and *lorry* in figure 30. Note that, strictly speaking, underspecified segments don't correspond to a single phoneme, so we'll represent them using capital letters R, J and L. The dotted boxes here are simply to indicate that while [+lat] is not attached to anything on the left-hand side of the arrows, it is nonetheless an integral part of the representations.

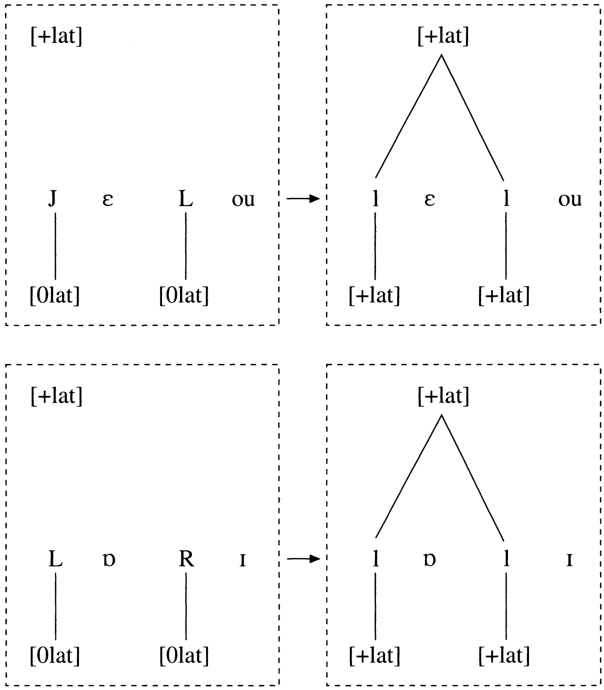


Figure 30 *Lateral harmony as feature spreading*

Now, an intriguing aspect of this analysis is that it doesn't fit the simple model of figure 29 in which the child is assumed to have representations that correspond to the adult URs. In these latter, *distinctive* features including [±lat] are fully specified and there is no place for [0lat] or other underspecified values ([0asp] is, of course, a different case, as [asp] is not distinctive in *adult* English). The reason for assuming full specification was that children appear to *perceive* sound distinctions in an adult-like manner from a very early age, and there is good reason to believe that this perceptual accuracy extends to words which include /l r j/. This means that the representations which reflect the child's perceptions are fully specified. However, children's production of words is much less accurate than their perception at this age. We can therefore think of the underspecification of the lateral feature in words like *lorry* or *lolly* as the way in which the theoretical model reflects this inaccuracy in pronunciation. On the perceptual side, Amahl knows that *lorry* has an /r/. However, he doesn't know how to pronounce that /r/ in a word of that shape. We can propose, therefore, that the initial set of representations in figure 30 (those on the left-hand side of the arrows) are representations of the child's production ability, an indication that the child doesn't know how to articulate the /j/ in *yellow* or /r/ in *lorry*. If this is correct, there are *three* representations we must consider: (a) what the child actually says (the SRs in figure 29, the right-hand side of figure 30); (b) the adult forms (the URs of figure 29 to which the child appears to have access via perception; (c) forms which are relevant to the child for production (the left-hand side of figure 30).

What the above discussion suggests is that it is plausible to maintain that there are *two* phonological representations stored in the child's mind, one for perception (b immediately above) and one for production (c). We call these **input representations** and **output representations** and there clearly has to be some relationship between them. In general, the output representations are similar to the input representations, but with certain aspects of the representation missing or simplified. For instance, suppose we maintain that the child's input representation (based on perception) for *lorry* corresponds to the adult representation /lɒlɪ/. In order to 'derive' an appropriate output representation (what we have on the left-hand side of figure 30), we have to assume two processes. First, the [–lateral] feature representation of /r/ is replaced by [0lateral]. This is called **despecification**. Then, the [+lateral] feature is 'floated' or **delinked** from the /l/, so that the /l/ segment itself is also [0lateral]. This is illustrated in figure 31, where for clarity we have separated delinking (indicated by breaking the line between /l/ and [+lat] and 'floating'.

The output representation in figure 31 can now serve as the UR for the process of lateral harmony illustrated in figure 30, and this UR can be referred to as the child's **output UR**, i.e. the underlying representation, which is subject to phonological processes that determine the form of the child's utterances. Thus, we are

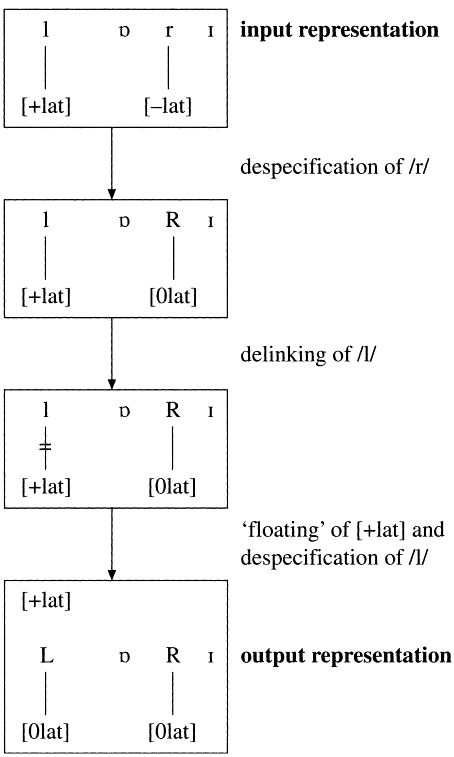


Figure 31 *Lateral harmony: constructing the output UR*

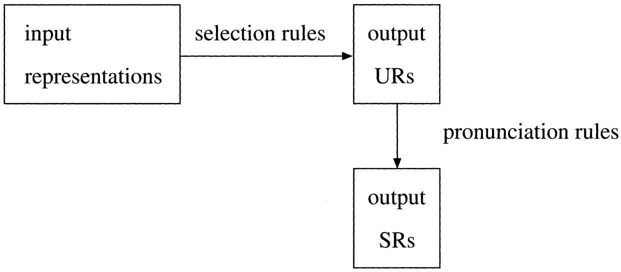


Figure 32 *A dual-lexicon model of child phonology*

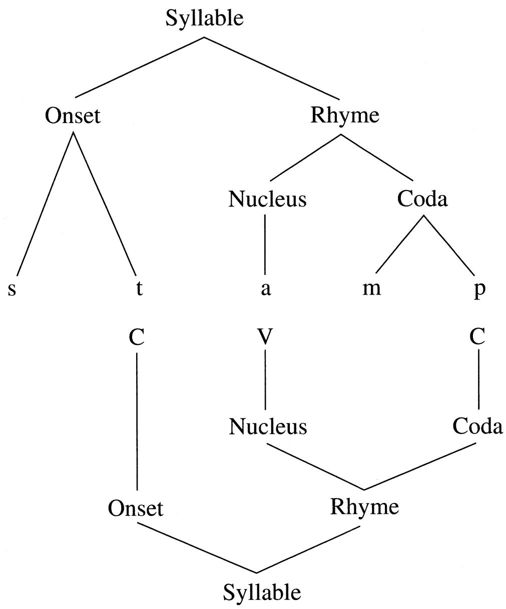
now proposing *two* types of processes. The type of process represented by figure 31 is called a **selection rule**, and, taking the adult form as input, it gives rise to an output UR which contains a number of unspecified features and other aspects of representation which need to be filled in. This filling in is achieved by other processes, which we call **pronunciation rules**. The spreading of the floating [+lateral] feature to give lateral harmony is an example of such a rule.

In the model that results from this type of analysis, children are credited with two types of phonological representation, one corresponding to their perception of the word and the other determined by the set of distinctive features, syllable templates and so on over which they have mastery in production. Because there are two distinct sets of lexical representations, we will call such a model a **dual-lexicon model**. The overall structure of the model is illustrated in figure 32.

It is possible to see how the model in figure 32 can account for other processes which we have so far assumed to be accommodated in the simpler model of figure 29. For instance, we noted above that Amahl Smith's most complex syllables were of the form CVC; that is, they included at most one onset consonant and at most one coda consonant. Obviously, this can be accommodated to the model of figure 29 by relying on a rule such as (72) linking URs and SRs, but our dual-lexicon approach now provides us with an alternative way of dealing with this phenomenon, provided we take English syllable structure into account (as discussed in section 5, pp. 79ff.). Specifically, we can propose that Amahl operates with a **syllable template** over the input representations governed by the Sonority Hierarchy. Children in general find it easier to pronounce sounds and combinations which differ from each other maximally, so they tend to choose the least sonorous elements as onsets and codas and the most sonorous elements as nuclei. At early stages, only one consonant is allowed in the onset or the coda and so this has to be the least sonorant of the cluster. We know from section 5 (p. 81) that /s/ in clusters such as *stay* or *string* is exceptional in English, so this will not enter into early child templates even in clusters such as *sm-* or *sl-*, in which it is the less sonorant (though children tend to differ in the precise way they treat these clusters).

In the case of codas, there is rather more variability between children; in part, which item from a cluster is pronounced by a child depends on the language being

input representation



Syllable template (=a constraint on syllable structure determining a selection rule)

Figure 33 *Matching input representation to syllable structure template*

learned. However, Amahl treated the voiceless plosive in a coda cluster such as the *-mp* of *stamp* as we would predict from the Sonority Hierarchy. How this works is illustrated in figure 33 for *stamp*, which at this stage Amahl pronounced as [dap].

This template, operating as a selection rule, produces the syllable [tap], along with an unattached [s] and an unattached [m]. What happens to these items that are not integrated into the child's syllable via the matching process? The answer is that they are deleted by a general process which phonologists refer to as **Stray Deletion** or **Stray Erasure**. In terms of the model in figure 31, this is a pronunciation rule. In general, any material that is left over, because it has not been associated with some part of the template or has not been incorporated into the word by means of some pronunciation rule, is deleted by this process. In the case of lateral harmony discussed above, the floating [+lat] feature in the output representation in figure 31 is saved from extinction by the pronunciation process of lateral spreading. There are no comparable processes which will save the unassociated /s/ or /m/ of *stamp* in Amahl's system. Thus, the only segments that survive to the level of the output SR for *stamp* are [tap]. Additionally, along the way the [t] is voiced to [d] by Prevocalic Voicing, another pronunciation rule, giving us the attested form [dap].

This concludes our brief survey of the nature of child phonology. We have, of course, only scratched the surface of this developing and fascinating field. However, consideration of what goes on when children acquire sound systems has enabled us to draw attention to some important notions in theoretical phonology, notions which are regularly applied in the analysis of adult phonological systems. Of particular importance is *underspecification*, especially as a way of formalising harmony processes, and another useful notion is that of the *floating feature*. We have also seen the fundamental importance of syllable structure, in understanding the nature of children's forms, and the idea of associating segments to a template to filter out combinations which are not allowed in the phonological system is used widely. However, perhaps most important of all is the idea of *distinct levels of representation*, and especially the idea that there is at least a distinction between an underlying level and a surface level. Although the model of child phonology we have introduced here raises additional complications (because unlike adults, children can't pronounce most of the words they can recognise), if we look at the output (right-hand) side of the model in figure 32, we see there the two-level system introduced in figure 29. The distinction between underlying and surface levels is one of the key ideas in phonology and indeed in linguistics generally, and even in widely different theoretical approaches, it tends to reappear in some guise or other (***exercises 4*** and ***5***).

Exercises

1. Below is a sample of words from the first stages of development of Amahl Smith. Assuming that the child's underlying representations are identical to the adult surface representations, what **neutralisation processes** (processes which ensure that Amahl does *not* make a distinction which is made in the adult system) affect Amahl's speech at this time? (The transcriptions have been simplified slightly.)

word	adult pronunciation	child's pronunciation
apple	/apl̩/	/ɛbu/
bath	/bɑːθ/	/bɑːt/
brush	/bɹʌʃ/	/bʌt/
bus	/bʌs/	/bʌt/
caravan	/karavan/	/gawəwan/
church	/ʧəːʧ/	/dəːt/
dark	/dɑːk/	/gɑːk/
feet	/fiːt/	/wiːt/
finger	/fɪŋgə/	/wɪŋə/
flower	/flaʊə/	/wawə/
John	/ʤɒn/	/dɒn/
knife	/naɪf/	/maɪp/
leg	/lɛg/	/gɛk/
light	/laɪt/	/daɪt/
nipple	/nɪpl̩/	/mɪbu/
other	/ʌðə/	/ʌdə/
sing	/sɪŋ/	/gɪŋ/

snake	/sneɪk/	/ŋeːk/
sock	/sɒk/	/gɒk/
stop	/stɒp/	/bɒp/
table	/teɪbl̩/	/beːbu/
taxi	/taksɪ/	/gɛkiː/
uncle	/ʌŋkl̩/	/ʌgu/
write	/ɹaɪt/	/daɪt/
yes	/jɛs/	/dɛt/
zoo	/zuː/	/duː/

2. Neil Smith, Amahl's father, uses the following data to argue that his son's phonological processes must apply in a strictly defined order. State the processes in as general a form as possible. Then show why, when so stated, they must apply in a set order (assume that the child's underlying forms are identical to the adult surface forms):

bottle	/bɒkəl/	colour	/kʌlə/	gentle	/dɛŋkəl/
gollywogs	/gɒlɪwɒgd/	kennel	/kɛŋəl/	kettle	/kɛkəl/
metal	/mɛkəl/	muzzle	/mʌdəl/	nice	/naɪt/
nose	/noːd/	nozzle	/nɒdəl/	pedal	/pɛgəl/
pencil	/pɛntəl/	pickle	/pɪkəl/	puddle	/pʌgəl/
sew	/təu/	shoe	/tuː/	tassel	/tatəl/
television	/tɛlɪwɪdən/	whistle	/wɪtəl/	zoo	/duː/

3. Marlys Macken has argued that Amahl Smith has actually *misstored* the pronunciation of a word such as *puddle* and represented it not with the adult pronunciation but as /pʌgəl/. If this were the case, how would it affect your conclusions in exercise 2?

4. Here are two sets of words from an early and a later stage of Amahl Smith's development. Formulate two syllable templates, one for each of the two sets of data. Comment on the differences between the templates. How do the templates account for the child's data?

word	**adult pronunciation**	**early stage**	**later stage**
ant	/ant/	ɛt	ant
black	/blak/	pak	blak
break	/bɹeɪk/	peːk	bɹeɪk
child	/ʧaɪld/	taɪl	taɪld
clean	/kliːn/	kiːn	kliːn
count	/kaʊnt/	kaʊt	kaʊnt
drink	/dɹɪŋk/	kɪk	dɹɪŋk
friend	/fɹɛnd/	wɛn	fɹɛnd
hand	/hand/	ɛn	and
hold	/hould/	uːd	uːld
jump	/ʤʌmp/	tʌp	dʌmp
lunch	/lʌnʃ/	lʌt	lʌnt
mend	/mɛnd/	mɛn	mɛnd

monkey	/mʌŋkiː/	mʌgiː	mʌŋkiː
pencil	/pɛnsɪl/	pɛtəl	pɛntəl
Smith	/smɪθ/	mɪt	mɪt
snake	/sneɪk/	ŋeːk	neɪk
spider	/spaɪdə/	paɪdə	paɪdə
spring	/spɹɪŋ/	pɪŋ	plɪŋ
stamp	/stamp/	tap	t^hamp
stroke	/stɹouk/	koːk	tɹoːk
swing	/swɪŋ/	wɪŋ	wɪŋ
think	/θɪŋk/	kɪk	t^hɪŋk

5. Below are two sets of words from different stages in Amahl Smith's development.
   (a) Describe the syllable template for the child at each stage.
   (b) The words at Stage A show two phonological processes that affect consonants, one of which affects only final consonants at Stage A in particular circumstances. Describe these processes in words.
   (c) What crucial difference between Stage A and Stage B might account for the change in the pronunciation of the final consonants between the two stages?

	Stage A	Stage B
quick	kɪp	kwɪk
queen	kiːm	kwiːn
squeeze	kiːb	kwiːz
quite	kaɪp	kwaɪt
twice	daɪp	twaɪs
win	wɪn	wɪn
sweet	wiːt	swiːt
spoon	puːn	spuːn

7 Processing sounds

There are two aspects to the real-time processing of language in which we all indulge on a day-to-day basis. One is hearing what others say to us, or in the case of written language and sign languages, seeing what others are saying to us. This is the problem of **speech perception**, and a fundamental part of it for spoken languages is the recognition of speech sounds. The other is producing language ourselves, **speech production**. For spoken varieties of language, this includes the problem of control of the muscles of the vocal tract (lungs, throat, tongue, lips) responsible for making the sounds. For sign languages, it is the problem of control of movements of the hands and face. In psychology, the organisation of movement is referred to as **motor control**.

Speech perception

Suppose you are singing a note on a certain pitch. If you wish to sing a different note, one option you have is to shift to the new note gradually and continuously (you can also jump straight to it, but this option doesn't concern us here). This indicates that the pitch of the human voice, determined by the rate at which the vocal cords vibrate, admits of any number of gradations. Now contrast this with someone playing two notes on a piano. A piano has a finite number of *discrete* notes, and as a consequence it isn't possible to play a note *between* C and C#; it is, however, perfectly feasible to sing such a note.

What are speech sounds like? Do they gradually shade into one another like the notes we sing, or are they discrete like the notes of a piano? If we recall our descriptions of the way speech sounds are produced in section 2, we should be immediately attracted by the former possibility. Take place of articulation and the difference between, say, a dental and an alveolar sound. The former requires contact between the tip of the tongue and the upper teeth, whereas the latter requires contact between the tip of the tongue and the alveolar ridge. But the space between the bottom of the upper teeth and the back of the alveolar ridge is a continuous space and the tip of the tongue can make contact at any of the infinite number of points in this space. This suggests that the shift from [t̪] to [t] or from [s̪] to [s] will be gradual and continuous rather than discrete. Or consider vowel sounds and the front/back and high/low axes, which are fundamental in categorising these sounds. Given any two points on either of these axes, there will always be another point between them, suggesting that the shift from a high to a mid to a low vowel or from a front to a central to a back vowel will again be gradual and continuous.

An alternative perspective is, however, presented by our discussion in section 5, where we saw that as far as the structure of the language is concerned, this infinity of speech sounds is reduced to a finite inventory of functioning units, the phonemes of the language.

Let's approach this topic by changing our question. Rather than being concerned with what speech sounds are like, let's ask what our *perception* of speech sounds is like? Obviously, it could be the case that we perceive all the infinite gradations which the continuous nature of such notions of place of articulation, front/back and high/low make available, or it might be that our perceptual systems are 'tuned' to the phonological structure of our native language, so that we simply do not hear differences in speech sounds which are not linguistically significant. The answer to our revised question is surprisingly complex, and it is likely that a complete understanding of this matter lies some way in the future. Part of the answer, however, seems to depend on what sort of speech sound we are considering.

In order to investigate systematically the issue which concerns us, it is important to be able to control the characteristics of the speech sounds we test. Native speakers cannot vary their speech sounds with the required degree of control, but it is possible to produce speech sounds synthetically using a speech synthesiser. For example, reasonably accurate tokens of syllables such as /ba/ or /pe/ can be produced in this way, and it is then possible to introduce slight, carefully controlled changes into the acoustic form of the synthesised syllables and words, changes which correspond to a gradual shift in place of articulation of a consonant or the height or frontness of a vowel, etc.

One set of experiments we can perform is on vowel sounds. We can synthesise tokens of, say, the words *pit* and *pet*. Then, starting with our token of *pit*, we change its acoustic characteristics in a number of discrete steps until we get to our token of *pet*. The outcome of this process is referred to as an [ɪ – ɛ]-series, i.e. a set of synthesised stimuli with something which is unambiguously *pit* at one end, something which is unambiguously *pet* at the other and a number of acoustically intermediate forms. Such a series can then be used in a variety of experiments with native speakers.

One commonly performed experiment is an **identification experiment**. In this, members of the series are simply presented to native speakers in random order, and they have to say whether they hear *pit* or *pet* – note that we do not allow them to say that a stimulus is neither *pit* nor *pet*, i.e. we employ what is called a 'forced choice paradigm'. A typical (idealised) result from such an experiment appears in figure 34.

Here, along the y-axis, we have the number of times subjects report that they have heard *pit* as opposed to *pet*, and along the x-axis the items in the series of synthesised stimuli, with 1 corresponding to the original *pit*, 10 to the original *pet*

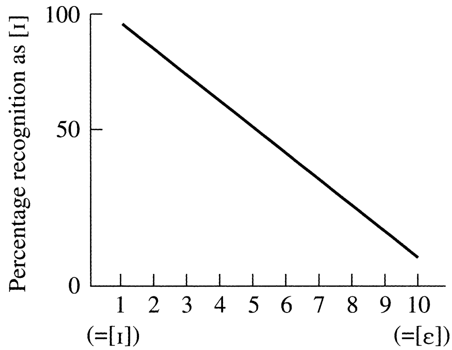


Figure 34 *Results of an identification experiment for an [ɪ – ε]-series*

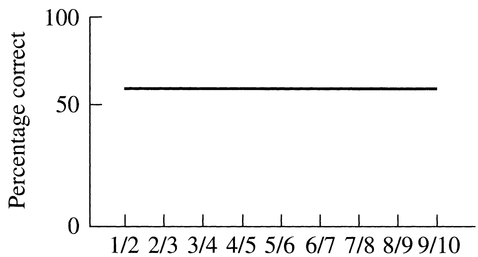


Figure 35 *Results of a discrimination experiment for an [ɪ – ε]-series*

and 2–9 labelling the intermediate stimuli. What results such as this seem to show is that the perception of vowels is *continuous*, with each vowel appearing to shade gradually into the next. For items such as 4, 5 and 6, intermediate between *pit* and *pet*, subjects appear to have recourse to guessing.

A rather different experimental procedure which leads to the same conclusion is a **discrimination experiment**. Such an experiment typically presents native speakers with pairs of adjacent stimuli from a synthesised series followed by a third stimulus which is identical to one of the first two. The subjects' task is to say whether the third stimulus is identical to the first or the second. Obviously, we would expect such a task to be difficult for subjects if their perception is continuous, and this turns out to be the case for a vowel series such as that considered above. Results of a typical experiment are presented in figure 35 (again these are idealised – empirical enquiry never yields lines as straight as this – but this does not affect the point under discussion).

Here, on the x-axis, we have pairs of synthesised stimuli which are presented for discrimination, and what the straight line indicates is that subjects did only slightly better across the whole series than they would if they were guessing, i.e. discrimination of adjacent pairs was uniformly poor in this case.

What we have described so far is perhaps not very surprising, but when we turn to the perception of consonants, a very different picture emerges. A contrast which has been extensively studied is the voiced–voiceless contrast in [b/p], [d/t] and so on. As we know from section 2, voicing occurs when the state of the larynx permits the vocal cords to vibrate. In our earlier discussion, we talked as if voicing occurs *during* the production of voiced consonants, but for plosives this is not quite correct. In fact, if the syllable [ba] is produced in English, the vocal cords do not begin to vibrate until a short time *after* the release of the bilabial closure. By contrast, if [pa] is produced, there is a relatively long time between the release of the closure at the lips and the onset of vocal cord vibration for the vowel, and if the consonant is heavily aspirated, this time becomes even longer. Thus, the *acoustic correlate* of the distinction between voiced, voiceless and aspirated voiceless plosives lies in the time interval between the release of the closure and the beginning of the voicing associated with the following vowel sound. This interval is called **Voice Onset Time** or VOT. Now, of course, time is a continuous variable, and using synthetic stimuli, it is possible to create a set of syllables, comprising a [b–p]-series in which VOT is systematically varied. Obviously, with a short VOT, we expect subjects to perceive [b], whereas with a long VOT, we predict that they will perceive [p]. The interesting question is what happens with intermediate values?

In figure 36 we see the results of an identification experiment on the perception of [b] and [p], with VOT varying along the x-axis.

What is significant here is what happens when the VOT value is about 25 ms. Subjects shift suddenly from reporting [b] to reporting [p]. However, any VOT value less than about 20 ms. is heard as [b], while any VOT greater than about 30 ms. is reported as [p].

Of course, on the basis of this identification experiment, we cannot conclude anything about the subjects' abilities to perceive distinctions *within* categories, but the discrimination experiment enables us to investigate this. What we find here is that if test stimuli fall on opposite sides of the boundary indicated in figure 36, subjects are very accurate in their identifications. If, however, the stimuli fall on the same side of the boundary, then subjects' responses indicate that they are guessing, i.e. they cannot perceive the difference between a stimulus with a VOT of, say, 40 ms. and another with a VOT of, say, 60 ms. Typical results from such

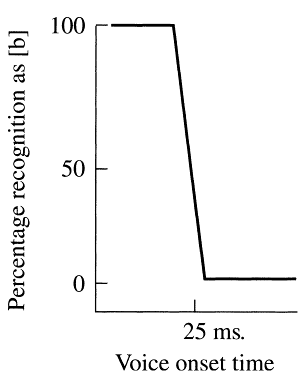


Figure 36 *Results of an identification experiment for a [b – p]-series*

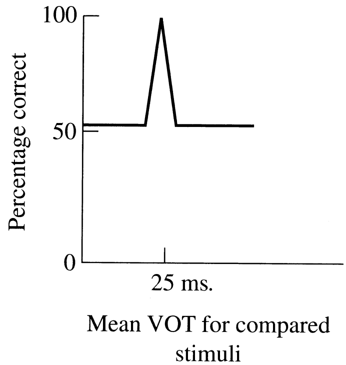


Figure 37 *Results of a discrimination experiment for a [b – p]-series*

an experiment appear in figure 37, where on the x-axis we have the mean VOTs for the stimuli being presented for discrimination (e.g. 25 ms. gives the result for discrimination of stimuli with 20 ms. and 30 ms. VOT).

What figure 37 indicates is that hearers can discriminate the phonetic categories, voiced v. voiceless, very well but they cannot hear differences *within* these categories. This type of perception is known as **categorical perception** because the hearer perceives in terms of categories (voiced or voiceless) rather than in terms of minute gradations of sound. It is of considerable interest that categorical perception appears to be rather unusual, and it may well be an aspect of the special capacities which humans have for language mentioned in our main introduction. A further observation supporting this possibility comes from the behaviour of infants. As we mentioned in the last section, it is possible to perform experiments with very young babies, and to use measures such as head turning, sucking or heart rate as indicators that they do or do not perceive a difference between two sounds. When this is done with babies that have been exposed to some form of language, it is discovered that they too perceive VOT categorically, many months before they start trying to pronounce adult plosive sounds themselves (***exercise 1***).

Speech production

At some stage in the production of speech, the speaker has to formulate plans for moving the articulators in such a way as to produce the required sounds in the required order. This is far and away the most complex motor-control problem faced by human beings. The number of different muscles involved is enormous and the fine-tuning required to get even an approximation to human speech is extremely delicate. The complexity of the process is seen to be even greater when we realise that we can and do introduce extremely subtle changes into our normal speech, by altering its rhythm and loudness, and especially our tone of voice (intonation), so as to achieve different nuances of meaning. We can even play with our speech, by imitating other accents or modes of speaking. When we speak to someone with a different accent, we unconsciously accommodate to that accent in a fashion that is only really apparent to a person who is trained in phonetics (see section 4 for sociolinguistic perspectives on this phenomenon).

Given the complexity of the problem, it is all the more remarkable that we speak with relatively few errors. However, errors are made in normal speech and these throw considerable light on the nature of the speech production process. Later in the book, we shall be looking at speech errors made by people which involve whole words, and how these might be used to investigate the nature of the mental lexicon. Here, we shall focus on errors which indicate the importance of individual sound segments and syllable structure with a view to understanding the process of speech production. In most cases, the errors we cite have been collected by linguists or psycholinguists listening to conversations, lectures, or TV and radio programmes.

One of the types of speech error that we all make, and which everyone is aware of, is in the context of the tongue-twister. In every language there are certain sequences of sounds or syllables, which, for some reason, are particularly hard to pronounce. Some of these can be remarkably innocent-looking. For instance, you can get friends to try saying the name *Peggy Babcock* three times very quickly. Make a note of what they actually say, using phonetic transcription (you will probably find it necessary to record their attempts), and see what types of error are made.

The problem posed by tongue-twisters is one of vocal gymnastics, something akin to patting your head and rubbing your tummy at the same time. However, there are different sorts of errors which, in many ways, are more interesting, because they don't have such obvious correlates in non-speech motor control. One of the most famous types of speech error is illustrated in (74):

(74) a. You have hissed all my mystery lectures [missed all my history lectures]
b. You have tasted the whole worm [wasted the whole term]
c. our queer old dean [our dear old Queen]

These are examples of spoonerisms, allegedly uttered by the Reverend William Spooner, a lecturer at Oxford University in the last century. ('Allegedly', because undergraduates were in the habit of making up such things and attributing them to their notorious mentor.) What is happening here is that two sets of sounds are being exchanged, as shown for (74b) in (75):

(75) (w)asted the whole (t)erm ⇒ (t)asted the whole (w)orm

Example (74a) is similar in that single whole segments are exchanged, but (74c) is different, as we can see if we refer to phonetic transcription, as in (76):

(76) [(d)ɪə ould (kw)iːn] ⇒ [kwɪə ould diːn]

In terms of segments, we are exchanging *two sounds for one* here; however, our discussion of syllable structure in section 5 has shown us how we can construe this as an exchange of one unit for another. The cluster *kw-* in *queer/queen* is the *onset* of the syllables which make up these words, and it is this onset which is being exchanged with the onset of the syllable [diːn]. Indeed, it turns out that syllable structure is important in analysing speech, since it is only onsets that get exchanged for onsets, or codas for codas. We don't find constituents of the syllable getting confused with each other in exchanges. In other words, we don't find the onset of one word being exchanged with the coda of a later word, i.e. we don't observe errors of the form shown in (77):

(77) a (d)og and a ca(t) ⇒ a tog and a cad (unattested error type)

Simple as this observation is, it provides a very direct indication of the involvement of syllable structure in speech production. If the speech production mechanisms did not have access to this structure, there would be no reason to expect that such errors would not occur – logically, they are just as plausible as those involving the switching of onsets or codas.

Exchanges are not the only kind of speech error involving individual sounds. In (78–82) we see a number of other reasonably common types (in each case collected by researchers from ordinary conversations):

(78) a. it's a meal mystery [real mystery]
b. fonal phonology [tonal phonology]

(79) a. give the goy [give the boy]
b. Michael Malliday [Michael Halliday]

(80) his retters [letters]

(81) country presents [peasants]

(82) the Britch [British]

The examples in (78) are *anticipations*, in which a sound is anticipated from a following word, whereas those in (79) are *perseverations*, in which a sound is repeated from an earlier word. Example (80) is a *substitution* of one phoneme by another, while (81) is the *addition* of a phoneme (producing incidentally a real word). Finally, in (82) we see a case of *omission* of a phoneme. (***exercise 2***).

Exchanges are a relatively commonplace type of error, so it may not be immediately apparent that they pose an important theoretical problem for the modelling of action. In fact, they indicate very clearly that we formulate a *plan* of what we are about to say before we actually get round to saying it. As early as 1951, the psychologist Karl Lashley used this as an argument against Behaviourism, a psychological position that maintains that all our actions are governed by habitual responses to stimuli. Lashley pointed out that errors of *serial order* of the kind illustrated by exchanges demonstrate that we must

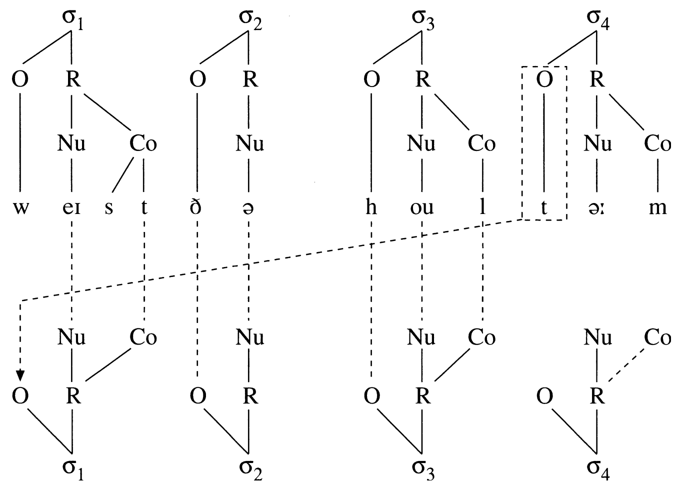


Figure 38 *A simplified version of the scan-copier model of speech production*

plan ahead, and that we don't simply respond to whatever stimulus has just impinged on us.

The idea of forward planning is enshrined in an influential model of speech production called the **scan-copier model**. According to this model, we first form an abstract representation of the next phrase we are about to utter. Then we copy that representation into a 'buffer'. This then gets translated into movements of the articulators. As we saw from example (74c), syllable structure is very important, so it is appropriate to assume that the scan-copier is sensitive to syllable structure. This model is shown schematically in figure 38.

In figure 38, we see the stage at which the phrase *waste the whole term* has been put into the buffer (we omit the past tense *-ed* on *wasted* for simplicity). This is an 'abstract' representation of what the speaker intends to say. However, we now need to copy this to the next level of representation, that at which we specify the instructions to the articulators of the vocal tract. For the sake of argument, we'll assume that the syllabic structure of the phrase has been copied. This forms the skeleton for the set of instructions to the articulators and is illustrated in the bottom half of figure 38. We now need to fill in the appropriate slots in the copied syllable structure. The system scans the contents of the buffer from left to right and copies onsets to onset slots, codas to coda slots and so on. As it does so, it monitors its progress by checking off each of the segments it copies. A checked-off segment will not normally be eligible for further copying, of course. In figure 38, the system has made an error by running ahead of itself and has selected as onset of its first syllable the onset of the final syllable (it is probably no coincidence that this final syllable is the most emphasised word in the phrase). The scanner continues, this time from the correct syllable, and copies the nucleus then the coda of *waste* and moves on to the next syllable. When it reaches the fourth syllable, it encounters a problem. The onset here, inside the dotted rectangle, has already been copied. It seems that the copier has two options at this point. Firstly, it can ignore the fact that the onset 't' has already been copied, and copy it again, giving the phrase *tasted a whole term*. This is an anticipation error. However, if, as we have suggested above, a checked-off item is not available for further copying, this route will not be available; arguably, then, the only course open to the copier is to recognise that the /w/ onset of the first syllable has yet to be copied and to use this stray /w/ to fill in the stray onset slot in the final syllable; this will also result in the stray consonant being finally checked off by the monitor. This gives us our spoonerism.

There is one further point to make about phonology and speech errors. Section 14 will examine cases where whole words (or meaningful parts of words) are exchanged, but examples of this of particular relevance here appear in (83):

(83) a. ministers in the church ⇒ ministers in the church-[əz]
b. take the steaks out of the freezer ⇒ take the freezer-[z] out of the steak-er

In (83a), the plural ending of *ministers* is perseverated on the word *church*. In (83b), we have an exchange between *steak* and *freezer*. In both cases, the plural ending accommodates its pronunciation: on *ministers* in (83a), it is /z/, but when it gets added onto *church*, it is pronounced as /əz/, in accordance with the phonological rules of English. In (83b), when the plural ending finds itself attached to the wrong word, it again accommodates from the /s/ form in *steaks* to the /z/ form of *freezers*. More generally, we find that speech errors *never* give rise to phonological combinations that would be disallowed by the language. That is, we don't find violations of phonological rules or of the phonotactic constraints of the language. This means that a speech error is nonetheless always a pronounceable word in the language. This shows that the forward-planning mechanism operates at a level before the final phonological adjustments take place, such as the pronunciation of the plural ending (***exercises 3***, ***4*** and ***5***).

Other aspects of phonological processing

When linguists study the form and function of the linguistic expressions found in their native language, and write grammars to account for them, their primary source of data is provided by their own intuitions regarding how a word is pronounced, whether a sequence of words is a legitimate sentence, etc. If they work on a language which is not their own, such data may be provided by an informant who is a native speaker (see Introduction, p. 2). Obviously, if we study the utterances produced by small children or the results of psycholinguistic experiments, we are dealing with different kinds of data, and in so far as such data are used to test and modify theories of grammar, they can be regarded as providing an indirect source of evidence on the nature of linguistic competence. Other sources of indirect evidence, of particular relevance to sound systems, are language games, poetic devices and writing systems, and we will close this part of the book by looking briefly at the last two of these (for a language game, see exercise 6).

One aspect of phonological structure which seems to be easily identifiable even by non-linguists is the syllable. For instance, it is relatively easy to get people to identify the number of syllables in a word, and even very small children (as young as three) can be trained to tap out the number of syllables of polysyllabic words like *elephant*. Many poetic systems work on a syllabic principle. Particularly famous are Japanese verse forms such as the haiku, in which each line has to have a set number of syllables.

Rhyme constituents, too, are very salient. Rhyme, of course, is the basis of classical European versification, but very small children are aware of rhymes and often play rhyming games with themselves in which they make up nonsense words to rhyme with words they know. Perhaps less obviously, onsets can also be important in poetic systems. Before rhyming became the organising principle of English verse, around the time of Chaucer, English poetry operated with a system of alliteration. For instance, in the mystical poem *The Vision of Piers Ploughman* by William Langland (a contemporary of Chaucer), there are no rhymes. However, every line generally has at least three accented words whose stressed syllables begin with the same onset. Sometimes, if there is a consonant cluster, it is just the first member that governs the alliteration, as in the last line of the opening of the Prologue reproduced in (84) (the alliterated onsets are in bold):

(84) Prologue
In a **s**omer **s**esoun whan **s**ofte was the **s**onne,
I **sh**oop me into **sh**roudes as I a **sh**eep were,
In **h**abite as an **h**eremite un**h**oly of werkes,
Wente **w**ide in this **w**orld **w**onderes to here.
Ac on a **M**ay **m**orwenynge on **M**alverne hilles
Me be**f**el a **f**erly, of **F**airye me thoghte.
I was **w**ery for**w**andred and **w**ente me to reste
Under a **b**rood **b**ank by a **b**ourne syde;
And as I **l**ay and **l**enede and **l**oked on the watres,
I **s**lombred into a **s**lepynge, it **s**weyed so murye.

Translation
In a summer season, when mild was the sun,
I dressed myself in clothes as if I were a sheep,
In habit as a hermit untrue to his holy vows,
I went wide in this world to hear wonders.
But on a May morning on Malvern hills
A strange experience befell me, from Fairyland it seemed.
I was weary from wandering and went to rest
under a broad bank by the side of a stream;
And as I lay and leaned and looked at the water,
I fell into a sleep, it [=the stream] made such a sweet sound.

There is one important phonological unit which ordinary language users tend not to be consciously aware of. This is the phonemic segment. This is not to say that the segment-sized unit plays no role in the phonological system of the language, of course. It would be impossible to state a good many phonological rules without reference to segmental structure. Moreover, there is ample evidence that segment-sized units are important in speech production. As we have seen above, speech errors at the phonological level tend to involve constituents of syllables, down to the level of the segment. However, segment-sized units have a far less important role in poetry or writing systems than do, say, syllables or even rhymes.

It might seem bizarre to say that the segment plays little role in writing systems, since very many languages have alphabetic writing systems and such systems are clearly based on segments. However, when we look at the history of writing, it turns out that the alphabet derives from a writing system devised by Phoenician merchants about 4,000 years ago. This itself was developed from a hieroglyphic system in which whole words were represented by pictures. Phoenician was a Semitic language (like Arabic and Hebrew), in which consonants play a particularly salient role, and, presumably because of this, the system gradually came to represent individual consonant phonemes (though not vowels – to this day, the written forms of Semitic languages tend not to represent vowels directly). The Phoenician alphabet was taken over by the Greeks (who modified the symbols for consonants not appearing in Greek and used them as vowels). It is also thought to be the precursor of the Armenian and Georgian alphabets. The Greek system gave rise to a number of others, including the Latin alphabet. This then formed the basis of a good many other writing systems throughout the world. The upshot is that, as far as we can tell, all alphabetic writing systems derive from the Phoenician system. In other words a phoneme-based writing system seems to have been 'invented' (or rather, gradually evolved) just *once* in the history of human literacy.

Now, many cultures have evolved their own writing systems independently, and, in all other cases, they are based either on pictures representing whole words (like Ancient Egyptian hieroglyphs or modern Chinese ideograms) or on the syllable. Syllabic systems include those of Japanese, Inuit, later forms of Egyptian and Sumerian cuneiform and the Linear B script with which Greek was written on Mycenaean Crete. An intriguing case is that of the Cherokee writing system, adopted in 1821. This was devised single-handedly (and in the face of opposition from some of his fellow Cherokees) by a man named Sequoyah, who decided that his people needed a script in which to write their language. Though he could speak only Cherokee, and though Cherokee was not written at that time, he adapted written symbols he had seen in printed books. This meant that he had to spend about thirty years trying to figure out the phonological system of the language. What he produced was effectively an exhaustive analysis of the syllable structure of Cherokee, one of the most remarkable feats of linguistic analysis ever recorded. What is interesting about Sequoyah's writing system is that even this extremely gifted intellectual was not led to analysing the structure of his language in terms of phonemes, but rather in terms of syllables (***exercise 6***).

This concludes our discussion of some of the major issues which arise when we begin to examine systematically the way sounds are used in human languages. As far as the notion of a *grammar*, presented in our main introduction, is concerned, the core section of this part of the book is section 5. There we saw that as soon as we begin to describe what native speakers know about their language, it is necessary to postulate a variety of theoretical constructs, e.g. *phonemes*, *syllables* and *distinctive features* which belong to a complex system of representation. This latter consists of a number of *levels* and these levels are linked by what we have referred to as *phonological processes*. Together, these representations and the processes linking them constitute the *PF-component* of a grammar, and in sections 6 and 7, we have discussed a small sample of the evidence available from studies of language acquisition and of language processing pointing to the involvement of these abstract constructs in the developing child and in the adult's *use* of language.

More basically, we have seen the necessity of having available notation (the IPA system of section 2) which enables us to be precise and unambiguous in our discussions of sounds, and the usefulness of IPA notation was amply demonstrated in sections 3 and 4, where we employed it in illustrating the systematic nature of sound variation and historical sound change. We now turn our attention to words.

Exercises

1. Experimental work has revealed that chinchillas and macaque monkeys perceive some speech sounds categorically. Discuss the significance of this for the claims that aspects of the ability to acquire, use and understand language are (a) innate in humans, (b) specific to humans.

2. Collect a corpus of speech errors. This will entail carrying a notebook with you everywhere for two or three weeks! Analyse the phonological errors as 'exchanges', 'anticipations', 'perserverations', 'additions' and 'others'. What are the main difficulties in collecting such a corpus?

3. Analyse the following errors in terms of the scan-copier model:

(a)	spack rice	[spice rack]
(b)	fart very hide	[fight very hard]
(c)	face spood	[space food]
(d)	do a one stetch swip	[step switch]
(e)	flay the piola	[play the viola]
(f)	blake fruid	[brake fluid]
(g)	week at workends	[work at weekends]

What is special about the error in (e)? How does the error in (f) relate to syllable structure? How many possible analyses are there for (g)?

4. The following examples in broad IPA transcription contain errors. Discuss the relevance of these for the role of phonology in processing:
   (a) /gɪv ðə nɪpl ən ɪnfənt/ for ‘give the infant a nipple’
   (b) /ən æŋgwɪʤ lækwɪziʃn prɒbləm/ for ‘a language acquisition problem’
   (c) /ɪt səːtənlɪ rʌn auts fæst/ for ‘it certainly runs out fast’
   (d) /sɛvɹəl ɹæbɪts houl/ for ‘several rabbit holes’

5. Analyse the following sample of *typing* errors, where the target word appears on the right in each case. Identify the exchanges, perseverations and anticipations. Do these obey the same sorts of constraints as those of errors in spoken language? What other types of error are illustrated here?

carerr	*career*
exercieses	*exercises*
fromal	*formal*
godd	*good*
hooly	*holly*
imemediately	*immediately*
incidentalyy	*incidentally*
lingiustics	*linguistics*
matirial	*material*
spychology	*psychology*
teh	*the*
whtether	*whether*
substition	*substitution*
langauge	*language*
studnet	*student*

6. An interesting systematic way of distorting words is seen in ‘secret languages’. These seem to abound in all cultures. Here is a passage in Pig Latin, transcribed into IPA. What is the system behind this secret language? What phonological units does it refer to?

   igpeɪ atinleɪ eksttеɪ ɪʧweɪ æzheɪ ɔːleɪ əðeɪ ɛtəzleɪ əveɪ ɪðeɪ ælfəbɛteɪ:
   əðeɪ ɪkkweɪ aunbreɪ ɒksfeɪ ʌmpsʤeɪ ɔuvəreɪ əðeɪ eɪzɪleɪ ɒgdeɪ.

Further reading and references

A very basic introduction to phonetics is Ashby (2005), which could serve as pre-reading for this text. A more detailed account of the same material is found in Roach (2001). A good introduction to basic phonetics which extends the content of section 2 can be found in Ladefoged (2005a, b). Laver (1994) gives a much more detailed survey of modern phonetics.

Sound variation and its relationship to social, linguistic and interactional factors are discussed in detail in a number of texts, including Chambers and Trudgill (1998), Chambers (2002), Wolfram and Schilling-Estes (2005) and Bayley and Lucas (2007). Other books tend to concentrate on specific social factors. For instance, L. Milroy (1987) and J. Milroy (1992) are the classic introductions to variation and social networks (see also L. Milroy's chapter in Chambers, Trudgill and Schilling-Estes 2002), and both Bell (1984) and Coupland (1984, 2007) have been particularly influential in the study of stylistic variation. The investigation of Jocks and Burnouts in a Detroit High School can be found in Eckert (2000). Meyerhoff (2002) provides a useful overview of work on communities of practice, and Bucholtz (1999) is an interesting case study. Milroy and Gordon (2002) is an excellent introduction to the methods of data collection and analysis in variation studies, as is Tagliamonte (2006), which very usefully also covers statistical methods in variation studies. The Bradford study mentioned in section 3 is reported in Petyt (1985), and the work on (ing) in Norwich is from Trudgill (1974). Research on ethnic variation in New Zealand English can be found in Holmes (1997). The (T) and -*t*/-*d* deletion studies are by Wolfram (1991), and the research on Farsi vowel assimilation is outlined in greater detail in Hudson (1996). Labov (1972, 1994) discusses the now very famous research in the New York department stores, and the research on workers in Spain is in Holmquist (1985).

Good introductions to sound change (approached exclusively from the historical linguistic perspective) can be found in McMahon (1994) and Trask (1996). Beard (2004) and Aitchison (1991) are both very introductory accounts of change. Chambers (2002) offers a sociolinguistic approach to language change. At a more advanced level, Chambers, Trudgill and Schilling-Estes (2002) provides a state-of-the-art account of the major themes of sociolinguistic research on change. An introductory account of the Northern Cities Vowel Shift is presented by Wolfram and Schilling-Estes (2005), and much more detailed discussions of chain shifts, mergers, splits and the Neogrammarian–Lexical Diffusion argument can be found in Labov (1994). The research on intonation change referred to in section 4 is from

Britain (1998). The example of Dutch and Belgian sound change can be found in van de Velde, van Hout and Gerritsen (1996).

The topics introduced in section 5 are dealt with in more detail in Spencer (1996). Other introductions include Davenport and Hannahs (1998), Gussenhoven and Jacobs (1998) and Roca and Johnson (1999). Yavas (2006) provides a very useful overview of the issues with the added perspective of first and second language acquisition. Discussions of Optimality Theory can be found in textbooks such as Roca and Johnson (1999). Optimality Theory has been applied to all other aspects of linguistics and an introduction to the approach with applications to syntax, morphology and phonology can be found in Archangeli and Langendoen (1997). A detailed textbook survey of Optimality Theory and English phonology is given in Hammond (1999) and a good general survey appears in Kager (1999).

The most influential work on generative child phonology (section 6) is Smith's (1973) diary study of his son, Amahl, from the age of two to four. The technical analysis is written in a framework which is now somewhat out of date (that of Chomsky and Halle 1968), but Smith provides a useful overview of his work in a less technical form at the beginning of the book, and it is still well worth reading. There is no up-to-date, linguistically based introduction to child phonology. Vihman (1994) provides a more psychologically oriented overview of the topic. Chapter 2 of Goodluck (1991) gives a brief summary of some of the issues, including the use of features in child phonology, and Ingram (1989) gives a useful discussion of the nature of children's phonological representations. A recent general introduction to the issues can be found in Lust (2006, chapter 8), while Ferguson, Menn and Stoel-Gammon (1992) is an interesting collection of articles giving an overview of a good many issues.

The linguistic justification for the dual-lexicon model presented here is given in Spencer (1986), though this is rather too technical for beginners. A gentler introduction to the model can be found in Spencer (1988). A very readable, non-technical introduction to much of the material covered here is provided by Smith (1989, chapters 4 and 8).

Further information about speech perception and production (section 7) can be found in almost any introduction to psycholinguistics. More advanced information can be found in texts such as Borden and Harris (1984). The earliest work reporting categorical perception of speech sounds by non-humans (chinchillas) is reported in Kuhl and Miller (1975). For further discussion of what speech errors can tell us about speech production, see Levelt (1989, chapter 9). There are several interesting collections of articles on speech errors, including Fromkin (1973, 1980).

PART II

Words

8 Introduction

All languages have words, and words are probably the most accessible linguistic units to the layman. As part I has amply demonstrated, in order to get a sense of the sounds which are used in an utterance, a good deal of analysis is required, and most speakers of a language cannot easily identify these sounds. Similarly, sentences do not have the same intuitive immediacy as words, an observation that probably owes much to the fact that when we speak, we often employ sequences of words which do not make complete sentences. The following mundane dialogue illustrates this perfectly:

(85) SPEAKER A: Where are you going?
SPEAKER B: Shopping.
SPEAKER A: What for?
SPEAKER B: To buy some socks.

Of the utterances in (85), only the first corresponds to a complete sentence, the others being elliptical and not including information which A and B can readily supply from the context of their conversation.

Now, while it is not true to suggest that we always fully articulate the sequence of sounds which go to make up a word (see examples of elision and assimilation cited in the main introduction), it is also not true that we systematically get by with 'word fragments'. Just imagine the difficulties we would confront if in either spoken or written text, we did indulge in such an activity: we might be faced (along with A and B) with trying to interpret (86):

(86) SPEAKER A: Whareying?
SPEAKER B: Shing.
SPEAKER A: Whor?
SPEAKER B: Tymsos.

Despite this comfortable familiarity of the word based on our everyday experience with language, it should come as no surprise that serious consideration of words leads to intriguing questions and sometimes, when we're lucky, answers. Of all linguistic constructs, the word is probably closest to familiar physical objects, but, as the history of physical science has shown, beneath these everyday objects lies a world that we cannot perceive without expensive equipment and which is organised in ways which few of us can readily understand. It would be misleading to suggest that our understanding of words (or, indeed, any aspect of language) is as developed as natural scientists' understanding of the physical world; but we should be ready to be surprised and to have challenged those preconceptions which emanate from our practised acquaintance with words in our native language.

The next four sections of this part of the book develop some of the issues which are important in understanding the nature of words from the theoretical perspective presented in our main introduction. It will be recalled that we proposed there that a grammar of a language must contain a *lexicon*, i.e. a listing of the words occurring in the language along with their linguistic properties. In part I, particularly section 5, we developed some ideas on the nature of the phonological information which appears in a lexical entry, one aspect of the *form* of a word. This focus on form will continue in sections 9, 10 and 11, where we will examine in some detail aspects of the morphological and syntactic information which must appear in lexical entries. Additionally, (most) words have one or more *meanings*, and section 12 raises some of the questions that arise when we consider how the semantic properties of a word might be represented in its lexical entry and what implications considerations of word meaning have for the overall organisation of the lexicon. Having introduced a set of notions for dealing with the cognitive representation of words in the lexicon, we move to the other perspectives from the introduction. The quite remarkable acquisition of words by small children is the topic of section 13, and the ways in which experimental studies might throw light on how we store words in our memory and perceive and produce them in our everyday linguistic interaction are dealt with in section 14. Some language disorders give rise to problems which are rather specifically to do with words, and we shall introduce these difficulties and discuss their implications in section 15. Finally, adopting the sociolinguistic perspective, in section 16 we examine some of the issues which affect words when languages or varieties of a single language are in contact.

9 Word classes

A natural first step in a scientific approach to words is to seek to establish the different types of words which appear in languages. It's easy to see that native speakers can divide words into different types (even if they can't actually tell you how they do this), and, moreover, we can see that speakers can use their knowledge of what the different word types are when they are confronted with a completely new word. Suppose, for instance, that you hear the sentence in (87):

(87) A plingle has arrived

Of course, you don't know what *plingle* means, but you can immediately infer that *plingle* is the sort of expression which occurs in the constructions *the plingle*, *two plingles*, *every plingle which has ever existed*, etc. In short, (87) enables you to assign *plingle* to a particular class of words, and once you know what class of words it belongs to, you know a great deal about its potential for occurrence within the language. It is reasonable, then, to suppose that the word class to which a word belongs is specified in that word's lexical entry. The immediate task facing us in this section is that of developing criteria for assigning words to classes.

Lexical categories

A familiar distinction is that between **nouns** (N) and **verbs** (V), and there are several ways in which we can justify this for English. For instance, nouns often refer to types of concrete objects in the world (e.g. *cake*, *engine*, *moon*, *waiter*, and, we might now suppose, *plingle*!), while verbs typically refer to activities (*applaud*, *steal*, *collide*, *bark*). Furthermore, verbs and nouns exhibit a different range of forms: most nouns have a special form for the plural (*engine* ~ *engines*), while verbs have a larger number of forms, as shown by the sentences in (88):

(88) a. Dogs *bark*
b. Fido *barks*
c. Fido is *barking*
d. Fido *barked*

Thirdly, nouns and verbs combine with other words to form phrases in distinct ways. For example, a noun will often be found preceded by a **definite** (*the*) or **indefinite article** (*a/an*) (*the moon*, *an engine*). Most forms of a verb cannot be preceded by these articles (**the applauds*, **an applauded*). If we form a phrase consisting of an article and a noun, this can often follow a verb to form a larger phrase (*steal a car*, *applaud the singer*) – we say that *a car* and *the singer* function as **complements** of the verbs *steal* and *applaud* in these constructions. Words which are unmistakably verbs cannot themselves fulfil the roles of complements (**We heard barked*). Additionally, an article–noun sequence may combine with a verb to form a whole sentence as in *the dog barked*. Here, the phrase *the dog* functions as the **subject** of the sentence (see section 17 for further discussion of subject and complement). Again, words which are unmistakably verbs cannot themselves fulfil the role of subject (**Barked surprised us*). Generalising, we say that subjects and complements are **arguments** of verbs and a typical simple sentence, such as that in (89), consists of a verb (*stole*) and its arguments (*the waiter*, *a cake*):

(89) The waiter stole a cake

A third major word class recognised in traditional grammar is **adjectives** (A). These typically refer to properties which people or things possess and they are used to modify nouns, e.g. ***happy*** *man*, ***noisy*** *engine*. Although they share with articles the property of appearing in front of a noun, if an article and an adjective both combine with a noun, they do so in a fixed order (*a happy man*, **happy a man*, *the noisy engine*, **noisy the engine*). We can also ascribe a property by putting the adjective after a form of the verb *be* to form a sentence (*the man is happy*, *the engine was noisy*). Like nouns and verbs, many adjectives have special forms indicating the extent to which a property is true of something: the **comparative** form, *happier*, 'happy to a greater degree than', and the **superlative** form, *happiest*, 'happy to the greatest degree'.

A fourth class of word is **adverbs** (ADV). While an adjective modifies a noun, an adverb typically modifies a verb, adjective or another adverb, indicating how, when or why something happened or the degree to which a property characterises an individual or event. Examples illustrating these three uses appear in (90) – the modifying adverbs are in italics and the modified item is in bold:

(90) a. The waiter *carelessly* **dropped** the plate
b. The engine is *really* **noisy**
c. The audience applauded the singer *very* **enthusiastically**

(note that in 90c, the adverb *enthusiastically*, itself modified by *very*, modifies the verb *applauded*).

Adverbs can readily be formed from a majority of adjectives by the addition of *-ly*: *happily*, *slowly*, *reluctantly*, etc. However, adverbs which do not fit this characterisation are far from uncommon: *very*, *well*, *yesterday*.

Another important word class is illustrated in (91):

(91) a. Harriet was sitting *under* a tree
b. They're due to arrive *before* noon
c. That is the end *of* the news
d. There was a debate *about* economic policy

The italicised words in (91) precede nouns (or phrases centred around nouns, such as *a tree* or *economic policy*). They typically serve to relate objects, people or events in space or time (*under/before*), though often the relationship is more abstract as in (91c, d). Words of this type are called **prepositions** (P), and they do not have the capacity to appear in a range of different forms (**unders*, **abouted*, **ofest*, **beforely*).

Up to now, we have distinguished five word classes or **lexical categories**. In doing this, we have appealed to three types of criteria for establishing a category: semantic (relying on meaning), morphological (relying on word forms) and syntactic (taking account of behaviour in phrases). Taken together, these criteria identify our separate classes quite well. However, it is important to be clear that there are plenty of cases where one or other type of criterion fails to work. For instance, some nouns refer to abstract ideas rather than concrete objects (*justice*, *idea*, *quantity*); worse still, there are nouns such as *game* and *speech* which refer to types of activities, the semantic criterion we introduced for recognising verbs. For some nouns the pluralisation criterion does not work in a straightforward fashion, either because their plural forms are irregular (*men*, *women*, *children*) or because they lack a plural form entirely (**furnitures*, **sakes*). Likewise, there are verbs which refer to states rather than activities (*fear*, *border (on)*), and other difficulties with applying these criteria too rigidly will become apparent as we proceed. Despite these problems, it is uncontroversial to suppose that lexical entries in the lexicon must contain an indication of word-class membership (***exercises 1***, ***2***, ***3*** and ***4***).

A particularly interesting illustration of the semantic correlations breaking down arises from observing that English provides many ways of forming new words from old ones. For example, we can form a noun *happiness* from the adjective *happy*. That *happiness* is a noun is indicated by the fact that it can be preceded by the definite article (*the happiness John felt*), and that it is not an adjective by the fact that it does not have comparative and superlative forms (**happinesser*, **happinessest*). Thus, *happiness* is a noun denoting the *property* of being happy. So, both the adjective and the noun seem in this case to denote a property, and semantic criteria for establishing class membership are not useful. Of course, the example we have chosen here is not exceptional and it illustrates the pervasive process of **word formation**. The word *happiness* is formed by adding an ending, *-ness*, to *happy* (the spelling change is irrelevant here and has no effect on the pronunciation). Such a process is referred to as **derivational morphology** (because we derive a new word from the old one). Derivational processes typically apply to nouns, verbs and adjectives, allowing us to change the category of the word, and we shall return to a more systematic discussion of such processes in section 10.

Functional categories

Nouns, verbs, adjectives, adverbs and prepositions are the major word classes of English, and they are the sorts of words we find in dictionaries with meanings attached to them (cf. section 12). However, not all words are straightforwardly meaningful in this way, and this observation paves the way for extending the word classes which must be recognised in grammars for languages. Consider the italicised words in the following example:

(92) Bill thinks *that* Tom *and* Dick *have been* visiting Harriet *to* ask for help with one *of the* assignments *which have to be* finished for *the* next morphology class

It is difficult to begin to ascribe a simple meaning to such words in the way that we often can for words in our major classes. For instance, imagine being asked by someone who doesn't know English well what *think* or *assignment* means in (92). Since major class words normally denote objects, ideas, events, states, properties and so on, native speakers of English can usually formulate answers of some kind to such questions. However, suppose that instead you are asked what *that* or *of* or *to* mean in (92), and it is unlikely that you will have an answer. A better way of thinking of these words is as fulfilling a particular *function* in the sentence. For instance, *that* (in this usage) is traditionally regarded as a subordinating conjunction. It is attached to the beginning of the sentence *Tom and Dick have been visiting Harriet* ... to indicate that the clause it introduces is a statement rather than a question. The word *to* in *to ask* signals that this was the purpose of Tom and Dick's visits, while the *to* in *to be finished* is there simply because it appears to be part of English grammar that the verb *have* in its meaning of 'obligation' must be followed by *to* and the base form of a verb (notice that *must*, a synonym of this type of *have*, does not require this *to*; indeed, it would be ungrammatical to add it: *the assignments which must be finished / *must to be finished*). From a quite different perspective, *which* appears to be somehow dependent on *the assignments* (they have to be finished) and to be devoid of any meaning in its own right. The reader is invited to reflect on the remaining italicised words in (92).

Words such as the above, which do not denote objects, ideas, etc. are known as **function words** and they belong to classes known as **functional categories**. They are distinguished from nouns, verbs, adjectives, adverbs and prepositions, which are often called **content words**. The distinction has proved important, not only in the description of individual languages, but also in the study of the acquisition of language and the study of language disorders (see sections 13, 24 and 26).

There is an important relationship between function words and content words, in that very often the syntactic criteria for assigning words to lexical categories rely on specific types of function words. For example, above it was pointed out that nouns can be preceded by a definite or indefinite article (*the* or *a(n)*). The function of the article is (very roughly) to make what the noun refers to either more or less specific. If you say *I bought a car* this simply refers to a car-buying event on your part, without implying anything about the car concerned, but if you say *I bought the car*, then you must be assuming that your addressee already knows which car you are talking about (for example, because you have described it earlier). We can be even more specific with **demonstratives**, *this* or *that*. The articles *the/a* and the demonstratives belong to a class of function words called **determiners** (D). These are often found before nouns, though the determiner may be separated from the noun by one or more adjectives, e.g. *a bright, shiny, new car*).

Verbs can also be preceded by a type of function word, the **auxiliary verbs** (AUX) such as *can*, *will*, *must*, *have*, *be*:

(93) a. You *can* go to the ball
b. Linguistics *is* developing rapidly
c. Sam *has* lost the plot again

That auxiliary verbs behave quite differently from **lexical verbs** (V) can be seen by examining their role in forming questions:

(94) a. Harriet *is* studying linguistics
b. *Is* Harriet studying linguistics?

(95) a. Tom *can* speak Urdu
b. *Can* Tom speak Urdu?

Here we see that the formation of a question involves 'moving' an auxiliary verb to the initial position in the structure. Lexical verbs do not 'move' in this way in Modern English (see sections 21 and 22 for much more extended discussion):

(96) a. Harriet *studies* linguistics
b. **Studies* Harriet linguistics?

Furthermore, a sentence is negated by placing *not* (or *n't*) after an auxiliary:

(97) a. Harriet *is* studying linguistics
b. Harriet *is*n't studying linguistics

Again, this is not possible with lexical verbs:

(98) *Harriet *studies*n't / *studies* not linguistics

We can immediately see, then, not only that auxiliary verbs are useful in enabling us to assign lexical verbs to the appropriate class, but also that they have distinctive properties which justify the recognition of the separate functional category AUX.

Another function word that often accompanies lexical verbs is the word *to*. This is added to the base form of a verb to form the **infinitive**: *to be or not to be*, *to know her is to love her*. In English, the infinitive is the **citation form** of a verb, that is, the form we use to name a verb (as in *The most irregular verb in English is the verb 'to be'*). Although *to* usually comes immediately before the verb, it can be split from it by an adverb, and sometimes this is the only possible construction: *to **really** impress her, you have to be able to cook*. Often, the split infinitive sounds cumbersome and for that reason it's often avoided (especially outside the United States), but it's always been possible to split infinitives in English (despite assertions to the contrary from people who know nothing about English grammar). A convenient label for the infinitive use of *to* is 'INF' (see section 19, p. 259, where a slightly different proposal on the status of infinitival *to* is adopted).

Another important type of function word is the **pronoun** (PRN). This is a group of words the members of which (roughly speaking) stand for a noun expression (like *John*, *the president*, *a book of mine*, etc.). The commonest pronouns are the **personal pronouns**, which can be (partially) described in terms of number (singular/plural) and person (first person when the speaker is included, second person for the addressee when the speaker is excluded, and third person in other cases).

Table 14 shows that *we/us* is a first person plural pronoun, that *he/him* is a third person singular pronoun, etc. Nouns such as *Tom*, or *apples* can also be regarded as third person forms (singular and plural respectively) because they can be replaced by the corresponding personal pronouns *he* and *them*.

Another type of function word is illustrated in (92) by *and*. Such words are called **co-ordinating conjunctions** (CONJ) and further examples are shown in (99):

(99) a. naughty *but* nice
b. your money *or* your life
c. Harriet is English *but* she speaks Russian

These conjunctions serve to join words or phrases together to form larger phrases of the same type (99a, b), or join whole sentences together to form new sentences (99c).

Table 14 *Personal pronouns in English*

	number	singular	plural
person			
first		I/me	we/us
second		thou/thee/you	you
third		he/him, she/her, it	they/them

(The second person singular pronoun *thou/thee* is obsolete in standard dialects of Modern English, though it survives in other varieties.)

The subordinating conjunction *that* has already been mentioned in connection with (92). In modern linguistics, words like this are known as **complementisers** (C) because one of their most important uses is to introduce complement clauses (i.e. clauses which function as the complement of a verb, adjective or noun). Additional examples of this type are shown in (100):

(100) a. Tom **wonders** [*if* it will rain]
b. Tom **arranged** [*for* Dick to leave early]

Each of the bracketed clauses in (100) is a complement clause, since it serves as the complement of the bold-face verb.

Up to this point, then, we have seen that it is necessary to recognise at least five lexical categories (N, V, A, ADV, P) in the grammar of English along with a number of functional categories (D, AUX, PRN, CONJ, C). We have also suggested that category membership will be specified as part of a word's lexical representation in the lexicon. Without wishing to suggest that our set of categories is exhaustive, we shall now focus on verbs and on some of the complexities which arise in consideration of their morphological properties.

The morphological properties of English verbs

Verbs in English have a simple form, such as *read*, *write*, *illustrate*, called the **base** form. However, consider the verbs in sentences such as *Tom reads poetry*, *Dick writes letters*, *Harriet illustrates comics*. These are in a special form, consisting of the base form plus an ending *-s*. This form is used whenever the word or phrase referring to the person doing the reading, writing or illustrating (i.e. the subject) is third person singular and the verb is in the present tense. The *-s* form is not used for any other person (*I*, *we*, *you*) or for third person plural subjects: *I/we/you read / *reads novels, the girls write / *writes letters*. Because of these different verb forms, we say that the verb **agrees** with its subject. In English, the agreement system has almost entirely disappeared (in some dialects it has completely withered away, see section 16), and the third person singular agreement form in the present tense is its last vestige.

The special agreement forms for third person singular subjects are characteristic of verbs as a class. Other special forms of this class are shown in (101):

(101) a. Harriet *took* a picture of Dick
b. Harriet is *taking* a picture of Dick
c. Harriet has *taken* a picture of Dick

Verbs typically signal the time when an action or event occurs. In (101a), the picture-taking event is presented as taking place in the past, whereas in (101b), it is presented as unfolding at present. In (101c), the event took place in the past, but because of the use of the auxiliary *have*, the action is perceived as retaining relevance for the present (so that 101c might be taken as implying that the picture of Dick is available and could be viewed).

The use of the special form *took* in (101a) signals **Tense**, which is primarily used to indicate the time at which an event took place (but also has secondary uses, as in *I wish you **took** me seriously*). In this case, we have the past tense, indicating that the event occurred before the moment at which (101a) is uttered. The form *took* is, in fact, an irregular past tense form. Regular verbs in English form their past tense by adding the (orthographic) suffix *-(e)d: applauded*, *barked*, *snored*. Because of this, people often refer to the past tense form as the *-d* form of a verb.

The verbs in (101b, c) are in special forms used with the auxiliaries *be* in (101b) and *have* in (101c). The *ing*-form is sometimes referred to as a *present participle*, but the fact that it can occur in past tense sentences like *she was working* or *she had been resting* shows that this is an inappropriate term. A better description is found in those pedagogical grammars which say that *ing*-forms (in sentences like 101b) are 'progressive' or 'continuous' forms which mark an on-going action that continues to be in progress at the time in question: for this reason, we will refer to verb forms like that in (101b) as **progressive participles**. Such sentences illustrate the **progressive aspect**. However, when we just want to concentrate on the form of the verb and not necessarily on its function we can simply refer to the **-*ing*** form.

The form *taken* in (101c) is traditionally referred to as a *past participle*: but this again is an inappropriate description which wrongly implies that such a form can always be used together with expressions referring to past times, such as *yesterday*. This is not the case, otherwise it would be possible to say things like **Harriet has taken a picture of Dick yesterday*. More accurate terminology for forms such as *taken* in sentences such as (101c) is **perfect participle**. The point of this term is that the perfect participle is used to form the **perfect aspect** construction, which marks the fact that an action has been completed. Again, if we just want to talk about the form we can refer to the *-n* form of the verb, although a little caution is necessary here as the perfect participles of all regular verbs involve the addition not of *-(e)n* but of *-(e)d* (e.g. *he has walk**ed** a long way*, *she has jump**ed** over the stream*). Even in these circumstances, however, a perfect participle ending in *-(e)d* is referred to as the *-n* form of the verb! Some justification for this apparent perversity will be given in the next section.

The auxiliary *be* is referred to as a **progressive auxiliary** when it's used in progressive aspect sentences such as (101b). By the same token, the auxiliary *have*, when used in conjunction with a perfect participle, is known as a **perfect auxiliary**. We can now see that it is the combinations of auxiliary verb and special forms of the lexical verb that give us two different kinds of aspect, whether it is on-going (progressive) or completed (perfect). We can also have the combination of progressive and perfect *has been taking pictures*.

When a word appears in a variety of forms depending on its grammatical role in the sentence, we say that it **inflects** or undergoes **inflection**. A category such as Tense is therefore called an **inflectional category**. The category of Tense has two forms, past and non-past in English, signalled in the case under discussion by *took* (past) versus *take/takes* (non-past). Specific values of an inflectional category of this sort are called **inflectional properties**, and we shall have more to say about these in the next section.

Earlier, we noted that the phrase referring to whoever or whatever is performing the action denoted by the verb is referred to as the subject of the sentence. Additionally, the phrase referring to whoever or whatever is affected by the action denoted by the verb, one type of complement, is referred to as the verb's **object**. Now, there are many verbs such as *sleep* and *hop* that refer to states or activities which are not directed towards another entity; as a consequence, such verbs cannot occur with objects and they are called **intransitive verbs**. By contrast, verbs which do take objects are called **transitive**.

The simple picture we have just described is complicated somewhat by example (102):

(102) A picture of Dick was *taken* by Harriet

Here, Harriet is still the one taking the picture, and it is still the picture that is being affected by the action of being taken (in that it is being created). However, grammatically speaking, *a picture of Dick* is the subject in (102). This is clear if we consider agreement in (102) in contrast to (103):

(103) Pictures of Dick were taken by Harriet

Here, the form *were* is the appropriate form for a third person plural subject (**pictures of Dick was taken by Harriet*), indicating this reversal of grammatical roles, which is a systematic phenomenon affecting transitive verbs. When it occurs, the verb appears in another special inflectional form (identical to the perfect participle) and is accompanied by the auxiliary *be*, the old object becomes the subject of the new verb form, while the old subject is either introduced by the preposition *by*, as in (102, 103), or omitted altogether (as in *pictures of Dick were taken*). The traditional term used to distinguish sentences in which the relations of subject and object are changed is **voice**. Thus, we say that (101a) is in the **active** (voice), while (102, 103) are in the **passive** (voice). The verb form *taken* in (102, 103) is the **passive participle**. The passive participle of any verb in English is always identical to the perfect participle in form, that is, it is always the *-n* form (cf. section 21, pp. 304ff., for further discussion of passive constructions).

English has little inflection. Nouns have only two forms, singular and plural, and verbs have relatively few forms. Subject agreement takes place only with third person singular subjects, and then not in the past tense (with the exception of forms of *be* as in *I was*, *you were*, etc.). Not all words inflect in exactly the same way, of course. Languages have irregularities in morphology. For instance, as we have noted, the regular past tense form consists of adding *-(e)d* to a verb (*walk* → *walked*), though *take* has an irregular form *took*. English has about two hundred verbs with inflectional irregularities. The implications of these observations for the structure of the lexicon are straightforward. As the lexicon is a repository for the *idiosyncratic* linguistic properties of words, if a word is regular inflectionally, there will be no need to specify its inflectional forms in the lexicon. Thus, the lexical entry for the noun *train* will not contain any indication that the plural form of this word is *trains*; and the lexical entry for the verb *jump* will not include the information that this verb has a third person singular present form *jumps*, a past tense form *jumped*, etc. These facts are entirely predictable, so do not need to be specified. However, the fact that *women* is the plural form of *woman* will be listed in the lexical entry for *woman*, as will the fact that *gave* is the past tense form of *give* in the latter's lexical entry, etc. (***exercise 5***)

Exercises

1. The following text contains invented words (like *plingle*). Identify the lexical class of each word, giving a justification for each case.

   In the Ancient Order of Grand Wizards a monesticant often demogulates the less vericle regulations. In a recent lecture anent the history of Order, one of the monesticants drongly explained why an old splink should never be croodled.

   ### Model answer for *monesticant*

   monesticant is a noun because
   (a) it has a plural form in *-s*, as we see later in the text;
   (b) it is preceded by the articles *a* with its singular form and *the* with its plural form, *monesticants*;
   (c) it serves as the main word in the phrase *one of the monesticants*, in which *the monesticants* comes after a preposition (*of*);
   (d) the phrase *the monesticants* appears to function as an argument (subject) of the verb *explain*; if *demogulates* is also a verb form, the phrase *a monesticant* appears to function as an argument (again, subject) of this verb.

2. The following words have unusual plurals. Identify as many other words as you can which show similar behaviour in the plural.

goose	change vowel of singular form
sheep	no change at all
criterion	replace *-on* with *-a*
knife	replace voiceless fricative with voiced fricative then add /z/

3. The following words do not have plurals or undergo an interesting shift in meaning when pluralised. Describe the nature of these meaning changes. How would you account for this behaviour?

   water, sand, lemonade, arrogance, kindness

4. Consider the adjectives below. Some form a comparative and superlative in *-er/-est* and others do not, in which case the comparative/superlative meaning is conveyed by *more/most*, e.g. *more/most sarcastic* and not **sarcasticer*/**sarcasticest*. What might account for this difference in behaviour?

large	warm	complex	crooked	malicious
strong	frantic	splendid	frightened	grand
dreadful	frank	pretentious	close	comical
candid	incorrigible	remarkable	round	dark
fiendish	small	stupid	trenchant	wild

The following words may seem to be counter-examples to the solution you've proposed for the first set of words. Is there any way of incorporating them into your explanation?

friendly, gentle, slimy, noble, happy, funny, simple, hazy

5. Assign *all* the words in the following examples to word classes by means of a **labelled bracketing**. This involves placing the word between square brackets […] and labelling the left-hand bracket with the word category using the abbreviations we have introduced in the text. For instance, *John has left* would come out as [N John] [AUX has] [V left]:

(a) Will the gerbils want to be fed again before we go out to the cinema?
(b) The plucky arctic fox can withstand the unbelievably harsh climate of the Siberian tundra
(c) Often, the meerkat will carefully and patiently observe the distant horizon for hours

(If you get stuck, note that the technique of labelled bracketing is introduced with discussion in section 19.)

10 Building words

In the previous section, we have referred to both *derivational* and *inflectional* processes which enable us to form words from other words. The field of linguistics that examines the internal structure of words and processes of word formation is known as **morphology**, and in this section we shall introduce some of the important ideas in this domain by illustrating their application to English word structure.

Morphemes

Many words in English can easily be split into smaller components. Consider words like *reader*, *printer* and *illustrator*. These are all nouns related to the verbs *read*, *print* and *illustrate*, and they all mean roughly 'person or instrument that *Verb*-s'. Clearly, it is the ending *-er* (with its alternative spelling *-or* in certain words) which conveys this new aspect of meaning and we can say that *-er/-or* creates a new noun from a verb. We can also create new verbs from verbs, as illustrated by pairs such as *read ~ re-read, print ~ re-print* and *illustrate ~ re-illustrate*. Here, the new verb begins with *re-* and means 'to *Verb* something again'. In both these cases, the complex word consists of a number of components, each with its own meaning. We call such components **morphemes**, and to make them easier to identify we can separate them by means of a hyphen (e.g. *read-er*). You will often see the morpheme described as the **minimal linguistic sign**. What this means is that the morpheme is the smallest component of a word which contributes to its meaning. We will see that if we are to subscribe to this, we have to understand 'meaning' rather broadly.

In *reader*, we have a morpheme *-er* attached to a word *read*. However, we cannot split *read* itself into smaller morphemes. This means that we can say that the word *read* is itself a single morpheme. A morpheme which can also stand as a word is called a **free morpheme**. By contrast, *-er/-or* and *re-* are unable to function as free-standing words and these are called **bound morphemes**. The verbs *read*, *print* and *illustrate* are the starting point for the derivation of *reader*, *printer* and *illustrator* in the sense that these verbs specify the activity undertaken by the person to whom *reader*, etc. refers. We therefore assume that *-er/or* and *re-* are attached to the morphemes *read*, *print* and *illustrate* to form the derived words. The ultimate starting point for deriving a word, that is, the most basic morpheme in a word, is its **root**. A morpheme such as *-er/or* added to the right of a root is a **suffix**. One added to the left of the root, such as *re-*, is a **prefix**. The general term covering suffixes and prefixes is **affix**.

We often find more than one affix added to a word. Consider *indecipherability*. The root is the noun *cipher*. From this, we form a verb *de-cipher* from which the adjective *de-cipher-able* is formed. This is then negated by the prefix *in-* to give *in-de-cipher-able*, and finally we create a noun from the adjective by adding *-ity* (and making a change to *-able-*, of which more later, pp. 151f.): *in-de-cipher-abil-ity*. The structures of the items in this sequence can be represented by **labelled bracketings** as in (104) (see section 9, exercise 5):

(104)
a. [$_{\text{N}}$ cipher]

b. [$_{\text{V}}$ de [$_{\text{N}}$ cipher]]

c. [$_{\text{A}}$ [$_{\text{V}}$ de [$_{\text{N}}$ cipher]] able]

d. [$_{\text{A}}$ in [$_{\text{A}}$ [λde [$_{\text{N}}$ cipher]] able]]

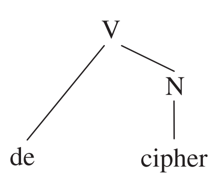
e. [$_{\text{N}}$[$_{\text{A}}$ in [$_{\text{A}}$ [$_{\text{V}}$ de [$_{\text{N}}$ cipher]] able]] ity]

In (104), we have explicitly indicated paired brackets using double-headed arrows, although it should be noted that such arrows are *not* part of the conventional labelled bracketing notation. Taking (104c) for illustration, we have [$_{\text{A}}$ marking the beginning of the adjective *decipherable* and its paired unlabelled bracket marks the end of this word; [$_{\text{V}}$ marks the beginning of the verb *decipher* and the paired unlabelled bracket marks the end of this word; and [$_{\text{N}}$ marks the beginning of the noun *cipher*, the end of which is indicated by the paired unlabelled bracket.

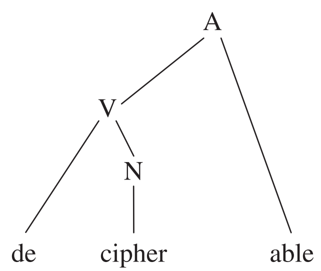
Alternatively, we can represent the same information using the **tree diagrams** in (105):

(105)
a.

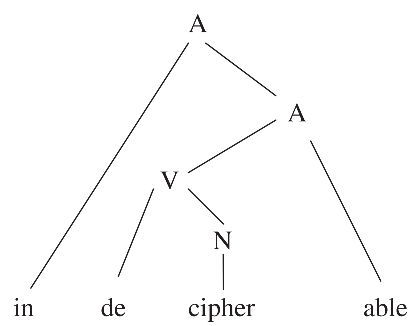
b.



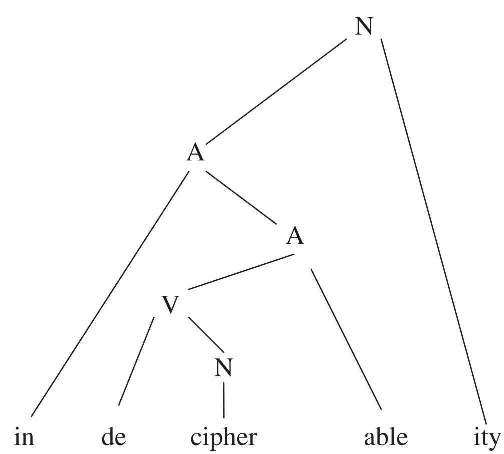
c.



d.



e.



To illustrate the interpretation of such trees, take (105c). This tells us that *cipher* is a noun (N), that *decipher* is a verb (V) formed by adding the prefix *de-* to the noun *cipher* and that *decipherable* is an adjective (A) formed by adding the suffix -*able* to the verb *decipher*.

Although English has a fair number of affixes, it also makes use of a morphological process whereby, *without any affixation*, a word of one syntactic category is used as though it belonged to a different category. This commonly happens when we treat nouns as verbs, as in the examples in (106):

(106) a. Smith *motored* along for three hours
b. Mary *codes* her messages skilfully
c. The tourists are *fishing* near the bridge

Furthermore, we are equally likely to find examples of verbs being used as nouns in such phrases as *a splendid* ***catch****, a dangerous* ***run****, a fitful* ***sleep***. This process is known as **conversion**, and in some cases it is difficult to tell which is the original category. For example, is *rain* basically a verb (107a) or a noun (107b), or is it more appropriate to regard it as having dual-category status, with neither the noun nor the verb being derived from the other?

(107) a. It *rained* every day on our holidays
b. This *rain* is good news for the farmers

Morphological processes – derivation and inflection

One of the key concepts in morphology is that of 'word'. Up to now, we have taken this concept for granted, but at this point we are going to have to be a little more careful. Note first that the term 'word', as it is used in ordinary language, hides an important ambiguity, which we must understand before we can proceed. Consider the following examples:

(108) a. cat
b. cats

(109) a. cat
b. dog

How many words are illustrated in (108) and in (109)? The answer seems clear: two in each example. However, while it is obvious that this is the only answer for (109), there is a sense in which only one word appears in (108). This is the word CAT, with (108a) being its singular form and (108b) the plural. This second sense of 'word' is the one we intend to convey when we say 'this dictionary contains 50,000 words' or 'I know 5,000 words of Greek.' The term we use for this more abstract notion of 'word' is **lexeme**, and when we wish to make it clear that we are discussing a lexeme, the convention is to write it with capital letters. Thus, (108) illustrates only the lexeme CAT, while (109) illustrates the two lexemes CAT and DOG. What, then, of *cat* and *cats* in (108)? These are the singular and plural forms of the lexeme CAT, and we say that (108) illustrates two **word forms** of one lexeme. The singular and plural forms of a lexeme are examples of **inflections**, and we say that CAT inflects for the plural by taking the suffix *-s*. In (109), we again have two word forms (*cat*, *dog*), but these are the singular forms of two lexemes, CAT and DOG. From the point of view of meaning, different lexemes refer to distinct concepts, whereas this is not so for word forms of the same lexeme. Up to this point, then, we have replaced the problematic 'word' with two distinct notions: lexeme and word form.

Returning now to the processes with which we introduced this section, we can ask about the status of *read* and *reader* with respect to the lexeme/word form distinction. Clearly, both *read* and *reader* are word forms, but in addition they refer to rather different (though related) concepts, one a process and the other a physical object taking part in that process. Thus, adding *-er* to a verb creates a new lexeme and READER and READ are distinct lexemes. Of course, each of them has a number of word forms: *reader* and *readers* in the case of READER, and *read* (/riːd/), *read* (/rɛd/), *reads*, *reading* in the case of READ. Moreover, the new lexeme is of a different syntactic category from that of the original lexeme (a verb has become a noun). The creation of new lexemes is the province of **derivational morphology** (or 'derivation'). Of the major lexical categories from section 9, prepositions (P) do not participate in derivation in English (or most other languages for that matter), while adverbs (ADV) are often derived, but only from adjectives, by the suffixation of *-ly* (*bad* ~ *bad-ly*, *noisy* ~ *noisi-ly*, etc.). The other three categories (N, V and A) can, however, readily be derived from each other.

We have already seen that verbs can give rise to nouns via *-er*/*-or* suffixation, and to other verbs via *re-* prefixation. The third possibility for verbs is illustrated by the suffix *-able*. Suffixed to verbs, this gives words such as *read-able*, *print-able*, *illustrat-able*, etc., which are adjectives with the meaning 'such that can be *Verb*-ed'. This suffix is also spelt *-ible* in cases such as *convert-ible*. Starting with adjectives, in *happi-ness*, *sad-ness*, *disinterested-ness*, etc., we create nouns by suffixation of *-ness*. We also find cases in which an adjective is turned into a verb, e.g. by suffixation of *-en* as in *short-en*, *weak-en*, *wid-en*, etc.; and the negative prefix *un-* creates a complex adjective from another adjective as in *un-happy*. Finally, if we take noun roots, we can create adjectives such as *boy-ish* and *child-ish* using the suffix *-ish*, verbs such as *motor-ise* and *demon-ise* with the suffix *-ise* and complex nouns such as *boy-hood*, *child-hood* and *nation-hood* by means of the suffix *-hood*. These options are summarised in table 15 (***exercise 1***).

To date, we have seen various examples of derivations enabling us to form new lexemes in English. Derivation is not the only function of morphology, however. In the previous section, we considered examples such as *Tom reads comics*, pointing out that the verb *reads* consists of the base form *read* and a suffix *-s*. However, this suffix doesn't create a new lexeme; rather it signals agreement with a third person singular subject of the sentence (as well as the fact that the verb is present rather than past tense). Realising agreement is an important function

Table 15 *Examples of derivational morphology in English*

	Derived form		
Basic form	Noun	Verb	Adjective
Noun	boy-*hood*	motor-*ise*	child-*ish*
Verb	print-*er*	*re*-write	read-*able*
Adjective	sad-*ness*	short-*en*	*un*-happy

of **inflectional morphology**, and it is much more widespread in some languages than in English.

The *-s* ending which signals agreement in English is often thought of as a morpheme. However, such a morpheme does not have a meaning in the way that *re-* or *-er*/*-or* have meanings. Rather, it is an inflection which expresses an inflectional category (of agreement) and the purpose of this category is to signal a syntactic relationship, that of the verb to its subject. It is in this sense that we have to interpret rather broadly the notion of a morpheme as a minimal sign *having a single meaning*. Indeed, it is often thought appropriate to resort to a more neutral terminology in such cases. Instead of regarding the English agreement suffix *-s* as a morpheme, we can refer to it as an **inflectional formative** (or simply an 'inflection'), and instead of saying that an inflection means, say, 'third person singular', we say that it is the **exponent** of the property 'third person singular'. As we will see in section 11, there is much more than just terminology at stake here.

A further important concept can now be introduced if we return to (108). We have already noted that (108a, b) illustrate two word forms of the lexeme CAT. However, both of these word forms 'contain' the word form *cat* – (108a) just is *cat*, whereas (108b) is *cat-s*. Thus, we need to observe that the word form *cat* is found in two distinct *functions* in (108). In (108a), it is simply the singular form of the noun, but in (108b), it is the form of the noun to which the plural suffix is added. The form obtained when we remove inflections is called the **stem**. In regular nouns in English the stem is always the same as the singular word form. However, in a plural form such as *knives* the stem is pronounced with a voiced final fricative [naɪv], while the singular ends in an unvoiced fricative [naɪf]. In other words, the plural form of the lexeme KNIFE has a special stem form. Note that the notion of stem is distinct from that of root. The root is the smallest morphological form associated with a lexeme, while a stem is that form to which inflections are added. Thus, the root of the word form *printers* is *print*, but the stem (of the plural form) is *printer-*, which itself consists of a root and a derivational suffix *print-er-*.

The important distinction between lexemes and word forms enables us to explain a widely observed phenomenon in morphology: inflectional affixes tend to appear outside derivational affixes. Thus, in English we have *painter* 'one who paints', a form of a derived noun lexeme (PAINTER), composed of a form of the verb lexeme PAINT and the suffix *-er*. The plural form of this new lexeme is *paint-er-s* and not **paint-s-er*. This makes sense if we regard plural formation as something which happens to the lexeme. The morphological rule of plural formation is to add *-s* to the end of the stem of the lexeme: *cat-s, painter-s*, and this rule doesn't need to worry about whether the lexeme itself is derived or not. Clearly, we can't form the plural of a derived lexeme such as *painter* until we have created that new lexeme, so we do not see forms such as **paint-s-er.*

A further complication concerning the notion of 'word' can be appreciated if we return to the inflectional categories of English verbs discussed in section 9. If we take a regular verb lexeme such as CROSS, it has the word forms *cross*, *crosses*, *crossing* and *crossed*. Setting the base form *cross* and third person singular present form *crosses* aside, let's focus attention on *crossed*. As we have observed, one function of this form, illustrated in (110), is to express past tense:

(110) The dog crossed the road safely

Additionally, recall that a form such as *crossed* helps to form the perfect aspect construction with the auxiliary verb *have* as in (111) (see p. 136):

(111) I have crossed this road before

We have referred to the word form *crossed* in this construction as the *perfect participle*, and the same form is found with the passive voice combined with the auxiliary verb *be*:

(112) This river is crossed by three bridges

In (112), *crossed* is referred to as the *passive participle*. But now note that the terminology we have introduced to date for replacing the unclear concept 'word' does not enable us to come to terms with these distinctions. Focusing entirely on the lexical verb, there is only one lexeme in (110)–(112), namely CROSS. Furthermore, there is only one word form of this lexeme in these examples, namely *crossed*. It is necessary, then, to introduce a third sense of 'word' which is distinct from both lexeme and word form. We need to convey the fact that the single word form *crossed* corresponds to *two* distinct inflected forms, the past tense form of CROSS and the perfect/passive participle form of CROSS. We will call a description such as 'the past tense form of CROSS' a **grammatical word** or **morphosyntactic word**. This means that *crossed* corresponds to *two* grammatical words, though it is a *single* word form of a *single* lexeme. At this point, it is useful to recall that in the previous section, we insisted that perfect/passive participle forms should be referred to as the *-n* forms of verbs even when they were suffixed with *-ed*. It should now be clear that the distinction between the *-d* and *-n* forms of verbs which we introduced there is a distinction between two *grammatical words*. In many cases, this distinction corresponds to a distinction between two word forms (*ate* ~ *eaten*, *sang* ~ *sung*, *gave* ~ *given*); in the case of regular verbs, however, only one word form corresponds to these two grammatical words (*crossed* ~ *crossed*, *walked* ~ *walked*, *jumped* ~ *jumped*, etc.) (***exercise 2***).

The *-ing* suffix is also rather complex. Suffixed to a verb form which is combined with the auxiliary *be*, it forms the progressive participle in a progressive aspect construction, as in (113):

(113) Harriet is sending a text message

It is also used to create from a verb a form which has some of the characteristics of nouns, as (114) shows:

(114) Sending text messages is easy

In this example, the phrase *sending text messages* behaves rather like an ordinary noun such as *linguistics* in *linguistics is easy*. However, in a phrase such as *the person sending text messages*, the word seems to behave more like an adjective, in that it forms a phrase, *sending text messages*, which serves to describe *person*, rather like the adjective *responsible* in *the person responsible for this message*. The use of a participle form as an adjective-like modifier is even clearer in an expression such as *running water*.

At this point, it is appropriate to assess the implications of our discussion so far for the lexical entries which form a fundamental component of a grammar. We can now see that it is lexemes which appear in the mental lexicon. When we say that speakers of English know the word *walk*, we are saying that their lexicon contains a lexical entry WALK which provides several kinds of information. Firstly, there is information about the meaning of the lexeme (see section 12). Secondly, there is the syntactic information that it is a V and is intransitive. Thirdly, there is information about how to pronounce all the word forms associated with the lexeme. Now, the lexeme itself doesn't have a pronunciation; rather, it can be realised by one or more word forms and it is they that have a pronunciation. In regular cases the lexical entry just contains the pronunciation of the base form. For instance, the lexeme WALK has the base form *walk* which is pronounced /wɔːk/. Sometimes things are more complex and the lexical entry will contain the pronunciation of certain of the stem forms of a lexeme, as in the case of KNIFE, with its irregular plural stem. In other cases, it is necessary to include the pronunciation of a whole word form, as in the case of the irregular verb BRING with the past tense form, /brɔːt/.

In (115), we see highly simplified lexical entries for WALK, KNIFE and BRING:

(115)	a.	Lexical entry for WALK		
		Phonology:	/wɔːk/	base
		Syntax:	V, intransitive	
		Semantics:	'move on foot with alternate steps'	
	b.	Lexical entry for KNIFE		
		Phonology:	/naɪf/	base
			/naɪv/	plural stem
		Syntax:	N	
		Semantics:	'instrument for cutting'	
	c.	Lexical entry for BRING		
		Phonology:	/brɪŋ/	base
			/brɔːt/	[past tense]
		Syntax:	V, transitive	
		Semantics:	'carry something towards the speaker'	

Other types of information (e.g. the fact that the third person singular present forms of WALK and BRING end in *-s*) are predictable from the principles of

English morphology and therefore don't need to be included in the lexical entries. More subtly, we haven't mentioned the perfect/passive participle form (such as occurs in *has brought* and *was brought*) in (115c), even though this is also irregular. This is because, in the general case, the perfect/passive participle form is identical to the past tense form, and this generalisation of English morphology allows us to predict the perfect participle form of most verbs in the language. There are some exceptions. For example, *sang* is the past tense form of *sing* but *sung* is the perfect participle (*has sung*). In such cases, the lexical entry will have to contain the perfect participle form as well as the past tense form.

Having urged caution with respect to the concept of 'word' in the above discussion and introduced terminology which obviates confusion when precision is called for, we shall continue to use the word 'word' from here on, unless it is necessary to be circumspect.

Compounds

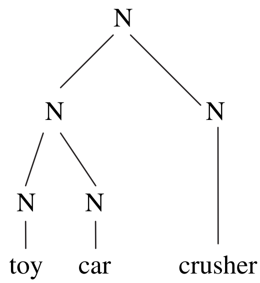
English shares with many languages the ability to create new words by combining old words. For instance, *blackbird* is clearly formed from the adjective *black* and the noun *bird*. However, a blackbird is a different thing from a black bird. Firstly, *blackbird* denotes a particular bird species, not just any old bird that happens to be black; and secondly, female blackbirds are brown, but a black bird has to be black. The expression *blackbird* is a type of word, just like *thrush* or *crow*, but it happens to consist of two words. It is therefore called a **compound word**.

A blackbird is a type of bird, a windmill a type of mill, a coffee table a type of table and so on. We say that *bird*, *mill* and *table* are **heads** of the compounds *blackbird*, *windmill* and *coffee table*. The other part of the compound is a **modifier**. It is possible to form compounds out of compounds. For instance, we can have *finance committee*, *finance committee secretary*, *finance committee secretary election*, *finance committee secretary election scandal* and so on. Now, the way these are written makes them look rather like phrases, but they behave in sentences just like single words. The above list consists of compound nouns and determiners such as *the*, and adjectives such as *efficient* have to precede these compounds just as they would a single non-compound noun: *the highly efficient finance committee secretary*. The fact that they are written with spaces between the elements of the compound is a fact about English orthography and an arbitrary one at that. There are no principled criteria that would tell us whether *windmill* has to be written as one word, as two words (*wind mill*) or as a hyphenated word (*wind-mill*).

There is no theoretical limit to the lengths of compounds because the process of forming compounds can feed itself ad infinitum: a compound noun is itself a noun and can be subject to further compounding. This property is called **recursion** and we say that compounding in English is **recursive**. This is an important property which makes compounding resemble the syntactic processes of phrase- and sentence-formation (see. pp. 3f. and section 19).

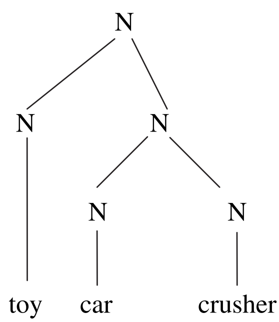
Another respect in which compounding is reminiscent of syntactic processes is in the types of ambiguities it permits. Consider a compound such as *toy car crusher*. This can refer to either a device for crushing toy cars (say, in a recycling factory) or a child's toy modelled after a car crusher. The ambiguity can be represented in terms of labelled brackets and tree diagrams as in (116):

(116) a. toy car crusher 'crusher for toy cars'



[$_N$ [$_N$ [$_N$ toy] [$_N$ car]] [$_N$ crusher]]

b. toy car crusher 'car crusher which is a toy'



[$_N$ [$_N$ toy] [$_N$ [$_N$ car] [$_N$ crusher]]]

An ambiguity of this sort, which results from the way the words are bracketed together, is called a **structural ambiguity** (see also section 23). It is an important type of phenomenon because it is very difficult to see how we could explain such ambiguities without resorting to something like the structures in (116). (***exercise 3***).

English permits a variety of compounds. We can combine adjectives with nouns (*sweetcorn*, *lowlife*), or nouns with nouns (*windmill*, *coffee table*). In these cases, it is the first element (*sweet-*, *low-*, *wind-*, *coffee*) which receives the most stress in the compound. We can also combine two adjectives (*dark blue*, *icy cold*) or nouns with adjectives (*canary yellow*, *iron hard*), but in these cases the stress usually falls on the last element. However, in English it is rare for a verb to participate in compounding. Examples such as *swearword* (verb + noun) and *babysit* (noun + verb) are exceptional.

We observed earlier that inflection generally appears outside derivation, a fact that we put down to derivation giving rise to new lexemes and regular inflectional processes such as pluralisation applying to lexemes. Now derivation can appear inside compounding in the sense that a derived word can be compounded with another word. Thus, in the compound *printer cable*, the first element, *printer*, consists of the verb *print* suffixed with *-er*, giving the overall structure $[_N[_N[_V$print]-er] $[_N$cable]]. We clearly don't first form a (non-existent) compound of the verb *print* and the noun *cable* (**print cable*) and then add *-er* to the *print* component. (Apart from other considerations, as we have just noted, it is virtually impossible in English to form a compound by adding a noun to a verb.)

The situation with regard to inflection is more revealing. Thus, with noun + noun compounds, we seldom find morphology on the first noun. A dog catcher is presumably someone who catches more than one dog, yet we don't say **dogs catcher*, and even if we had a cable for use with several printers we wouldn't call it a **printers cable*. The lack of plurals in this position even extends to words which only ever occur in the plural, so that although there is no noun **trouser*, we do have *trouser leg* and *trouser press*. There are a few cases of plurals inside compounds, e.g. *systems analyst*, *arms control*, but usually the plural form is more than just a simple plural and involves some change of meaning, suggesting that we have a different lexeme from that linked to the singular form. On the other hand, we do have *dog catchers* and *printer cables*. Here, the plural formation rule pluralises the whole compound (***exercise 4***).

Clitics

Another puzzle about words can be illustrated by the examples in (117). How many words are there in each of these examples?

(117) a. it's
b. they've
c. she'll
d. wasn't

It will come as no surprise that there are *two* correct answers. In one sense, *it's* is a single word (indeed, it's just a single syllable), homophonous with (that is, being pronounced identically to) *its*. However, while *its* means 'pertaining or belonging to it' (*its name*, *its function*), *it's* means the same as *it is* or *it has*. Thus, there is a sense in which it combines two distinct words. The *-s*, *-ve*, *-ll* and *-n't* components of the words in (117) correspond to the full words *is/has*, *have*, *will/shall* and *not* and can be thought of as words. However, they can't stand alone in a sentence and they can't be stressed – to be pronounced they have to be attached to some other word (much like an affix). For this reason, they are referred to as **bound words**.

A similar phenomenon is represented by the possessive *-'s* of *Harriet's hat*. It is often thought that *Harriet's* is a suffixed form of *Harriet*, just as the plural form *hats* is a suffixed form of *hat*. However, this is misleading, because we can have expressions such as *the man who Harriet met's hat* or *the girl I'm speaking to's hat*. Here, the -*'s* ends up attached to a verb form (*met*) or a preposition (*to*). This is not the normal behaviour of a suffix. What is happening here is that -*'s* is added to the last word of a whole phrase, *the man who Harriet met* or *the girl I'm speaking to*. Unlike the bound word, this type of element never corresponds to a full word and hence it is called a **phrasal affix**.

Bound words and phrasal affixes are examples of **clitics** (from a Greek word meaning 'to lean') and the word that a clitic 'leans' on is its **host**. Clitics such as -*'s* and -*'ve* appear to the right of their hosts, like suffixes. Such clitics are called **enclitics**. In other languages, we find clitics which attach to the left side of the host, as though they were prefixes, called **proclitics**. Pronouns in Romance languages behave like this. Thus, in (118), the Spanish unstressed pronouns *me* 'me' and *las* 'them' appear immediately before the verb:

(118) Me las enseña
me them (he) shows
'He shows them to me'

When the verb is in the imperative form, however, the clitics follow the verb (they are enclitics):

(119) ¡Enséñamelas!
show.me.them
'Show them to me!'

Notice that in Spanish orthography the proclitics are written separately, while the enclitics are written as one word with the verb. However, once more this is merely an orthographic convention, which does not bear at all on the status of these items as clitics.

Allomorphy

We noted earlier that when *-ity* is suffixed to *indecipherable*, a change occurs in the suffix *-able*. Specifically, there is a change in its pronunciation from [əbl̩] to [əbɪl], a change which is reflected by a change in spelling to *-abil-*. To look at what is going on here in a little more detail, we will consider a similar, but more regular, case involving the pronunciation of the suffix *-al*. This creates adjectives from nouns, and its pronunciation also changes when such an adjective is converted to another noun by the suffixing of *-ity*. So consider the sets of examples in (120):

(120) a. nation, nation-al, nation-al-ity
b. music, music-al, music-al-ity
c. tone, ton-al, ton-al-ity
d. origin, origin-al, origin-al-ity.

In each case, *-al* is pronounced as a syllabic /l̩/ at the end of the word and as /al/ before *-ity*. What is happening here is that *-ity* causes the word stress to move to the immediately preceding syllable. When *-al* is unstressed, it is pronounced as /l̩/ but when stressed, it is pronounced with a vowel /a/. This is a regular phonological alternation. Thus, we can say that the morpheme *-al* occurs in two shapes /l̩/ and /al/ depending on stress. The shapes of morphemes as they are actually pronounced in a word are referred to as **morphs**, and where two morphs are variants of one morpheme, we say they are **allomorphs** of that morpheme. The terminology here mirrors that of the phoneme, phone and allophone discussed in section 5.

We have said that the /al/ ~ /l̩/ alternation depends on stress. Since stress is an aspect of the phonology of a word, we can therefore say that the alternation is **phonologically conditioned**. This means that we can describe the difference between the two in purely phonological terms. However, this is not true of all allomorphy. In some cases, a word form will be idiosyncratic in that it contains unusual inflections. Thus, the plural form of the lexeme OX is *oxen*. This is simply a peculiar property of this particular lexeme, and so we say that the plural allomorph *-en* is **lexically conditioned** here (***exercise 5***).

A well-known irregular verb in English is GO. This has a base form /gou/ and a past tense form /wɛnt/, which is completely different. This change in form illustrates the phenomenon of **suppletion**. Since there is no overlap at all in form between *go* and *went*, this is a case of **total suppletion**. The example of *bring* ~ *brought* to which we have already referred (115c) is also a case of suppletion, but as the form /brɔːt/ bears a partial resemblance to the base form /brɪŋ/ (they have the same syllable onset), we say that it is **partial suppletion**. In these cases, we can't say that the allomorphy is triggered by some phonological factor such as stress. Again, we have idiosyncratic properties of the lexemes concerned and so further instances of lexically conditioned allomorphy. Of course, it is precisely such lexically conditioned allomorphs which must appear in lexical entries (***exercises 6*** and *7*).

The concept of allomorphy pertains to morphemes, and it encourages the view that complex word forms consist of strings of morphemes with the form of these morphemes (their allomorphs) being determined by either phonological or lexical factors. However, while this view is attractive in some cases, in others it proves difficult to sustain. We can illustrate the type of problem it confronts by considering again the exponents of the property 'perfect participle'. These include the endings *-ed* (*walked*) and *-en* (*taken*), and perhaps in these cases, it is appropriate to suppose that there is a morpheme PERF(ect) which enables us to analyse *walked* as *walk* + PERF and *taken* as *take* + PERF, with *-ed* and *-en* being treated as lexically conditioned allomorphs of this morpheme PERF. However, we also find forms such as *sing* ~ *sung*, where the perfect participle differs from the base form by virtue of a vowel change. Should we regard *sung* as analysable as *sing* + PERF, with something (what exactly?) being a distinct allomorph of PERF in *sung*? It doesn't make much sense to say this, but it's a question of a type that recurs continually with inflection. An alternative is to say that there is a **morphological process** of perfect participle formation and this can be **realised** in a variety of ways, including affixation (*-ed* suffixation and *-en* suffixation) and a vowel change. We therefore speak of the affixes *-ed*/*-en* or the vowel change to /ʊ/ in *sung* as **realisations** of the morphological process. Morphologists sometimes also use **exponents**, a term we have already met, for referring to realisations. Adopting this perspective, it is common to represent morphological properties as *features*, similarly to the way we treated phonological properties in section 5, and so we can say that a perfect participle form of a verb has the feature [+perfect participle]. Thus, selecting a verb from the lexicon with this feature is a signal to trigger whatever phonological operation realises that function, whether regular affixation of *-ed*, the irregular *-en* suffixation, vowel change, or the choice of a suppletive form like *brought*.

One upshot of this reasoning is that we don't now have to say that complex words consist of morphemes, neatly strung out in a row, each with its own meaning. Instead, we regard the operations of affixation (if they are what the morphology requires) as separate from the morphological process which is realised by each affixal morpheme. The morphological function itself is then represented by the set of features the word bears. The idea that affixes don't necessarily have a fixed meaning in the way that words do is known as the **Separation Hypothesis**. For simple cases, of course, such as regular plurals or past tenses in English, it does no real harm to simplify the description and treat the affixes as things which have their own form and their own meaning. Thus, for many purposes in syntax it is sufficient to think of the past tense form *walked* as WALK + PAST TENSE, just as *coffee table* is COFFEE + TABLE. However, when we come to look at more complex inflectional systems in the next section, we will see that the notion of Separationism is an important idea.

Exercises

1. This is an exercise in English derivational morphology. Analyse the following words into root and derivational affix. Identify the function of each affix, the lexical category of the root (base category), V, N or A, and the lexical category of the derived word (output category):

   absorbent, defamation, freedom, ladylike, mishear, purify, unaware, accessible, motorise, Marxist, counter-example, encircle, expressive, greenish, broaden, unlock, Roman, obscurity, arrival

Model answer for *absorbent*

The word form *absorbent* comprises a root *absorb* and a suffix *-ent*. The root is a verb indicated by the fact that *absorb* has the forms *absorbs*, *absorbed*, *absorbing* that are characterstic of regular English verbs. Of these forms, *absorbs* signals third person singular agreement illustrated by the contrast between *he absorbs punishment* and

I absorbs punishment*/they absorbs punishment*; *absorbed* has a number of functions, serving as the past tense form of the verb (*he absorbed a lot of punishment yesterday*), the perfect participle form (*he has absorbed a lot of punishment*) and the passive participle form (*a great deal of information was absorbed in the session*); *absorbing* is the progressive participle form of the verb (*he is absorbing the lesson*). The derived form *absorbent* is an adjective, which can be used to modify nouns (*absorbent material*) and can follow forms of the verb *to be* (*this material is absorbent*). While it does not have *-er* and *-est* forms like some adjectives (**absorbenter*, **absorbentest*), the comparative and superlative senses can be expressed by using *more* and *most* (*more absorbent*, *most absorbent*). Thus, *-ent* is a suffix that converts verbs like *absorb* into adjectives like *absorbent*.

2. For each of the following words, give a full grammatical description. Indicate those instances where you need more than one description of a single word form (for instance, *crossed*: 'past tense; perfect/passive participle of the lexeme CROSS').

   walks
   sheep
   cut
   left

   (Hint: bear in mind what was said about conversion.)

3. Draw tree diagrams for the following compounds. Note that they all have more than one meaning and therefore require more than one tree. How does the tree structure relate to the difference in meaning?
   (a) French history teacher
   (b) criminal law firm
   (c) senate inspection review committee

4. Analyse the following words into morphemes and explain their structure in terms of derivation, inflection, compounding, affixation and conversion. Give a brief explanation of the meaning or function of each bound morpheme.

incomprehensibility	disingenuosity	unhappier
reprivatised	counterintuitively	deforestation
babysitter	party hats	

5. (a) English regular plural allomorphy
   Regular nouns in English form their plural by 'adding an *-s* (or sometimes *-es*)': *cats*, *dogs*, *cows*, *horses*, *ostriches*, *flamingos*, etc. However,

this *-(e)s* suffix undergoes phonologically conditioned allomorphy, appearing as [s], [z] or [əz]/[ɪz]. Use the following examples to identify the phonological conditions of this allomorphy (Hint: you will need to pay particular attention to the phonological nature of the final segment of the singular form.):

tops	pots	tabs	pads
packs	bags	cliffs	cloths
classes	clutches	crashes	cruises
cages	cows	quays	suckers
names	manes	rails	

(b) English third person singular and possessive *-'s* allomorphy
Collect together examples of uses of the third person singular ending and the possessive *-'s* phrasal affix, using 5a as a model. Like the English regular plural, this morpheme undergoes allomorphy. Describe this allomorphy and identify the conditioning factors. Compare your results with your answer to 5a. (Hint: don't forget the possessive forms of regular and irregular plural nouns.)
(c) English regular past tense allomorphy
Regular verbs in English form their past tense by 'adding a *-d* (or sometimes *-ed*)': *walked*, *played*, *waited*, etc. However, this *-(e)d* suffix undergoes phonologically conditioned allomorphy, appearing as [t], [d] or [əd]/[ɪd]. Use the following examples to identify the phonological conditions of this allomorphy. Comment on the relationship between this allomorphy and the allomorphy you have described in 5a and 5b.

caged	padded	rolled	crashed
classed	laughed	played	proved
tabbed	bagged	named	moaned
topped	potted	packed	clutched

6. The past tense and perfect/passive participle of *bring* is *brought*. However, children (and some adults) sometimes use the form *brung*. On the other hand, it is very rare for a child to coin a form such as **rought* for the past tense or perfect/passive participle of *ring* (although *ringed* is common in children's speech, see section 13). Why might this be so?

7. Take the verbs BE, HAVE, UNDERGO and SEND. Enumerate all their inflectional forms and transcribe them phonetically. Then segment each word form into morphemes. How many distinct stems do we need for each verb? How many forms show partial suppletion and how many show total suppletion? How many stems are used for more than one word form in each verb?

11 Morphology across languages

The previous section has concentrated almost entirely on English morphological phenomena. In fact, languages differ considerably in the extent and nature of the morphological processes employed in their grammars. Vietnamese, for example, has no bound morphemes, so that the only morphology in the language is compounding. By contrast, there are languages in which morphology is extremely intricate and accounts for much of the grammar's complexity. In this section, we will look at some examples of the types of morphological system that are found in the languages of the world, and the kinds of functions realised by that morphology. A range of the examples we consider will be seen to provide further support for the Separation Hypothesis introduced at the end of the previous section.

The agglutinative ideal

In the last century, linguists introduced a classification of morphological systems which is still often referred to today. This classification distinguished **isolating**, **agglutinating** and **inflectional** languages. We start with isolating languages. These, exemplified by Vietnamese, Chinese and a number of other Far Eastern languages, as well as a number of West African languages, have few, if any, bound morphemes. Thus, in Vietnamese, there is no morpheme corresponding to English *-er* in *driver*, this concept being conveyed by a compound with roughly the structure '*drive* + *person*'.

At the other extreme are languages such as Turkish, Finnish, Hungarian, the Bantu languages of Africa, many languages of the Americas and Australasia and most of the languages of Russia. Here, words of great complexity, consisting of many morphemes, are formed. A (fairly typical) word from the classic example of an agglutinating language, Turkish, appears in (121) (note that this example uses the orthographic system of Turkish):

(121) çalıştırılmamalıymış
'apparently, (they say) he ought not to be made to work'

The segmentation of this word into its component morphemes is indicated in (122):

(122)

çalış-	tır –	ıl –	ma –	malıy –	mış
work	cause	passive	negation	obligation	inference

The root, the verb *çalış* ‘work’, comes at the beginning and the suffixes each add their own component of meaning.

Languages such as Turkish give the impression that every morpheme has just one meaning and every meaning in the language is assigned its own unique morpheme. This is often thought of as a kind of morphological ideal, with the characterisation of such languages as agglutinating conveying the idea that morphemes are glued together one by one.

It is indeed the case that a ‘perfect’ isolating or agglutinating language would have the property that every morpheme would have just one meaning and every individual component of meaning expressible in the language would correspond to just one morpheme. The difference between the two types would be that in an agglutinating language some of the morphemes would be bound, giving the possibility of the construction of complex words like that in (121), whereas in an isolating language they would all be free. In practice, however, there are innumerable deviations from such ideals, and it’s unlikely that any language has ever met the ideal. Moreover, there are many languages which show, say, agglutinating tendencies in some areas of grammar and isolating tendencies in others. For this reason, it is much more interesting to ask whether *specific morphological processes* are isolating, agglutinating or something else. Whether a language can be so categorised is something of a non-question. With this background, we can now ask more detailed questions about the kinds of inflectional systems we find in the world’s languages.

We begin by contrasting two languages, Latin and Turkish. In tables 16 and 17, we see sets of forms of the Turkish noun EV ‘house’ and the Latin noun VILLA ‘villa, country house’.

Table 16 *Forms of the Turkish noun EV ‘house’*

	singular	plural
nominative	ev	evler
accusative	evi	evleri
genitive	evin	evlerin
dative	eve	evlere
ablative	evden	evlerden

Table 17 *Forms of the Latin noun VILLA ‘country house’*

	singular	plural
nominative	viːlla	viːllae
accusative	viːllam	viːllaːs
genitive	viːllae	viːllaːrum
dative	viːllae	viːlliːs
ablative	viːllaː	viːlliːs

These nouns each have sets of singular and plural forms, but in addition they have **case** forms. A case form of a noun is a special form used to indicate various types of grammatical relationship. Roughly speaking, the functions of the cases are as follows: nominative – the basic form of the word; accusative – the form used when the noun is the object of the verb undergoing the action denoted by the verb (e.g. *They painted **the house***); genitive – possession, *of **the house***, dative – *to/for **the house***, ablative – *away from **the house***. However, the meanings are not so important here; our focus is on the way the words are constructed.

The first thing we notice about the Turkish forms is that there is a single set of case endings which are used for both singular and plural: *-i*, *-in*, *-e*, *-den*. Moreover, the exponent of the plural for all case forms is the suffix *-ler*. When we turn to the Latin forms, however, the picture is much less clear. Firstly, there's no single suffix which expresses the property 'plural'. Moreover, the case endings for the singular and plural don't correspond to each other at all. In fact, it's worse than this because the nominative plural form is identical to the genitive and dative singular forms. And yet, when we investigate the Latin noun system, it's clear that we need to distinguish the five cases and the two numbers, because all nouns have sets of distinct forms for the various case/number combinations. The problem is that each Latin noun is only able to take a single suffix. Therefore, each suffix has to be simultaneously the exponent of *two* properties, number and case. When a single affix expresses more than one property within a word form in this way, we say that the affix **cumulates** those properties, and the phenomenon in general is called **cumulation**.

Latin nouns illustrate a further important feature of inflecting languages. The endings of the Turkish word KEDI 'cat' are essentially the same as those in table 16: *kediden* 'from a cat', *kedilerin* 'of the cats' and so on. In table 18, we see the forms of the Latin noun FELES 'cat':

There are only vague similarities between the endings for VILLA and those for FELES. Now, it turns out that there is a very large number of words which take the same endings as VILLA and quite a few which take the same endings as FELES, so this is not just a case of isolated irregularity. Moreover, there are other patterns of endings for other groups of nouns (traditionally, five such classes are recognised). Distinct groups of words with different inflections to express the same sets of properties are called **inflectional classes**. The traditional term for inflectional

Table 18 *Forms of the Latin noun FELES 'cat'*

	singular	plural
nominative	feːleːs	feːleːs
accusative	feːlem	feːliːs
genitive	feːlis	feːlium
dative	feːliː	feːlibus
ablative	feːle	feːlibus

classes of nouns (and adjectives) is **declension**, and the facts of Turkish, briefly referred to above, indicate that it lacks declensions. For verbs, if we find that inflections expressing agreement, tense, etc. fall into distinct classes, as they do in Latin, we speak of **conjugations** (***exercise 1***).

Although it's not immediately apparent, the two Latin nouns we have cited illustrate a further characteristic feature of Latin declensions. If we look at the dative and ablative plural forms of VILLA and FELES, we find that they are identical: *viːlliːs*, *feːlibus*. This identity obtains for all nouns in Latin, and therefore it is a fact about the grammar of Latin. Here we have to say, then, that we have a single word form but that form corresponds to two grammatical words, much like the past tense and perfect/passive participles of English regular verbs (see p. 146). This is a widespread phenomenon in languages such as Latin, and morphologists refer to it as syncretism. We say that the forms *viːlliːs*, *feːlibus* are **syncretic**, and that they **syncretise** the dative/ablative plural.

A rather different morphological phenomenon can be observed in Latin verbs. In (123), we see various forms of the verb AMO 'I love':

(123)	am-oː	'I love'
	amaːb-oː	'I will love'
	amaːb-am	'I was loving'
	amaːv-iː	'I have loved'
	amaːver-am	'I had loved'

These forms are based on a stem form *amaː-* (or *am-* in the present tense). The final suffix is the exponent of the first person singular form, but notice that it's a different suffix depending on the tense/aspect of the form. In the present and future forms, we have *-oː* but in the two past tense forms, the ending is *-m*, while in the present perfect form, it *-iː*. This kind of variation is different from that illustrated by the different noun suffixes in tables 17 and 18, because here we are dealing with forms of a single lexeme (and, moreover, an example of a completely regular verb in Latin). When we come to analyse a form such as, say, *amaːviː* 'I have loved', what we find is that the *-iː* suffix is not just an exponent of the property first singular – it is also telling us that the verb is present tense and perfect aspect. This is diagrammed in (124):

(124)	LOVE	PERFECT	PRES/FIRST SINGULAR
	amaː	v	iː

In (124), we can see that the property PERFECT is extended over two distinct suffixes. This situation is referred to as **extended exponence** (***exercises 2*** and ***3***).

An interesting fact about English is that a single base form such as *walk* or *book* is in most cases a perfectly good word. Therefore, we are tempted to think that we take the base form of a word and then add inflections to it (e.g. *walk-ing*, *book-s*), or conversely that we can get to the base form by stripping off the inflections. This makes sense for English and a number of other languages including German, Hungarian and Turkish, but for many inflecting languages, stripping off all the inflections often produces something which cannot function as a word. Thus, the Latin word forms we've seen all need some sort of inflectional ending to form a proper word. The bare root can't be used on its own: **viːll*, **feːl* or **am(a)* are not words in Latin. In other words, the root of a word in such languages is a bound form, not a free form. The same is true, broadly speaking, of Russian, Spanish, Greek, Latin, Japanese, Swahili, Chukchee, Navajo (for verbs at least) and many other languages. Moreover, we sometimes get a different form depending on which set of inflections we strip off. For instance, in Latin the noun meaning 'body' has a basic (nominative) form *corpus*, but its other forms are based on the stem *corpor-* (e.g. *corporis* 'of a body', *corporibus* 'to/from bodies').

While English has small numbers of examples justifying more than one stem appearing in the representation of a lexeme (see the discussion of KNIFE in section 10), we can generally think of its inflection (or that of German, Hungarian, etc.) as being **word-based**, while Latin (or Spanish or Russian, etc.) inflection is **stem-based**. The distinction has implications for psycholinguistic theories of the way that words are processed by the mind/brain and the way that language processing develops in children or is disturbed by brain damage (see sections 15 and 26).

The properties of Latin that we have briefly sampled here are what lead to its exemplifying the class of inflectional languages, and a fourth class of language, often added to the traditional typology, is the class of **polysynthetic** languages. This class is illustrated by Chukchee (also spelled *Chukchi*), a language spoken in NE Siberia. In (125b), we see a *word* which corresponds to the *phrase* in (125a):

(125) a. nəteŋqin ŋelgən
good hide
'a good skin, hide'
b. teŋŋelgən
'a good skin, hide'

In (125a) *teŋ* is the adjective root and *nə-…-qin* combines with this to form an adjective *nəteŋqin* 'good'. In (125b), the adjective root has formed a compound with the noun *ŋelgən* 'hide' to make a single word. There are various ways in which we can show that this is a single word and not just a closely knit phrase, one of which is the fact that adjective roots like *teŋ* never appear without their prefix *nə-* and suffix *-qin* except in compounds.

In (126), we see a similar phenomenon:

(126) a. tə-lʔu-gʔen ŋelgən
I-saw-it hide
'I saw a/the hide'
b. tə-ŋelgə-lʔu-k
I-hide-saw-I
'I saw a/the hide'

In (126a), the verb form *təlʔugʔen* has a prefix *tə-* marking a first person singular subject ('I') and a suffix *-gʔen* marking a third person singular object, agreeing with the direct object *ŋelgən* 'hide'. In (126b), three things have happened. Firstly, the object has now joined the verb and formed a compound verb stem *ŋelgə-lʔu* 'hide-saw'. Secondly, in so doing it has lost the *-n*, which in fact is a case suffix. Thirdly, the verb now ends in a suffix referring again to the first person singular subject. This suffix occurs with *intransitive* verbs in Chukchee, but this is explicable as the verb in (126b) is intransitive. This is because its original object has actually formed a compound with it (to have this compound appear with an object would produce a structure equivalent to the English **I saw the hide the tent* with too many complements).

Compounding of this kind, functioning as an alternative to a syntactically formed phrase, is known as **incorporation**. The noun incorporates its adjective in (125b) and the verb incorporates its object in (126b). Adjective incorporation is not very widespread (though in Chukchee itself it is extremely common), but object incorporation or noun incorporation is very frequently found in the world's languages. In fact, in Chukchee, object incorporation can apply to the result of adjective incorporation:

(127)	a.	tə-lʔu-gʔen	nəteŋqin	ŋelgən
		I-saw-it	good	hide
		'I saw a/the good hide'		
	b.	tə-lʔu-gʔen	teŋ-ŋelgən	
		I-saw-it	good-hide	
		'I saw a/the good hide'		
	c.	tə-teŋ-ŋelgə-lʔu-k		
		I-good-hide-saw-I		
		'I saw a/the good hide'		

Here, we first incorporate the adjective into the noun in (127b). Then, this compound noun, which functions as an object in (127b), is incorporated into the verb in (127c). Words like *təteŋŋelgəlʔuk* are not especially uncommon or exotic in Chukchee.

Incorporation is found in a large number of language groups; many languages of the Americas, such as the Iroquoian languages, the Mayan languages, Nahuatl (the language of the Aztecs), large numbers of languages of the Pacific including Maori, Samoan and Tongan, a number of Australian languages, certain of the languages of India and a host of others exhibit incorporation.

What are referred to as polysynthetic languages are those that make use of incorporation in their morphology, though they may also have agglutinating or inflectional processes, or even show isolating tendencies. Chukchee, for instance, is typical in having a large number of very regular derivational processes, which are relatively agglutinating, just like Turkish. However, it also has a rich inflectional system showing cumulation, extended exponence, syncretism and so on (***exercise 4***).

Incorporation processes like those described above strike us as ‘exotic’. It is noteworthy, then, that a similar phenomenon is found with a very common type of compound in English. This is illustrated in (128):

(128) a. Tom drives taxis
b. Tom is a taxi-driver

The compound in (128b) includes the object of the verb *drive* from which the deverbal noun *driver* is derived. Similar examples are *taxi-driving*, *insect repellent* and *motorcycle maintenance*. In these compounds, the head is derived from a verb (*drive*, *repel*, *maintain*). The non-head of the compound functions effectively as the object of the verb (see *drive taxis*, *repel insects*, *maintain motorcycles*). This is referred to as **synthetic compounding**. If it were possible to form a verb from these, as in (129), we would have proper noun incorporation in English:

(129) a. *Tom taxidrove yesterday
b. *Agent Orange insectrepels very effectively
c. *Bikers should motorcyclemaintain regularly

Even where it looks as though we have such a case, as in *Dick babysat for Tom and Harriet*, we generally find that there is no syntactic (analytic) equivalent in which the object and the verb are separated: **Dick sat the baby for Tom and Harriet*. The verb *babysit* is just an idiosyncratic form, not a regular compound, and we are justified in concluding that English does not exhibit proper incorporation.

Types of morphological operations

We have already seen numerous examples of prefixation and suffixation, and the examples of vowel changes and suppletions, as in English past tense forms *sang* and *brought*, have indicated that there are additional ways in which the morphological structure of a word can be modified. The Chukchee example in (125) provides another case, where the root *teŋ* in the word *nə-teŋ-qin* is *simultaneously* prefixed and suffixed to form the adjective. A similar phenomenon is seen in German. In regular verbs, the perfect/passive participle is formed by simultaneously adding a prefix *ge-* and a suffix *-t* to the verb stem. Thus, from the stem *hab* ‘have’ we get *ge-hab-t* ‘had’. Since the prefix and suffix are added together, we can think of *nə-…-qin*, or *ge-…-t* as a composite, discontinuous morpheme. Such a morpheme is called a **confix** or **circumfix**.

The languages of the Philippines illustrate another type of affixation. Here are some verb forms in the major language of those islands, Tagalog:

(130)		verb stem	infinitive	meaning
	a.	aral	umaral	‘teach’
	b.	sulat	sumulat	‘write’
	c.	basa	bumasa	‘read’
	d.	gradwet	grumadwet	‘graduate’

The crucial thing about these examples is that *aral*, *sulat*, *basa* and *gradwet* are single, undecomposable morphemes. In (130a), we see the prefix *um-* added to a vowel-initial stem. However, (130b, c, d) do not have the infinitive forms **umsulat*, **umbasa*, **umgradwet*. Rather, when the stem begins with a consonant, the affix goes *inside* the stem morpheme, after the onset of the first syllable. This is a regular and pervasive process in Tagalog and several hundred related languages, as can be seen from the fact that it applies to the recent English loan word from *graduate* (130d). An affix which is inserted strictly inside another affix or stem like this is known as an **infix**.

Prefixes and suffixes (and circumfixes) behave like things which are added to stems. This is like compounding in that we simply concatenate two entities, and, indeed, such affixation often develops historically from compounding. Morphology of this type is called **concatenative**, and it encourages the view, briefly discussed in section 10, that complex word forms consist simply of strings of morphemes. However, very often a morphological process seems to be realised by a *phonological operation* performed on the stem itself, as in the case of the vowel changes in *sing* ~ *sung* ~ *sang*. Indeed, infixation can be construed in this way as involving first affixation, then a phonological operation which moves the affix to a position inside the stem. It should also be clear that infixation represents another type of deviation from strict agglutination.

Tagalog illustrates a further way in which affixation looks more like a process than a straightforward concatenation of morphemes. Here are some more verb forms in this language:

(131)		verb stem	future	meaning
	a.	sulat	susulat	'write'
	b.	basa	babasa	'read'
	c.	trabaho	tatrabaho	'work'

From (131) we can see that the future tense form of the verb involves taking the first syllable and copying the first consonant from its onset and its vowel to create a new syllable which appears as a prefix. This type of process is known as **reduplication**, and it provides a rather vivid demonstration of the inappropriateness of suggesting that Tagalog has a morpheme FUTURE with various lexically conditioned allomorphs. Obviously, the list of such allomorphs would be rather long and such a list would fail to make explicit the fundamental fact about Tagalog future formation. This fact is acknowledged by suggesting that there is a morphological feature, say [+future], which can attach to verb lexemes. When this happens, a phonological process is triggered which produces the correct future form of the verb by consulting the syllable structure of the stem form and performing the appropriate operations (***exercise 5***).

On several occasions, in this and the previous section, we have invoked examples of vowel changes in English verb forms as another type of phonological operation which subserves a morphological purpose. Alongside *sing* ~ *sang* ~ *sung*, we find *ring* ~ *rang* ~ *rung*, *hang* ~ *hung*, *fling* ~ *flung*, etc., and it is now time to introduce the technical term for this sort of process. It is known as **ablaut** (sometimes called **apophony**). A larger number of English verbs combine a vowel change with suffixation, especially in the participle, so we find such sets of forms as the following: *write* ~ *wrote* ~ *written*, *give* ~ *gave* ~ *given*, *take* ~ *took* ~ *taken*, *do* ~ *did* ~ *done*. Each of these simply involves a vowel change in forming the past tense form (the second member of each set); for the participles (the third member of each set), however, there is suffixation of *-en* with or without a vowel change. A specific kind of ablaut, which is particularly common in Germanic languages (and a number of other language groups), occurs when a back vowel is replaced by a front vowel. A number of German plurals are formed this way: /apfl ~ epfl/ 'apple', /fogl ~ føgl/ 'bird', /brudr ~ brydr/ 'brother'. This type of vowel fronting is known as **umlaut**, and there are vestiges of this in English irregular plurals such as *men, teeth* and *geese*.

The last morphological process we shall consider here is represented marginally by some English verbs which are derived from nouns. The difference between *a mouth* and *to mouth* or *a house* and *to house* is that the final consonant is voiced in the verb: /maʊθ ~ maʊð/, /haʊs ~ haʊz/. In the Nilotic language DhoLuo, spoken in Western Kenya, much more systematic use is made of this process in the formation of plurals. Here are some singular and plural forms of nouns in this language:

(132) DhoLuo plurals

	singular		plural	
a.	kede	'twig'	kete	'twigs'
b.	got	'hill'	gode	'hills'
c.	luθ	'stick'	luðe	'sticks'
d.	puoðo	'garden'	puoθe	'gardens'
e.	buk	'book'	buge	'books'
f.	ʧogo	'bone'	ʧoke	'bones'
g.	apwojo	'rabbit'	apwoʧe	'rabbits'
h.	kwaʧ	'leopard'	kwaje	'leopards'

One way of forming a plural involves adding a suffix *-e* as in these examples. In general, when this occurs, the voicing of the final consonant of the stem changes from voiced to voiceless or vice versa (with the palatal glide /j/ being treated as the voiced correlate of the voiceless palato-alveolar affricate /ʧ/).

The above phenomenon exemplifies what is often called **consonant mutation**, and this is even more obvious and varied in its effects in Celtic languages. Look at the way adjectives behave in Literary Welsh when modifying masculine nouns and feminine nouns (adjectives come after nouns in Welsh):

(133) Welsh consonant mutation

	masculine nouns		feminine nouns	
a.	dur klir	'clear water'	nos glir	'clear night'
b	gwint poeθ	'hot wind'	teisen boeθ	'hot cake'

c.	hogin tal	'tall lad'	geneθ dal	'tall girl'
d	ti glan	'clean house'	calon lan	'clean heart'
e	ɬivr bax	'little book'	ferm vax	'little farm'
	[/ɬ/ is a voiceless /l/]			

Operations such as reduplication, ablaut and consonant mutation are rather different from the concatenative types of morphological operation discussed earlier because they do not involve adding anything (such as an affix) to a stem or base in any obvious sense. This type of morphology is often referred to as **non-concatenative morphology**, and, as we have observed, it is very difficult to interpret in terms of the morpheme concept. For instance, in the past tense form *sang*, what is the past tense morpheme? Or in the plural form *men*, what is the plural morpheme? We don't want to say that it is the /a/ or the /ɛ/, because this would imply that the non-past form of SING was **/sng/* and the singular form of MAN **/mn/*, which is clearly not the case. Earlier, we pointed out that a single morph may realise several different functions at once. Thus, the *-iː* ending of the Latin verb form *amaːviː* 'I have loved' in (124) realises present tense, perfect aspect and first person singular, while the inflectional suffix of a Latin noun realises simultaneously noun declension, number and case. Equally, we have found that a single function may be realised by several different morphs. In the Latin *amaːviː* 'I have loved', both the suffix *-v-* and the suffix *-iː* help to realise the property PERFECT. Similarly, in the English perfect participle form *driven* (/drɪvn̩/), PERFECT is realised by the *-n* suffix and by the process of ablaut applied to the verb root: /aɪ/ ⇒ /ɪ/ (cf. *drive* (/draɪv/). These phenomena are more intelligible if we appeal to Separationism and distinguish the abstract morphological processes of tense formation, agreement, perfect participle formation, plural formation and so on, from the concrete operations of suffixation, ablaut and so on (***exercises 6*** and *7*).

Exercises

1. For the regular Spanish verb forms below, which have been segmented into their constituents, indicate the functions of the suffixes and comment on any difficulties there are in finding a single meaning or function for each suffix. (The accent over a vowel marks exceptional stress, which would otherwise fall on the previous syllable.)

habl-a-r	'to speak'	com-e-r	'to eat'
habl-o	'I speak'	com-o	'I eat'
habl-a-s	'you speak'	com-e-s	'you eat'
habl-a-n	'they speak'	com-e-n	'they eat'
habl-é	'I spoke'	com-í	'I ate'
habl-a-ste	'you spoke	com-i-ste	'you ate'
habl-a-ron	'they spoke'	com-ie-ron	'they ate'

habl-aba	'I was speaking'	com-ía	'I was eating'
habl-aba-s	'you were speaking'	com-ía-s	'you were eating'
habl-aba-n	'they were speaking'	com-ía-n	'they were eating'
habl-a-r-é	'I shall speak'	com-e-r-é	'I shall eat'
habl-a-r-ás	'you shall speak'	com-e-r-ás	'you shall eat'
habl-a-r-án	'they will speak'	com-e-r-án	'they shall eat'

Model answer

The verb forms illustrate three tenses (traditionally called present, preterite and imperfect) and two inflectional classes, the first and second conjugations (there's also a third conjugation not illustrated here). The outermost endings indicate the person/number of the subject of the verb (the person speaking/eating). These are the same for both conjugations. However, they differ depending on the tense as indicated below:

	present	preterite	future
1sg.	-o	-é/í	-é
2sg.	-s	-ste	-ás
3pl.	-n	-ron	-án

In addition, the first singular preterite form depends on the conjugation class. The imperfect tense is indicated by the suffix *-aba* (first conjugation) or *-ía* (second conjugation). In the present and the preterite, there is no special tense marker. However, the two tenses are kept apart by their distinct person/number suffixes. In the future, yet another set of person/number endings is added to a form which is identical to the infinitive form. In the infinitive and present tense forms, the root of the verb is followed immediately by a vowel, *-a* or *-e*, which distinguishes the two conjugations. In the preterite, the second conjugation has instead the vowel *-i* (*-ie* in the third plural form). These conjugation class vowels are traditionally called 'theme vowels'. In the imperfect, there is no separate ending for first singular. In the present and preterite, there is no theme vowel in the first singular forms.

These paradigms illustrate a large number of dependencies. Firstly, all the person/number endings also serve to help indicate the tense, so these can be said to cumulate tense properties as well as expressing their own basic person/number properties. The first singular preterite endings additionally cumulate conjugation class information. The imperfect tense suffixes also indicate conjugation class information, so these cumulate inflectional class with tense properties. The lack of first singular ending (zero morph) in the imperfect serves as an indirect signal of tense.

The data also illustrate extended exponence. The *-ie* theme vowel for the second conjugation preterite form is unique to the third plural form, so this person/number property is signalled twice in the form *comieron* (as is the preterite tense information). The unique future tense endings are added to a special form which is almost always identical to the infinitive. Thus, the property 'future tense' is spread over the *-ar/er* form and the endings themselves.

2. Analyse the following English verb forms to show how they illustrate cumulation, syncretism, inflectional allomorphy and extended exponence. (Hint: you may find it useful to transcribe the verb forms into IPA.)

(she) walk**s**
(they have) dr**iven**
(we) walk
(he) walk**ed**
(you have) sp**oken**

3. Here are some verb forms in Italian (a language closely related to Spanish). Segment the words into their components. In some cases, this will not be straightforward, so comment on any difficulties you have in deciding where the boundaries fall between suffixes. Then indicate any instances of cumulation and extended exponence in the data. Finally, identify any syncretisms you find in these paradigms. (The present subjunctive is a form used in contexts where the speaker isn't entirely certain of the truth of the statement.)

number	person	present indicative	present subjunctive	past indicative
parlare 'to speak'				
	1	parlo	parli	parlai
sing.	2	parli	parli	parlasti
	3	parla	parli	parlò
	1	parliamo	parliamo	parlammo
plural	2	parlate	parliate	parlaste
	3	parlano	parlino	parlarono
credere 'to believe'				
	1	credo	creda	credei
sing.	2	credi	creda	credesti
	3	crede	creda	credè
	1	crediamo	crediamo	credemmo
plural	2	credete	crediate	credeste
	3	credono	credano	crederono

finire 'to finish'				
	1	finisco	finisca	finii
sing.	2	finisci	finisca	finisti
	3	finisce	finisca	finì
	1	finiamo	finiamo	finimmo
plural	2	finite	finiate	finiste
	3	finiscono	finiscano	finirono

4. Below are some Chukchee words, slightly simplified. Segment them into their component morphemes and provide a rough meaning for each morpheme. Comment on the types of affixation found and on any allomorphy you observe.

ekwetək	to set off
eretək	to fall
nəwilək	to come to a halt
rəgelək	to go in
rənwiletək	to stop someone
rərgeletək	to introduce
rərgelewək	to lure in
rərultetək	to move something away
rətejŋetək	to feed (something to someone)
rətenmawək	to prepare (something)
rekwetewək	to send someone off (on a journey)
reretək	to drop
rultək	to step aside
runtəmewetək	to calm someone
tejŋetək	to eat (something)
tenmawək	to get oneself ready
untəmewək	to calm oneself down

5. In the data below we see examples of reduplication in the Palan dialect of Koryak (a language closely related to Chukchee). What is the rule for forming a noun of this kind in Koryak?

ʧajʧaj	'tea'	həlwehəl	'wild reindeer'
jiŋejiŋ	'mist'	jilhejil	'gopher'
kalikal	'book'	liŋliŋ	'heart'
mətqmət	'fat'	milgmil	'fire'
nutenut	'tundra'	tərgtər	'meat'
wətwət	'leaf'	wiruwir	'seal'
ʔawtaʔaw	'flint'		

6. Some plural forms in Arabic are very difficult to predict from the singular form. However, there are patterns. What is the common, invariant component of the following Arabic nouns (the forms are slightly

simplified in some cases)? How can the plural be constructed from the singular form in each case? (A doubled vowel, e.g. *aa*, represents a long vowel, e.g. [aː]; representing long vowels in this way may make it easier to see the principles that underlie this system. Note that the nouns come in two groups depending on the form of the singular.)

singular	plural	meaning
qidħ	qidaaħ	arrow
ʤamal	ʤimaal	camel
ħukm	ħakaam	judgement
ʔasad	ʔusuud	lion
jundub	janaadib	locust
raʤul	riʤaal	man
ʕinab	ʕanaab	grape
nafs	nufuus	soul
saħaabat	saħaaʔib	cloud
ʔumθulat	ʔamaaθil	example
ʤaziirat	ʤazaarʔir	island
ħaluubat	ħalaaʔib	milch-camel
kariimat	karaaʔim	noble
marħalat	maraaħil	stage

7. What deviations from agglutination are exhibited by the Swahili verb forms shown below? (The data are slightly simplified.)

(a) i.	nilitaka	I wanted	tulitaka	we wanted
	ulitaka	you (sg.) wanted	mlitaka	you (pl.) wanted
	alitaka	he/she wanted	walitaka	they wanted
ii.	nitataka	I shall want	tutataka	we shall want
	utataka	you (sg.) shall want	mtataka	you (pl.) shall want
	atataka	he/she shall want	watataka	they shall want
iii.	ninataka	I want	tunataka	we want
	unataka	you (sg.) want	mnataka	you (pl.) want
	anataka	he/she wants	wanataka	they want
(b) i.	sikutaka	I did not want	hatukutaka	we did not want
	haukutaka	you (sg.) did not want	hamkutaka	you (pl.) did not want
	haakutaka	he/she did not want	hawakutaka	they did not want
ii.	sitataka	I shall not want	hatutataka	we shall not want
	hautataka	you (sg.) shall not want	hamtataka	you (pl.) shall not want
	haatataka	he/she/it shall not want	hawatataka	they shall not want
iii.	sitaka	I do not want	hatutaka	we do not want
	hautaka	you (sg.) do not want	hamtaka	you (pl.) do not want
	haataka	he/she/it does not want	hawataka	they do not want

12 Word meaning

So far, we have not attempted to develop any analytic account of the semantic representations which appear in lexical entries. Indeed, in the examples in (115) (section 10), what we see under the heading 'semantics' is taken directly from an ordinary dictionary. Whether such dictionary definitions can be regarded as supplying the meanings of words for the purposes of linguistic analysis is something we shall briefly consider later in this section after we have introduced some basic ideas.

As well as being concerned with the contents of lexical entries, a further matter which will arise in this section is that of the overall structure of the lexicon. In the Introduction (p. 4), we talked about the lexicon as a list of lexical entries, but it is at least conceivable that it has a more interesting structure than this. To say that the lexicon is no more than a list is to accept that there is no reason why items which are similar to each other in some linguistically relevant way are 'close' to each other in the mental lexicon. As we shall see, similarity of meaning is a rather rich notion, and as subsequent sections of this part of the book will show, it seems to play an important role in human cognitive processing. In such circumstances, it is important for our model of the lexicon to represent this notion properly.

A difficulty we immediately encounter when we turn to the meanings of words is that native speakers do not provide the rich source of data we have been relying on in our discussions of phonology and morphology. The contrast between *TRANSport* (Noun) and *transPORT* (Verb) is one native speakers will readily confirm, as is the fact that **singed* is not the past tense form of *sing*, etc. These are judgements of *form* with which native speakers are comfortable, but meanings seem much less tangible and correspondingly less open to study by the methods we have used up to now. We, therefore, have to resort to less direct methods for probing the semantic aspect of the lexicon and of lexical entries.

Entailment and hyponymy

Consider the sentences in (134):

(134) a. Max managed to finish *Infinite Jest*
b. Max finished *Infinite Jest*

Suppose that the sentence in (134a) is *true*. Then, the sentence in (134b) is also true. There is no possible state of affairs in which (134a) is true while (134b) is false. In these circumstances, we say that (134a) **entails** (134b), and a general definition of entailment appears in (135):

(135) A sentence (S_1) entails a sentence (S_2) if and only if whenever S_1 is true, S_2 is also true

Before going further, it is important to be clear that this relation of entailment does not obtain between sentences that just happen to be true in the current or any other state of affairs. Take, for instance, the sentences in (136):

(136) a. The dodo is extinct
b. Berlin is the capital of Germany

Both these sentences are true at the time of writing this book, but it is not the case that (136a) entails (136b). The definition in (135) contains the word 'whenever', and while (136a) was true in 1980, (136b) was not – indeed, in 1980 there was no unified Germany for Berlin to be the capital of. Intuitively, this lack of an entailment relationship between (136a) and (136b) is linked to the fact that there is no meaning relationship between the sentences: knowing that (136b) is true does not help at all in understanding (136a), or any part of this sentence. However, the case of (134) is different: knowing that (134b) is true *whenever* (134a) is tells us something about the meaning of the lexeme MANAGE, and it would be reasonable to conclude of someone who maintained that (134b) could be false while (134a) was true that they did not know the meaning of this lexeme.

Now consider the sentences in (137):

(137) a. Max failed to finish *Infinite Jest*
b. Max didn't finish *Infinite Jest*

Again, we note that (137a) entails (137b), but in this case the entailed sentence contains the negative clitic *n't*. The entailed sentences (134b and 137b) are semantic 'opposites' and this coincides with the fact that the two lexemes MANAGE and FAIL, while having a good deal in common semantically (they both concern relations between someone trying to do something and whatever they are trying to do) are themselves 'opposites' (***exercises 1*** and ***2***).

Let's now consider some simpler examples of entailment relations, which will help us to build up a picture of how the lexicon might be structured. That the (a) examples in (138–140) entail the (b) examples is uncontroversial:

(138) a. The thing in the cage is a lion
b. The thing in the cage is an animal

(139) a. The thing in the grass is a snake
b. The thing in the grass is a reptile

(140) a. The thing in the tree is a sparrow
b. The thing in the tree is a bird

In each case, what we have is a relationship of entailment between pairs of sentences that is due to the presence of particular pairs of words: *lion* and *animal* in (138), *snake* and *reptile* in (139) and *sparrow* and *bird* in (140). Focusing on (138), we have the general schema in (141), where X is an expression which identifies an individual, *the thing in the cage*, *Simba*, etc.:

(141) 'X is a lion' entails 'X is an animal'

When we find this situation, we say that *lion* is a **hyponym** of *animal* (equivalently *lion* and *animal* are in the semantic relationship of **hyponymy**, sometimes referred to as **meaning inclusion**). On the basis of (139) and (140), we can also assert that *snake* is a hyponym of *reptile* and *sparrow* is a hyponym of *bird*. Looking at the semantic relation from the converse perspective, we say that *animal*, *reptile* and *bird* are **superordinates** of *lion*, *snake* and *sparrow* respectively. A very straightforward test for many examples of hyponymy is to use (142):

(142) An X is a kind/type of Y

Thus, a lion is a type of animal, a snake is a type of reptile, etc.

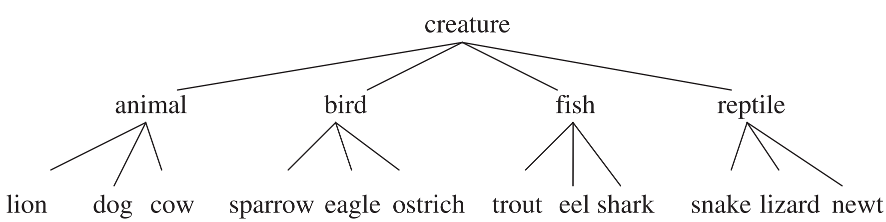
An important property of hyponymy is that it is a 'one-way' relation. Thus, while (138a) entails (138b), it is not the case that (138b) also entails (138a). There are possible states of affairs in which a designated creature is an animal without it being a lion, and, relying on (142), this corresponds to the fact that an animal is not a type of lion. To put this another way, being an animal is a *necessary condition* for being a lion; it is not, however, a *sufficient* condition.

Recognition of hyponymy as a semantic relation which holds between some words raises a number of issues. Firstly, we must recognise that, as well as *animal* being a superordinate of *lion*, it is also itself a hyponym of *creature*. As well as (141), we have (143):

(143) 'X is an animal' entails 'X is a creature'

This means that for this part of the English lexicon, the **taxonomy** (a structure in which we meet more *general* terms as we ascend to higher levels) defined by the semantic relation of hyponymy is multiply layered. Part of this taxonomy is illustrated in (144):

(144)



In (144), *lion*, *dog*, *cow*, etc. are **co-hyponyms** of the superordinate *animal*, which, along with *bird*, *fish* and *reptile*, is a co-hyponym of *creature*.

It is readily apparent that this taxonomy can be further extended at certain points to include another level. For instance, *dog* has *spaniel*, *corgi*, *rottweiler*, etc. and *snake* has *cobra*, *viper*, *anaconda*, etc. as co-hyponyms. However, this is not the case for all the items at the lowest level of (144) (e.g. *ostrich*), and for other cases, extension of the taxonomy involves a resort to morphologically complex forms (*white shark*, *blue shark*, *basking shark*, etc.). This is an issue to which we shall return in sections 13 and 15. Examples of taxonomies from other parts of the vocabulary of English are not difficult to find (***exercises 3*** and ***4***).

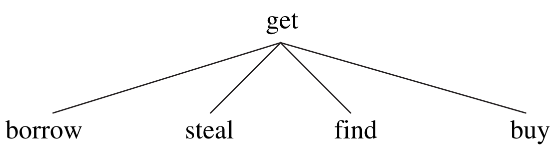
All the words appearing in the taxonomy in (144) are nouns. Do members of other word classes enter into hyponymy relations? For verbs, there are some clear instances. Consider the pairs of examples in (145) and (146):

(145) a. X borrowed/stole/found/bought Y
b. X got Y

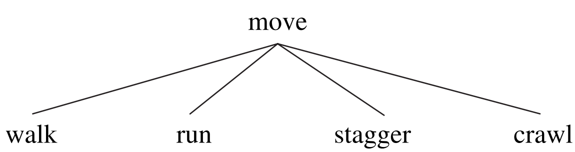
(146) a. X walked/ran/staggered/crawled to Z
b. X moved to Z

In both of these cases, the various sentences in (a) entail the sentence in (b): there is no possible state of affairs in which someone can borrow something and not get it, etc., so we can justify the partial taxonomies in (147) and (148):

(147)



(148)



Note that we cannot straightforwardly extend (142) to apply to examples such as these. However, if we manipulate the syntax appropriately, it is easy enough to come up with a formulation which produces a simple test for whether a verb X is a hyponym of another verb Y. The sentence in (149) will serve this purpose:

(149) X-ing is a sort of/type of Y-ing

The semantic relation of hyponymy must be distinguished from another semantic relation which is illustrated by pairs such as those in (150):

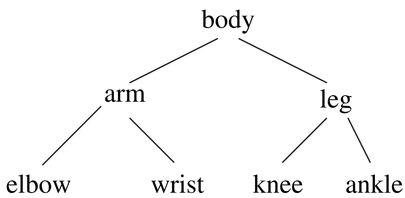
(150) a. body, arm
b. arm, elbow
c. house, roof
d. engine, carburettor

It is easy to see that the one-way entailment that we have seen to be characteristic of hyponymy does not obtain for cases such as these. Thus, neither (151a) nor (151b) obtains:

(151) a. 'X is a body' entails 'X is an arm'
b. 'X is an arm' entails 'X is a body'

The relationship between *arm* and *body* is one whereby the objects to which they refer are in a part–whole relation, and the term used for this relationship is **meronymy**. We also say that *arm* is a **meronym** of *body* and that *arm*, *leg*, etc. are **co-meronyms**. As (150a, b) show, it is also possible to have meronymic structures with more than one level, as in (152):

(152)



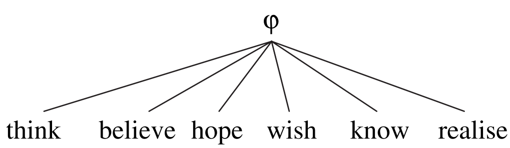
Note, however, that structures such as this are not to be confused with taxonomies – as we move up such a structure, we encounter 'larger' entities, not more general categories (***exercise 5***).

While large sections of the vocabulary of a language can be analysed in terms of relations such as hyponymy and meronymy, such analysis is not always straightforward. For instance, consider the set of verbs in (153):

(153) think, believe, hope, wish, know, realise

These verbs (and the set could be extended) are known as *propositional attitude verbs*, i.e. they are all used to express something about the nature of the attitude of someone to a particular proposition, and the fact that they are labelled in this way indicates that they are perceived as having something in common semantically. However, there is no verb in English which qualifies as a superordinate for members of this class. In these circumstances, there is a **lexical gap**, and if we wished to represent the fact that the verbs in (153) do form a natural set, we could do so using (154), where φ indicates the position of the gap (***exercise 6***):

(154)



Synomymy or **identity of meaning** is a semantic relation with which most readers will be familiar. However, it is doubtful whether there are lexemes in a language which can be regarded as completely identical in meaning. As a consequence, linguists often distinguish different types of synonymy, and among these **cognitive synonymy** can be defined in terms of entailment, as in (155), where S(L) means that L occurs in a sentential context S:

(155) Lexemes L_1 and L_2 are cognitive synonyms if and only if $S(L_1)$ entails $S(L_2)$ and $S(L_2)$ entails $S(L_1)$

(Note that strictly speaking it is not lexemes which occur in specific contexts but the appropriate word forms.)

To illustrate, consider the pair of lexemes HORSE and STEED. These are cognitive synonyms because if we consider a sentential context such as *Sir Lancelot rode a white . . .*, both entailments in (156) obtain:

(156) a. 'Sir Lancelot rode a white horse' entails 'Sir Lancelot rode a white steed'
b. 'Sir Lancelot rode a white steed' entails 'Sir Lancelot rode a white horse'

Why can we not simply drop the modifier 'cognitive' and say that these two lexemes are synonyms? Because there are sentential contexts where their appearance, while not affecting the truth-value of the containing sentence, certainly affects its acceptability. For the case at hand, we feel that (157b), while sharing the truth-value of (157a), is rather odd (***exercise 7***):

(157) a. The old lame horse gamely pulled the plough
b. The old lame steed gamely pulled the plough

Obviously, synonymous lexemes exhibit considerable overlap of meaning. Interestingly, the same is true of pairs of words opposite in meaning to which we now turn.

Meaning opposites

We have already noted properties of *manage* and *fail* which led us to regard these items as 'opposites'. Oppositeness of meaning is a pervasive semantic relation in the lexicons of human languages and it comes in several varieties. Here we shall introduce two particularly important types.

Consider the pairs of *dimensional adjectives* in (158):

(158) tall–short, high–low, wide–narrow, fat–thin, old–young, old–new

We can readily agree that each of these pairs illustrates oppositeness of meaning, but it is worthwhile to use our entailment relation to pursue the properties of such pairs in a little more detail. Thus, taking just *tall* and *short* (the other pairs behave identically), we have the entailments in (159) which make explicit that these are indeed semantic opposites:

(159) a. 'X is tall' entails 'X is not short'
b. 'X is short' entails 'X is not tall'

Now, we might expect that these entailments could be *reversed*, but this is not the case. The entailments in (160) do *not* obtain:

(160) a. 'X is not short' entails 'X is tall'
b. 'X is not tall' entails 'X is short'

The reason for this is easy to see. If we imagine all of those objects which can be described using *tall* and *short*, they fall into not two but three categories: there are tall things, there are short things and there are things in between which are neither tall nor short (***exercise 8***). It follows that if X in (160a) designates one of these things, then 'X is not short' will be true, but 'X is tall' will not be true, i.e. the entailment does not hold. Pairs of opposites which behave like *tall* and *short* with respect to entailments are known as **antonyms** and they exhibit the semantic relation of **antonymy**.

Remaining with adjectives, opposite pairs such as those in (161) behave rather differently to antonyms:

(161) open–closed (of a store); married–single; dead–alive; broken–unbroken

Here we find analogous entailments to those in (159):

(162) a. 'The store is open' entails 'The store is not closed'
b. 'The store is closed' entails 'The store is not open'

For this case, however, the converse entailments *do* obtain:

(163) a. 'The store is not closed' entails 'The store is open.'
b. 'The store is not open' entails 'The store is closed'

This reflects the fact that for a store there is no state of being neither open nor closed but somewhere in between the two. Opposites like those in (161) are referred to as **complementaries** and the corresponding semantic relation is **complementarity** (***exercise 9***).

Semantic features

The semantic relations we have introduced above are clearly important in suggesting that there may well be links of different kinds between lexical entries, i.e. the lexicon in a grammar is more than just a list of lexical entries. However, we have not yet sought to look inside a lexical entry and see how semantic information is represented there. We shall now see whether we can make any headway with this problem.

A proposal which many linguists have found attractive is that the meaning of a lexeme should be *decomposable* into a set of **semantic features**. The best way to illustrate what this involves is to immediately consider the triples of words in (164):

(164) a. ram, ewe, lamb
b. bull, cow, calf
c. stallion, mare, foal

In these triples, the first two words are opposites, and for concreteness we can regard them as complementaries. However, they are not merely opposites: for each pair, it appears that the same fundamental distinction underlies their oppositeness. This is the distinction of gender, so we might propose a two-valued gender feature with values [male] and [female]. Such a feature can then function as part of the meaning of a word, and our intuition that *ram* differs in meaning from *ewe* in the same way as does *bull* from *cow* and *stallion* from *mare* is now explicated: the distinction in each case comes down to the presence of [male] or [female] in the representation of the words' meanings.

Next, consider the relationship between *ram* and *ewe*, on the one hand, and *lamb* on the other. We haven't offered a name for this semantic relationship, but this doesn't matter, since all we need to recognise is that it is the same relationship as that obtaining between the pair *bull* and *cow* and the single word *calf*, and of course this observation can be extended to the items in (164c). Again, then, we can propose a two-valued 'maturity' feature with values [adult] and [non-adult], with the former being part of the meaning of *ram*, *ewe*, *bull*, *cow*, *stallion* and *mare* and the latter part of the meaning of *lamb*, *calf* and *foal*. Proceeding in this fashion, then, we can begin to build up representations of the meanings of our lexical items, as indicated for the ovine members of (164) in (165):

(165) a. ram – [male, adult, …]
b. ewe – [female, adult, …]
c. lamb – [non-adult, …]

In (165c), *lamb* does not of course have either [male] or [female] in its semantic representation, as it is not gender-specific. There are a number of reasons why this general programme might be attractive.

Firstly, it establishes important correspondences between the semantic representations of words and the phonological representations of sounds. It will be recalled from section 5 that distinctive phonological features have the role of distinguishing the sounds in a language and that the *same* feature distinguishes distinct pairs of sounds. Thus, the feature [±voiced] underlies the distinction between /p/ and /b/, /t/ and /d/, /k/ and /g/, /s/ and /z/, etc. Here, we are considering something entirely analogous in the domain of word meaning: the feature [male]/[female] underlies the distinction between the meanings of *ram* and *ewe*, *bull* and *cow*, *stallion* and *mare*, etc.

A second attraction is that we appear to be provided with an *understanding* of semantic relations such as antonymy, complementarity and hyponymy. Taking the two types of opposites, it is not unreasonable to suppose that feature analysis will uncover a small number of binary features which can be regarded as underlying *all* opposites. Consider again dimensional adjectives. Obviously, we will need some way of distinguishing *tall* and *short* as a pair from *wide* and *narrow* as a pair, but within each pair all we need to note is that one member ascribes more than average extent along a dimension, whereas the other ascribes less than average extent along that same dimension; a tall child is taller than the average child (of that age), a narrow road is narrower than the average road (of that type), etc. We can code this as a feature, say [±Average], and offer the partial analyses in (166):

(166) a. tall – [+Average, …]
b. short – [–Average, …]
c. wide – [+Average, …]
d. narrow – [–Average, …]

Pairs of complementaries will employ other oppositely valued features and the logical properties of antonyms which distinguish them from complementaries (recall the contrast between 160 and 163) will be ultimately explained in terms of the difference between these features and [±Average].

As for hyponymy, the label 'meaning inclusion' gives an immediate clue as to how this should be handled. If we consider a pair such as *snake* and *reptile*, we might suppose that we have the analysis in (167) for the meaning of the latter:

(167) reptile – [F_1, F_2, …, F_n]

Obviously, we have not done the analysis, but it is easy enough to think of candidates such as [animate] and [cold-blooded] for the sorts of features we might need. With (167) in place, then, the meaning of *snake* will have an analysis along the lines of (168):

(168) snake – [F_1, F_2, … F_n, F_{n+1}, …, F_m]

In (168), we see the features F_1, F_2, …, F_n corresponding to the meaning of *reptile* – the meaning of *reptile* is actually included in the meaning of *snake*. Additionally, however, we have the features F_{n+1}, …, F_m, and these features will serve to distinguish the meaning of *snake* from the meanings of other words denoting reptiles.

Finally, there is something inherently appealing about the idea that meanings can be decomposed into more basic parts. If something along these lines is *not* correct, it is very unclear what a theory of word meaning might look like (***exercise 10***).

Despite the positive views we have just sketched, there are a number of difficulties which the supporter of semantic features must face. We can raise one of these in the context of the *partial* analyses we have presented in (165) and (166). Take (165) first. What we have there is sufficient to distinguish the meanings of *ram*, *ewe* and *lamb* from each other. However, we have done nothing to distinguish this set of items from the sets in (164b, c). In terms of the semantic features we introduced above, the three items in (164b) will receive exactly the same analysis as we have in (165) and the same goes for the three items in (164c). Of course, this incompleteness is acknowledged by the dots in (165), but this ought not to disguise the fact that in a complete account something must replace the dots. What might that be?

We can observe that the semantic relationship between *lamb* and *calf* is identical to both the semantic relationship between *ram* and *bull* and that between *ewe* and *cow*. Using the methodology we adopted above, we can propose a feature with values [ovine] and [bovine] as underlying this relationship. Consideration of the set of words in (164c) requires that this feature also takes the value [equine], and then we can offer an analysis like that in (169) which could be extended to our full set of items in an obvious way:

(169) ram – [male, adult, ovine]

There is nothing to object to here from a formal perspective, but we are unlikely to feel as comfortable with [ovine], [bovine] and [equine] as we are with our earlier features, which brought with them an air of 'basicness' and the belief that they would find wide employment in the analysis of word meanings in any language. By contrast, our new feature will find no role outside the very restricted domain which led to its introduction. Furthermore, consideration of additional species is just going to lead to a proliferation of feature values, and we might begin to suspect that our feature vocabulary is going to end up not much smaller than the set of words the meanings of which we set out to account for.

This pessimism is reinforced by considering (166) in a similar way. Again, our analysis is incomplete, and in order to complete it, we will have to introduce features which distinguish *tall* and *short* from *wide* and *narrow*. In itself, this may seem easy; after all, *tall* and *short* are concerned with vertical extent, whereas *wide* and *narrow* refer to extent in horizontal dimensions. So, we could introduce a feature with values [vertical] and [horizontal] and add these values to (166) to yield a complete analysis – note that this makes explicit that *tall* and *short* are indeed similar in meaning. Now, [vertical] and [horizontal] don't have the uncomfortable specificity of [ovine], but a little more reflection suggests that something equally worrying is not too far away if we pursue an analysis of dimensional adjectives along these lines. For instance, consider the antonymic pair *high* and *low*. Like *tall* and *short*, these two words refer to extent along the vertical dimension, so at least one additional feature is going to be necessary to distinguish these pairs. But it is not at all clear what this feature might be (see exercise 6).

Furthermore, the worry we are pursuing here also arises in connection with our brief account of how a theory of semantic features might enable us to deal with hyponymy. We noted that additional features would appear in the meaning of *snake* when comparing it to the meaning of *reptile*, but we did not offer any clues as to what these features might be. Obviously, something like [having the characteristics of a snake] would do the job, but this is hardly enlightening.

An analysis such as that in (169) can be seen as providing a **definition** of the meaning of *ram* with the features providing *necessary and sufficient conditions* for something being a ram. That is, if anything is a ram, then it is male, it is adult and it is ovine (the features are individually necessary), and if anything is male, adult and ovine, then it is a ram (the features are jointly sufficient). However, we have noted that some of the features emerging from this analysis (e.g. [ovine]) have unattractive properties. Of course, we are all familiar with the idea that dictionaries contain definitions of word meanings, so we shall close this section by looking briefly at familiar monolingual dictionary entries to see whether they provide any additional perspectives on the semantic components of lexical entries.

Dictionaries and prototypes

Consider a typical dictionary entry for *octagon* as in (170):

(170) octagon – a plane figure of eight sides and eight angles

This has all the characteristics of a definition, with the expression following the dash providing necessary and sufficient conditions for something being an octagon. We confirm this by noting that the entailments in (171) hold, indicating that the conditions are individually necessary:

(171) a. 'X is an octagon' entails 'X is a plane figure'
b. 'X is an octagon' entails 'X has eight sides'
c. 'X is an octagon' entails 'X has eight angles'

Furthermore, (172) holds, showing that the conditions are jointly sufficient:

(172) 'X is a plane figure and X has eight sides and X has eight angles' entails 'X is an octagon'

For the case of *octagon*, then, we can conclude that (170) provides a good definition and that it is plausible to regard the expressions which appear in the definition (*eight*, *side*, *angle*, etc.) as being unlike [ovine], in that they are conceptually more 'primitive' than the item they are being used to define.

It is no accident, perhaps, that *octagon* is an expression used in plane geometry, a branch of mathematics. When we move outside this highly formal and precise domain, we soon begin to encounter difficulties. Consider the example of *spaniel* in (173):

(173) spaniel – a kind of dog, usually liver-and-white or black-and-white, with long pendent ears

An immediate observation on (173) is that the phrase introduced by *usually* does not even introduce a necessary condition: if spaniels are *usually* coloured in one of these ways, it presumably is the case that the occasional spaniel comes differently turned out. Such an occasional spaniel will be sufficient to falsify the entailment in (174):

(174) 'X is a spaniel' entails 'X is liver-and-white or black-and-white'

If it is definitions we are after, we may as well remove this condition, leaving (175):

(175) spaniel – a kind of dog, with long pendent ears

It seems uncontroversial to say that if anything is a spaniel it is a dog, so being a dog looks like a good necessary condition for being a spaniel; what now of long pendent ears?

It is not inconceivable (indeed, it seems highly likely) that sometime in the history of spaniels there have been examples lacking the relevant attributes. This *spaniel* has short ears because it was born like this, or because its ears have been bitten in a fight, or because its ears have been surgically shortened for cosmetic purposes. Such a spaniel remains a spaniel, thereby demonstrating that possessing long pendent ears is not a necessary condition for spanielhood. Accordingly, we must remove this condition from the definition, leaving us with (176):

(176) spaniel – a kind of dog

But (176), consisting of a single necessary condition, does not approach sufficiency. If it were sufficient, (177) would hold:

(177) 'X is a kind of dog' entails 'X is a spaniel'

Any whippet suffices to show that (177) does not obtain.

What we have found for *spaniel* is that there is at least one condition, that of being a dog, which counts as a necessary condition, and again without further argument here, it is usually possible to locate conditions which are individually necessary in this sense (see the relation of hyponymy discussed above); it is the provision of a set of conditions which are jointly sufficient which gives rise to the difficulties we have encountered.

So much for spaniels. The position we have arrived at is that whereas for some nouns dictionaries do indeed provide definitions, for others they do not, and this raises the question as to what the status of (173) is. In fact, the appearance of the word 'usually' is revealing, as it suggests that what (173) does is provide a description of a *typical* or *normal* spaniel, and this might lead us to wonder whether the semantic representations of at least some lexemes have similar characteristics.

We shall see in section 14 that there is a range of psycholinguistic evidence which suggests that lexical semantic representations are **prototypical** in that they supply descriptions of typical members of categories. For our purposes here, we can simply note that there is some linguistic evidence which points in the same direction. Consider the appropriateness of the adverbial expressions such as *strictly speaking* or *technically* in the following examples:

(178) a. Strictly speaking, an ostrich is a bird
b. ?Strictly speaking, a robin is a bird
c. Technically, a whale is a mammal
d. ?Technically, a trout is a fish

In our view, all of these sentences are true and syntactically well formed, but, whereas (178a, c) are entirely appropriate, there is something odd about (178b, d), this oddness being signalled by the prefixed question marks. We can account for this oddness if we propose that the appropriate use of expressions like *strictly speaking* and *technically* is partly determined by prototypicality or 'goodness' of category membership. We have already noted that both *ostrich* and *robin* are hyponyms of *bird*, but in the taxonomy (144), there is no indication that robins are somehow more representative of the class of birds than are ostriches. We are now suggesting that the taxonomic structure requires elaboration if it is to adequately represent the structure of the mental lexicon. For instance, we might suppose that our lexical entry for BIRD, rather than containing a set of features which provide necessary and sufficient conditions for something being a bird, consists of a description (perhaps in the form of a set of features) of a prototypical bird. This description will approximate a description of a robin but not an ostrich, with the consequence that BIRD and ROBIN will be 'closer' to each other than will BIRD and OSTRICH. Evidence suggesting that this is not entirely fanciful will be introduced in section 14 (***exercise 11***).

Exercises

1. In the text (pp. 170f.), we discuss the entailment properties of sentences containing *manage* and *fail*. You are to extend that discussion in two ways:
   (a) determine the entailments of *manage/fail* sentences that themselves contain negation (e.g. *Max didn't manage to finish the book*).
   (b) consider additional verbs (V) that appear in the context *Max V-ed to finish the book* and see what additional classes of such verbs you can discover.

Model Answer for (1a)

We first consider (i):

(i) Max didn't manage to finish the book

It is clear that (i) entails (ii):

(ii) Max didn't finish the book

If we wish to be convinced of this, we can note that (iii) is a contradiction:

(iii) Max didn't manage to finish the book and Max finished the book

What this shows is that it is not possible for (i) and the negation of (ii) (*Max finished the book*) to be true together, and this, in turn, shows that whenever (i) is true, (ii) must also be true.

Next, consider (iv):

(iv) Max didn't fail to finish the book

It may be felt that there are reasons to suggest that (iv) entails (v):

(v) Max finished the book

However, reflection might persuade us that this is not the case. If (iv) entails (v), then whenever (iv) is true, (v) is also true. But now consider circumstances in which Max has not even *tried* to read the book. In these circumstances, (vi) is not a contradiction; indeed, it is true:

(vi) Max didn't fail to finish the book because he didn't even start it

And, of course, if (vi) is true, (v) is false – it's not possible for Max to finish something that he's not started. Accordingly, we have circumstances where (iv) is true and (v) is false, so (iv) does not entail (v).

(The fact remains that we might normally expect (v) to be true if (iv) is true, and there is an interesting question as to how we might deal with this sort of relationship between pairs of sentences (see section 27, pp. 392ff. for relevant discussion).)

2. Consider the sets of sentences below and decide for each set whether (i), (ii) or both entail (iii):

(a) i. Smith knows that trupids are a type of kontel
ii. Smith doesn't know that trupids are a type of kontel
iii. Trupids are a type of kontel

(b) i. Brown believes that prons grow on fargets
ii. Brown doesn't believe that prons grow on fargets
iii. Prons grow on fargets

(c) i. Green maintains that byfters eat mung
ii. Green doesn't maintain that byfters eat mung
iii. Byfters eat mung

(d) i. Jones recognises that pogballs make you greep
ii. Jones doesn't recognise that pogballs make you greep
iii. Pogballs make you grepe

By considering other verbs which can be followed by the complementiser *that* and an embedded sentence, try to develop an informal hypothesis which will account for your data.

3. Which of the following statements are true?

(a) *tennis* is a hyponym of *sport*
(b) *pea* and *vegetable* are co-hyponyms
(c) *plant* is a superordinate of *tree*
(d) *lamb* is a hyponym of *creature*
(e) *lemon* and *tomato* are co-hyponyms
(f) *poker* is a hyponym of *game*
(g) *game* is a hyponym of *sport*
(h) *poker* is a hyponym of *sport*
(i) *bread* is a co-hyponym of *butter*
(j) *disease* is a superordinate of *influenza*
(k) *swing* and *toy* are co-hyponyms

Use your answers to construct partial taxonomies for the relevant sections of vocabulary. For each taxonomy, try 'extending' it upwards and downwards beyond the levels which the words in (a)–(k) require and comment on any difficulties or points of interest which arise.

4. In the text, we have supposed that *animal* is a co-hyponym of *bird* and *reptile*, but it may be felt that *mammal* should occupy this place in the taxonomy. Then, it could be maintained that *animal* is a superordinate

for *mammal*, *bird* and *reptile*, and this would be consistent with birds and reptiles being viewed as types of animal. Use this difference to discuss the implications of the existence of 'expert' vocabulary in particular domains for claims we might make about semantic structure.

5. The relation of hyponymy is *transitive*. What this means is that if A is a hyponym of B and B is a hyponym of C, then A is a hyponym of C. Identifying the meronymy relation with that of part–whole, we have (i):

   (i) A is a meronym of B if and only if an A is a part of a B

   Thus, *arm* is a meronym of *body* as an arm is a part of a body. Use the following sets of expressions to investigate whether meronymy is transitive:

   (a) knuckle, finger, hand, arm, body
   (b) handle, door, room, house, street, city, country (= nation)

6. The examples of verbs of movement which appear in (148) could be extended to include such examples as *swim*, *fly*, *fall*, *ascend*, *descend*, *cross*, etc. Suppose we regard the instances in (148) as all types of deliberate movement on land with no inherent direction. This characterisation would exclude the items in the above list and would lead to the construction of a more complex taxonomy for verbs of movement. Starting from the above items, try to identify what factors might be important in constructing such a taxonomy. Present your taxonomy, clearly indicating lexical gaps where they occur.

7. The following sets of lexemes are cognitive synonyms. For each member of each set, think of a sentential context in which it is more acceptable than other members of its set.

   (a) HORSE, NAG
   (b) SUP, DRINK
   (c) BUY, PURCHASE
   (d) FIDDLE, VIOLIN
   (e) MUM, MOTHER, MA

8. It is interesting to try to ascertain which types of objects can be both tall and short. Obviously, people can, but 'short' buildings are low buildings (as opposed to high, that is tall, buildings!) and 'short' trees are just small trees. List further examples of types of object which are typically regarded as having vertical extent, and see which dimensional adjectives are used for referring to this extent. Repeat the exercise for types of object which are typically regarded as having horizontal extent, starting from *wide road*, *narrow road*, *wide ocean*, **narrow ocean* (here the asterisk means that the phrase is odd *in some way* – there is nothing wrong with it syntactically).

9. The comparative forms of adjectives *(bigger*, *older*, etc.) have been introduced in section 9. Many adjectives do not occur with this *-er* suffix but form their comparative using *more* (e.g. *more suspicious*, *more intelligent*, **suspiciouser*, **intelligenter*). For the purposes of this exercise, both the *-er* form and the *more* form are both simply referred to as the comparative. Starting from the examples given in the text and adding as many of your own examples as you can, investigate the status of the comparatives of antonymic and complementary adjectives. In your investigation, you should comment on the *interpretation* of sentences such as the following:
   (a) Smith is more married than Brown
   (b) Green is more alive than Jones

10. Consider the subset of English kinship vocabulary including *father*, *mother*, *son*, *daughter*, *grandfather*, *grandmother*, *grandson*, *granddaughter*. By considering pairs or sets of lexemes from these items which exhibit the same semantic relationships, devise a set of semantic features according to which each of the items receives a distinct semantic representation. Next, extend the analysis so that it includes *uncle*, *aunt*, *nephew*, *niece* and *cousin*.

11. You are to investigate directly the proposal that semantic representations of lexemes may exhibit prototype structure. Begin by constructing sets of items from a small number of superordinate categories (e.g. sport, fruit, vegetable). Then ask native speakers to rate each of the items on a scale of 1–7 for their 'goodness' of category membership. The instructions you should use are:

    I am going to read out the names of a number of items each of which is an X (sport, fruit, vegetable, etc.). Using a number between 1 and 7, you must indicate how good a member of X you consider each item to be. For example, suppose X is *sport* and the item I read is *tennis*. If you think that tennis is a particularly good member of this category, you should give it 7, if you think it is a particularly bad member, you should give it 1, if you think that it is intermediate, you should give it 4, and so on. Are there any questions?

    Summarise your results in a systematic way and, where possible, pool them with those of others in a class so that the total sample is as large as possible. Discuss the significance of your results.

13 Children and words

In the previous sections of this part of the book, we have introduced a large number of the tools used by linguists when they examine words and their structure in a range of languages. From now on, we seek to apply some of these tools, beginning with the child's acquisition of words. Like most aspects of first language acquisition, this process, once started, is something that parents and other adults take very much for granted. The very first strings of sounds produced by the child which are recognised as words are greeted with great acclaim, but from then on sight is often lost of the child's massive achievement.

In considerations of first language acquisition, it is customary to be concerned with questions of *order*. For example, if we suppose that part of what is involved in acquiring a language is the establishment of appropriate word classes and assigning specific words to those classes, we can immediately ask whether there is evidence that children acquire word classes in a particular order. Assuming a positive answer to this question immediately gives rise to a second, more difficult question: why? Pursuit of the first question is a largely *descriptive* enterprise, which could be viewed as a prerequisite to seriously posing the second; answers to the second question will, if adequate, provide us with an *explanatory* account of some aspect of acquisition. In this section, we shall see that there is considerable evidence for small children controlling remarkably sophisticated systems of linguistic representation from a very early age. Of course, in a general sense, this is what we might expect if the child comes to acquisition innately equipped to achieve linguistic competence.

Early words – a few facts

It has been estimated that small children acquire on average about ten new words each day. While they sometimes make what adults regard as errors in their use of words, some of which we shall discuss below, in many respects children's early words are used with remarkable linguistic accuracy.

The linguistic concepts which have been introduced earlier enable us to raise a number of questions about order of acquisition. As far as major lexical categories go, children's early production vocabularies exhibit a preponderance of nouns, typically used to refer to objects in the child's immediate environment (e.g. *mummy*, *daddy*, *dolly*, *car*). Alongside these, children are often quick to develop a small number of 'general purpose' verbs. The sort of thing we have in mind will be familiar to parents and is illustrated by the following interaction:

(179) PARENT: (puts hat on doll)
CHILD: (removes hat, gives it to parent) Do it.
PARENT: (puts hat on doll)
CHILD: (removes hat, gives it to parent) Do it.
PARENT: (hides hat behind back)
CHILD: (finds hat, gives it to parent) Do it.
PARENT: (indicates behind back) Put it here?
CHILD: (nods) Do it.

Here we see the verb *do* (or possibly the sequence *do it*, if this is the only context in which *it* appears) being used to cover a range of actions, and reliance on one or more verbs of this type is characteristic of the early stages.

Small numbers of adjectives (e.g. *nice*, *big*) and prepositions (e.g. *up*, *down*) also occur in transcripts of early child speech. Now, it is important to be clear that in making this sort of claim, we are viewing things from the perspective of adults. At the earliest stages, children do not string words together into phrases and sentences, nor do they systematically inflect words, so the morphosyntactic criteria for recognising lexical classes, which were introduced in section 9, cannot be applied to the very beginnings of language production. However, when these criteria do become applicable, evidence for lexical categories is readily available (see section 24).

A different, and in many ways more interesting, question arises if we contrast the acquisition of lexical categories with that of functional categories (see section 9). While the evidence that lexical categories are present from a very early stage is overwhelming, the same cannot be said for functional categories. A typical utterance from a two-year-old is (180):

(180) Car go innere (as child places car in toy garage)

Setting aside the phonological characteristics of the phrase *innere*, there are two observations to make about this utterance. Firstly, *car*, a singular count noun, requires a determiner in English (*a car*, *the car*, *this car*, etc.); secondly, since *car* is a third person singular subject, the agreement inflection *-s* should appear on the verb (*car goe***s** *innere*). Both of these items are missing from the child's utterance, and such apparent omission of members of functional categories (in this case a member of D) along with certain inflections is a characteristic of early child English. Indeed, the extent of such omissions and their implications for theories of the child's morphosyntactic development have been, and continue to be, major research questions. We shall return to these matters in detail in section 24.

Suppose, for present purposes, that members of functional categories are indeed absent in the English-speaking child's early language. Various possibilities might account for this including a lack of perceptual salience (typically, functional category items do not carry stress) and semantic opaqueness – coming to terms with the semantics of determiners (*the*, *a*, *this*, *that*) or complementisers (*that, if*, *for*) looks like a rather forbidding task, and while nouns which refer to concrete objects and verbs which denote activities bear some relation to the child's non-linguistic experience, it is not clear that this is true of *for* in *I'm anxious for you to eat this*. We can surely understand a child systematically ignoring such items. More intriguingly, it has been suggested that the early absence of functional categories (if, indeed, they are absent) may be explicable in terms of an unfolding genetic programme. After all, to say that language is part of human genetic endowment is not to say that *all* aspects of language are simultaneously available to the child. Indeed, if this latter were the case, we might expect first language acquisition to be an even faster process than it is. In fact, the account of early sentences which we present in section 24 does not suggest that functional categories are completely absent in the early stages; rather, it proposes that they are 'deficient' in certain respects. Whatever view turns out to be correct here, the suggestion that the course of acquisition is at least partly determined by genetic mechanisms remains a live option (***exercise 1***).

Supposing that there is some development of functional category systems (i.e. it is not the case that the child completely controls all aspects of all functional categories from the very earliest stages of acquisition), we can immediately pose another developmental question. We have already seen that even in a language like English, which is relatively impoverished morphologically, there is quite a variety of inflectional endings (third person singular present -*s*, past tense -*ed*, progressive -*ing*, perfect/passive -*en*, plural -*s*, comparative -*er*, superlative -*est*, etc.), along with a rather rich set of derivational and compounding processes and various other functional categories containing free morphemes (members of D, AUX, PRN, etc.). Are these items acquired in any determinate sequence? Indeed, what sort of evidence should we accept for these items being acquired at all? We turn to consideration of these questions.

Apprentices in morphology

Consider the plural morpheme in English. In section 10 (exercise 5a), we have suggested that with a number of well-known exceptions, the allomorphic realisation of this morpheme as /-s/, /-z/ or /-əz/ is predictable by taking account of the phonological characteristics of the final segment in the singular form of a noun. Thus, the plural form of *cats* (/kæts/) will not appear in the lexical entry for *cat*; adults, it is assumed, have access to this regular morphological process, i.e. they control a morphological rule. Do we have means for ascertaining whether young children control this rule?

Firstly, note that the mere fact that young children produce appropriately inflected tokens of *cats*, *dogs* and *buses*, while suggestive, does not provide conclusive evidence for them using the above rule. This is because there is every reason to believe that they will have *heard* tokens of the appropriately inflected forms in which we are interested. Surely, they could simply have committed them to memory and either include /kæts/ as part of the lexical entry for *cat*, indicating that it is the plural form (precisely what we would advocate for *feet* and *men*), or list it as a quite separate lexical entry, thereby failing to acknowledge any systematic relationship between *cat* and *cats*.

In a celebrated experiment reported in 1958, Jean Berko devised a technique which enabled her to distinguish the above alternatives. Acknowledging that existing forms could not be used to demonstrate the child's command of rules, Berko invented some simple words, which she introduced to children in a specific context. For plural allomorphy, her technique was to show the child a picture of a single bird-like creature and say *this is a wug* (/wʌg/). Then, the child was shown a picture of two of these creatures and prompted with *now there are two of them, there are two …* The child was to supply an appropriate form. Now, if the mechanism for acquiring plurals requires children to be exposed to every specific example, they should be unable to complete the Berko test. However, the overwhelming majority of children tested responded with *wugs* (/wʌgz/). Note, furthermore, that the form the children supplied contained the correct allomorph of the plural morpheme (/-z/). As well as plurals (for which there were several other items to test other allomorphs), Berko devised ways of investigating other aspects of inflectional and derivational morphology. While her results were not always as clear-cut as in the case of plurals, overall she established that children in the age range five to seven do exhibit creative control of a variety of morphological processes. In fact, evidence for this is available from a different source, the spontaneous speech of English-speaking children, and from a much earlier age (***exercises 2*** and ***3***).

In a seminal study of the 1970s, Roger Brown and his colleagues at Harvard reported the results of their detailed longitudinal work with three children. This study had many aspects, but here we shall concentrate on what Brown referred to as '14 grammatical morphemes'. This set included a number of verbal inflections and here we shall restrict our attention to these. Within this group, Brown distinguished between regular and irregular past tense inflections (as in *jumped* and *came*) and between regular and irregular third person singular present (as in *walks* and *does*, where the latter involves a vowel change as well as the addition of *-s*). Completing his list was the progressive inflection *-ing*.

When we work with samples of naturally occurring production data, it is necessary to formulate a criterion for acquisition. The point is that when children begin to use, say, past tense forms, they do not do so consistently, vacillating for some time between the appropriately inflected form and the base form. Brown decided that an appropriate criterion was 90 per cent usage in obligatory contexts, the rationale behind this figure being that once the children in his study satisfied this criterion, they continued to do so; setting the criterion lower would have entailed that children moved from not having acquired a morpheme to having acquired it, only to subsequently return to not having acquired it. With this methodological decision in place, it was then possible to determine the point at which each of the verbal inflections was acquired. The ordering which emerged is in (181):

(181) 1. progressive *-ing*
2. past tense irregular
3. past tense regular
4. third person singular present regular
5. third person singular present irregular

To begin with, we attend briefly to the fact that the progressive morpheme comes first in this ordering. One possible reason for this is simply its *regularity*. Unlike the past tense and third person singular morphemes, the progressive has no variant realisations as allomorphs (although, see section 16 on the sociolinguistic variable (ing)). As a verbal suffix, it attaches in a fixed form to the vast majority of English verbs, and this, coupled with its relatively transparent semantics in signalling on-going activities, may be sufficient to account for its accessibility to children. Of the remaining four items, the third person singular present forms will not delay us. There are very few irregular allomorphs of this morpheme (*does*, *says* [sɛz], *has*, *is*), and it is perhaps hardly surprising that these forms are relatively late in being acquired.

The surprise package in (181) is provided by the past tense allomorphs, with the irregular forms meeting Brown's 90 per cent criterion before the regular forms. Of course, there are more irregular past tense forms than there are irregular third person singular forms, but they are far outweighed by the regular forms, and in these circumstances, intuition suggests that the regular pattern would prevail first. There are two observations bearing on this order of acquisition. Firstly, the irregular forms, while relatively small in number, include some of the most *frequently occurring* verbs in English (*was*, *had*, *came*, *went*, *brought*, *took*, etc.). Secondly, the regular pattern does indeed prevail but only after a period during which the irregular forms are correctly produced. A consequence of this is the phenomenon of **overregularisation**, when the child incorrectly applies the regular past tense formation rule to a base form which, in the adult language, requires an irregular process. The result is a stage at which the child's performance on such past tense forms as *went* and *came* deteriorates, as these forms are partially replaced by **goed* and **comed*. It is forms such as these, typically occurring in the child's third year, which demonstrate that the child is operating in a rule-governed fashion. Such forms are very uncommon in the speech children hear (adults can be induced to overregularise in this way if, for example, they are asked to produce past tense forms under time pressure) and it would be fanciful to suggest that, having apparently successfully mastered the irregular forms, children abandon their mastery on the basis of a very unusual occurrence. It is more plausible to suggest that overregularisation is indicative of reliance on a rule system (***exercise 4*** and ***5***).

Turning to a different aspect of morphological organisation, one of the issues which concerned us in section 10 was the relative positioning of derivational and inflectional affixes and the possibility of combining both sorts of affixation with compounding. We also suggested that lexical entries will contain information about *irregular* inflectional forms (*brought*, *went*, *teeth*, *mice*, etc.) but that *regular* forms would not be listed in this way, as they can always be produced by reference to the rules of English morphology. Now, among derivational processes, some appear to be entirely regular, including that which adds *-er* to a verb to form an agentive or instrumental noun, and the productivity of this process can readily be attested by noting that we are comfortable with a noun like *e-mailer*, derived from the verb *e-mail*, itself presumably a conversion from the noun *e-mail*. If, in the future, some individuals develop the capacity for transmitting mail mentally (mail which will be unadventurously dubbed *m-mail*), as soon as any English speaker cares to think about it, the transmitters will become *m-mailers*. We must conclude, then, that the process of *-er* suffixation can freely consult the lexical entries of verbs and do its work on whatever it finds there. This capacity for creating new forms also appears to apply to compounding, and one particular such process, alluded to in section 11, combines an *-er* suffixed noun with another noun which could function as an object of the verb from which the *-er* noun is derived. Thus, we find compounds such as those in (182):

(182) a. taxi-driver
b. road-mender
c. horse-rider
d. crossword-compiler
e. net-surfer

From our present perspective, (182e) is the most interesting of these; it indicates that this compounding process is alive and well, as wasting one's time by surfing the net (indeed, the net itself and surfing in this sense) were unknown until relatively recently.

What the above discussion suggests is that the formation of compounds like those in (182) is entirely rule-governed. Consultation of a lexical entry produces the base form of a verb, which undergoes *-er* suffixation. Further consultation of the lexicon produces a noun which then enters into a compound with the derived nominal (see section 10 for the argument that the processes take place in this order rather than the reverse). We now consider the interaction of these processes with plural formation.

It is a well-known observation that the simple nouns appearing in the compounds in (182) cannot be pluralised (**taxis-driver*, **roads-mender*, etc.), despite the fact that a taxi-driver usually drives more than one taxi, a road-mender typically mends many roads, etc. This is readily explained if we adopt the account of the previous paragraph and suppose that regular inflectional processes such as plural formation only occur after derivational processes and compounding (this will, of course, enable us to deal with *taxi-driver***s**, *road-mender***s**, etc.). But now consider nouns which have irregular plurals, such as *geese*, *teeth* and *mice*. Given our assumptions about lexical entries, these forms appear in such entries. In principle, therefore, they (unlike regular plurals) are available to be involved in the formation of compounds.

We can pursue this informally by considering a hypothetical situation. Suppose that you live in a house near a lake. During the spring, early in the morning, the local geese mate noisily leading you to lose sleep. Mercifully, you discover that the local supermarket stocks a powder which, when applied in small quantities, quietens geese. Your sleep is saved, but also your linguistic intuitions are aroused because on the packet containing the powder, you see not ***goose*** *quietener* but ***geese*** *quietener*, i.e. a compound of the type under discussion which includes a plural noun. Now, while *goose quietener* is OK, it is our view that *geese quietener* is also fine (certainly, considerably better than **ducks quietener*) and, of course, if the irregular *geese* is available to take part in compounding, this is precisely what we would expect.

Now, it seems that children as young as three already have lexical entries and control of morphological processes which match what we are taking to be the adult system. In a simple experiment, Peter Gordon presented children with a puppet who liked to eat various kinds of objects (e.g. buttons, teeth, mice, pins). Pre-tests established whether the children (aged three to five) understood the singular and plural forms of the nouns tested, and they were then asked to tell the experimenter what they would call someone who liked to eat buttons, etc. Depending on whether the noun being tested had a regular or irregular plural, the results were remarkably different. For regular plurals, almost all the children's responses employed the singular form in the compound (*button-eater*); for irregular plurals, a large majority of the responses from those children who had exhibited knowledge of the correct form used the plural in the compound (*teeth-eater*). This result suggests not only that children can perform quite complex morphological operations by the age of three, but that the *organisation* of their morphological systems and the relationship between this and the form of their lexical entries is already strikingly similar to that of adult English speakers (***exercise 6***).

The semantic significance of early words

Above, we mentioned that a feature of the early vocabulary of many children is that it contains one or more rather general verbs which are used to refer to a wide range of activities. If we turn our attention to the meaning of the child's early vocabulary items, we meet the view that this widening of use is a feature not just of early verbs, but also of some nouns used to refer to concrete objects. We begin our discussion by briefly looking at some of the evidence for this claim.

The stories of embarrassment are largely apocryphal but contain an element of truth. A small child being pushed along the street points to an unknown man and squawks *daddy*! Sometimes, it is the milkman who gets this treatment in the stories, but the general idea is that at a certain stage, children are likely to

overextend the reference of some of their nouns to include inappropriate objects. Other examples which are often cited include overextending *doggie* to refer to all hairy, medium-sized beasts and overextending *ball* to include all circular objects such as the moon. Early attempts to account for this phenomenon assumed that, for the child, nouns referring to concrete objects had a wider meaning than they have in the adult language; from this perspective, acquiring the meaning of such a noun involved gradually coming to restrict the set of objects to which it applies.

Now, the notion of 'meaning' which was employed in these discussions was the definitional one employing features that we have encountered and been somewhat cautious about in the previous section. Thus, we might suppose that from this perspective, the meaning of *doggie* for an adult might be along the lines of (183):

(183) doggie – [medium-sized, hair-covered, four-legged, carnivorous, …]

The claim, then, is that children have only a subset of these defining conditions. Furthermore, because the child's world is dominated by that which is perceptually present, it is plausible to suppose that this subset consists of those features which are perceptually based. Thus, (183) might be replaced by (184), adopting the assumption that being carnivorous is not a property which is readily perceived by the small child:

(184) doggie – [medium-sized, hair-covered, four-legged]

Of course, if this is the case, cats, sheep and various other creatures will satisfy the conditions in (184) and a child, confronted with such a creature, will refer to it as a doggie.

Another example is provided by *ball*. Here we might suppose that the semantic representation in the adult lexical entry is along the lines of (185):

(185) ball – [round object, used in games, …]

By contrast, the child relying entirely on perceptually based features, and therefore not having access to [used in games], which concerns the *function* of balls, has (186):

(186) ball – [round object]

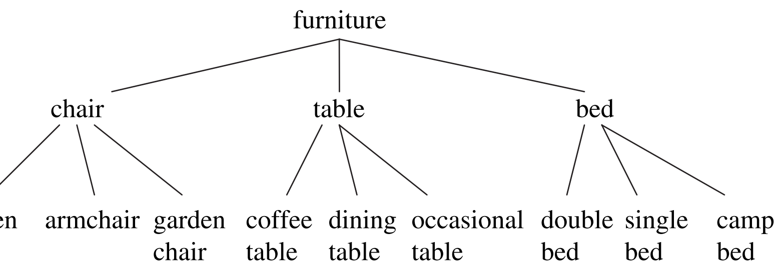
We can immediately see why a child will use *ball* to refer to the moon on the basis of (186).

It will come as no surprise that we regard the above proposals as flawed in certain respects. Most obviously, the reliance on definition-like constructs as providing word meanings has been examined in section 12 and, we believe, found to be wanting. To set the child off on the acquisition road with a construct not employed in the adult system, while not totally unintelligible, would require extensive justification. More importantly, overextension of children's early nouns is a fairly short-lived and limited phenomenon. The majority of children's concrete nouns are not overextended, and the truly remarkable aspect of the acquisition of words is the *accuracy* of children's use. Of course, we tend not to notice appropriate usage, but the fallacy of building a theory of lexical development on a minority of aberrant cases should be apparent. Finally, there is an alternative way of thinking about overextension, which in our view is more plausible.

Take the case of *doggie*. Small children with limited lexical resources may find themselves in situations where they wish to draw attention to, say, a sheep. They know that the creature in front of them is not a dog, but they lack a lexical item for referring to it; in these circumstances, they may resort to the strategy of finding the word in their lexicon which most nearly matches in meaning what they are looking for. The plausibility of this way of looking at things is increased if we consider the case of an adult confronted with a novel type of creature. Such an adult may well resort to something along the lines of, 'there's a sort of X over there', where X is an item in this adult's lexicon. In these circumstances, we would not conclude that the adult's meaning of X was too general; rather, we would say that they were doing their best in the face of inadequate lexical resources. We remain uncertain about what the 'matching' required by this account might amount to, because we do not have an adequate theory of the semantic representations appearing in lexical entries. However, this view does not require that the child's semantic representation for *doggie* should be different to the adult representation, and this is consistent with the overwhelming accuracy in child usage to which we have drawn attention.

As a final issue in this section, we would like to sketch what may prove to be a more promising approach to some aspects of early lexical development. In the previous section, we introduced the semantic relation of hyponymy and indicated how it defined taxonomies in certain areas of vocabulary. Part of a taxonomy appears in (187):

(187)



In (187), we refer to the level occupied by *furniture* as the **superordinate** level (note that this is a slightly different use of 'superordinate' to that which was introduced in the previous section), the level occupied by *chair*, *table* and *bed* is the **basic** level, and the lowest level is the **subordinate** level.

Taxonomies such as the one in (187) are very interesting for a number of reasons. For example, it will not have escaped notice that the move down the taxonomy from the basic to the subordinate level is accompanied by the appearance of morphological complexity; *kitchen chair*, *armchair*, etc. are compounds (cf. a similar observation in connection with extensions to 144, p. 172). There is no logical reason why such complexity appears at this level. The hypothetical (even more partial) taxonomy in (188) categorises the world in exactly the same way as the relevant portion of (187), but here morphological complexity appears at a higher level:

(188)

- furniture
  - sitting furniture
    - kitchen sitting furniture
    - lounge sitting furniture
    - garden sitting furniture
  - sleeping furniture

Now, of course, it may be entirely accidental that the level we are referring to as basic has the property of being the most specific level of categorisation which has morphologically simple labels, but what is intriguing is that this *linguistic* observation (which could be extended by considering further taxonomies in English and other languages) is linked to a set of *psycholinguistic* observations (see section 14) and some rather interesting facts about lexical development. Here, we focus on the latter.

The question we raise is at what level do children 'enter' taxonomies such as (187)? The answer is very clear. Children acquire words such as *chair*, *table* and *bed* before they acquire *furniture* or any of the subordinate terms. Of course, the subordinate items include the basic-level morphemes as components, so this observation ought not to be too surprising, but if, as some have supposed, children's early words are 'too general' in their meaning, we might expect superordinate terms to be early acquisitions. But this is not the case.

Now, consider the fact that a child confronted with a chair is, inevitably, confronted with a piece of furniture (a child being given a carrot is also being given a vegetable, a child eating an apple is also eating a fruit, etc.). Why is it that in these circumstances children inexorably home in on the basic-level items? Easy, you might say: this is because *adults* use basic level items in such situations and obviously the child must be exposed to an item in order to acquire it. This is true, but we can continue to ask why this should be, i.e. why do adults label basic-level categories rather than superordinate ones? To answer this question, we need to consider the 'information' which categories at different levels in taxonomies contain. To get a sense of what is involved here, we will ask you to conduct a short 'thought experiment'.

Referring to (187), try to think of as many properties as you can which you reliably associate with the category of furniture – note that you are not being asked to come up with a definition of *furniture*. You should soon admit to being stumped by this request: there simply are not very many properties that all (or, indeed, most) items of furniture typically have in common. Next, do the same thing for the categories of chairs, tables and beds. You should do better – there are quite a few properties that are reliably associated with chairs ('is used for sitting on', 'has a back', 'has a smallish flat part', etc.). Furthermore, these properties reliably distinguish chairs from tables and beds, which are other categories at the basic level. Finally, try the same process for the category of kitchen chairs. Naturally, as kitchen chairs are chairs, all your chair properties will carry over to kitchen chairs; it is, however, unlikely that you will be able to come up with very much that is new about kitchen chairs (beyond, 'usually found in a kitchen'!) which distinguishes them from other varieties of chair.

Our thought experiment is complete, and it is time to confess that the genuine experiment has been done by Eleanor Rosch and her colleagues in the 1970s with the results hinted at above. What do these results mean? It appears that the basic level is the most abstract level at which (relatively) large numbers of *diagnostic* (i.e. fairly reliable) properties are associated with categories. In this sense, basic categories are 'informationally rich' – there are many properties which will give you fairly reliable cues that you are confronted by a chair, and not a bed or a table, and this will in turn enable you to predict that the object you are concerned with has the range of properties generally associated with chairs, even if, for whatever reason, you don't get a good look at it, say. By contrast, there are few, if any, properties that enable you to decide that something is a piece of furniture (excluding, of course, knowing already that what you have is a chair, a table or a bed). Finally, the problem of our relationship with kitchen chairs and other subordinate categories is that the vast majority of properties we associate with them will not serve to distinguish them from other varieties of chair. In short, it appears that categorisation at the basic level can be achieved with reasonable reliability *on the basis of partial information*, whereas this is not true at either the superordinate or the subordinate levels. It is not true at the superordinate level because there are *no properties* which predict category membership at this level; it is not true at the subordinate level because the predictors of category membership here are *not reliable*.

The suggestion that a certain level of taxonomic categorisation is informationally rich in this way leads to the provocative idea that children are somehow geared to informational richness (clusters of co-ordinated properties) in their environments. And adults 'know' unconsciously that this is the case. As a consequence, they provide words which small children are 'ready' for. Much remains to be understood in connection with this suggestion, but if it is along the right lines, it provides an illustration of how the maximisation of the informativeness of categories provides children with ready-made meanings to be matched by the words supplied by their linguistic environment. From this perspective, absence of error is precisely what we would expect in the acquisition of early vocabulary (***exercises 7*** and ***8***).

Exercises

1. In section 11 we distinguished between word-based and stem-based morphology. Consider the acquisition of a language with stem-based morphology, such as Italian or Spanish. Would you expect this process

to support the hypothesis that the development of functional categories (*including tense and agreement inflections*) is delayed, this delay being the consequence of the gradual unfolding of a genetically determined programme? Are these difficulties fatal to the proposal?

2. Devise your own small experiment to test children's control of past tense allomorphy. To do this, you will need to invent a number of verbs referring to actions which can be easily depicted in drawings. For instance, you might draw a cat balancing on its tail and have accompanying text along the lines of the following: 'This is a cat who knows how to *zid*. He does it most days. Yesterday he did it; yesterday he …' The child's task is to complete the sentence, and evidence for control of the relevant morphological processes would be provided by a child saying *zidded*.

   If you have access to a small group of children, try your experiment on them and summarise the results. As an alternative, the class can co-operate in devising the experiment and each member of the class for whom it is possible can run the experiment on one or more children, with a subsequent pooling of the results.

3. Thinking along similar lines to those you have pursued in exercise 2, devise experiments for testing children's control of the comparative (*-er*) and superlative (*-est*) suffixes. Make sure that you include adjectives for which an adult would use the *more* and *most* constructions. Again, run your experiment if you have the opportunity.

4. It has been noted that when children overregularise past tense morphology, they are more likely to do this with certain types of irregular verbs than with others. For example, English verbs which undergo ablaut (see section 11) and no other process in forming their past tense (*sing*/*sang*, *ring*/*rang*, etc.) are more likely to be overregularised than are verbs which undergo no change (*hit*/*hit*, *shut*/*shut*, etc.). When adults are asked to supply past tense forms under time pressure, a similar difference in the amount of overregularisation occurs. Why do you think this might be? (Hint: think of as many no-change verbs as you can and pay close attention to their phonological characteristics in the light of what you know about regular past tense formation.)

5. The two classes of irregular verbs in exercise 4 do not exhaust the full set of English verbs which have irregular past tense forms. Think of as many irregular past tense forms as you can, and classify them in terms of the morphological processes they involve. Test adults informally on their ability to supply irregular forms from your various classes under time pressure (you do this by saying that you are going to present them

with a verb and they have to produce the past tense form *immediately* – give them some examples, so that they are clear on what is required). Do you think that the results of such informal testing will generalise to predict frequencies of overregularisation errors in child speech? Does your answer to the question in exercise 4 help in understanding the data you have collected?

6. In the text, we introduced the compounds *geese-quietener* and *goose-quietener* and suggested that adults are likely to find the former reasonably acceptable (cf. **ducks-quietener*). By making up a small set of compounds involving regular and irregular plurals, test whether this is so. You might, for example, provide a context for each of your compounds, and then ask adults to rate them for acceptability on a scale of 1 to 5. Note that the important observations to make are comparative: even if people don't like *geese-quietener* much, do they nonetheless clearly prefer it to *ducks-quietener*?

7. You are to conduct a simple naming experiment with children to ascertain whether they use superordinate-, basic- or subordinate-level expressions to name a variety of common objects. The simplest way to do this is to cut pictures of objects out of magazines and show them to children with the question 'What's this?' Present your results in a systematic way.

   How might you deal with the objection that the children you tested simply did not know the superordinate and subordinate terms you were interested in eliciting?

8. Construct partial taxonomies for which the most abstract term is (a) *fish*; (b) *reptile*, indicating clearly where in the taxonomy morphologically complex forms appear. Now consider the claims in (i) and (ii):
   (i) children acquiring English acquire *fish* before they acquire *cod*, *trout*, etc.
   (ii) children acquiring English acquire *snake*, *lizard*, etc. before they acquire *reptile*.

   If (i) and (ii) are true, what are the implications of this for the view presented in the text that the child's entry to a taxonomy is always at the 'basic' level.

14 Lexical processing and the mental lexicon

An adult native speaker of English with a normal speech rate produces more than 150 words per minute – on average, more than one word every half second. Indeed, under time pressure, for example, when you are calling your friend in New Zealand from a public telephone in Britain or the United States, a native speaker can produce one word every 200 ms, which is less than a quarter of a second, and your friend can still understand what you are saying. The lexicon of an average native speaker of English contains about 30,000 words. This means that in fluent speech you have to choose continuously from these 30,000 alternatives, not just once, but two to five times per second, and there is no clear limit on how long you can indulge in this process. Furthermore, your friend is *recognising* your words at the same rate at the other end of the telephone line. If you wanted to, and had enough money, you could make the telephone companies happy by talking to your New Zealand friend for hours, with a decision rate of one word every 200–400 ms. Incredibly, despite the high speed of lexical processing, errors in the production and comprehension of words are very rare. Research has revealed that in a corpus of 200,000 words, getting on for twice the length of this book, only 86 lexical errors were found, i.e., fewer than 1 in every 2,000 words. Thus, lexical processing is speedy and very accurate, and decisions are made at very high processing rates although there are many alternatives.

In this section, we will discuss the sorts of processes that are involved in our production and comprehension of words. We will structure our account around two general questions. These will enable us to raise some of the major issues surrounding the processing of words in contemporary psycholinguistics.

Serial-autonomous versus parallel-interactive processing models

In the light of the figures mentioned above, we can begin by intuitively considering what might be involved in recognising or producing a common word such as *dog*. It ought to be self-evident that these processes can be broken down into a number of sub-processes. Thus, focusing on recognition for the sake of concreteness, in order to recognise that a sequence of sounds impinging on your aural receptors constitutes a token of *dog*, it is necessary for you to recognise that the sequence contains an initial /d/, etc. Failure to do this, say by 'recognising' an initial /b/, would result in an obvious misperception, and, under normal conditions, these are uncommon. Obviously, by complicating the word in question, we could offer similar observations for the perception of suprasegmental features such as stress (it is important to your interlocutors that when you say *TORment*, a noun with stress on the initial syllable, they do not 'perceive' *torMENT*, a verb with stress on the final syllable). It is incontestable that sound properties are generally important in spoken word recognition. It is also easy to see that information about the *category* to which a word belongs is important: if you are going to understand a simple sentence such as (189), then you had better categorise the token of *dogs* in that sentence as a verb and not as a noun:

(189) A problem with speech perception dogs me wherever I go

Additionally, it is easy to agree that the *morphological properties* of words must be recognised: *I bother Bill* and *Bill bothers me* are interpreted quite differently, and these different interpretations are due to the choice between nominative *I* and accusative *me* and the related choice between *bother* and *bothers*. Finally, you can make the various decisions we are sketching here, but your decisiveness is unlikely to do you much good unless you also come to a view on what a specific occurrence of *dog* or *bother* means. Recognising words in the sense introduced above involves *understanding* them, and this presupposes semantic choices.

Now, there are at least two ways in which we can conceptualise these various decisions being made. The first, which gives rise to **serial-autonomous** accounts of processing, maintains that these decisions are taken in sequence, with all decisions of a certain type being taken before decisions of the next type. Furthermore, information which may be available on the basis of later decisions cannot inform earlier decisions. The alternative **parallel-interactive** approach takes the opposite perspective: in principle, information relevant to any decision is available at any point in processing, and there is no place for a strictly ordered set of sub-processes. We shall now try to be a little more specific.

Serial-autonomous models of lexical processing involve a series of steps in which information is passed from one component of the mental lexicon to the next. One characteristic property of serial-autonomous models is that each stage in the processing of a word is carried out by a specialised module which accepts input only from the previous module and provides output only to the next one. Thus, crudely, we might suppose that word recognition begins with a module which recognises a sequence of sounds, and this module presents its output to an independent module which assigns a morphological analysis to this sequence of sounds. At this point, if a token of (189) is being listened to, the word *dogs* may be analysed as either the verb stem *dog* plus the third person singular present suffix *-s* or as the noun stem *dog* plus the plural suffix *-s*. Of course, ultimately, only the first of these analyses is correct, but from the serial-autonomous perspective, the syntactic, semantic and contextual information that will force the listener to this decision is not available at this stage in the perceptual process. To use a notion introduced by Jerry Fodor, each specialised module is **informationally encapsulated** and can take account only of the information supplied by modules which operate earlier in the perceptual process. By contrast, supporters of parallel-interactive models claim that language perception (and production) involves the activation of some or all sources of relevant information at the same time. According to this view, then, the morphological analysis of *dogs* as the noun stem *dog* plus the plural suffix *-s* will not be produced in the course of perceiving a token of (189). This is because enough syntactic, semantic and contextual information is already available from earlier parts of the utterance to rule out the possibility of this analysis. We can try to sharpen up the difference between these two approaches by considering another (plausible) situation.

Suppose that the telephone companies are experiencing a technical problem, so that the line to your friend in New Zealand is occasionally interrupted by a crackling noise for about a quarter of a second. This occurs while you are saying (190); as a consequence, your friend hears (191):

(190) I thought you were coming on Wednesday

(191) I thought you were (krrrrk) on Wednesday

As your friend listens to (191), we can ask whether any lexical recognition is going on during the crackle. According to the serial-autonomous view, the answer would be a definite ‘no’, while parallel-interactive models would answer with an equally clear ‘yes’. In a serial model, there is only one way to get access to a word form such as *coming* and that is through its phonological form (if we were concerned with written word recognition, we would again maintain that there is only one route to recognition, but in this case this would be via an orthographic analysis). Since a phonological analysis is unavailable to your friend in (191), modules which would subsequently analyse *coming* as *come* + *ing*, assign appropriate morpho-syntactic properties to these morphemes and then associate meanings with them cannot operate. Generalising, we can say there is no lexical access at this point. Of course, what your friend might do under these conditions is try to guess what you are talking about and ask for clarification (*Do you think I’m coming/dying/graduating on Wednesday?*), but these kinds of conscious inferences are different from the automatic process of accessing the mental lexicon.

Now consider how a parallel-interactive perspective approaches the same problem. According to this view, all sorts of information are simultaneously used to access the lexicon, regardless of where in the processing system the information comes from. If, as in (191), the phonological information for accessing *coming* is not available, an interactive system can have recourse to information from another source so that lexical processing does not break down because of an inadequate input signal. Suppose, for example, you were talking about your friend’s visit to Britain before you produced (190), and that only the exact date still had to be fixed. Then, he or she might understand (191) as (190), despite the degenerate signal, by having access to information from the surrounding context.

A very large number of experimental studies have attempted to differentiate between the two approaches and to argue for the appropriateness of one or the other. Many of these studies involve complex experimental designs, the details of which we cannot engage in here due to space constraints. We can, however, offer a brief overview of two types of experiment which, intriguingly, lead to opposing conclusions.

Consider firstly, then, the sentence in (192):

(192) The young woman had always wanted to work in a bank

Of course, *bank* is ambiguous in English, with the senses ‘financial institution’ and ‘side of a river’. From a parallel-interactive perspective, when listeners to (192) hear *bank*, they take advantage of all the information available to them, including the contextual information supplied by their general knowledge of the world and earlier parts of the sentence. Since this information is incompatible with the ‘side of a river’ sense of *bank*, this possibility will not be considered and only the ‘financial institution’ sense will be accessed. The serial-autonomous view, on the other hand, sees lexical access as entirely driven by phonology and so maintains that both senses will be accessed – the phonology does not differentiate them. Now, suppose that immediately following the aural presentation of (192), subjects are presented with a visual word/non-word decision task, i.e. on a screen in front of them appears an English word, say *garden*, or a non-word sequence, say *brogit*. Their task is to respond as quickly as possible, by pressing one of two buttons, to indicate whether the visual item is a word or not.

In order to convey the major finding of this type of experiment, we need to make one further assumption explicit. This is that words are organised in the mind so that semantically related words (in the sense of section 12) are ‘close’ to each other. More technically, if you hear a token of *dog*, some (mental) **activation** spreads to semantically associated items such as *cat* or *animal* or *bark*, and we say that these latter items are **primed**. When an item is primed, we would expect it to be more readily available for lexical access than when it is not. We return to our experimental study.

A parallel-interactive approach will maintain that for subjects who have just heard (192), only the ‘financial institution’ sense of *bank* will be active and only lexemes semantically related to *bank* in this sense, e.g. *money*, *cheque*, will be primed. For the serial-autonomous theorist, however, both senses of *bank* are activated, so additional items such as *river* and *tow-path* will also be primed. The following experimental conditions are the crucial ones, where the capitalised words are the items presented visually for a word/non-word decision:

(193) a. The young woman had always wanted to work in a bank. MONEY
b. The young woman had always wanted to work in a bank. RIVER
c. The small yellow car was found outside the village. MONEY
d. The small yellow car was found outside the village. RIVER

Here, (193c) and (193d) are intended to provide **neutral contexts**; neither *money* nor *river* is primed in these contexts, so decisions that the visually presented items are words provide a measure of how long this process takes when these items are unprimed. For both the serial-autonomous and parallel-interactive accounts, (193a) provides a **primed context** for the recognition of *money* as a word. Both approaches predict that subjects' responses to (193a) should be faster than their responses to (193c). For (193b), however, the two approaches make different predictions; this is a primed context only from the serial-autonomous perspective. Thus, this approach predicts that subjects' responses to (193b) will be significantly faster than their responses to (193d); the parallel-interactive approach predicts no significant difference in these cases. Results supporting the serial-autonomous position have appeared in the psycholinguistics literature, thereby suggesting that the perceptual mechanisms are 'stupid' in the sense that they do not utilise all available information. Lest we lose sight of it in the dispute between serial-autonomous and parallel-interactive accounts, we should also note that *any* priming effects depending on semantic similarity provide experimental support for the view of the structured lexicon we developed in section 12, namely that the mental lexicon is not just a list of items but rather a structured set over which a notion of psychological 'distance' can be defined, with semantic similarity contributing to this measure of distance.

Alongside studies which support the serial-autonomous view, the psycholinguistics literature contains many reports of experiments which favour the parallel-interactive position. Again, we offer just a brief outline of the thinking behind one of them.

Suppose that experimental subjects are instructed to respond as quickly as possible, by pressing a button, to an occurrence of a designated word, say *party*. They can be presented with tokens of *party* in a variety of contexts, illustrated in (194):

(194) a. John and Mary shared a birthday last week when their **party** …
b. The giraffe walked rapidly into the bedroom where its **party** …
c. Ghost although out yesterday the runs street which my **party** …

These contexts represent three distinct categories. In (194a) we have an example which is syntactically and semantically well formed. The example in (194b) is syntactically well formed but semantically odd, given our knowledge of the world, and (194c) is just a random list of words exhibiting neither semantic nor syntactic structure. Again, we note that the serial-autonomous view regards word recognition as phonologically driven, so this approach ought to predict no differences in recognition times for *party* in these examples. By contrast, the parallel-interactive account expects that subjects will be able to take account of syntactic information in (194b) and of syntactic and semantic information in (194a); this should enable subjects to produce enhanced recognition times in these two conditions when compared with (194c). Using this technique, the parallel-interactive view has been supported, with recognition times being fastest for the condition in (194a), slowest for (194c) and of intermediate speed for (194b).

We conclude this brief discussion with some general remarks. Parallel-interactive models of lexical processing are highly efficient in that they almost always compute an output, even in cases such as (191) in which crucial information is not available via phonological recognition. Thus, they lead us to expect that words can be recognised in an appropriate context, even in circumstances where there are no phonological or orthographic cues at all. Serial-autonomous models cannot account for such context effects, except by suggesting that a listener can guess the identity of a particular word, using inference processes which do not themselves belong to the system of language perception. At the same time, however, parallel-interactive models are theoretically unconstrained, and it is therefore difficult to make testable predictions on the basis of such approaches. Given parallel interaction, anything goes, and you can, for example, recognise a word without having any direct cues. This is impossible with the serial-autonomy approach. Moreover, as each module has a clearly described task in a serial-autonomous model, an output error or a recognition error can be traced back to the module that caused the error. This is impossible in a parallel-interactive model in which information is distributed over many different places which are all continuously interacting. In sum, parallel-interactive models of word recognition are extremely successful at the product level; in fact, they almost always produce an output, i.e. recognise a word. But they provide little insight into the actual mechanisms that are involved in understanding words. Serial-autonomous models are theoretically more interesting, and they make specific predictions as to which kinds of inputs are required for word recognition, but when the input is faulty or noisy, they are not efficient enough, and they cannot straightforwardly account for context effects.

It should be clear from the above where the lines of this particular dispute are drawn. Both types of model offer a story about how degenerate word forms may be perceived. For the adherent of a parallel-interactive account, such perception is due to the normal functioning of the perceptual system. It is a characteristic of this system that it is always seeking to identify words on the basis of any type of information available to it, and the only difference between a well-formed signal and a degraded signal is that, in the latter situation, *one* sort of information (the phonological form) is missing. From the serial-autonomous perspective, the lack of phonological form means that the language perception system breaks down at this point and another cognitive system (of guessing or inferencing) comes into play. Devising experiments which will distinguish clearly between these alternatives is a difficult task, and we have outlined above two paradigms which produce conflicting conclusions. It is perhaps not accidental that most current models of lexical processing include both serial-autonomous and parallel-interactive features (***exercises 1*** and ***2***).

On the representation of words in the mental lexicon

A basic property of words is the arbitrary relationship they exhibit between meaning and form: words have meaning, and they have phonological

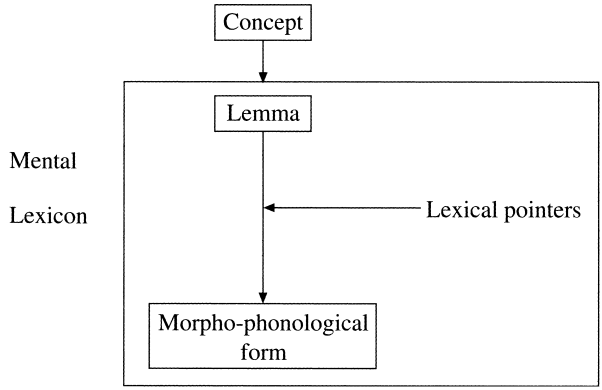


Figure 39 *One view of the structure of the mental lexicon, illustrating the form of a lexical entry*

or orthographic structure, and there is no way of recovering the former from the latter. Note that if this were not the case, we would not expect to find lexical differences between languages: if *cow* is the 'natural' sign for a bovine creature, we should be puzzled by the existence of *vache* in French. Given this **arbitrariness of the linguistic sign**, the lexicon (or the mental dictionary of a language) must include some sort of stored entry for the lexemes of a language. Most psycholinguists believe that the mental lexicon must contain lexical entries which contain a number of separate but interconnected levels. The model of a lexical entry in figure 39 is based on suggestions of the psycholinguist Pim Levelt.

According to this model, **concepts** must be distinguished from **lexical entries**, and lexical entries consist of two levels, one for the semantic form of the lexical entry, i.e. its meaning or content, and the other for the entry's morphological make-up and its phonological properties. Hence, a lexical entry can be split into two parts, its **lemma** and its **form** information (note that in this literature the term lexical entry is used to refer to what we called lexemes and that the term lemma refers to the semantic representation of a lexeme). The lemma lexicon and the form lexicon are connected through lexical pointers: each lemma points to its corresponding form, i.e. it can address a particular entry in the form lexicon where the morpho-phonological properties of the lemmas are stored.

What is the evidence for distinguishing between these levels of representation in the mental lexicon? Switching our focus from perception to production, consider firstly the distinction between concepts and lemmas, and suppose a native speaker of English wants to formulate a message about the object/concept represented in figure 40.

According to the model in figure 39, this concept will activate the appropriate lemma in the lexicon, i.e. *scissors*, and subsequently the word form /sɪzəz/. Concepts are represented on a prelinguistic level, whereas lemmas must be part of the mental lexicon of a particular language. Thus, for native speakers of

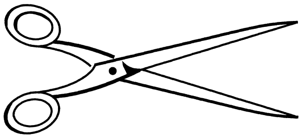


Figure 40 *A simple concept*

English, the concept represented in figure 40 is probably the same as for native speakers of German, but at the lemma level there are differences: *scissors* is inherently plural and is not countable (**one*/**two*/**three scissors*), but the German equivalent of *scissors* is *Schere*, which is inherently singular and a count noun (*eine Schere, zwei/drei/vier Scheren*, 'one scissor, two/three/four scissors'). Similar examples are *trousers* (plural) versus *Hose* (singular), *glasses* (plural) versus *Brille* (singular). The fact that *Schere, Hose* and *Brille* are count nouns, whereas *scissors, trousers* and *glasses* are not, is a semantic difference on the lemma level, which is not a consequence of and does not result in different conceptualisations.

What about the distinction between the lemma and the form lexicon? Returning to perception, one important piece of evidence for distinguishing between these two levels of representation comes from our ability to process non-words, i.e. words for which we have no proper meaning representation. Thus, native speakers of English perceive a clear difference between the items in (195) and (196):

(195) blatt

(196) plaupf

The item in (195) is a potential English word, in terms of its phonological form, although it does not have any meaning in English. The item in (196), however, is an impossible word in terms of its form properties – specifically, English does not permit a syllable coda to comprise the consonant cluster /pf/ (see section 5). In other words, the difference between (195) and (196) in terms of their phonological form demonstrates that we can make judgements about the form of a lexical entry independently of its meaning. This in turn shows that the mental lexicon cannot be thought of as a set of entities (structured or otherwise) with direct form–meaning mappings; the form lexicon, it seems, can be accessed independently without activating any links to meaning.

This idea has been confirmed in reaction-time experiments involving the recognition of non-words. In one set of experiments, subjects are presented with strings of four letters and their task is to decide as quickly as possible whether the stimulus letter string is or is not a word of English. Different conditions were tested as indicated in figure 41.

The experiment showed that decision times on totally illegal and unpronounceable sequences such as SJMF are considerably faster than for any other stimulus used; they are even faster than those for existing words of English. This indicates

Stimulus	Example	Mean decision time
Word	DESK	708 msec.
Non-word (fully unpronounceable)	SJMF	607 msec.
Non-word (onset unpronounceable)	SJIF	644 msec.
Non-word (coda unpronounceable)	SAJF	680 msec.
Non-word (pronounceable)	SARF	746 msec.

Figure 41 *Five conditions in a word/non-word recognition experiment*

that we possess a rapid process by which globally illegal words can be detected, and this process must be purely form-based.

Failures of lexical access, as, for example, in speech errors, provide another important source of evidence for discovering the internal structure of the mental lexicon, and we shall now introduce some of the key issues in this area of speech production (see section 7 for speech errors involving phonological units).

Three classes of speech errors, illustrated in (197) to (199), can be distinguished for our purposes:

(197) **Blends**: two words are fused into one.
- a. Irvine is quite *clear* (← *close* and *near*)
- b. At the end of today's *lection* (← *lecture* and *lesson*)
- c. to determine *whatch* (← *what* and *which*)

(198) **Substitutions**: mis-selections of words
- a. He's a *high* grader (← *low*)
- b. Don't burn your *toes* (← *fingers*)
- c. I just put it in the oven at a very low *speed* (← *temperature*)

(199) **Word exchanges**: two words within the speaker's utterance are exchanged
- a. You can't cut *rain* in the *trees*
- b. This *spring* has a *seat* in it

Victoria Fromkin and Anne Cutler have collected speech errors over many years, and the anthologies they have put together provide the most extensive database of naturally occurring speech errors we have; the examples mentioned above were taken from these collections.

Speech errors in lexical access all involve failures of lemma retrieval, but the mechanisms underlying blends, substitutions and exchanges are different. In general, a speech error occurs when lemma selection is disturbed by the simultaneous activation of two elements. Consider, for instance, blends, and notice from the examples in (197) that the two words forming the basis for the blend are roughly equivalent in meaning. Thus, in (197b), lemma selection is disturbed by the fact that the two closely related elements *lecture* and *lesson* are active at the same time. But at which processing level are these two elements active? Given figure 39, there are two possibilities: at the conceptual level and/or at the lemma level. To answer this question, we must have a closer look at the meaning relations that hold between the two elements activated in a speech error.

As noted, in blends the two elements are very similar in meaning and are usually of the same syntactic category. We hardly ever find antonym blends, i.e. fusion of two words that have opposite meanings (e.g. *harsy* ← *easy*/*hard*), or blends in which one element is a superordinate term for the other one (e.g. *dealsman* ← *dealer*/*salesman*). In an extensive published list of blends, for example, there was not a single antonym blend and just three involving a hyponym and its superordinate.

Compare this with the elements involved in substitution errors in (198). The most common cases of this type involve antonyms (198a) or other semantic relations. For example, *fingers* and *toes* are co-meronyms, each entering into the relation of meronymy with *body*. Moreover, there is a clear frequency effect in substitutions: high-frequency words are more likely to substitute for a low-frequency word, but not the other way round, and it has been found that in 74 per cent of a large corpus of substitutions, the intruding element had a higher frequency than the correct item, with only 26 per cent of cases involving a lower-frequency item substituted for one of higher frequency.

Finally, in word exchanges the two elements that are exchanged are typically unrelated in meaning. Rather, they express different concepts, as, for example, in (199a, b).

Let us briefly summarise the similarities and differences between these three kinds of speech errors in figure 42.

Given these facts, we conclude that the explanation of word exchanges differs radically from the other two kinds of speech errors. Word exchanges result from different sentence fragments being active at the same time. For example, in producing (199a), there is a point at which the slot for the object of the verb *cut* and the slot for the object of the preposition *in* have to be filled, and at this point two candidate fillers, *rain* and *trees*, are simultaneously active and are somehow exchanged. Thus, the two elements that are involved in word exchanges are neither conceptually nor semantically related; rather they are syntactically related. They belong to different phrases, but they have similar syntactic functions in their phrases.

	BLENDS	SUBSTITUTIONS	EXCHANGES
meaning relation	closely related	closely related	unrelated
antonyms	no	yes	no
co-meronyms, etc.	no	yes	no
frequency effect	no	yes	no

Figure 42 *Differences between types of speech errors*

How do substitutions come about? Take example (198b) for illustration. In this case, the speaker wanted to convey a message involving the concept of a finger. Given figure 39, this concept activates the lemma *finger*. In the mental lexicon, lemmas that are semantically related are closely associated (cf. the discussion of spreading activation earlier in this section). Thus, the lemma *toe* is a close associate of the lemma *finger* in the mental lexicon. For some reason, the activation of *toe* is stronger in this case than that of *finger*, and this produces the substitution. The kinds of errors that occur in word substitutions are familiar from word-association experiments in which subjects are asked to freely associate to a given stimulus. In such experiments, responses such as *last* as a response to *first*, *wine* to *beer*, *later* to *earlier* and *sun* to *moon* are typically found. These responses reflect the semantic structure of the mental lexicon, for example, the fact that a given lemma is closely connected to its antonym(s), synonym(s) co-hyponym(s), etc. The same can be said about word substitutions: generally speaking, word substitutions reflect semantic relations in the mental lexicon.

Consider finally how we might explain the occurrence of blends. Blends occur between two words that are broadly similar in meaning, but unlike in the case of substitutions, semantic relations such as antonymy, hyponymy and meronymy appear to be irrelevant. Thus, as noted, antonym blends and blends involving a word and its superordinate are extremely rare. This suggests that in blends the intrusion of the second element occurs at the *conceptual level*, rather than in the mental lexicon. Take, for example, (197b). The message fragment the speaker wants to convey at this point, namely selecting a reference point of the school/ university day, would be compatible with using both concepts, LECTURE and LESSON. These two concepts are closely related and are simultaneously activated. Subsequently, they both activate their corresponding lemmas (see figure 39). Both lemmas are retrieved and inserted into the same slot. In short, blends result from conceptual intrusion. Viewed from the perspective we have sketched above, speech errors are not a random phenomenon; they reflect levels of representation in the mental lexicon (***exercises 3, 4*** and ***5***).

A rather different set of issues concerning the structure of the mental lexicon arises in connection with our observations at the end of section 12. There we noted that there is psycholinguistic evidence which supports the idea that the notion of *prototype* plays a role in lexical organisation, and we shall now briefly discuss a small sample of this evidence.

Recall that within the category of birds, a robin appears to be prototypical, particularly if it is contrasted with an ostrich. We suggested that this might be a reflection of the lexical entry for *robin* being ‘closer’ than that for *ostrich* to that for *bird*. One piece of evidence supporting this view is very easily obtained. If subjects are simply asked to list the names of birds, then typically *robin*, *sparrow* and *eagle* will appear early on such lists, whereas *ostrich*, *emu* and *chicken* will appear late, if at all. If we suppose that presentation and processing of the word *bird* produces activation which spreads ‘outwards’ from the lexical entry for *bird*, becoming less effective the further it travels, we have a ready explanation for this finding. The lexical entries for *robin*, *sparrow* and *eagle*, being 'close' to that for *bird*, receive a large amount of activation and are thereby primed (see above) and produced on subjects' lists. Lexical entries for other, more remote, bird names are primed to a lesser extent or not at all.

Another very direct approach to this topic is to ask subjects to rate pairs of words for semantic similarity using, say, a five-point scale. Thus, you might be presented with *sparrow* and *eagle* and if you feel that they are very similar semantically, you will score them at five, if you consider them not semantically similar at all, you will give them one, and if you perceive a middling amount of semantic similarity, you will use one of the intermediate numbers. It comes as a surprise to many people that a technique as simple as this produces reliable results across large populations of subjects. As far as our current interest goes, the important finding coming out of such experiments is that pairs such as *robin* and *bird* receive significantly higher scores than pairs such as *ostrich* and *bird*. Again, this is consistent with the lexical representation for *robin* being 'closer' than that of *ostrich* to that of *bird* in psychological space, a conclusion that is not captured by supposing that lexical organisation in this area is merely taxonomic.

Finally, another twist to this story emerges from an experiment conducted by Lance Rips and his colleagues. In this study, subjects were asked to imagine a small remote island populated entirely by various species of birds and were told that all members of one species (e.g. the owls) had been infected with a particularly virulent (for birds) disease. The subjects' task was to judge what proportion of other species succumbed to the disease. In support of what we have seen above, it was found that if the initially infected species was prototypical (e.g. robins), then greater proportions of other species were judged to contract the disease than if the initially infected species was not prototypical (e.g. ducks). Putting this crudely, if the robins started it, more sparrows, eagles, owls, etc. were judged to get the disease than if the ducks started it. Intriguingly, this result applies to specific pairs of birds. For instance, if the disease starts with robins, maybe 60 per cent of ducks are judged to get it; however, if it starts with ducks, only 40 per cent of robins fall ill. This is a rather different result to those which show that the lexical representation of *robin* is relatively 'close' to that of *bird*. What this seems to show is that the 'distance' from the lexical representation of *robin* to that of *duck* is smaller than the distance from the lexical representation of *duck* to that of *robin*, i.e. 'distance' in the mental lexicon might not even be symmetrical!

In general, we can conclude that lexical processing is an extremely rapid and efficient cognitive process, and psycholinguists have only just begun to develop appropriate theoretical models for understanding this process. Additionally, the organisation of the mental lexicon, while broadly in line with the ideas that linguists have developed, appears to have some rather unusual properties. Most importantly, while psycholinguists often appeal to non-linguistic notions such as memory and frequency in their studies, the proposals made by linguists on such issues as semantic similarity, categorisation and lexical representation regularly provide the basis for modelling (***exercise 6***).

Exercises

1. Obusek and Warren (1973) presented subjects with samples of speech such as those below from which individual phonemes were deleted or replaced with a cough (the spelling we have used reflects the missing word, but, of course, this is not available to subjects in an aural presentation experiment). Participants often failed to detect that a phoneme was missing and supplied appropriate phonemes in the different contexts. Discuss these *phoneme restoration effects* in the light of the controversy between serial-autonomous and parallel-interactive models of word recognition.

   (a) It was found that the *eel was on the orange (*peel*)
   (b) It was found that the *eel was on the axle (*wheel*)
   (c) It was found that the *eel was on the fishing-rod (*reel*)
   (d) It was found that the *eal was on the table (*meal*)

2. In a lexical priming experiment (Carreiras, Duñabeitia and Perea 2007), where subjects had to recognise targets as words or non-words, target words (e.g. the word MATERIAL in the examples below) that were immediately preceded by prime words containing digits (a below) or symbols (b below) were responded to as quickly as when they were preceded by an identity prime (c below), and responses under all three conditions were much faster than when the target word was preceded by an unrelated control word (d below).

	Primes	Target
(a)	M4T3R14l	MATERIAL
(b)	MΔT€R!ΔL	MATERIAL
(c)	MATERIAL	MATERIAL
(d)	CORPORAL	MATERIAL

   What do these findings tell us about word recognition during reading? Do we really recognise words from left to right by identifying one letter after another? How is it possible that NUM83R5 ΔND $YMβ0L$ C4N B€ U$3D Δ$ L3††3R$!N 4 $3N7€NC€ ΔND †H3 R3$UL7!NG $3N7$NC$ C4N B$ UND3R$ †00D?

3. With respect to the processing of lexically ambiguous words, at least two possibilities must be considered: (A) On encountering an ambiguous word, only *one* of its possible meanings is accessed; or (B) all meanings are accessed initially, and all but the 'correct' one are discarded later. What do the findings below tell us about the way we process lexically ambiguous words?

   (a) McKay (1966) found that in a sentence-completion task, subjects would take longer to complete (i) than (ii).

(i) After taking the right turn at the intersection, I …
(ii) After taking the left turn at the intersection, I …

(b) In a cross-modal lexical decision experiment, Swinney (1979) found priming effects for all meanings of the word *bug* (not just the one that fitted the context). Specifically, in (iii) below, he found that recognition of both *ant* and *spy* as words was facilitated at the point marked *.

(iii) Rumour had it that, for years, the government building had been plagued with problems. The man was not surprised when he found several *bugs* * in the corner of his room.

4. Below are some examples of picture-naming errors typical of a type of aphasia called *semantic anomia*:

	Patient's error	Target word
(a)	*buffalo*	lion
(b)	*hair*	comb
(c)	*wash*	towel
(d)	*sugar*	coffee
(e)	*sink*	desk

Describe the nature of the above errors. What do cases of anomia tell us about the way words and concepts are represented in the mind/brain?

5. Analyse the following speech errors. Which (if any) are problematic for serial-autonomous models of speech production, and why?

(a)	*week at workends*	(work at weekends)
(b)	*I'd hear one if I knew it*	(I'd know one if I heard it)
(c)	*I hate raining on a hitchy day*	(I hate hitching on a rainy day)
(d)	*blond eyes*	(blond hair)
(e)	*I'm making the kettle on*	(making some tea / putting the kettle on)
(f)	*I've eaten all my library books*	(I've read all my library books)
(g)	*It's difficult to valify*	(validate / verify)

6. You are to conduct a small experiment to investigate the prototype structure of a number of common categories. Firstly, choose your categories by identifying a number of superordinates for which fairly large numbers of hyponyms exist, e.g. *sport*, *occupation*, *vegetable*, *fruit*, *crime*. Then ask as many subjects as you can muster to write down in thirty seconds as many instances of the category as they can think of – make sure that they write them down in such a way that you can ascertain the *order* in which they appear.

Examine your results for any obvious patterns across your subjects and draw appropriate conclusions on whether your experiment is consistent with the ideas on prototypes which have been discussed in this section.

15 Lexical disorders

In the introduction (pp. 11ff.), we offered some preliminary remarks on the types of language disorders which are of most interest to the linguist. These are **aphasia** and **Specific Language Impairment (SLI)** and it is important that we re-emphasise a very important difference between these. Aphasia is a disorder of language and speech that is caused by a brain lesion which may be due to an accident or a stroke, *after language has been acquired in the normal way*; before the brain lesion occurred, aphasics had normally functioning language systems. By contrast, SLI is a term covering disorders *in the normal acquisition of language* without there being any clear primary deficit. Despite their linguistic problems, SLI children and adults have normal non-verbal IQs, no hearing deficits and no obvious emotional or behavioural disturbances; unlike aphasics, SLI subjects have never acquired language in the normal way.

Aphasia provides us with a potentially valuable source of information as to how linguistic representations are implemented in the brain. It is reasonable to suppose that we might learn how a machine (or any other physical device, such as the human brain) works by investigating how it goes wrong. In aphasic patients, there is typically some residual language left after brain damage, indicating that the knowledge of language can be **selectively** impaired by brain lesions, and it is by carefully studying the range and nature of such selective impairments that we hope to learn something about the interconnections of the brain mechanisms underlying language. From a different perspective, SLI provides an important strand in the argument for adopting the strong innateness views Chomsky and his followers propose. If our knowledge of language and, specifically, of grammar, is indeed controlled by our genes, then we should expect to find genetically caused disorders of grammatical development, namely in cases in which something has gone wrong with the language genes. SLI subjects provide us with the chance of studying the effects of a rather isolated, and probably genetically determined, deficit in the acquisition of language, specifically of grammar (see the main introduction for reasons for believing that the disorder is genetically determined).

In this section, we will focus on disorders which display their effects at the lexical and morphological level. We will firstly look at which linguistic properties of words and morphemes are typically lost in aphasics, and then describe which aspects of the lexicon and morphology are hard to acquire for SLI subjects.

Words and morphemes in aphasia

Typically, aphasic patients are reported to have word-finding difficulties, they sometimes mis-name things, or they use circumlocutions to replace difficult words. According to the standard clinical classification of aphasic syndromes, we can distinguish two characteristic types of errors of word usage in aphasia. The first is called **agrammatism** and affects function words such as articles, auxiliaries, complementisers and bound morphemes, such as those marking tense and agreement in English, and also gender, case, etc. in those languages such as Italian and Russian which are inflectionally richer than English. It does not affect content words such as nouns, verbs and adjectives (see section 9). Agrammatism is considered to be the characteristic symptom of **Broca's aphasia**, and in our main introduction, we saw that this disorder tends to be associated with damage to a particular area of the left cerebral hemisphere. The second type of lexical disorder consists of **paraphasias**, which are errors in the use of content words that typically occur in **Wernicke's aphasics**; function words seem to be unaffected in these cases. Consider, as an illustration, the following two attempts by aphasic patients to describe a picture of a child stealing a biscuit:

(200) Ah … little boy … cookies, pass … a … little boy … Tip, up … fall

(201) They have the cases, the cookies, and they were helping each other with the good

The example in (200) comes from a Broca's aphasic. Speech like this is emitted slowly with great effort (a characteristic we have partially indicated by the pauses between different parts of the utterance). Content words such as adjectives (*little*), nouns (*boy*, *cookies*) and verbs (*tip*, *fall*) are produced by the patient, whereas function words such as articles and bound morphemes are sometimes omitted. This combination of properties produces the characteristic **telegraphic speech** of Broca's aphasics, a term which has given way to 'agrammatism' in more recent research.

It should be immediately apparent that the example in (201) is quite different from (200). This was produced by a Wernicke's aphasic describing exactly the same picture. The speech of such patients is fluent and effortless, and the rate of production of words can *exceed* the normal rate (see section 14, p. 199). However, the content of the speech can be remarkably empty and convey little information, as illustrated by the sequence ... *and they were helping each other with the good* in (201). Typically, Wernicke's aphasics do not demonstrate disturbances of grammar and function words, but rather these patients make many errors in content-word usage, e.g. *cases* instead of *cookies* in (201). This characteristic of inappropriate content-word selection appears also in reading aloud, where, for example, the sentence in (202a) is read as (202b):

(202) a. The spy fled to Greece
b. The spy filed to grain

The frequency of such paraphasias ranges from 10 per cent to about 80 per cent of words in extreme cases.

Let us now look at these two characteristic errors in word (and morpheme) usage, agrammatism and content-word paraphasias, in a little more detail.

Agrammatism

According to the standard clinical classification, agrammatism is defined as the omission of function words in speech production, whereas in comprehension, agrammatic patients perform in the normal range. Recent linguistic studies have shown that this traditional clinical picture is too superficial and partly incorrect.

It is true that English-speaking agrammatics omit many function words, but from studies on agrammatism in other languages, we quickly learn that this observation cannot be generalised. Consider, for example, Italian. If Italian-speaking agrammatics were using the strategy of dropping functional elements, specifically bound morphemes, they would produce bare stems such as those in (203):

(203)	*and-	ospedal-.	Non cred-	parol- …
	go	hospital.	Not believe	word …

But these bare stems (*and-*, *ospedal-*, etc.) are not possible words in Italian, which has a stem-based morphology (see section 11), and utterances such as (203) are *not* found in the speech of Italian agrammatics. What we do find is that agrammatic patients use 'unmarked' verb forms, for example the infinitive, as in (204), or they produce inflectional errors such as the error in gender marking in (205):

(204)	andare	ospedale.	Non	credere	parola
	to-go	hospital.	Not	to-believe	word

(205)	capucetto	rossa (*capucetto rosso* would be correct)
	riding hood-masc.	red-fem.

(Note that both 204 and 205 would be marked with a * in standard Italian – the lack of annotation here indicates that the expressions *do* occur in agrammatic Italian speech.)

Furthermore, the range of errors that aphasics produce is rather restricted and narrowly constrained. Erroneous infinitive inflections occur, as in (204), but only on verbs and never on nouns, and gender mistakes, such as that in (205), are also found, but only on nouns and adjectives and never on verbs. This observation suggests that significant remnants of Italian morphology remain in place.

Studies on other languages, e.g. French, Hebrew and Russian, lead to the same outcomes as may be derived from Italian and justify a number of general conclusions. Specifically, it appears that agrammatics respect:

a. the word-structure properties of their native language;
b. the categorial features of bound morphemes;
c. inflectional paradigms.

We shall now say a little more about each of (a) to (c).

The generalisation in (a) covers the fact that agrammatics never produce words, stems or roots that would violate word-structure properties of their language. Thus, bound inflectional morphemes are dropped in English-speaking agrammatics, but the consequence of this is the occurrence of stems which *can* function as words (e.g. *walks* → *walk*). However, such morphemes are not dropped, for example, in the speech of Hebrew-speaking agrammatics. It therefore seems that the broad distinction between word-based morphology (English) and stem-based morphology (Italian, Hebrew) is retained in the grammars of agrammatics.

The generalisation in (b) describes the fact that agrammatics seem to know the categorial identity of affixes, in the sense that they retain knowledge of the categories to which specific affixes can be attached. Thus, verb inflections, e.g. infinitive endings, are only attached to verbs, never to nouns; conversely, case suffixes are never attached to verbs but only to nouns.

The third observation in (c) is that agrammatics still have inflectional paradigms. What this acknowledges is that many of the inflectional errors agrammatics produce are exchanges between individual cells of morphological paradigms, e.g. feminine gender is incorrectly used instead of masculine gender, as in (205). It is important to be clear that this is a stronger generalisation than (b), which does not rule out the replacement of one type of nominal affix by another nominal affix, say, replacing a gender affix by a number affix. But, in fact, this does not occur and the contents of the inflectional paradigms are typically intact. To take a particular case, it is as if the agrammatic knows that case affixes attach in a specific slot, but makes incorrect choices from the available set of case affixes.

Taken together, these findings indicate that agrammatism cannot be accounted for in terms of a global simplification process by which functional elements are simply deleted from the linguistic output. Rather, the linguistic impairments are more specific, and the proper understanding of agrammatism requires notions such as word-structure properties, categorial features and morphological paradigms. Linguistic theories of agrammatism will be considered in section 26, after we have extended our discussion to include the syntactic disorders that occur in these patients.

Another myth of the clinical classification of aphasias is that Broca's aphasia is mainly a production disorder and that comprehension is largely unimpaired in these patients. This view was mainly based on lack of knowledge, specifically on the fact that in the clinical interview, comprehension is not systematically studied. Rather, clinicians ask patients everyday questions such as *How did the stroke come about*?, and agrammatic patients answer such questions appropriately. But this does not mean that comprehension is unimpaired, as the meaning of such questions could be directly inferred from the meaning of the content words and the context in which the question is posed. An important feature of English telegrams, which gave rise to the characterisation of agrammatic speech as ‘telegraphic’, was the omission of function words (e.g. *ARRIVE HEATHROW TOMORROW 3PM STOP HEAVY BAGS PLEASE MEET STOP JOHN*), and such telegrams were typically understood by their recipients, giving a clear indication that the presence of function words is not always necessary for understanding to occur. In the 1970s, aphasiologists started to carry out experimental studies on agrammatism, the results of which clearly demonstrated that agrammatics have comprehension problems with functional elements which are similar to those they show in production (***exercises 1*** and ***2***).

Paraphasias

Errors in the use of content words, i.e. paraphasias, are reported to be characteristic of Wernicke’s aphasics. What kind of content words cause difficulty and how can we account for the error patterns? First of all, performance of Wernicke’s aphasics on content words is affected by the *frequency* of the word in the vocabulary: infrequent words take longer to retrieve and are more often inaccurately retrieved than frequent words. Secondly, and more importantly, the typical error patterns that occur in paraphasias can be explained in terms of the structures which characterise the mental lexicon such as we have already met in the previous three sections of this part of the book. Consider the data in (206) from object-naming experiments; in such experiments, subjects are presented with a picture of an object and are simply asked to name it:

(206) target picture: SHARK subjects’ responses:
a. *fish*
b. *trout*
c. *guitar*
d. *rainbow trout*

Among these responses, (206a, b) represent the common types, and we can understand what is going on here by referring to section 13 where we distinguished between three levels of categorisation in taxonomies: the basic level (where we find such words as *trout*, *shark* and *guitar*), the superordinate level (*fish*, *musical instrument*, *fruit*, etc.) and the subordinate level (*rainbow trout*, *great white shark*, *bass guitar*, etc.). These notions, as well as being significant in understanding the child’s acquisition of words, have also proved important in the study of how visually presented objects are categorised by normal adult subjects. Such subjects typically categorise an object (e.g. by naming it) at the basic object level, despite the fact that *logically* it could be categorised at a variety of other levels. In object-naming experiments with Wernicke’s aphasics by contrast, the subject’s typical naming response to the picture of a shark is either the superordinate level term (*fish*) or a *prototypical* element from the basic set (*trout*) (see section 12 for the notion of prototypicality). Wild paraphasic misnaming as in (206c) occurs only in severely impaired subjects, and responses at the subordinate level such as that in (206d) are practically non-existent.

In another set of experiments, the role of phonetic and semantic similarity in aphasics' perception of category names has been tested. Aphasics were asked to match a picture of an object from a set of multiple-choice pictures to a test word presented orally by the experimenter. A typical situation is schematised in (207):

(207)	test word: *chair*	subjects' choices: a picture of	a. CHAIR
			b. STAIR
			c. TABLE
			d. APPLE

When the aphasics produced errors in this experiment, it was typically an error of type (207c), i.e. an exchange based on the semantic similarity between the test word (*chair*) and the name of the depicted object (*table*) – in this case, the similar items are co-hyponyms. Errors such as (207b), based on phonological similarity, specifically on rhyme, were much less frequent, and wild 'paraphasias' such as (207d) were produced only by severely impaired subjects (note that these subjects did not actually produce these errors in their speech in this study, hence referring to them as 'paraphasias' is an extended use of this expression). These findings indicate that the meanings of words and their associative links in the mental lexicon are accessible to Wernicke's aphasics, and that only in severe cases of vocabulary deficit do the associative processes themselves begin to break down. The examples cited in the last category in (208) below indicate that the notion of 'semantic relatedness' which we are relying on here has to be interpreted fairly liberally if it is not going to exclude significant numbers of cases; the fact remains, however, that the overwhelming proportion of paraphasias do appear to be explicable in terms of one semantic relation or another.

In sum, the following effects have been found in content-word paraphasias from aphasics:

(208) **I.** **Frequency effects**:
Low-frequency content words yield more paraphasias than high-frequency words.

II. **Categorisation-level effects**:
- a. Hyponym exchanges: *sparrow* → *owl*
- b. Use of superordinates: *sparrow* → *bird*

III. **Similarity effects**:
- a. Semantic exchanges: *hair* → *comb*
- b. Pragmatic exchanges: *flowers* → *visit* (flowers and visits are often associated in everyday life)

In general, the content-word usage of Wernicke's aphasics is markedly poorer than in normal speakers. Thus there are more errors, but the types of errors (as set out in 208) are familiar from normal subjects. When normal speakers are under stress, or are distracted or confused, their word usage too is influenced by word frequency and semantic similarity, and they produce errors with all the characteristics of paraphasias (cf. section 14). Thus, there do not seem to exist any *qualitative* differences in content-word usage between aphasics and normal speakers, and, apart from severe cases of jargon aphasia, the organisational principles of the mental lexicon, in terms of levels of categorisation and associative processes, are not affected by the deficit. We now turn our attention to our second major category of language disorders, SLI (***exercises 3*** and ***4***).

Dissociations in SLI subjects' inflectional systems

There is a consensus that SLI children have problems in the area of inflectional morphology, and at first sight, the picture we get from examining the language of such children is very similar to that of agrammatism in Broca's aphasia. Specifically, SLI subjects often omit grammatical function words and bound morphemes encoding case, gender, number, person etc., or they use them incorrectly. It also seems that in SLI children, the development of inflectional morphology comes to a standstill at an early stage, and that beyond that point the acquisition process cannot advance without difficulties.

Consider the following examples from a ten-year-old SLI child:

(209) a. you got *a* tape recorder*s*
b. the four bus go in Boucherville
c. when the cup break *he* get repair
d. *the* Marie-Louise look at the bird
e. the superman *is say* good-bye and *hiding*
f. the ambulance arrive

In these examples, we see problems in number marking within noun expressions (209a, b), an inappropriate pronominal choice (209c), an inappropriate determiner choice (209d), difficulties with participle forms and auxiliary verbs (209e) and in subject–verb agreement (209c, f).

How can we explain the difficulties of SLI subjects in the area of inflection? One interesting proposal is that SLI individuals' ability to learn inflectional rules is impaired relative to their ability to memorise and store individual words. Consider the two inflected verb forms in (209) which are irregular and correct (*got* and *is*). By contrast, regular verb inflections such as the third person singular -*s* are omitted (*go*, *break*, *get*, *look*, and *arrive*). These data indicate that SLI subjects can retrieve irregular verbs such as *got* and *is* from memory – equivalently from the relevant lexical representations – but that they cannot generate the third person singular forms of verbs. Recall that we are assuming that these do not appear in lexical representations since they are derivable by regular processes. SLI subjects have problems learning regular inflectional rules, while at the same time their ability to retrieve irregular forms, which are stored as part of a verb's lexical entry, remains intact. In short, whereas normal speakers appear to possess two distinct psychological mechanisms for inflection, a rule system that attaches regular affixes, e.g. the third person singular -*s*, to stems, and a set of irregular forms such as *got* and *is* which are stored in memory, SLI subjects' knowledge of inflection is selectively impaired. In support of this rule-deficit hypothesis on the nature of SLI, it has been reported that SLI subjects produce practically no overregularisations of plural or past tense affixes; such overregularisation would, of course, indicate productive use of these affixes (see section 13). This, then, is a further indication that SLI individuals have more problems with regular rules of inflection than with accessing irregulars from memory, and it is this selective impairment which enables us to conclude that two psychological capacities (the ability to implement rules and the ability to retrieve forms from memory) can be *dissociated*.

Results from other SLI studies have indicated that the linguistic deficit is even more selective than has been suggested above. One of these investigated SLI children's performance on two regular inflectional affixes, the plural -*s* (*two book-s*) and the third person singular present -*s* (*she arrive-s*). It was found that the SLI children's usage of the third person singular present -*s* was only 36 per cent correct, whereas 83 per cent of their -*s* plurals were correct, this difference being statistically significant. Despite the fact that both affixes are regular, SLI subjects' performance with the plural is considerably better than with the tense/agreement suffix. Notice also that the two inflectional morphemes tested in this study are homophones, displaying identical phonologically conditioned allomorphy (see section 10); this rules out phonological explanations for the observed difference. Taken together, these findings indicate that the different grammatical functions of the affixes is the controlling factor. SLI subjects seem to be significantly less impaired in their use of noun plurals than in their use of the affix encoding subject–verb agreement and tense. We will come back to these findings in section 26, after we have discussed the structure of the sentences SLI subjects typically produce (***exercise 5***).

In summary, we have seen that language disorders such as aphasia and SLI do not involve global disruptions of the mental lexicon and the grammar, but rather selective deficits to otherwise normal lexical and morphological systems. In the so-called agrammatic errors produced by Broca's aphasics, word-structure properties, categorial features and inflectional paradigms are respected, and the notion 'agrammatism', literally meaning 'lack of grammar', is in fact a misnomer. Agrammatics have a grammar that is selectively impaired, but the architecture of the system is identical to that of linguistically normal people. A similar point can be made for paraphasias, i.e. errors in content-word usage typically occurring in Wernicke's aphasics. The relevant variables controlling content-word usage in aphasics are the same as for normal subjects, namely word frequency, semantic similarity and categorisation level, thus showing that the basic structure of the mental lexicon does not globally change as a result of the impairment. In the case of SLI, the development of inflection is selectively impaired: the acquisition of regular inflection causes more problems than learning irregulars, and inflectional morphemes encoding tense/agreement seem to be more adversely affected than pluralisation morphemes. The precise basis for this selectivity awaits further insight.

Exercises

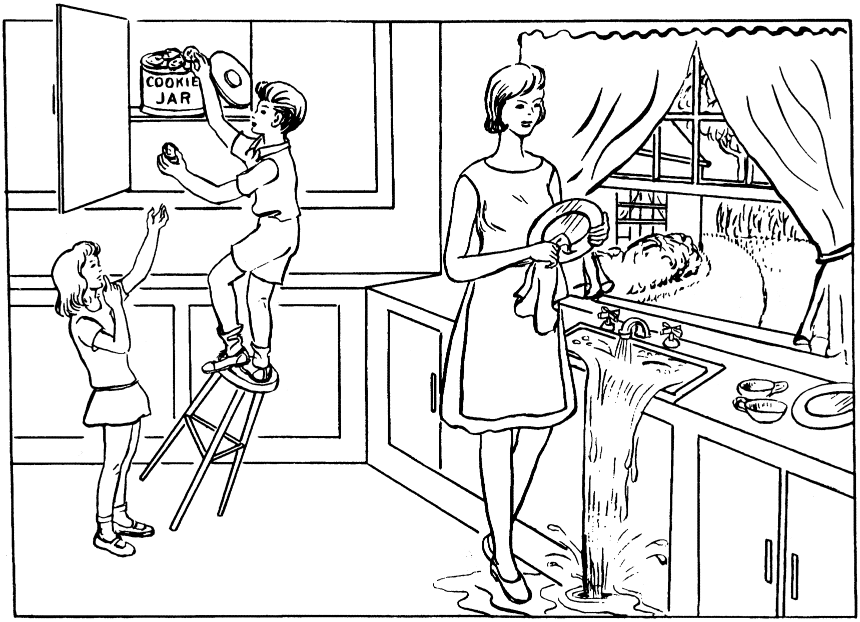
1. Agrammatism (in Broca's aphasia) is characterised by the omission of function words. Explain and assess this claim in the light of findings from languages other than English.

2. In 1881, the neuropsychologist T. Ribot postulated that cognitive capacities which are acquired early in life, for example by children at around the age of two, are lost relatively late in cases of brain damage, whereas cognitive capacities which are acquired later in life, for example by ten-year-olds, are the first to be lost as a consequence of trauma to the brain. This idea came to be known as the 'regression hypothesis'. In essence, it says that patients with brain damage fall back to an earlier stage of normal cognitive development. Below is a summary (from de Villiers 1974) of the order of acquisition in children and difficulty for aphasics of a number of grammatical morphemes. Amplify what this summary is claiming and discuss whether or not the findings support the regression hypothesis.

	Level of difficulty in aphasia	Acquisition order in children
Progressive -*ing*	1	2
Plural -*s*	2	1
Articles (*a*, *the*)	3	5
Regular past tense	4	4
Irregular past tense	5	3
Third singular -*s*	6	6

(1 = easiest, 6 = most difficult)

3. Word-finding difficulties such as those seen in Wernicke's aphasia are also characteristic of a type of aphasia called *anomia*. Analyse the word classes that cause particular difficulties exhibited by an anomic patient's attempt at describing the picture shown below and how he tries to deal with these difficulties. Discuss how anomia, as characterised here, differs from agrammatism.



First of all this is falling down, just about, and is gonna fall down and they're both getting something to eat … but the trouble is this is gonna let go and they're both gonna fall down … I can't see well enough but I believe that either she or will have some food that's not good for you and she's to get some for her, too … and that you get it there because they shouldn't go up there and get it unless you tell them that they could have it. And so this is falling down and for sure there's one they're going to have for food and, and this didn't come out right, the uh, the stuff that's uh, good for, it's not good for you but it, but you love, um mum mum [smacks lips] … and that so they've … see that, I can't see whether it's in there or not … I think she's saying, I want two or three, I want one, I think, I think so, and so, so she's gonna get this one for sure it's gonna fall down there or whatever, she's gonna get that one and, and there, he's gonna get one himself or more, it all depends with this when they fall down … and when it falls down there's no problem, all they got to do is fix it and go right back up and get some more.

(Used with permission from Pro-Ed – Goodglass, Kaplan and Barresi, *Boston Diagnostic Aphasia Examination*, Third Edition)

4. Design an object-naming experiment to elicit paraphasias from Wernicke's aphasics. Comment on at least the following points:
   - experimental procedure/design
   - subjects (number of subjects, control group, selection criteria, pretests, etc.)

- materials (test items, control items, pictures, oral v. visual presentation, etc.)
- theoretical assumptions (explain your views on paraphasias)
- predictions (explain the expected results of the specific experiment given your assumptions)

Try the experiment on your friends and/or relatives. It might be unwise to diagnose any of them as aphasic!

5. In a study of twelve SLI children ranging in age from 8 years, 2 months to 12 years, 11 months, Bishop (1994) reports that with existing irregular verbs in past tense contexts, the same children sometimes alternated between producing the correct irregular past form and producing a bare form, as illustrated in (a) and (b). Bishop also observed errors such as those in (c) to (f):
(a) *Took* it off (in reply to 'What did they do with the top part of the pram?')
(b) It *take* me a long time (in reply to 'Did it take you a long time to get better?)
(c) And then Mummy *taked* to the garage
(d) He *falled* in (in reply to 'What did Andrew do when the ice gave way?')
(e) He *sawed* mine brother (in reply to 'Has the doctor ever been to see you?')
(f) The car has *broked* down
Discuss the implications of these data for the idea that morphological rules are selectively impaired in SLI.

16 Lexical variation and change

Variation in language is multidimensional. In sections 3 and 4, we have looked at how variation in social structure is reflected in the sound patterns of language and how this variation is often indicative of language change in progress. We have also seen how geographical variation in language is caused by different levels of contact between different peoples at different times. In this section, we are interested in variation in words and in their origins, meanings and contexts of use. We'll also examine change in both the choice of words and the meanings of those words.

Borrowing words

What is the origin of words like *shampoo*, *pizza*, *alcohol* and *curry*? When did they enter the English language? And why? Almost certainly, you will be able to answer these questions for at least some of these words, but we can ask the same questions with respect to words which are much less 'exotic'. According to published counts of word frequencies, the items listed in (210) are among the most frequently occurring nouns in English:

(210) people, way, water, word, man, day, part, place, things, years, number, name, home, air, line

All these words have been part of the English language for centuries, and while most of them date back to Germanic languages which preceded the separate development of English, some had their origins in Latin (*part*, *place* and *air*, for example). Throughout its history, English has been adding to its lexicon by acquiring new words from other, often unrelated, languages. *Risotto* and *pizza* come from Italian, *vodka* from Russian, *goulash* from Hungarian, *coffee* and *yoghurt* from Turkish, *alcohol* and *sherbet* from Arabic, *sago* from Malay, *ketchup*/*catsup* from Chinese and *tomato* from Nahuatl (a central American language, already observed to have been the language of the Aztecs). These new words are known as **borrowings**. Of course, as well as having borrowed thousands of words, English has been a great provider too, much to the annoyance, for example, of language purists in France who strive to find native French words to replace *le parking*, *le hamburger* and *le walkman*.

Why do speakers borrow words from other languages? Perhaps the most obvious reason is sheer necessity. People need to develop words for new and unfamiliar concepts – new technology, new plants and animals, and in the examples above, new and unfamiliar foods. Note that the model of lexical representations discussed in section 14 supposes that there is a distinction between concepts and lexical entries, and from this perspective, there is nothing odd about the suggestion that we have concepts for which we lack words. Another reason is prestige. If certain cultures are associated with particular prestigious activities, it is common for the words associated with that activity to come from the language of that culture. Continuing with the food theme, France was at one time considered the centre of world gastronomy, and hence English has words like *cordon bleu*, *gourmet*, *cuisine*, *restaurant*, *menu*, *mousse* and *soup* that it has borrowed from French.

When a word is borrowed, it is often gradually changed so that it fits the phonological and morphological structure of the borrowing language or dialect. So whilst Françoise and Ricardo might go to a cafe [kafe] for a croissant [kʁwasɑ̃] and a cappuccino [kaputtʃino], Mavis and Vic, in London, would go to the [kæf] for a [kwasɒnʔ] and a [kapətʃɪinɐʊ]. Similarly, whereas the plural of *pizza* is *pizze* in Italian, English now applies its own plural morpheme to the borrowed word, hence *pizzas*.

Sometimes, when new concepts are introduced from other societies, the speakers of a particular language may use their own native linguistic resources to coin a new word. These are known as **calques**. Let's look at some examples of this. Comanche, an American language of the southern United States, has a word *ʔohapltiʔa-taka-sikikamatl*, which literally means 'orange's brother tastes sour'. It is the word used for a lemon! In Irish Gaelic, the words *sciath fearthanna* translate as 'rain shield' and refer to an umbrella. In New Zealand, it is the job of the Maori Language Commission to create new words by using words already in the language. As a consequence, we find examples such as those in (211):

(211)				
	New word:	papa patopato	wai mangu	roro hiko
	Literal meaning:	board knock	water black	brain electric
	Idiomatic meaning:	keyboard	ink	computer

English tends to resort to Latin and Greek when new words are devised, particularly for referring to new technology. Examples appear in (212):

(212) television: Greek *tele* ('far') + Latin *visio* ('sight, thing seen')
microscope: Greek *mikros* ('small') + Greek *skopein* ('observe closely')
photograph: Greek *photo* ('light') + Greek *graphos* ('written')

Borrowings, then, are words which originated in one language (or dialect), but which have come to be used in another, even by people who don't speak the 'lending' language. These borrowings are very often assimilated to the phonological and morphological structure of the new host language (***exercise 1***).

Register: words for brain surgeons and soccer players, hairdressers and lifesavers

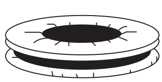
A **register** is the specialised vocabulary common to a particular trade, occupation, topic or activity. Hairdressers, soccer players, brain surgeons and undertakers all have specialised words or uses of words which refer to concepts particularly common or specific to their activity or profession. As a soccer player, you might *nutmeg* your opponent (kick the ball between their legs) or play a *one-two*; you might ask a hairdresser for a *flat top* or a *bob*, or need a surf lifesaver to rescue you from a *rip* (a dangerous backcurrent on a surf beach), but you are unlikely to ask a brain surgeon for a *lobotomy*. It is of some interest that occupations, interests, etc. can have some impact on the important idea of a basic level of categorisation introduced in section 13. Thus, whereas for many of us, *dog* corresponds to a basic-level category, for those of us preoccupied with dogs, the basic level shifts down to that of particular breeds. Similarly, while all of us are familiar with such words as *beech*, *ash* and *elm*, many of us are not in a position to distinguish these different types of tree. For those of us who are arboreally challenged in this way, it is plausible to suggest that *tree* appears at the basic level in our categorisation systems. However, this is not the case for botanists and tree surgeons. For them, the basic level of categorisation will be that of *beech*, *ash* and *elm* or, indeed, the more specific level of *copper beech*, *mountain ash*, etc.

Often, people consider that the registers of doctors and lawyers (and even linguists) hinder communication and understanding. The term ‘jargon’ is sometimes used to refer to the confusing registers of particular occupations. In some senses, registers are ‘in-group’ varieties, which lead to accurate and speedy communication of information among those who know and use them but confuse those who don’t. It is obviously important that the doctor tells the nurse that you have had a coronary infarction or a stress fracture of your left tibia, but what *you* want to know is that you’ve had a heart attack or broken your left leg. In this medical example, the use of a special register is clearly a necessity – the leg, for example, has several major bones and it is vitally important for the nurse to know which one you’ve broken. Some registers, however, are deliberately confusing so as to hinder understanding by outsiders. This may be because the group speaking the particular register wants to maintain a sharply contrasting identity, or has something to hide.

Biscuit or cookie? Variation and change in word choice

Consider (213):

(213)

Concept	Word to refer to concept	
	Britain:	*biscuit*
	USA:	*cookie*
	Australia:	*biscuit/cookie*

The thin flat, often round, usually sweet, hard but crumbly thing we eat during our coffee break is called different things in different English-speaking areas.

In Britain it is usually referred to as a biscuit and in the USA it is a cookie. Australia is experiencing the very initial stages of language change with the word *biscuit* gradually losing out to the word *cookie*.

Such geographical differences in word choice are well known. Most people are familiar with the US–UK contrasts between *sidewalk* and *pavement*, *gas* and *petrol*, *pants* and *trousers*, *elevator* and *lift*, *vacation* and *holiday*. Just as borrowing is frequent in situations of **language contact**, as we saw earlier, it is also very common when **dialect contact** arises. In the past century, within the English-speaking world, most interdialect borrowings have come from American English, with the newly borrowed words pushing out, or beginning to push out, older words, usually of British English origin. Thus, we find examples such as those in (214), where in each case, the American English form is replacing, or has replaced, the British English equivalent:

(214)

British English	American English
housey	bingo
bakery	baker's shop
minerals	soft drinks
pictures	movies
lorry	truck
chips	fries
crisps	(potato) chips

An interesting study of lexical shift from older 'British'-type words to American borrowings has been conducted by Miriam Meyerhoff in New Zealand. As is indicated in figure 43, she found that while some 'British' English words were being retained, many Americanisms were being borrowed, a finding which reflects the increase in sociocultural contact between the United States and New Zealand.

A number of studies have suggested that people are able to acquire new lexical items rather more quickly than they can acquire new phonological features. For instance, Jack Chambers has compared the rate at which a group of Canadian children whose parents had moved to southern England adopted British English

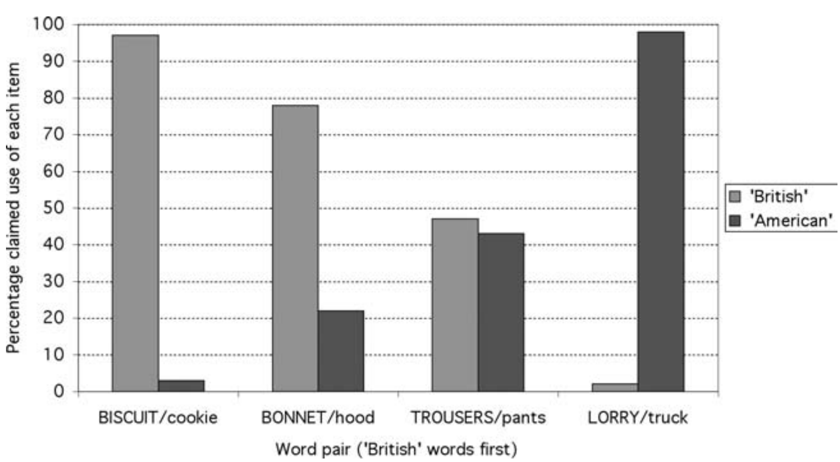


Figure 43 *Reported use of lexical pairs in New Zealand English (based on Meyerhoff 1993)*

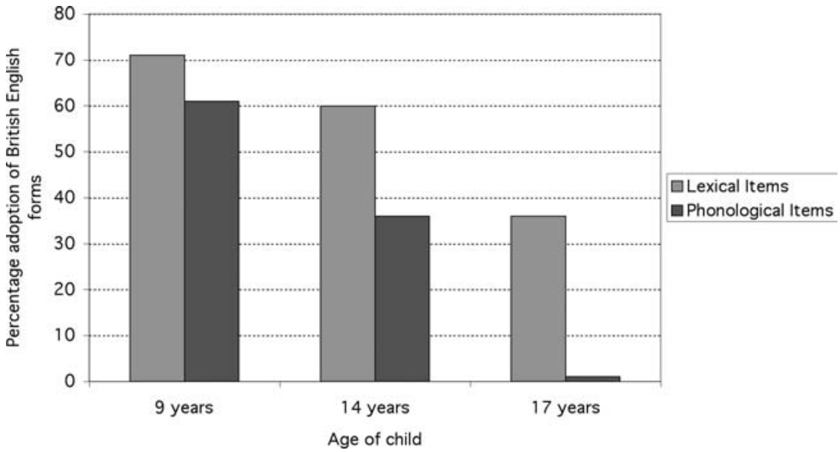


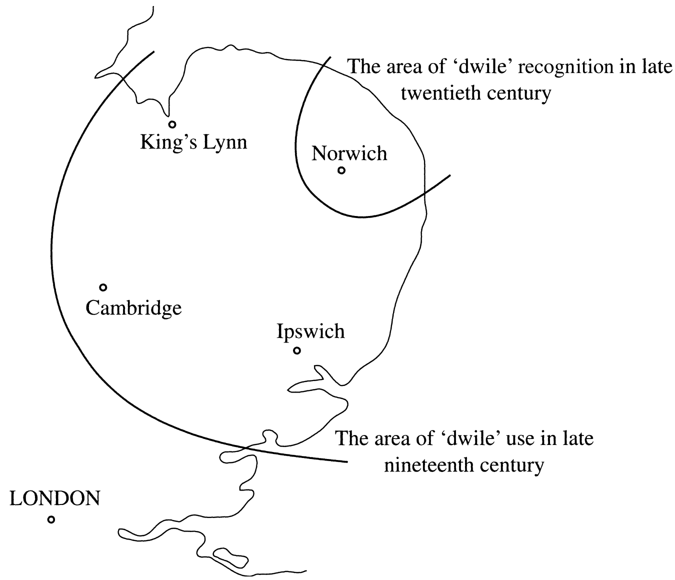
Figure 44 *The adoption of British English by Canadian children (from Chambers 1992: 678). Adapted from two original graphs with permission of the author.*

lexical and phonological features. He selected twenty-five British/Canadian lexical pairs (including *nappy*/*diaper*, *pushchair*/*stroller* and *boot*/*trunk*) and five pronunciation pairs (including [bənɑnə]/[bənænə] and [təmɑtʌʊ]/[təmeɪdʌʊ]) and analysed the extent to which the Canadian youngsters adopted the British forms. The graph in figure 44 presents the findings for three of the children he studied. Each child had acquired more of the lexical items than of the pronunciation features.

We have now seen two examples of dialect contact leading to change in lexical choice: sociocultural contact with North America has led to the adoption of American English words in other English dialects, and contact with British English has led a number of Canadian children to shift away from their indigenous lexical patterns to those of their new home. This dialect contact also has a considerable effect on lexical variation *within* individual English-speaking countries. In England, the urbanisation of rural areas has had a devastating effect on the survival of traditional rural dialects. Urban varieties are increasingly being diffused into the surrounding rural areas, with effects which are particularly visible in the lexicon. Traditional dialect words are losing ground in competition from words from urban or standard dialects. An example of such **lexical attrition** is presented in the map (p. 229). A century ago, the word *dwile* (meaning 'floorcloth') was widely used in the eastern counties of England. Today, it is restricted largely to the adult populations of Norfolk and parts of Suffolk. In a recent study, as indicated in figure 45, the word *dwile* was barely recognised by any of the children surveyed, which strongly suggests that it is unlikely to survive long into the twenty-first century (***exercise 2***).

Same word – new meaning

A 'nice' example to begin our discussion of the way word meanings change is presented by the word *nice* itself. This word entered the English



Map 1 *The lexical attrition of the word* dwile *in East Anglia (from Britain forthcoming)*

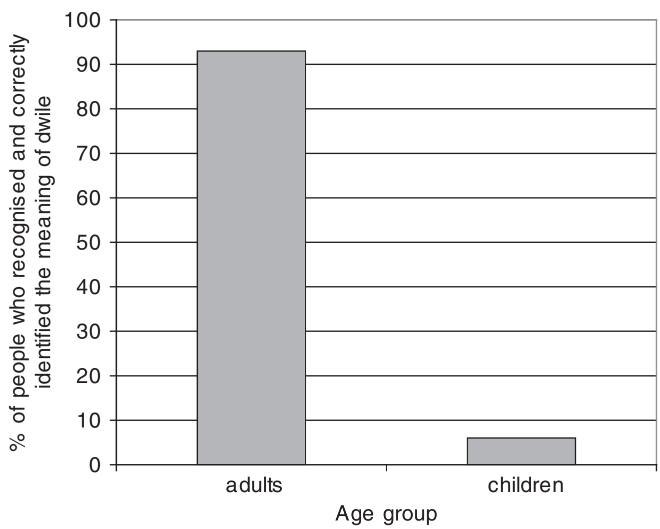


Figure 45 *The lexical attrition of* dwile *in East Anglia (based on Britain forthcoming)*

language around the thirteenth century from Old French, a descendant of the Latin word *nescius* meaning 'ignorant'. By the fourteenth century, its meaning had already changed to mean 'silly' or 'wanton': a nice person was one from whom favours might easily be obtained. In the fifteenth century, *nice* came to mean 'coy' or 'shy', by the sixteenth it meant 'subtle', and only in the eighteenth century did it reach its present meaning of 'agreeable' or 'good'. Nowadays, the meaning of *nice* appears to be weakening: it has such a bland, general, quality of 'goodness' that in some contexts, such as that illustrated in (215), it means little more than 'OK':

(215) [conversation between father and daughter]
HEIDI: Hey, dad, I've just bought a new Golf GTi convertible. What do you reckon?
ALBERT: Mm. It's nice.

For a more contemporary example of semantic change, consider the word *gay*. Originally, *gay* meant 'full of joy and mirth, light-hearted'. In the middle of the twentieth century, however, it also came to mean 'homosexual', and this later meaning is now the dominant one. In the UK at least, even this meaning is beginning to change. 'Gay' is now sometimes used to mean 'lame', 'second-rate' or 'feeble'. Just like linguistic change in phonology, which we discussed earlier (section 4), semantic change is always preceded by semantic variation – in other words, at some stage in the shift from meaning A to meaning B, *both* meanings will be current within a community. At one time, therefore, both 'joyful' and 'homosexual' were meanings of the word *gay*. Gradually, over time, one meaning has begun to be used much more than the other to such an extent that the older meaning is dying out. And now a new meaning is appearing, which is beginning to compete with the currently dominant one. For example, in the million-word Wellington Corpus of New Zealand English there are sixty examples of the word 'gay'. Fifty-four refer to its meaning of 'homosexual', three are in the expression 'gay abandon' and three are mentions of the word itself in a discussion about how its meaning has changed!

If we look back into the history of English, many thousands of words have changed their meaning in the same way that the word *gay* is changing today. In an attempt to establish regularities of semantic change, historical linguists tend to classify meaning changes according to the nature of the semantic shift.

Some changes are due to **semantic broadening**: here the word takes on a wider, more general meaning than it had previously. The word *thing* is a classic example of such broadening. In Old English and Old Norse, this word meant 'a public assembly'. In present-day Icelandic, a language with similar Germanic roots to English, it still does. In Modern English, however, it has now been extended so much that it simply means 'an entity of any kind'. The word *companion* provides another example. It used to mean 'someone who eats bread with you' (see Italian *con* 'with' + *pane* 'bread'); now it means 'someone who is with you'. The word *broadcast*, which only a couple of centuries ago meant 'to sow seeds', has now, in this technological age, been extended to include the spreading of information on television and radio. *Pudding*, which today is usually sweet and eaten for dessert, comes from the French word *boudin*, meaning a sausage made with animal intestines, a meaning retained in English *black pudding*.

Table 19 *Equivalences between Old and Modern English and other Germanic languages*

Modern English	Old English	Frisian	Dutch	German
meat	flesh	fleis	vlees	Fleisch
animal	deer	dier	dier	Tier
dog	hound	houn	hond	Hund
cloud	wolcen	wolk	wolk	Wolke
die	steorfan	stjerre	sterven	sterben
bird	fugol	fûgel	vogel	Vogel
smoke	reek	rikje	roken	rauchen
poor	earm	earm	arm	arm
air	lyft	lucht	lucht	Luft
take	niman	nimme	nemen	nehmen

The opposite of semantic broadening is **semantic narrowing**, with the word taking on a more restricted meaning than before. In Middle English, a *girl* was a young person of either sex, a *boy* was a male person of any age and *lust* simply meant 'pleasure'. A number of words with similar meanings have undergone shifts in different directions of generality. For example, the word *hound* was once the generic word for a canine. This word's meaning has narrowed and the generic canine term is now *dog*, which once referred to a particular breed of dog.

These changes in word meaning have often obscured the Germanic roots of the English language, with many originally Germanic words either changing in meaning or dying out.

Table 19 shows the similarities between the Old English words and the equivalents in the modern-day varieties of the closest cousins of English. Words such as *steorfan* (Modern English: *starve*) and *reek* have been semantically narrowed in the transition from Old English to Modern English, and many of the other words have died out in the face of competition from other English words, or from words borrowed from other languages. For example, *poor* is a word borrowed from Old French.

It is also common to contrast changes involving **amelioration** with those due to **pejoration**. Pejorations involve the development of a *less favourable* meaning or connotation for a particular word. *Villains* were formerly farm-dwellers but are now criminals; people who were *crafty* and *cunning* in medieval times were strong (see German *Kraft*) and wise but now are deceitful and evasive. *Grotesque* meant 'resembling a grotto or cave' but now means 'distorted and ugly'. The word *dunce* is taken from the name of a thirteenth-century scholar, John Duns Scotus, whose thinking was discredited long after his death. Ameliorations, or the development of more favourable meanings for words, are fewer in number. Some of the more notable examples are *constable*, the meaning of which has shifted from 'an attendant at the stable' to 'a police officer' and *knight*, which in Old English referred to a boy or servant but now has a much more prestigious meaning.

We have now seen a number of examples of semantic changes. But what is it about 'meaning' that allows such changes to take place? How is it possible for the meanings of words to alter so radically? April McMahon has suggested three possible reasons:

1. Most words are **polysemous** – they have a range of meanings – and over time marginal meanings may take over from central meanings (possibly because a borrowing has invaded the semantic space of the central meaning). Note that polysemy must be distinguished from ambiguity. An ambiguous word such as *match* or *bank* corresponds to two (or more) distinct lexemes and normally has two (or more) distinct entries in a conventional dictionary. A polysemous word has only a single lexical entry with a range of closely related meanings. An example is the word *sloth*, which once had a central meaning of 'lacking in speed'. This central meaning was taken over by the word *slowness* and so the central meaning of *sloth* shifted to what was formerly a more peripheral meaning, namely 'laziness'.
2. Children do not receive a fully formed grammar and lexicon from their parents, but, with help from Universal Grammar, have to figure it out for themselves. The child may therefore acquire a slightly different meaning for a word than that understood by its parents. Earlier we saw that children, in the very early stages of language acquisition, sometimes seem to use certain words with broader meanings than the adults around them, e.g. *dog* to mean 'any hairy animal with four legs' (see section 13). As the child gets older, it gradually restricts the meaning of the word more and more. It is not too difficult, however, to imagine that slight semantic shifts may emerge at the end of this restriction process. We did, of course, express some reservations about the extent of such overextended lexical use by small children in section 13, but these reservations need not rule out what we are contemplating here. Consider, for instance, the broadening of Old English *dogge*, referring to a specific breed of dog, to the current situation where *dog* is the generic term for canines. We suggested in section 13 that children are 'tuned in' to the basic level of categorisation, and we can suppose that for the case in question this is the level of Modern English *dog*. All we need to suppose, then, is that for whatever reason, at some point a child was exposed to examples of *dogge* and interpreted them as referring to the basic-level generic category. For such a child at this point, semantic broadening has occurred. Of course, it is still necessary to understand how such a child's 'non-standard' interpretation became established and spread throughout the community, but we do at least have a plausible account of the first important step in semantic change. Overall, the suggestion that children are crucially involved in language change is a very attractive one.

3. The relationship between concepts and the words which conventionally refer to those concepts is arbitrary (see section 14), and so either can vary or change fairly freely through time and across space. Just as different geographical areas may have different words to represent different concepts (**lexical variation**), so also different words may, through time, evolve so as to be associated with different concepts (**semantic change**) (***exercises 3***, ***4*** and ***5***).

Variation and change in morphology

As mentioned in section 10, English verbs have few inflections, but one which is found is that which marks present tense and agreement with the third person singular subject. This is not the case in all dialects of English, however, and in some dialects this suffix has been lost. Speakers of African American Vernacular English (AAVE) in the United States and the English of East Anglia in the UK produce examples such as those in (216):

(216) a. this dog chase rabbits
b. this cat miaow all night
c. he spend a lot
d. she dance well

This contrasts with the situation in south-west England, where some people would not only say *he spends a lot*, but also produce examples such as those in (217):

(217) a. they spends a lot
b. I dances every night

In this area, the *-s* suffix does not mark present tense and agreement (with third person singular subjects) but *only* present tense. Around the English-speaking world, therefore, there is variation both in the presence or absence of the *-s* suffix and in its grammatical function (***exercise 6***).

Older versions of English and most other Germanic languages (apart from Afrikaans) have far more extensive systems of inflection than present-day Standard English. In Old English, there were four different present tense forms (as there still are today in German, although they are distributed differently), in comparison with two in Modern Standard English. This is illustrated for the verb *help* and its equivalents in table 20.

Similarly, Modern Standard English has lost the three noun genders of Old English illustrated in (218):

(218)	tha stan*as*	the stones (masculine)
	tha gief*a*	the gifts (feminine)
	tha scip*u*	the ships (neuter)

Table 20 *The present tense forms of Modern English* help *and their equivalents in Old English and Modern German*

Old English		Modern German		Modern English	
ic	helpe	Ich	helfe	I	help
thu	hilpst	Du	hilfst	You (sing.)	help
he/heo	hilpth	Er/Sie	hilft	He/She	helps
we	helpath	Wir	helfen	We	help
ge	helpath	Ihr	helft	You (pl.)	help
hi	helpath	Sie	helfen	They	help

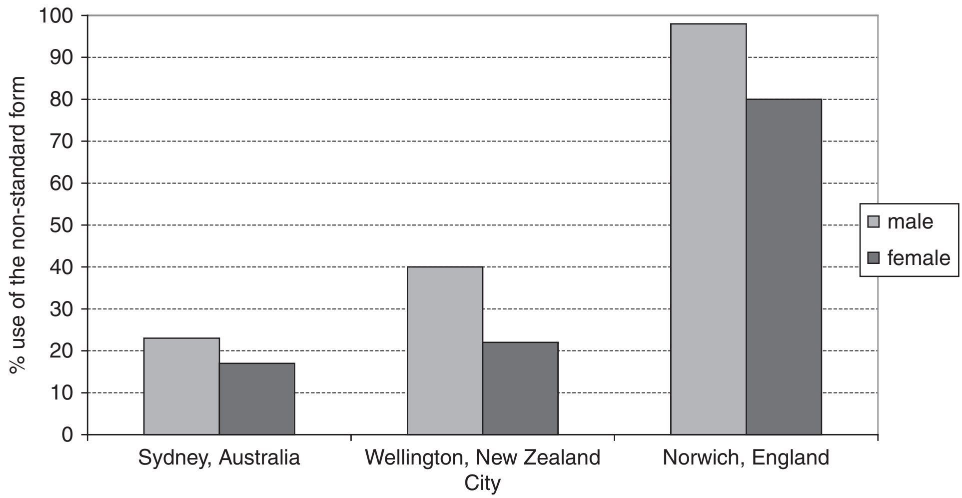


Figure 46 *Speaker sex and the use of (ing) in casual speech in three English-speaking cities (based on Horvath 1985, Bell and Holmes 1992 and Trudgill 1974)*

Over the centuries, then, morphological change in English has largely been in a direction of radical reduction and simplification of inflections to an extent not seen in most other Germanic languages.

The reduction of two former Old English inflections *-inde* and *-inge*/*-ynge* to Modern Standard English *-ing* has had a considerable effect on present-day variation in English. In most English-speaking countries, there is social variation in the pronunciation of (ing), some pronouncing it [ɪŋ], which is the standard form, and others [ɪn] or [ən], the widely used non-standard forms. Sociolinguists have found variation in (ing) particularly interesting for a number of reasons.

Firstly, a number of studies from around the English-speaking world have found that, all else being equal, women use a higher proportion of the standard [ɪŋ] form than men. Some representative results appear in figure 46.

Secondly, variation in (ing) appears to be fairly stable over the entire speech community of English. In other words, neither form seems to be replacing the other, but there is a pattern of **stable variation**, with [ɪŋ] being the **acrolectal** form

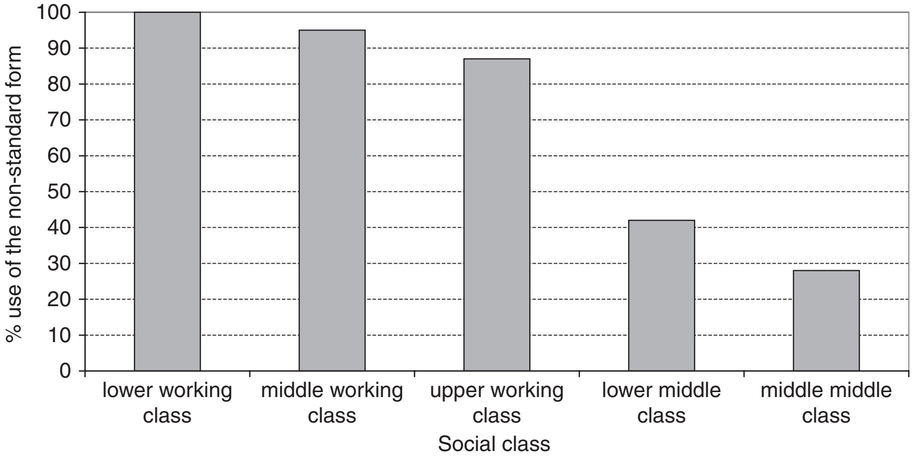


Figure 47a *Social class and the use of (ing) in casual speech in Norwich (based on Trudgill 1974)*

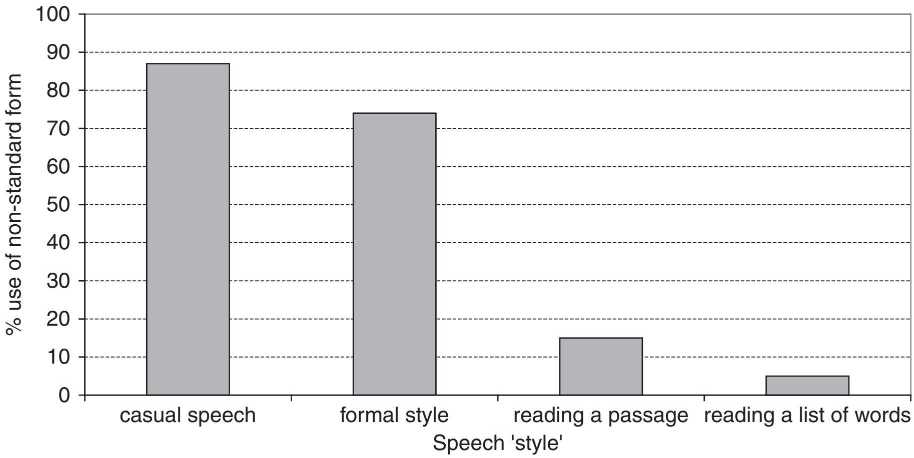


Figure 47b *Speech style and the use of (ing) among upper working-class residents of Norwich (based on Trudgill 1974)*

(used in higher social classes and in more formal contexts) while [ɪn] or [ən], the **basilectal** forms, are used among working-class groups and in more informal contexts. Figures 47a and 47b support this assertion.

Finally, research has shown that people use different proportions of [ɪŋ] and [ɪn] or [ən] at different stages of their life. A study in Norwich in eastern England, for example, found that young people predominantly used the non-standard [ən] form, but changed their behaviour in middle age to use a greater proportion of the standard form, before reverting to a greater use of the non-standard form again in retirement (see figure 48).

Peter Trudgill, who conducted the Norwich study, has suggested that people come under the pressure of the standard variety more in their economically active

Table 21 *Changes in the Old English suffixes* -inde *and* -inge/-ynge

Changes since Old English	Old English *-inde* (verbal suffix)	Old English *-inge*/*-ynge* (verbal noun suffix)
reduction of final /e/ to /ə/	*-ində*	*-ɪŋə*
loss of final /ə/	*-ind*	*-ɪŋ*
reduction of consonant clusters	*-in*	*-ɪŋ*
English of about 1400	*-in*	*-ɪŋ*

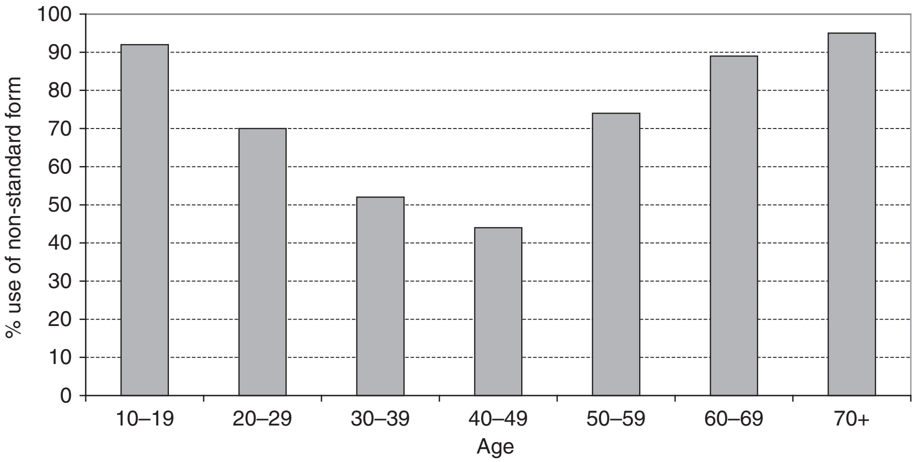


Figure 48 *Changes in the use of (ing) in Norwich across the generations (based on Trudgill 1988). Adapted and reprinted by kind permission of John Benjamins Publishing Company, Amsterdam/Philadelphia.*

years than in their youth or in their retirement, and that this would account for the variation in (ing) use across a person's lifespan.

Synchronically, (ing) can be regarded as a phonological variable, the alternation of velar and alveolar nasal realisations of the final segment (ng). Historically, however, it must be considered as a morphological variable since [ɪŋ] and [ɪn]/[ən] come from two different Old English morphemes and still retain signs of their former grammatical roles within present-day variation. The relevant changes between Old English and the English of about 1400 are set out in table 21.

By the middle of the fifteenth century, -*ing* had encroached on -*in(d)*'s territory as a verbal suffix in the south of England but retained its more restricted role in the north and in parts of East Anglia. In Modern English times, we can see that this geographical variation (-*in* in the north and -*ing* in the south) has evolved nationwide into social and stylistic variation. The former roles of -*inde* and -*inge* are, however, still reflected in present-day variation. Research has demonstrated that [ɪn] is much more likely to be found in progressives (*Madonna is singing again*) and verbal complements (*I don't mind listening to Madonna*) than in nominal -*ing* forms (*I don't like Madonna's singing*). The -*in*/-*ing* alternation, therefore, retains

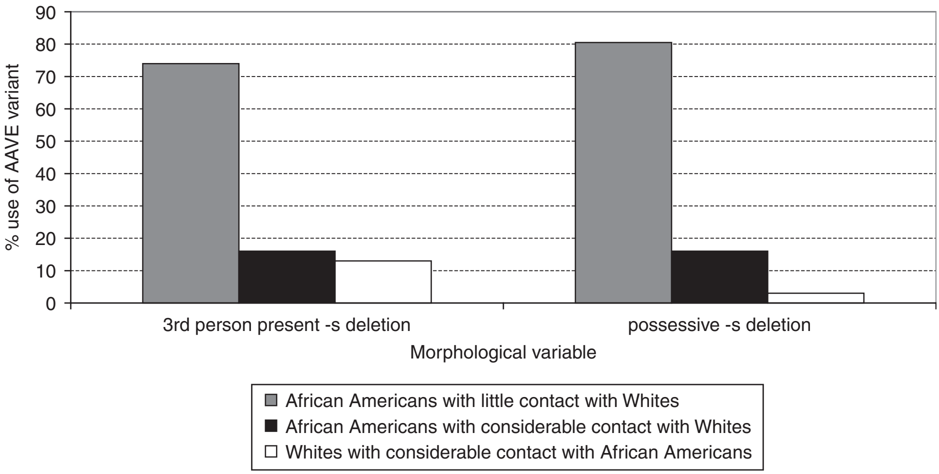


Figure 49 *Ethnicity, levels of interethnic contact and the use of AAVE morphological features (based on Ash and Myhill 1986). Adapted and reprinted by kind permission of John Benjamins Publishing Company, Amsterdam/Philadelphia.*

morphological importance, as well as being a salient marker of social and stylistic information around the English-speaking world (***exercise 7***).

Finally in this section, we shall consider the role of social contact on morphological variation. In section 4, we saw how the strength of social networks in the speech community has a considerable effect on the maintenance of local dialect forms and susceptibility to language change. In a study carried out on the speech of the African American and white populations of Philadelphia, Sharon Ash and John Myhill have found that there is a strong link between ethnicity, social network ties and the use of certain non-standard morphological features. We have already noted that one prominent characteristic of African American Vernacular English (AAVE) is the absence of the suffix *-s* as a marker of third person singular agreement (see the examples in 216 above). Additionally, possessive *-s* is not used in this dialect and we find examples such as those in (219):

(219) a. I met his brother wife
b. His cat name is Peanut

Ash and Myhill's research has revealed that there is a strong relationship between the use of these AAVE features and the levels of social contact between whites and African Americans in Philadelphia. Those blacks who have very little contact with whites use the AAVE features most, while those with more contact with the white population use them less frequently. Similarly, those whites who have little contact with the African American community rarely if ever use the AAVE features, while those who have more contact do use these features, albeit rarely (see figure 49).

Network links with other ethnic groups have led, in this case, to a weakening in the use of the ethnic variety and the adoption of linguistic features from 'outside' (***exercises 8 and 9***).

In this part of the book, we have introduced a range of concepts which are necessary to understand if we are to come to terms with the rich variety of processes on which different languages rely for forming complex words, focusing on English in section 10 and taking account of aspects of other languages in section 11. Just as progress in understanding sound systems requires a way for describing sounds accurately (the IPA of section 2), so discussion of word formation is dependent on classification of words into certain types, and we took the first steps in this direction in section 9 (see also section 18). A parallel aim throughout sections 9 to 11 has been to sketch a view of the *lexical representations* which are an integral part of a *grammar* (see the introduction, p. 41), constituting, as they do, the *lexicon*. Such representations, as well as having phonological and syntactic aspects (see 115), also encode the meanings of lexical items, and section 12 has examined how such meanings might be described. This section has also raised the issue of how the overall structure of the mental lexicon might be understood in terms of meaning relations; that is, as well as coming to terms with the internal structure of a lexical representation, we proposed that meaning relations such as hyponymy and meronymy are useful in determining the ways in which lexical representations are related to each other.

With basic concepts in place, the next three sections of this part have sought to establish their usefulness in the study of the acquisition of words by small children (13), the processing and storage (in a mental lexicon) of words by adults (14) and the difficulties in perceiving and producing words which can arise as a consequence of brain damage (15).

Finally, in section 16 we have examined *variation* with respect to two of the principle components of the lexical entries, the semantic representation and the morphological shape of word forms serving particular grammatical functions. We have seen cases where each of these may be subject to variation within the speech of an individual, across social groups, between dialects and at different stages in the historical development of a language or dialect. For a full description of a speaker's behaviour, then, the simple representations we have presented in section 10 are not fully adequate; however, we can be confident that they constitute the basic core or nucleus over which variation can be defined.

Our final major theme is the sentence, to which we now turn in the final part of the book.

Exercises

1. Check the following list of words in a good dictionary and:
   (a) find out the language of origin of each word;
   (b) ascertain when it is claimed the word entered the English language;
   (c) speculate on WHY the word was borrowed.

aardvark	anchovy	arsenal	bamboo
bistro	brandy	cauliflower	chocolate

cocaine	cocoa	coffee	cotton
cuddle	decoy	frolic	graffiti
jumbo	lilac	magazine	mango
moped	mugger	paprika	potato
robot	sandal	slogan	sugar

2. When sociolinguists wish to study variation in phonology, they normally rely on an analysis of recordings of natural speech. In an hour's recording, there are usually enough examples of most variables for an adequately representative sample. Attempting to analyse lexical variation and change from recorded speech samples is not so straightforward, however. Suppose we were interested in finding out whether people said 'biscuit' or 'cookie'. We might find that in an hour's recording (or even ten hours' recording) there will be no examples of *biscuit* or *cookie* or any other word associated with the relevant concept. (Let's face it, how often do *you* talk about biscuits or cookies in your everyday conversation?) So how do we find out which word people use? It might be reasonable to assume that we could simply ask: *Do you say 'biscuit' or 'cookie'?* There is evidence that this method is flawed too. Researchers in New Zealand found, for example, that while people claimed to use the word *trousers* when asked, it was discovered that they used the word *pants* in later conversation. Bearing in mind these data collection problems, how would *you* analyse lexical variation?

3. **Etymology** is the study of the history of words. Find a good etymological dictionary and examine how the meanings of the following words have changed over time:

luxury	engine	budget	toilet
bully	naughty	poison	brilliant

4. Recent technological developments have led to familiar words being used for new concepts in IT, the media and so on. Explore why the following words have been chosen for the new items they denote:

mouse	zip	blackberry	menu
window	surf	icon	web
virus	cookie	wallpaper	worm

5. In 2006, a DJ on a leading British popular music radio station was widely criticised in the media for using the word 'gay' to mean 'feeble' or 'rubbish', when referring to the ringtone of a mobile phone. His employers, the BBC, defended his use of the word, claiming that this was a common usage of the word among young people. Why do you think he received such criticism? What could a linguist add to such a discussion?

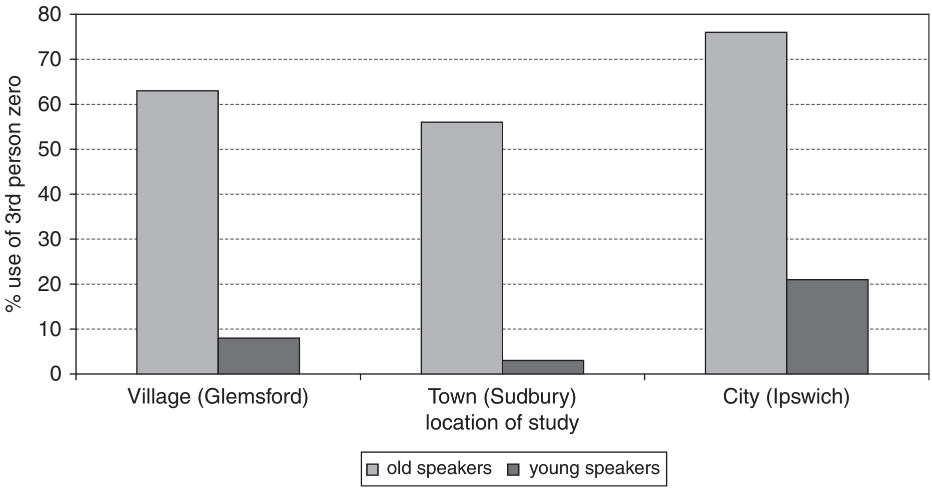


Figure 50 *Third person singular present tense zero in three locations in East Anglia*

6. As discussed earlier in this section, some dialects of (mostly northern) East Anglia in England delete third person singular -*s*, and so forms like (a) and (b) are common:
(a) he like going to the pub
(b) she make us laugh, she do
Figure 50 shows the results of a survey by Michelle Bray and Juliette Spurling of third person singular present tense -*s* in three places in East Anglia – a village, a town and a city – all of which are within 30 km of each other. What's going on in the three places and how might we explain the patterns found there? Are the results what you expected?

7. Having asked their permission, make a short recording of a group of your friends conversing. From the recording you have made, listen and note down the pronunciation of each occurrence of (ing). Compare the way males and females in your recording pronounce (ing). What are your results? Do your findings agree with those of other researchers? Can you identify any differences between (ing) in progressives and verbal complements on the one hand and nominal (ing) on the other?

8. In a number of varieties of English, the tag 'isn't it?' is often pronounced 'innit?' [ɪnɪʔ] as in (a) and (b) below:
(a) It's a wicked track, innit?
(b) It's been really cold lately, innit?
In and around London, *innit?* is now being used as an invariant tag as in (c) and (d):
(e) He's gonna fall over, innit?
(d) You found her asleep, innit?

Find out what you can about *innit?* – who uses it, in what contexts and how it developed in English? Why do you think it's so popular?

9. One of the most rapid linguistic changes that linguists have researched is the use of 'be like' to report speech or thought as in (a) and (b) below:
(a) and she was like 'no way, get out of here!'
(b) and I'm like 'yuck'!
It appears to have emerged first in the United States and has spread rapidly to many other Englishes – including in Britain, Australia and New Zealand. Many have suggested that its rapid spread is due to the media, especially American soap operas like *Friends* and *Sex in the City*. Research on 'be like' by the sociolinguist Isa Buchstaller suggests, however, that the social distribution of 'be like' and the stereotypes and attitudes attached to its use in England differ quite markedly from those in the United States. In the latter, 'be like' is both used by and stereotyped as being associated with young women. In England, it is actually used slightly more by men in Buchstaller's study. Furthermore, she found that British speakers only stereotype 'be like' as being associated with young people and not with a particular gender or social class, and more than half of the British people she asked in a social attitudes questionnaire had 'no idea' about which place 'be like' came from. Given this research, how do you think 'be like' has spread to Britain and to other Anglophone countries? Why do you think it is used and stereotyped differently in Britain and the United States?

Further reading and references

Straightforward introductions to some of the material in sections 9, 10 and 11 can be found in Haspelmath (2002), Coates (2003) and Aronoff and Fudeman (2005). Introductions specifically geared towards English morphology include Katamba (1994), Carstairs-McCarthy (2002) and Harley (2006). More detailed surveys of morphology are given in Katamba (1993), Bauer (2003) and Booij (2005). Carstairs-McCarthy (1992) provides a good overview of these issues, and Spencer (1991, chapters 1 and 2) gives details of many of the phenomena discussed. Matthews (1991), though tough going in places for beginners, provides interesting insights into morphology. For more advanced discussion of some of the topics of these sections, see the chapters by Stump (Inflection), Beard (Derivation), Fabb (Compounding), Halpern (Clitics), Spencer (Morphophonological Operations) in Spencer and Zwicky (1998).

Saeed (2003) is a comprehensive introduction to many topics in semantics. Chapter 3 is devoted to word meaning and reviews much of the material covered here. A very readable introduction to the use of entailment in studying lexical semantic relations is Cruse (1986), which acknowledges a considerable debt to Lyons (1977, particularly chapters 8 and 9). Arguments against the usefulness of definitions for understanding how meanings are composed can be found in Fodor (1981) and Fodor, Garrett, Walker and Parkes (1980), neither of which is easy to read for beginners. One of the earliest, and most accessible, attempts to argue for the importance of prototypes in the study of meaning is Rosch (1973).

Discussions of the remarkable rate of children's word acquisition appear in Carey (1978, 1985), and Bloom (2000) is a major review of the issues surrounding the development of word meanings, including a number of novel proposals. Valian (1986) is a study of syntactic categorisation in early stages of acquisition, while Radford (1990) was among the first to systematically examine children's difficulties with functional categories. Berko (1958) studied productive morphological processes in children, and Brown (1973) reports the order of morpheme acquisition discussed in the text. There are many discussions of the overregularisation of the English past tense *-ed*; among the most notable are Kuczaj (1977), Bybee and Slobin (1982) and Marcus (1995). Marcus, *et al.* Pinker, Ullman (1992) is an extended, non-introductory discussion of overregularisation. Gordon (1985) reports the results on pluralisation of compounds, and a fairly recent study, exploring alternative explanations for this sort of finding is Haskell, MacDonald and Seidenberg (2003). The classic account of children's word meanings as sets of perceptual features is Clark (1973), and the importance of the basic object level in children's initial categorisations is examined in Rosch, Mervis, Gray, Johnson and Boyes-Braem (1976).

Further discussion of the process of visual and spoken word recognition (introduced in section 14), including relevant experimental evidence, can be found in Harley (2001, section C) and in Ingram (2007, chapters 5–7). Technical terms relevant for lexical processing are explained in Field (2004, 150–61). The issues we have raised in connection with the representation of words in the mental lexicon are largely based on Levelt (1989, chapter 6).

For section 15, Ahlsén (2006, chapters 5 and 6). Ingram (2007, chapter 11) is also worth consulting. The discussion of agrammatism contains materials and is based on ideas from Grodzinsky (1990). Further explanation of relevant terms such as Specific Language Impairment, function-word processing, agrammatism, etc. can be found in Field (2004). Leonard (1998, chapters 2 and 3) provides an overview of research into SLI, focusing on English. The materials we rely on in our discussion are from Gopnik (1990).

Both Trask (1996) and McMahon (1994) provide good detail about borrowing and lexical, semantic and morphological variation and change. Research on register can be found in Biber and Finegan (1994). The study on lexical change in New Zealand English, referred to in section 16, was conducted by Meyerhoff (1993). The research on second dialect acquisition of lexical items was carried out by Chambers (1992) and that on lexical attrition in East Anglia by Britain (forthcoming). Further information about the Wellington Corpus of Spoken New Zealand English can be found at www.victoria.ac.nz/lals/research/corpora/wcs.aspx. The studies of the use of (ing) in Sydney, Wellington and Norwich come from Horvath (1985), Bell and Holmes (1992) and Trudgill (1974, 1988), respectively. The research on (ing) as a morphological variable can be found in Houston (1991), and Ash and Myhill (1986) investigated the relationship between ethnicity, social network strength and the use of African American morphological features. The work on quotative 'be like' was conducted by Buchstaller (2005).

PART III

Sentences

17 Introduction

In this final part of the book, we switch our attention to the study of syntax, focusing on the processes whereby words are combined to form phrases which in turn are combined to form sentences. With many linguists, we share the view that sentences constitute the 'largest' objects which fall under the generative approach to linguistics we are pursuing and that the *structure* of phrases and sentences is revealing of important aspects of human cognition.. Of course, this is not to say that there are no 'larger' linguistic objects worth studying, nor that the *use* of sentences in interaction is not of intrinsic interest. Such larger objects as *conversations*, *discourses*, *stories* and *texts* are, without doubt, structured, and, indeed, research into these areas has sometimes assumed that some notion of 'grammar' is applicable to them. This may be so, but we believe that any such 'grammar' will have a very different form to what we are considering here and will have to take account of a wide range of factors which extend beyond the knowledge of language. To take just one simple example, consider the two-turn conversation in (220):

(220) SPEAKER A: I'd like a cup of coffee.
SPEAKER B: The shop across the street is still open.

There is no reason to regard this as anything other than a well-formed conversation, but quite a complex set of assumptions underlie this judgement. For instance, if the shop across the street is known by both participants to be a shoe shop, the well-formedness of (220) immediately evaporates (unless they know the shop's staff well, and know that they will be invited into the back room for a cup of coffee); A and B *knowing that the shop across the street sells coffee* is a condition on the well-formedness of (220), but, while relevant to an account of language use, this has nothing to do with *knowledge* of language. What is sometimes known as **pragmatics** is undoubtedly interesting in its own right, and in recognition of this, section 27 introduces some of the issues that arise when this study is seriously pursued. In the remainder of this part of the book, however (sections 18 to 26), our emphasis is unashamedly restricted to the considerations of the properties of phrases and sentences as structured linguistic objects with no heed being paid to how they might be used in communicative settings.

Ever since Chomsky's ideas began to be influential in linguistics, syntax has probably been the area where most research effort has been directed, with the consequence that a rather large number of different theoretical accounts have developed, each with its specialised terminology (for instance, the lexical functional grammar of Joan Bresnan and her colleagues and the head-driven phrase structure grammar most closely associated with the work of Carl Pollard and Ivan Sag). What we shall do in this part of the book is introduce one such account which is based on fairly recent work of Chomsky himself. In doing this, we shall be able to bring into the discussion a wide range of basic syntactic ideas that will be transferable to theoretical frameworks which differ from that adopted here. Of course, these frameworks also have their own vocabularies and theoretical constructs, but acquaintance with what follows in this part of the book should enable readers to approach such alternatives with increased confidence.

Sections 18–23 contain the core theoretical ideas of this part of the book. The first of these sections builds on section 9 in introducing basic, traditional terminology for talking about phrases and sentences. Section 19 examines in detail one of the core operations in the theory of grammar, that whereby two linguistic objects are combined to create a third, complex object. Of course, we have already met combinatory processes in morphology (affixation and compounding), but the operation introduced here is different from these.

Scientific progress in a field often involves the postulation of theoretical entities with intuitively odd properties (e.g. gravity in Newton's physics, or the properties of subatomic particles in modern physics). Empty categories, that is positions in linguistic structures which are occupied by nothing audible or visible, but which nonetheless have syntactic and semantic properties constitute one of the contributions of syntax to this catalogue, and they are introduced in section 20. There is ample evidence to suggest that some linguistic expressions, having combined with others, can subsequently move into another position in a structure. Movement, another major operation in the syntactic theory we introduce here, is the topic of section 21.

In parts I and II of the book, we have examined linguistic variation from a sociolinguistic perspective. The applications of this perspective to syntax have to date not been extensive. However, the study of variation per se, between varieties of a language, historical periods of a language and between different languages has received a great deal of attention. How variation can be dealt with in the theoretical framework developed here is the topic of section 22. Finally, section 23 introduces some of the semantic issues that are of importance in the study of sentences, including considerations of Logical Form (see the Introduction, p. 5), a level of syntactic representation relevant to the interpretation of sentences that relies heavily on another construct with unusual properties, *invisible* movement.

The next three sections of this part of the book utilise the theoretical framework in examining the child's acquisition of grammar (section 24), adult processing of sentences (section 25) and syntactic disorders of language (section 26). Certain ideas that can be formulated rather naturally within the framework we adopt are seen to be fundamentally important in understanding issues which arise in these areas. Equally importantly, these areas offer additional perspectives for testing and expanding the scope of syntactic theories.

As noted above, this part of the book concludes with a discussion of sentence use, where we introduce some of the key ideas in pragmatics and conversational analysis.

18 Basic terminology

A substantial proportion of the terminology we need in order to embark on the study of syntax has already been introduced, particularly in section 9. However, there are some additional notions which are important for us to understand, so in this section we shall introduce these, integrating them with ideas with which we are already familiar.

Categories and functions

It is traditionally said that sentences are structured out of words, phrases and clauses, each of which belongs to a specific **grammatical category** and serves a specific **grammatical function** within the sentence containing it. The lexical and functional categories from section 9 are examples of grammatical categories, and as our discussion proceeds, we shall see how phrases and clauses can be categorised. The smallest type of sentence which we can produce is one containing a single clause, such as (221):

(221) John smokes

This comprises the noun *John*, which is traditionally claimed to function as the **subject** of the clause (in that it denotes the person performing the act of smoking), and the verb *smokes*, which functions as the **predicate** of the clause (in that it describes the act being performed). Consider next the slightly longer clause in (222):

(222) John smokes cigars

Here we have the subject *John*, the predicate *smokes* and a third item, *cigars*, which is the **complement** (*cigars* refers to the entities on which the act of smoking is being performed). The subject *John* and the complement *cigars* are the two **arguments** of the predicate *smokes* (i.e. the two entities involved in the act of smoking). A **clause** is an expression which contains a subject and a predicate, and which may also contain other types of element (e.g. the clause in 222 contains a complement as well, and so has the form *subject* + *predicate* + *complement*).

There are a number of morphological and syntactic properties which differentiate subjects from complements. For one thing, the two occupy different positions within the clause: in English, subjects generally precede predicates and complements follow them. Moreover (with an exception to be noted later), subjects generally have different **case** properties to complements. The different case forms of typical pronouns and noun expressions in English are given in (223):

(223)

nominative	accusative	genitive
I	me	my/mine
we	us	our/ours
you	you	your/yours
he	him	his
she	her	her/hers
it	it	its
they	them	their/theirs
who	who(m)	whose
Mary	Mary	Mary's
the dog	the dog	the dog's

Genitive forms are used (amongst other things) to mark possession. Some pronouns have two genitive forms, a *weak* (shorter) form used when followed by a noun expression, and a *strong* (longer) form used elsewhere (e.g. *My car is bigger than your car, but yours is faster than mine*). Of more concern to us here, however, is the nominative/accusative contrast, and the fact that subjects typically carry **nominative** case, whereas complements typically carry **accusative** case (sometimes termed **objective** case). This isn't immediately obvious from (222), since nouns like *John* and *cigars* aren't overtly inflected for the nominative/accusative case distinction. However, if we replace *John* by an overtly case-marked pronoun, we require the nominative form *he*, not the accusative form *him*; and conversely, if we replace *cigars* by an overtly case-marked pronoun, we require the accusative form *them*, not the nominative form *they*:

(224) a. He/*Him smokes cigars
b. John smokes them/*they

A third difference between subjects and complements is that, as we have noted on several occasions, in English verbs agree in Person and Number with their subjects. However, they don't agree with their complements. So, if we have a third person singular subject like *he* or *John*, we require the corresponding third person singular verb form *smokes*; but if we have a first person singular subject like *I*, or a first person plural subject like *we*, or a second person singular or plural subject like *you*, or a third person plural subject like *they*, we require the alternative form *smoke*:

(225) a. He smokes/*smoke cigars
b. I/We/You/They smoke/*smokes cigars

If, however, we change the complement, say replacing the plural form *cigars* with the singular *a cigar* in (222), the form of the verb in English is unaffected:

(226) John smokes cigars/a cigar

Overall, then, we can differentiate subjects from complements in terms of whether they normally precede or follow the verb, whether they have nominative or accusative case and whether or not they agree with the verb.

Now consider the even longer clause in (227):

(227) The president smokes a cigar after dinner

This clause comprises three **constituents** (i.e. structural units), the functions of which are already familiar – namely the subject *the president*, the predicate *smokes* and the complement *a cigar*. But what is the function of the expression *after dinner*, which also occurs in (227)? Since *after dinner* does not refer to one of the entities directly involved in the act of smoking (i.e. it isn't consuming or being consumed), it isn't an argument of the predicate *smokes*. On the contrary, it simply serves to provide additional information about the time when the smoking activity takes place. In much the same way, the italicised expression in (228) provides additional information about the location of the smoking activity:

(228) The president smokes a cigar *in his office*

An expression which serves to provide (optional) additional information about the time or place (or manner, or purpose, etc.) of an activity is said to serve as an **adjunct**. So, *after dinner* in (227) and *in his office* in (228) are both adjuncts.

Now consider the following kind of clause (characteristic of colloquial styles of English):

(229) Cigars, the president never smokes them in front of his wife

The functions of the constituents contained in the part of the clause following the comma are straightforward to analyse: *the president* is the subject, *smokes* is the predicate, *them* is the complement, and *never* and *in front of his wife* are both adjuncts. But what is the function of the expression *cigars*, which precedes the comma? The traditional answer is that *cigars* functions as the **topic** of the clause, in the sense that it serves to indicate that the clause tells us something about cigars; the part of the clause following the comma is said to be the **comment**. It is interesting to contrast (229) with (230):

(230) Cigars, the president never smokes in front of his wife

In (229) *cigars* is the clause topic, and *them* (which refers back to *cigars*) is the complement of the verb *smokes*. By contrast, in (230), *cigars* seems to serve both functions and hence is the topic of the overall clause as well as being the complement of the verb *smokes*.

Now consider the clause in (231):

(231) The president was smoking a cigar for relaxation

Again, this comprises a number of constituents with familiar functions: *the president* is the subject, *smoking* is the predicate, *a cigar* is the complement, and *for relaxation* is an adjunct. But what is the function of the auxiliary *was*? The answer is that it serves to mark **Tense**, indicating the time at which the activity took place (namely the past). English has a binary (i.e. two-way) tense system, so that in place of the past tense form *was* in (231), we could use the corresponding present tense form *is*. Although this distinction is traditionally said to be a past/present one, many linguists prefer to see it as a past/non-past distinction, since the so-called present tense form can be used with future time reference (e.g. in sentences such as *our guest is arriving at 3 p.m. tomorrow*). However, since the term 'present tense' is a familiar one, we'll continue to use it below.

Complex sentences

So far, we have looked at **simple sentences** – i.e. sentences which comprise a single clause (Hence, all the clauses in 221, 222 and 224–31 above are *simple* sentences). However, alongside these we also find **complex sentences** – i.e. sentences which contain more than one clause. In this connection, consider the structure of the following sentence:

(232) Mary knows John smokes

If we take a clause to be a structure comprising (at least) a subject and a predicate, it follows that there are two different clauses in (232) – the *smokes* clause on the one hand, and the *knows* clause on the other. The *smokes* clause comprises the subject *John* and the predicate *smokes*; the *knows* clause comprises the subject *Mary*, the predicate *knows* and the complement *John smokes*. So, the complement of *knows* here is itself a clause. The *smokes* clause is a **complement clause** (because it serves as the complement of *knows*), while the *knows* clause is the **main clause**. The overall sentence in (232) is a complex sentence because it contains more than one clause. In much the same way, (233) below is also a complex sentence:

(233) The president may secretly fear Congress will ultimately reject his proposal

Once again, it comprises two clauses – one containing the predicate *fear*, the other containing the predicate *reject*. The main clause comprises the subject *the president*, the auxiliary *may*, the adverbial adjunct *secretly*, the verbal predicate *fear* and the complement clause *Congress will ultimately reject his proposal*. The complement clause in turn comprises the subject *Congress*, the auxiliary *will*, the verbal predicate *reject*, the complement *his proposal* and the adjunct *ultimately*.

Now contrast the two different types of complex sentence illustrated below:

(234) a. We expect [John will win the race]
b. We expect [John to win the race]

Both sentences comprise two clauses – a main clause and a bracketed complement clause. The main clause in (234a) comprises the subject *we*, the verbal predicate *expect* and the complement clause *John will win the race*; the main clause in

(234b) is identically constituted, except that the complement clause is *John to win the race*. The complement clause in (234a) comprises the subject *John*, the auxiliary *will*, the verbal predicate *win* and the complement *the race*; the complement clause in (234b) comprises the subject *John*, the infinitive particle *to*, the verbal predicate *win* and the complement *the race*. So, superficially, at least, the two sentences appear to have much the same structure.

Yet, there are important differences between the two complement clauses they contain. In (234a), the auxiliary *will* is a **tensed** form (more specifically, a non-past form), as we see from the fact that if we transpose the whole sentence into the past tense, we use the corresponding past tense form *would* instead of *will*:

(235) We expected [John *would* win the race]

By contrast, if we transpose (234b) into the past tense, the infinitive particle *to* remains invariable:

(236) We expected [John *to* win the race]

So, we can say that the bracketed complement clause in (234a) and (235) is tensed, whereas its counterpart in (234b) and (236) is **untensed** (i.e. unspecified for tense).

A further difference between the two types of complement clause can be illustrated in relation to (237):

(237) a. I didn't know [John wears glasses]
b. I've never known [John wear glasses]

In (237a), the verb *wears* agrees with its third person singular subject *John*; but the corresponding verb *wear* in (237b) doesn't agree with *John*. More generally, complement clauses like that bracketed in (237a) contain a verb inflected for agreement with its subject, whereas complement clauses like that in (237b) contain a verb form which lacks agreement.

There is a third important difference between the two types of complement clause in (234a, 237a) and (234b, 237b), as we can see from the fact that if we replace the subject *John* by a pronoun overtly marked for case, we require the nominative form *he* in (234a, 237a), but the accusative form *him* in (234b, 237b):

(238) a. We expect [he/*him will win the race]
b. We expect [him/*he to win the race]

(239) a. I didn't know [he/*him wears glasses]
b. I've never known [him/*he wear glasses]

To use the relevant grammatical terminology, we can say that an auxiliary or a verb is **finite** if it inflects for tense/agreement and has a nominative subject, and **non-finite** if it doesn't inflect for tense or agreement and doesn't have a nominative subject. By extension, we can distinguish between a **finite clause** (i.e. a clause with a nominative subject which contains a verb/auxiliary inflected for tense/agreement) and a **non-finite clause** (i.e. a clause which doesn't have a nominative subject, and which doesn't contain a verb/auxiliary inflected for tense/agreement). Thus, the complement clauses in (234a) and (237a) are finite clauses, but those in (234b) and (237b) are non-finite, and, in non-finite complement clauses, we see exceptional examples of subjects that are not nominative (see p. 248 above).

We observed in section 9 that verbs in English can have up to five distinct forms, as illustrated in (240):

(240)	*-s*	*-d*	base	*-n*	*-ing*
	shows	showed	show	shown	showing

The *-s* and *-d* forms are finite forms, the *-s* form being the third person singular present tense form, and the *-d* form being the past tense form. By contrast, the *-n* and *-ing* forms are non-finite forms, since they are not inflected for either tense or agreement (recall that the *-n* form often ends in *-ed*!). At first sight, it might seem odd to claim that the *-n* and *-ing* forms are untensed, since (as we noted in section 9) *-ing* forms are sometimes referred to in traditional grammars as *present* participles and *-n* forms as *past* participles. However, it is clear from sentences like (241) that the tense of the clause is marked by the auxiliaries *is*/*was*, not by the verb form *going*:

(241) a. He is going home
b. He was going home

But if the *-ing* inflection on *going* doesn't mark tense, what does it mark?

The answer, as noted in section 10, is that *-ing* in this kind of use serves to mark **aspect** (a term used to describe the duration of the activity described by a verb, e.g. whether the activity is on-going or completed). In sentences such as (241), the *-ing* form indicates that the action of going home is still in progress at the time indicated by the auxiliary: hence (241a) can be loosely paraphrased as 'He is now still in the process of going home', and (241b) as 'He was then still in the process of going home.' Thus, the *-ing* forms like *going* in (241) mark **progressive aspect**. By contrast, *-n* forms such as *gone* in (242a, b) mark the completion of the act of going home:

(242) a. He has gone home
b. He had gone home

Hence (242a) can be loosely paraphrased as 'He has now completed the action of going home' and (242b) as 'He had by then completed the action of going home.' Tense is marked by the choice of *has* or *had*, and we say that *-n* forms like *gone* in (242) mark **perfect aspect** (i.e. they indicate *perfection* in the sense of completion of the relevant act). We have, of course, already met *-ing* forms and *-n* forms in section 10, where they were respectively referred to as *progressive participles* and *perfect participles*. Since participles mark aspect (not tense or agreement), they are non-finite forms.

So far, we have argued that the *-s* and *-d* forms of verbs are finite, but the *-ing* and *-n* forms are non-finite. But what about the uninflected base forms of verbs (the forms which appear in dictionaries of English)? The answer is that the base form of the verb has a dual status and can function either as a finite form or a non-finite form (i.e. it corresponds to more than one grammatical word in the sense of section 10). In uses like that italicised in (243) below, the base form serves as a finite present tense form:

(243) I/We/You/They/People *show* little interest in syntax these days

But in uses like those italicised in (244), the base form is non-finite and is traditionally termed an **infinitive** form:

(244) a. She didn't want him to *show* any emotion
b. He didn't *show* any emotion
c. You mustn't let him *show* any emotion

Base forms also have other uses which we will come across subsequently (e.g. the imperative use of *keep*/*tell* in 246c and 247c below).

Up to now, all the complex sentences we have looked at have comprised a main clause and a complement clause. But now consider the rather different kind of complex sentence illustrated in (245):

(245) I couldn't find anyone who could help me

There are two clauses here – the *find* clause and the *help* clause. The *find* clause comprises the subject *I*, the negative auxiliary *couldn't*, the verbal predicate *find* and the complement *anyone who could help me*. The complement in turn comprises the pronoun *anyone* followed by the clause *who could help me*. Since the pronoun *who* in this clause 'relates to' (i.e. refers back to) *anyone*, it is called a **relative pronoun**, and the clause containing it (*who could help me*) is called a **relative clause**. The relative clause in turn comprises the subject *who*, the auxiliary *could*, the verbal predicate *help* and the complement *me*. The relative clause is a finite clause. Although it doesn't inflect for agreement, the auxiliary *could* is a past tense form (since it carries the past tense suffix -*d*, see *I couldn't find anyone who help**s**/help**ed** in the kitchen*), and its subject *who* carries nominative case (in formal English, the corresponding accusative form would be *whom*, and this would be inappropriate here – cf. **anyone whom could help me*) (***exercise 1***).

The functions of clauses

One aspect of the syntax of clauses which we have so far overlooked is that different clauses have quite different functions. In this connection, consider the functions of the following simple (single-clause) sentences:

(246) a. He failed the exam b. Did he help you?
c. You keep quiet! d. What a fool I was!

The sentence in (246a) is said to be **declarative** in function, in that it is used to make a statement; by contrast, (246b) is **interrogative** since it serves to ask a question and (246c) is an **imperative** sentence used to issue an order or command. Finally, (246d) is an **exclamative** sentence, used to exclaim surprise or delight. In complex sentences, each clause has its own function, as we can see in relation to the examples in (247):

(247) a. He asked who had helped me
b. Did you know he had escaped?
c. You tell him what a great time we had!

In (247a), the main (*asked*) clause is declarative, whereas the complement (*helped*) clause is interrogative; in (247b), the main (*know*) clause is interrogative, whereas the complement *(escaped*) clause is declarative; and in (247c), the main (*tell*) clause is imperative, whereas the complement (*had*) clause is exclamative. The structure of the main clause in (247c) is particularly interesting. It comprises the subject *you*, the predicate *tell* (which is an imperative verb form in this use), the pronoun complement *him* and the clause complement *what a great time we had!* So, (247c) shows us that some verbs may have more than one complement – in this case, *tell* has both a pronoun complement and a clause complement, and this is a reflection of the fact that *tell* has three arguments corresponding to someone doing the telling, someone being told, and something being told (***exercise 2***).

Our discussion here has shown that sentences are built up out of one or more clauses: each clause contains a subject and a predicate and may contain one or more complements and/or adjuncts as well. As we shall see in the next section, clauses too have a complex internal structure and are typically built up out of a sequence of **phrases**. We can illustrate the difference between a phrase and a clause in terms of the two different kinds of reply which speaker B can give to speaker A's question in the following dialogue:

(248) SPEAKER A: When does the president smoke cigars?
SPEAKER B: He smokes cigars after dinner. (reply1)
After dinner. (reply 2)

Here, reply 1 is clearly a clause, since it comprises the subject *he* and the predicate *smokes*, as well as the complement *cigars* and an adjunct *after dinner*. By contrast, reply 2 isn't a clause, since it contains no subject and no predicate: in traditional terms, it is a phrase. For our purposes, we can define a phrase informally as a sequence of two or more words which is not a clause (because it does not contain a subject and/or predicate), but which can nevertheless serve as a free-standing expression and be used, e.g., as a reply to an appropriate kind of question. In the next section, we turn to look at how words can be combined to form phrases, phrases combined to form clauses, and clauses combined to form complex sentences.

Exercises

1. In relation to the sentences below, say what case each of the bracketed pronoun or noun expressions carries, and whether each italicised

verb/auxiliary is finite or non-finite. Give reasons in support of the analysis you present.

(a) [John] *has been following* [you]
(b) [Jane] *suspects* [he] *was lying* to [the police]
(c) [Someone] *would appear* to *have vandalised* [the chairman's] car
(d) [People] *expect* [politicians] to *be* accountable to [the electorate]
(e) [The authorities] *seem* to *have had* [the demonstrators] *arrested*
(f) [You] *should* not *let* [other people] *exploit* [you]
(g) [Mary] *thinks* [her] mother *may be expecting* [her] to *wait* for [her]

Model answer for (1a)

The table of case forms in (223) in the main text shows that names like *John* and pronouns like *you* are case-ambiguous forms which can be either nominative or accusative. One way to tell whether each is nominative or accusative as they are used in (1a) is to replace them by a case-unambiguous pronoun (i.e. one which has distinct nominative, accusative and genitive forms) like *he/him/his*. If we do this, we find that *John* in (1a) can be replaced by *he* but not by *him* (*He/*Him has been following you*) and so must be nominative, whereas *you* can be replaced by *him* but not by *he* (cf. *John has been following him/*he*) and so must be accusative. As for the verb forms in (1a), it is clear that *has* is a finite form since it has a nominative subject and inflects for both tense and agreement (*has* being a third person singular present tense form). By contrast, *been* and *following* are non-finite participle forms, *been* being a perfect participle form (carrying the perfect aspect inflection *-en*) and *following* a progressive participle form.

2. Analyse the structure of the clauses in the examples below:

(a) I know that two prisoners escaped from jail yesterday
(b) Did someone say the prisoners shot a guard?
(c) That kind of incident, I don't think anyone could have foreseen
(d) What a lot of questions the press asked about how the prisoners escaped!
(e) Somebody please tell me which guard the prisoners seriously wounded
(f) The authorities will severely punish the prisoners who organised the escape
(g) Does anyone know which prisoners made the knives which they were carrying?
(h) Which of the comments which the governor made have most antagonised the guards whom the prisoners brutally attacked?

More specifically, say how many clauses each sentence contains, what the grammatical function of each clause is (e.g. main clause, complement clause, relative clause), what type each clause is (e.g. declarative, interrogative, imperative, exclamative), what the constituents of each clause are, and what function each constituent serves within its containing clause (e.g. subject, predicate, complement or adjunct).

Model answer for (2a)

Sentence (2a) contains two predicates (*know* and *escaped*) and so comprises two clauses – a main clause and a complement clause. The complement clause is *that two prisoners escaped yesterday* and is declarative in type (and so is introduced by the declarative complementiser *that*). In addition to the complementiser *that*, the complement clause comprises the predicate *escaped*, the subject *two prisoners* and the adjunct *yesterday*. The main clause contains the predicate *know*, the subject *I* and the complement *that two prisoners escaped yesterday*: the main clause is also declarative in type.

19 Sentence structure

In this section, we shall look at the way in which words are combined to form phrases, phrases are combined to form clauses, and clauses are combined to form complex sentences. This involves the introduction of our first core syntactic operation, that of *merger*.

Merger

To put our discussion on a concrete footing, let's consider how an elementary two-word phrase such as that produced by speaker B in the following mini-dialogue is formed:

(249) SPEAKER A: What is the government planning to do?
SPEAKER B: *Reduce taxes*.

As speaker B's reply illustrates, the simplest way of forming a phrase is by joining two words together: for example, by combining the word *reduce* with the word *taxes* in (249), we form the phrase *reduce taxes*. Just as every compound word has a head (so that *mill* is the head of the compound *windmill* because a windmill is a kind of mill, not a kind of wind: section 10), so too every syntactic phrase has a head word. For example, the head word of the phrase *reduce taxes* in (249) is the verb *reduce*, and accordingly the overall phrase *reduce taxes* is said to be a verb phrase. One reason for thinking this is that the phrase *reduce taxes* describes a particular kind of reduction activity (that of reducing taxes), not a particular kind of tax. Moreover, since the head word of a phrase determines not only its semantic properties but also its grammatical properties, our claim that the verb *reduce* is the head of the phrase *reduce taxes* correctly predicts that when we combine a verb like *reduce* with a noun like *taxes*, the resulting phrase *reduce taxes* has verb-like properties (as opposed to noun-like properties or properties which are neither verb-like nor noun-like). This can be seen from the fact that the phrase *reduce taxes* can occupy the same range of positions as a verb like *resign*, and hence, for example, occur after the infinitive particle *to*:

(250) a. The government ought to *resign*
b. The government ought to *reduce taxes*

By contrast, *reduce taxes* cannot occupy the kind of position occupied by a plural noun such as *taxes*, as we see from (251):

(251) a. *Taxes* are at the heart of the debate about policy
b. **Reduce taxes* are at the heart of the debate about policy

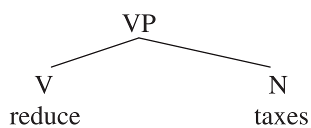
So, it seems clear that the grammatical properties of a phrase like *reduce taxes* are determined by the verb *reduce*, and not by the noun *taxes*. We can say that the verb *reduce* is the **head** of the phrase *reduce taxes*, and conversely that the phrase *reduce taxes* is a **projection** of the verb *reduce* (i.e. a larger expression whose head word is the verb *reduce*). Since the head of the resulting phrase is the verb *reduce*, the phrase *reduce taxes* is a **verb phrase**: and in the same way that we abbreviate category labels like verb to V, we can abbreviate the category label verb phrase to VP. If we use the labelled bracketing technique (section 10) to represent the category of the overall phrase *reduce taxes* and of its component words *reduce* and *taxes*, we can represent the structure of the resulting phrase as in (252):

(252) $[_{VP}\ [_{V}\ \text{reduce}]\ [_{N}\ \text{taxes}]]$

What (252) tells us is that the overall phrase *reduce taxes* is a verb phrase (VP), and that it comprises the verb (V) *reduce* and the noun (N) *taxes*. The verb *reduce* is the *head* of the overall phrase, and the noun *taxes* is the complement of the verb *reduce*. The operation by which the two words are combined to form a phrase is called **merger**.

Although we have used the labelled bracketing technique to represent the structure of the verb phrase *reduce taxes* in (252), we have seen in section 10 that an alternative way of representing this sort of structure is in terms of a **labelled tree diagram** such as (253):

(253)



The tree diagram in (253) is entirely equivalent to the labelled bracketing in (252), in the sense that the two provide us with precisely the same information about the structure of the phrase *reduce taxes*: so (253) – like (252) – tells us that *reduce* is a verb (V), *taxes* is a noun (N) and *reduce taxes* is a verb phrase (VP). The differences between a labelled bracketing like (252) and a tree diagram like (253) are purely notational: each category is represented by a single **node** (i.e. point) in a tree diagram, but by a pair of brackets in a labelled bracketing.

We can generalise our discussion at this point and hypothesise that all phrases are formed in essentially the same way as the phrase in (253), namely by merging two categories together to form a larger category. In the case of (253), the resulting phrase is formed by merging two words. However, not all phrases contain just two words, as we see if we look at the structure of B's reply in (254):

(254) SPEAKER A: What's the government's principal objective?
SPEAKER B: *To reduce taxes*.

The italicised phrase in (254) appears to be formed by merging the infinitive particle *to* with the verb phrase *reduce taxes*. What's the head of the resulting phrase *to reduce taxes*? There is evidence which indicates that this head is the infinitive particle *to*, so that the resulting string (i.e. continuous sequence of words) *to reduce taxes* is an **infinitive phrase**. The evidence is that strings such as *to reduce taxes* have a different distribution from verb phrases, as is indicated by sentences such as those in (255) and (256):

(255) a. They ought [to reduce taxes]
b. *They ought [reduce taxes]

(256) a. They should [reduce taxes]
b. *They should [to reduce taxes]

If we assume that *reduce taxes* is a verb phrase whereas *to reduce taxes* is an infinitive phrase, we can then account for the data in (255) and (256) by saying that *ought* is the kind of word which requires an infinitive phrase after it as its complement, whereas *should* is the kind of word which requires a verb phrase as its complement.

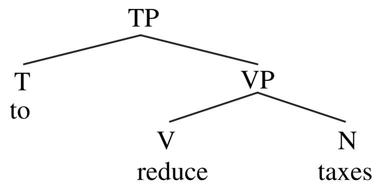
But what kind of word is infinitival *to*? It is traditionally termed an *infinitive particle*, and this terminology implies that it is a unique kind of word unrelated to any other kind of word in English. But is this so? In some respects, infinitival *to* seems to resemble an auxiliary like *will*, in that both are typically used in a clause with future time reference (as you can see from the fact that the bracketed complement clauses in (257) both refer to a future event):

(257) a. Everyone is expecting [the government *will* reduce taxes before the election]
b. Everyone is expecting [the government *to* reduce taxes before the election]

Moreover, the fact that the auxiliary *will* and the infinitive particle *to* occupy the same position in the two clauses (between the subject *the government* and the verb phrase *reduce taxes before the election*) makes it plausible to suggest that the two are different exponents of the same category. The core function of an auxiliary is to mark tense – as we see from the fact that the present/past tense distinction in sentences such as *He is/was lying* is marked by use of the present tense auxiliary *is* or the past tense auxiliary *was*. Let us therefore assume that finite auxiliaries and infinitival *to* both belong to the category T of Tense-marker and differ only in that auxiliaries are *finite* (and so are overtly inflected for the past/non-past distinction), but infinitival *to* is *non-finite* (and so is not inflected for the past/non-past distinction).

After this brief digression about the status of infinitival *to*, let's return to consider the structure of speaker B's utterance *to reduce taxes* in (254). This is an infinitive phrase formed by merging the infinitival tense particle *to* with the verb phrase *to reduce taxes*. Using T as a convenient abbreviation for infinitival tense particle and TP as an abbreviation for infinitival tense phrase, we can say that the phrase *to reduce taxes* is a TP formed by merging the infinitival tense particle (T) *to* with the verb phrase (VP) *reduce taxes* and so has the structure in (258):

(258)



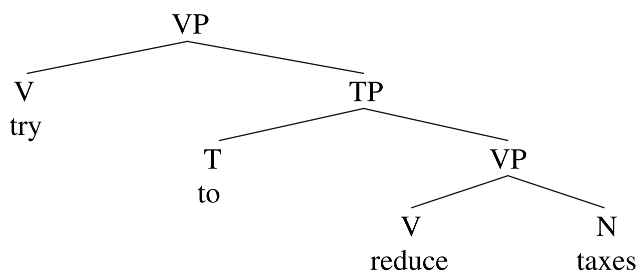
The resulting TP is headed by the T *to* (indicating that the action of reducing taxes is intended to take place at some unspecified time in the future), and the VP *reduce taxes* is the complement of *to*.

What is implicit in our discussion up to this point is the idea that we can build up complex structures by successively merging pairs of categories to form ever larger phrases. For example, by merging the infinitive phrase *to reduce taxes* with the verb *try*, we can form the phrase produced by speaker B in (259):

(259) SPEAKER A: What will the government do?
SPEAKER B: *Try to reduce taxes*.

The resulting phrase *try to reduce taxes* is headed by the verb *try*, as we see from the fact that (like a typical verb phrase) it can be used after the infinitive particle *to* in sentences like those in (250) above (*The government ought to try to reduce taxes*). This being so, the italicised phrase in (259) is a VP which has the structure in (260):

(260)



The head of the overall VP is the verb *try*, and its complement is the TP *to reduce taxes*. Now, (260) illustrates the important property of recursion, which we introduced in section 10, when discussing English compounds. Our analysis is claiming that *try to reduce taxes* is a VP which itself contains another VP, *reduce taxes*, and it is easy to see that further applications of merger will yield a larger VP–*expect to try to reduce taxes* including the VP in (260). We thus see that this simple operation of merger, as a core operation in the theory of grammar, immediately deals with the fact that English, and any other language, has a potentially *infinite* number of sentences (see the Introduction, pp. 3f.).

So far, we have restricted our discussion to the question of how phrases are formed. However, as we saw in the previous section, linguists draw a distinction between *phrases* and *clauses*. For example, the reply given by speaker B in (261) below is a clause, containing the subject *they* and the predicate *try*:

(261) SPEAKER A: What will the government do?
SPEAKER B: *They will try to reduce taxes.*

An obvious question to ask is how clauses are formed – or, in more concrete terms, what the structure of speaker B's reply is in (261).

As already noted, there are interesting similarities between infinitival *to* and auxiliaries like *will/would*, *shall/should*, *can/could*, *may/might*, etc. For example, as illustrated earlier in relation to the sentences in (257), *to* typically occupies the same position in a clause (between subject and verb) as an auxiliary like *will*. Moreover, just as *will* requires after it a verb in the infinitive form (cf. *will show*/ **will showing*/**will shown*), so too does infinitival *to* (cf. *to show*/**to showing*/ **to shown*). Furthermore, infinitival *to* behaves like a typical auxiliary (e.g. *will*) but unlike a typical verb (e.g. *want*) in allowing ellipsis (i.e. omission) of its complement:

(262) a. I don't really want to go to the dentist's, but I know I eventually *will*
b. I know I should go to the dentist's, but I just don't want *to*
c. *I know I should go to the dentist's, but I just don't *want*

The fact that *to* patterns like the auxiliary *will* in several respects strengthens the case for regarding them as belonging to the same category. As noted earlier, since it is a core property of auxiliaries that they mark tense, and since a clause containing infinitival *to* often has future time reference, it has been suggested in much recent work that the two are different exponents of the category of T(ense). (It should be noted, however, that in work in the 1980s, auxiliaries and infinitival *to* were taken to belong to the category INFL/inflection, the general idea behind this label being that finite auxiliaries inflect for tense/agreement, and infinitival *to* serves much the same function in English as do infinitive inflections in languages like Italian: however, we will adopt the more recent T analysis here – see also section 10, p. 134.)

Having established that auxiliaries like *will* are exponents of the category T, let's now return to the question of how clauses like that produced by speaker B in (261) are formed. The simplest assumption (and hence the most desirable theoretically) is to posit that clauses are formed by exactly the same binary (i.e. pairwise) merger operation which leads to the formation of phrases. This being so, we can suggest that the clause *They will try to reduce taxes* is formed by first merging the T-auxiliary *will* with the verb phrase *try to reduce taxes* to form the expression *will try to reduce taxes*, and then merging this larger expression with the pronoun *they* to form the complete clause *They will try to reduce taxes*.

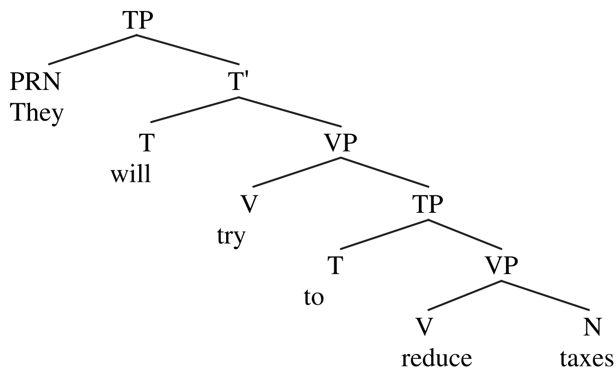
At first sight, it might seem plausible to claim that the expression *will try to reduce taxes* is a TP (i.e. tensed auxiliary phrase), and that when combined with the pronoun *they* it forms a pronoun phrase. But this can't be right, since it would provide us with no obvious way of explaining why it is ungrammatical for speaker B to reply as in (263) below:

(263) SPEAKER A: What will the government do?
SPEAKER B: **Will try to reduce taxes*.

If complete phrases can be used to answer questions, and if *will try to reduce taxes* is a complete TP, how come it can't be used to answer A's question in (263)?

The answer which we shall give to this question here is that *will try to reduce taxes* is an *incomplete* phrase. Why? Because auxiliaries require a subject, and the auxiliary *will* doesn't have a subject in (263). More specifically, let's assume that when we merge a T-auxiliary with a verb phrase (VP), we form an incomplete tense phrase which is often denoted $\overline{\mathrm{T}}$, pronounced T-bar. For typographical convenience, we shall follow many authors in using T′ (although readers should bear in mind that this too is pronounced T-bar!) and that only when we merge the relevant T-auxiliary with its subject do we form a TP (i.e. a complete tense phrase). Given these assumptions, the clause *They will try to reduce taxes* will have the structure in (264):

(264)



In a structure such as (264), the position occupied by the pronoun (PRN) *they* which serves as the subject of *will* is said to be the **specifier** position within TP. It is important to be clear that the term *specifier* (like the terms *subject* and *complement*) is the label of a grammatical *function* and not a grammatical *category*; thus, in (264) the function of specifier is fulfilled by the PRN (i.e. word belonging to the PRN category of pronoun) *they*. A specifier precedes the head of the phrase containing it, whereas a complement follows its head: so, the PRN *they* precedes *will* in (264) because it is the specifier (and also subject) of *will*, whereas the VP *try to reduce taxes* follows *will* because it is the complement of *will*; likewise in a determiner phrase (DP) such as *such a pity*, *such* is the specifier of (and so precedes) the head determiner (D) *a*, and *pity* is the complement of (and so follows) *a* – for discussion of DP structures, see section 20; similarly, in a prepositional phrase (PP) such as *right inside it*, *right* is the specifier of (and so precedes) the preposition (P) *inside* and *it* is the complement of (and so follows) *inside*.

Tests for constituency

Tree diagrams such as (264) provide a visual representation of what we claim to be the syntactic structure of the corresponding sentence. But this raises the question of how we can test whether claims made about structure in tree diagrams are correct. One way to do this is to make use of traditional tests which are designed to determine structure. We shall look at just one of these, relating to the phenomenon of **co-ordination**. English and other languages have a variety of co-ordinating conjunctions like *and*, *but* and *or* which can be used to co-ordinate (that is conjoin or join together) expressions such as those bracketed below (see section 9, p. 134):

(265) a. [fond of cats] and [afraid of dogs]
b. [slowly] but [surely]
c. [to go] or [to stay]

In each of the phrases in (265), a co-ordinating conjunction has been used to conjoin the bracketed pairs of expressions. Clearly, any adequate grammar of English will have to provide a principled answer to the question of what kinds of strings (i.e. sequences of words) can and cannot be co-ordinated.

It turns out that we can't just co-ordinate any random set of strings, as we see by comparing the grammatical reply produced by speaker B in (266) below with the ungrammatical reply in (267):

(266) SPEAKER A: What did he do?
SPEAKER B: Run *up the hill* and *up the mountain*.

(267) SPEAKER A: What did he do?
SPEAKER B: *Ring *up the electricity company* and *up the gas company.*

Why should it be possible to co-ordinate the string *up the hill* with the string *up the mountain* in (266), but not possible to co-ordinate the string *up the electricity company* with the string *up the gas company* in (267)? We can provide a principled answer to this question in terms of *constituent structure*. More specifically, we can maintain that the string *up the hill* in (266) is a constituent of the phrase *run up the hill* (*up the hill* is a PP), and so can be co-ordinated with another similar type of phrase (e.g. a PP such as *up the mountain*, or *down the hill*, or *along the path*, etc.). Conversely, however, we can maintain that the string *up the electricity company* in (267) is not a constituent of the phrase *ring up the electricity company*, and so cannot be co-ordinated with another similar string (*up* is associated with *ring* in such constructions, and the expression *ring up* forms a complex verb which carries the sense of 'to telephone'). On the basis of contrasts such as these, we can suggest that the following *constraint* (i.e. grammatical restriction) is part of an adequate grammar of English:

(268) Only *like* constituents can be conjoined; non-constituent strings cannot be conjoined
(a *non-constituent string* being 'a string of words which are not a constituent').

We are thus supposing that processes for combining words and phrases in native speakers' grammars are constrained by (268), and that (268) constitutes part of English native speakers' competence.

Having established (268), we can now make use of it as a way of testing the tree diagram in (264) above. A crucial claim made in (264) is that the strings *reduce taxes*, *to reduce taxes*, *try to reduce taxes* and *will try to reduce taxes* are all constituents (of various different types). Evidence for the correctness of this claim comes from co-ordination facts in relation to sentences such as those in (269):

(269) a. They will try to [reduce taxes] and [increase pensions]
b. They will try [to reduce taxes] and [to cut bureaucracy]
c. They will [try to reduce taxes] and [attempt to eliminate poverty]
d. They [will try to reduce taxes] but [may not succeed]

Given the crucial premise (268) that only strings of like constituents can be conjoined, example (269a) provides evidence for analysing *reduce taxes* as a VP since it can be conjoined with another VP such as *increase pensions*. Likewise, (269b) indicates the correctness of analysing *to reduce taxes* as an infinitival TP, since it can be co-ordinated with another infinitival TP like *to cut bureaucracy*. Similarly, (269c) shows us that *try to reduce taxes* is a VP since it can be conjoined with another VP such as *attempt to eliminate poverty*. And in much the same way, (269d) tells us that *will try to reduce taxes* is a finite T′ because it can be co-ordinated with another finite T′ such as *may not succeed*. Overall, then, we see that the assumptions about the structure of clauses embodied in tree diagrams such as (264) receive independent support from tests such as the *co-ordination test* (***exercise 1***).

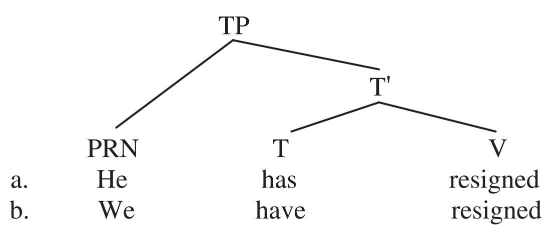
Agreement, case assignment and selection

Although we've suggested that all phrases and sentences are formed by successive applications of a simple binary merger operation, it's clear that we can't randomly combine any pair of categories by merger, as examples like the following illustrate:

(270) a. He *has/*have* resigned
b. We *have/*has* resigned

Given the analysis we are assuming here, sentences like (270a) and (270b) will have the respective structures shown in (271):

(271)



In terms of the structure (271), what the contrast between (270a) and (270b) shows is that a finite T-auxiliary such as *has/have* must agree in person and number with its specifier/subject: since the specifier of T in (270a) is the third person singular pronoun *he*, the present tense T-auxiliary HAVE is marked as third person singular via agreement with its specifier *he* and so is ultimately realised as the third person singular form *has*. And since the specifier of T is the first person plural pronoun *we* in (270b), the auxiliary HAVE in T is marked as first person plural via agreement with its specifier and so surfaces in the first person plural form *have*. This suggests that the derivation of sentence structures (i.e. the way in which they are built up) involves not only merger operations but also **agreement** operations. One such operation is **specifier-head agreement**, which we can sketch in simplified form as follows:

(272) Specifier-head agreement
A finite T constituent agrees in person and number with its specifier/subject

A further type of operation involved in sentence formation can be illustrated by contrasts such as the following:

(273) a. *He* has resigned
b. **Him* has resigned

In the grammatical sentence (273a), the subject of the clause is the nominative pronoun *he*, whereas in the ungrammatical sentence (273b), the subject is the accusative pronoun *him*. Why should it be possible to have a nominative subject in sentences like (273) but not an accusative subject? Note that we can't simply say that this is because all clauses have nominative subjects, since this is untrue of clauses like those bracketed below, which have (italicised) accusative subjects:

(274) a. She's keen [for *him* to be there]
b. She wants [*him* to be there]

What's the difference between nominative-subject clauses like (273a) and accusative-subject clauses like those bracketed in (274)? The obvious difference is that nominative-subject clauses are finite (by virtue of containing a finite T constituent), whereas accusative-subject clauses are not. Hence, an adequate grammar of English needs to incorporate a case assignment operation to the effect that the subject of a finite clause (i.e. one containing a finite T constituent) is assigned nominative case.

More generally, let us suppose that the grammar of English incorporates a set of case assignment conditions along the lines of those given in a simplified form below:

(275) Case assignment conditions in English
A noun or pronoun expression is assigned
a. nominative case if the specifier of a finite T (i.e. the subject of a finite clause)
b. genitive case if a possessor (i.e. an entity possessing something)
c. accusative case otherwise (by default, if ineligible for nominative or genitive case)

It then follows that the subject pronouns in (270) will be assigned nominative case in accordance with the case assignment condition in (275a), since *he/we* is the specifier of the finite T-auxiliary *has/have*. By contrast, the subjects of the bracketed infinitive clauses in (274) cannot receive nominative case (because they are not subjects of a finite T constituent) or genitive case (because they are not possessors), and so receive accusative case *by default* (i.e. as a last resort/ fall-back).

We can illustrate how (275) works more generally in terms of the italicised pronouns in the examples below (A and B represent different speakers in the c, e and f examples):

(276) a. *He* has lost *his* tax return
b. Remember *me* to *them*!
c. A: You've been lying to me. B: What! *Me* lie to you? Never!
d. *I* have never understood syntax, *me*
e. A: Who has finished the assignment? B: *Me.*
f. A: Who is it? B It's *me.*

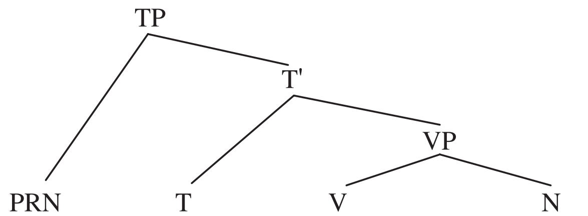
In (276a), *he* is nominative because it is the subject of the finite T-auxiliary *has*, and *his* is genitive by virtue of its possessive function. In (276b), *me* and *them* receive accusative case by default – i.e. by virtue of the fact that neither is used as a finite clause subject or as a possessor: hence, accusative case is said to be the *default* case in English. In (276c), *me* is the subject of the non-finite *lie* clause (*lie* here is a non-finite infinitive form) and so receives accusative case by default. In (276d), *I* is nominative by virtue of being the subject of the finite auxiliary *have*, and the topic pronoun *me* at the end of the sentence receives accusative case by default. In (276e), *me* is used as a sentence fragment and hence carries default accusative case. And in (276f), *me* is used as the complement of the verb *be* and again carries default accusative case.

Just as noun and pronoun expressions need to be in an appropriate case form in particular structures, so too non-finite verbs need to be in an appropriate form – as the following contrasts illustrate:

(277) a. He is *taking/*taken/*take* French
b. He has *taken/*taking/*take* French
c. He will *take/*taking/*taken* French

If we use the auxiliary *is* here, the italicised verb must be in the *-ing* form; if we use the auxiliary *has*, the italicised verb must be in the *-n* form; if we use the auxiliary *will*, the italicised verb must be in the bare (uninflected) form *take*. In order to try and understand what is going on here, let's take a look at the structure of the grammatical sentences in (277), which is as shown in (278) below:

(278)



a. He is taking French
b. He has taken French
c. He will take French

The reason why different types of auxiliary are followed by different types of verb form is that auxiliaries have **selectional properties** which determine the kind of complement they **select** (i.e. ‘take’). For example, the progressive auxiliary BE selects a complement headed by a verb in the progressive participle -*ing* form: this selectional requirement is met in (278a) by virtue of the fact that the progressive auxiliary *is* has as its complement the verb phrase *taking French*, and the head word of its VP complement is the progressive participle *taking*. Likewise, the perfect auxiliary *has* selects a complement headed by a verb in the perfect participle -*n* form, and this requirement is met in (278b) by its complement being a verb phrase (*taken French*) whose head verb is the perfect participle *taken*. Similarly, a modal auxiliary like *will* selects a complement headed by a verb in the infinitive form, and this requirement is met in (278c) because the complement of *will* is the VP *take French*, and the head of this VP is the infinitival V *take*.

What our discussion above implies is that sentence formation not only involves merger operations, but also a series of other operations involving agreement, case-marking and selection. It may be that at a more abstract level, case-marking and selection can be seen as involving a form of agreement. For example, since nominative case is assigned to the subject of a finite T constituent, and since a finite T agrees in person and number with its subject, another way of handling nominative case assignment is to posit that nominative case is assigned to an expression which agrees with a finite T (so making nominative case assignment an agreement-based operation); and since languages like Hungarian show overt possessor agreement (between a possessor and a possessum/possessed object), it might be possible to say that genitive case assignment also involves a form of agreement (visible in Hungarian, but invisible in English). And following an idea suggested by David Adger, we could take selection to involve a form of agreement. We would then say that the verb *taking* in (278a) agrees in progressive aspect with the progressive auxiliary *is*, that *taken* in (278b) agrees in perfect aspect with the perfect auxiliary *has*, and that the verb *take* in (278c) agrees in modality with the modal auxiliary *will*, so that *take* is a modal form of the verb (under Adger’s analysis). If so, we can say that there are two core operations involved in sentence formation: merger and agreement (It should be noted, however, that we shall introduce a third core operation of *movement* in section 21.) (***exercise 2***).

Exercises

1. Analyse the following sentences, showing how their structure is built up in a pairwise fashion by successive merger operations. Show how the *co-ordination test* can be used to provide evidence in support of the structures you posit.
   (a) He has bought a house
   (b) You should apologise to the teacher
   (c) They are claiming immunity from prosecution
   (d) John must feel sorry she is leaving
   (e) He won't admit he has made a mistake
   (f) People are saying he has made allegations of corruption
   (g) He is hoping to find she will collaborate with him
   (h) Parliament has decided to approve the plan to cut taxes

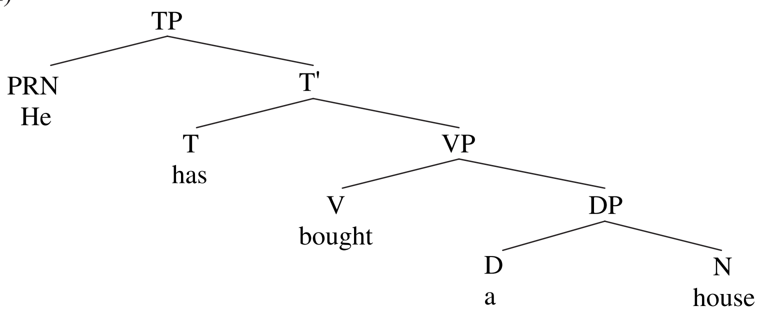
Hints

Assume that the sentences are derived by first merging the last two words in the sentence to form a larger category, then merging the category thereby formed with the third-from-last word to form an even larger category, then merging this even larger category with the fourth-from-last word, and so on. (It should be noted, however, that while this procedure will work for the sentences in this exercise, it requires modification to handle more complicated sentences.) In addition, assume that *won't* is a single word which belongs to the same category as *will*. Finally, assume that not just auxiliaries and verbs, but also determiners, nouns, prepositions and adjectives can merge with a following complement to form a determiner phrase (DP), noun phrase (NP), prepositional phrase (PP) or adjectival phrase (AP) (so that, e.g., when the D *the* merges with the N *budget*, it forms the DP *the budget*).

Model answer for (1a)

The D/determiner *a* merges with the N/noun *house* to form the DP/determiner phrase *a house*. The V/verb *bought* merges with the DP *a house* to form the VP/verb phrase *bought a house*. The T-auxiliary *has* merges with this VP to form the T′ constituent (i.e. incomplete present tense auxiliary expression) *has bought a house*. This T′ in turn merges with the pronoun *he* to form the TP (tensed auxiliary phrase) *He has bought a house*, which has the structure in (i):

(i)



We can use co-ordination data from sentences such as those in (ii) to test the above structure:

(ii) a. He has bought *a house* and *a car*
b. He has *bought a house* and *rented a car*
c. He *has bought a house* and *is renting a car*

The fact that it is possible to co-ordinate the DP *a house* with another DP like *a car* in (iia), the VP *bought a house* with the VP *rented a car* in (iib), and the T′ *has bought a house* with the T′ *is renting a car* in (iic) suggests that (i) is indeed the structure of sentence (1a).

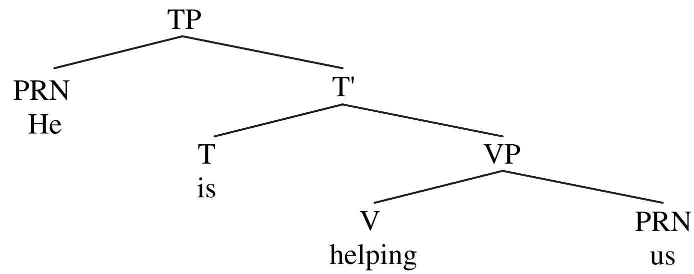
2. Comment on the form of each of the words in the sentences below, explaining the nature of the error involved where any item is in the wrong form.

(a) He is helping us
(b) *He am helping us
(c) *Him is helping us
(d) *He is help us
(e) I have seen them
(f) *I has seen them
(g) *I have see them
(h) *I have seen they
(i) She could help me
(j) *Her could help me
(k) *She could helped me
(l) *She could help my

Model answer for (2a)

Given the assumptions in the main text, (2a) has the following structure:

(i)



T contains a present tense progressive aspect auxiliary BE, which is marked as third person singular via specifier-head agreement with its third person singular subject *he*, and so surfaces in the third person singular form *is*. The pronoun *he* is assigned nominative case in accordance with the nominative case assignment condition (275a), which specifies that the subject of a finite T is assigned nominative case. The pronoun *us* is assigned accusative case via the default case assignment condition (275c), by virtue of being neither the subject of a finite clause, nor a possessor. The verb *helping* is in the progressive participle form because a selectional property of the progressive auxiliary BE is that it selects a complement headed by a verb in the progressive participle form (or, alternatively, via agreement in progressive aspect between verb and auxiliary).

20 Empty categories

So far, we have tacitly assumed that syntactic structures are projections of **overt** constituents (i.e. of words, phrases and clauses which have an overt phonetic form). However, as understanding of syntax has deepened, it has been argued that syntactic structures can also contain what are variously referred to as **covert**, **null** or **empty** constituents – i.e. 'silent' constituents which have no overt phonetic form. In this section, we will introduce a number of different types of empty category along with the arguments for supposing that such categories play a role in the grammar of English. In section 26, we shall see that evidence from a different source, psycholinguistic experiments, points to the importance of empty categories in sentence processing.

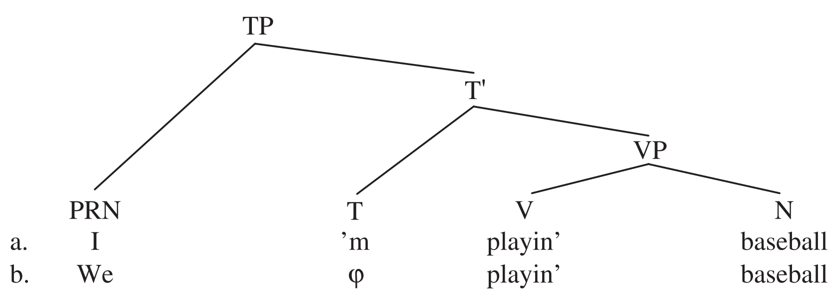
Empty T constituent

As a first illustration, consider how we might analyse the following set of examples from African American Vernacular English (AAVE) – see section 16 for discussion of the (ing) variable in this variety in connection with forms such as *playin'*:

(279) a. I'm playin' baseball
b. We/You/He/They playin' baseball

Example (279a) contains an overt form of the T-auxiliary *be* – namely the contracted form '*m*. However, the examples in (279b) contain no overt form of *be*, yet there are good reasons to suppose that they contain a covert/null/empty variant of *are*/*is* which we will symbolise as φ. If this is so, (279a, b) will have essentially the same structure, namely (280a, b):

(280)



Since (280b) is a TP headed by a null variant φ of *are*, we can provide a straightforward account of why the subject *we* is nominative (because φ is a variant of the auxiliary *are*, and finite T-auxiliaries like *are* require a nominative subject), and of why the complement verb *playin'* is in the *-ing* form (because φ is a variant of *are*, and it is a property of the auxiliary *are* that it selects a complement headed by a verb in the progressive participle *-ing* form).

Further evidence that structures like (280b) contain a null auxiliary comes from AAVE examples reported by Ralph Fasold such as the following (where *gonna* = *going to*):

(281) He gonna be there, I know he *is*

As we see from (standard English) examples like (282) below, in structures like these, the italicised auxiliary in the second clause (i.e. the clause after the comma) is generally a copy of that in the first clause:

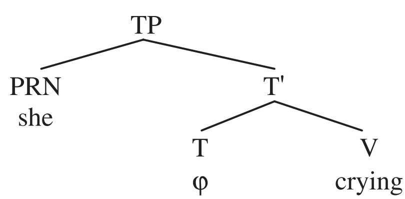
(282) a. You *can* do it, I know you *can*/**are*/**have*
b. He *is* trying, I know he *is*/**must*/**did*
c. They *will* come, I know they *will*/**were*/**do*

So, the fact that the auxiliary *is* appears in the second clause in (281) suggests that the first clause contains a null counterpart of *is*.

Although standard varieties of English don't allow the use of a null auxiliary in sentences like (279), there are specific types of constructions in which auxiliaries can be null. In this connection, compare the two sentences in (283):

(283) a. He *was* laughing and she *was* crying
b. He *was* laughing and she – crying

The second sentence seems to contain a 'gap' in the position marked –. The auxiliary *was* has been omitted in (283b) to avoid repetition, and we say that it has undergone a particular kind of ellipsis known as **gapping** (for the obvious reason that it leaves a gap in the middle of the sentence), so resulting in the structure in (284) below:

(284)


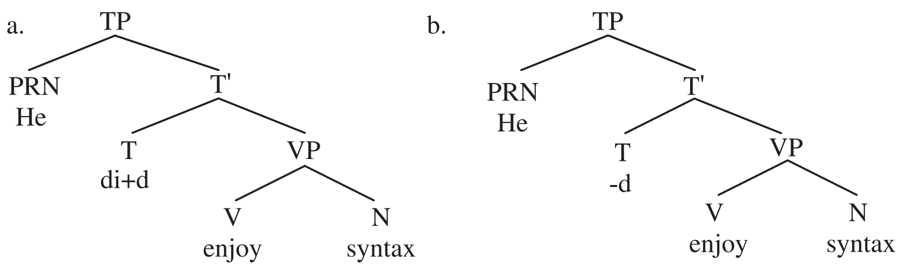
That is, the clause is a TP headed by a null auxiliary φ. If we assume that φ here is a null variant of *was*, we can account for the fact that the subject is *she* (since a finite T such as *was* requires a third person singular nominative subject like *he* or *she*, or the first person singular nominative subject *I*), and the verb *crying* is in the progressive *-ing* form (since *is* requires a complement headed by a verb in this form).

If we extend this reasoning a little further, we can account for sentence pairs such as (285a, b) in a similar fashion (where capitals mark emphatic/contrastive stress):

(285) a. He DID enjoy syntax
b. He enjoyed syntax

Here (285a) is clearly a TP headed by an overt T-auxiliary *did* which is a past tense form. If we look at the internal morphological structure of *did*, we find that it carries the same past tense affix *-d* as we find in other past tense verb forms such as *score-d*, *die-d*, *owe-d* etc. so that *did* comprises an irregular past tense stem *di-* of the auxiliary DO and the past tense affix *-d*. In order to maximise the structural symmetry between (285a) and (285b), we can then propose that both clauses are TPs headed by a T constituent containing the past tense affix *-d*, and that the only difference between the two is that this affix is attached to the (past tense) auxiliary stem *di-* in (285a) but has no auxiliary stem attached to it in (285b). This means that (285a, b) have the structures in (286a, b):

(286)



Let's also assume that where T contains a tense affix which has no auxiliary to attach to, the affix is instead lowered onto the head verb of the verb phrase (by an operation which we can call *Affix Attachment*), in order to satisfy the requirement for the affix *-d* to attach to an auxiliary or verb. This will mean that in (286b), the past tense affix *-d* is eventually attached to (the end of) the verb *enjoy*, with the result that the verb is realised in the past tense form *enjoyed*. Such an analysis allows us to attain a unitary characterisation of the syntax of clauses, and to posit that all clauses are TPs which comprise a subject expression, a T head (which will contain an overt or covert tense auxiliary or tense affix in a finite clause, and infinitival *to* in an infinitive clause) and a verb (phrase) complement.

Evidence that auxiliariless finite clauses contain an abstract (present or past tense) T constituent comes from so-called **tag questions**. Examples of typical tag questions are given in (287) below (where the part of the sentence following the comma is called the **tag**):

(287) a. He *is* working, *is* he?
b. He *can* speak Swahili, *can* he?
c. You *will* help us, *won't* you?
d. They *might* suspect him, *mightn't* they?
e. He *could* plead guilty, *couldn't* he?

As examples like these show, the tag in such questions generally contains a (positive or negative) auxiliary which copies grammatical features of the auxiliary that occupies the T position in the main clause (both auxiliaries are italicised in 287). So, for example, the main clause in (287a) contains the T-auxiliary *is* (which is a present tense form marking progressive aspect), and this is copied in the tag. If auxiliaries in tags copy grammatical features carried by the T constituent in the main clause, consider how we account for the fact that a sentence like (285b) *He enjoyed syntax* is tagged by the past tense auxiliary *did* in (288):

(288) He enjoyed syntax, *did* he?

If we assume, as in (286b) above, that (285b) is a TP headed by a T constituent containing a past tense affix, and that T in tags contains a matching affix, we can account for sentences like (288) by supposing that the auxiliary DO is used in the tag in (288) in order to *support* the past tense affix in the tag (i.e. in order to provide it with a suitable auxiliary stem to attach to). For obvious reasons, this phenomenon is known as **Do-support**.

A direct consequence of the TP analysis of clauses is that auxiliaries and verbs occupy different positions within the clause: auxiliaries occupy the head T position of TP, whereas verbs occupy the head V position of VP. An interesting way of testing whether this is correct is in relation to the behaviour of items which have the status of auxiliaries in some uses, but of verbs in others. One such word is *have*. In the kind of use illustrated in (289a) below, *have* is a *perfect auxiliary* (since it takes a complement headed by a verb in the perfect participle -*n* form), whereas in the kind of use illustrated in (289b), it functions as a *causative verb* (because it has a meaning akin to that of the verb *cause*):

(289) a. He *had* gone to Paris
b. He *had* a specialist examine the patient

By standard tests of auxiliarihood (cf. section 9), perfect *have* is an auxiliary, and causative *have* is a verb: e.g. perfect *have* can undergo inversion (*Had he gone to Paris?*), whereas causative *have* cannot (**Had he a specialist examine the patient?*). In terms of the assumptions we are making here, this means that *have* occupies the head T position of TP in its perfect use, but the head V position of VP in its causative use.

Evidence in support of this claim comes from facts about cliticisation, a process by which one word attaches itself in a leech-like fashion to another (see section 10). The word *had* can cliticise onto the pronoun *he* in (289a) (forming *he'd*), but not in (289b), as we see from (290a, b):

(290) a. *He'd* gone to Paris
b. **He'd* a specialist examine the patient

How can we account for this contrast? If we assume that perfect *had* in (289a) is an auxiliary which occupies the head T position of TP, but that causative *had* in (289b) is a verb occupying the head V position of VP, then prior to cliticisation the two clauses will have the respective (simplified) structures indicated by the labelled bracketings in (291a, b) below (the T constituent being empty in (291b) once the past tense affix -*d* attaches to the verb *had*):

(291) a. [$_{TP}$ He [$_{T}$ had] [$_{VP}$ [$_{V}$ gone] to Paris]]
b. [$_{TP}$ He [$_{T}$ φ] [$_{VP}$ [$_{V}$ had] a specialist examine the patient]]

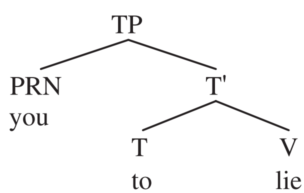
If we assume that *have*-cliticisation is possible only when *have* immediately follows the expression to which it cliticises and is blocked by the presence of an intervening constituent, it should be obvious why *had* can cliticise onto *he* in (290a) but not in (290b): *had* is immediately adjacent to *he* in (291a) but is separated from *he* by a null T constituent in (291b). A crucial premise of this account is that *have* is positioned in the head T of TP in its perfect use, but in the head V of VP in its causative use. So, *have*-cliticisation facts lend support to the claim that all clauses are TPs of the form *subject + T + complement*, and that clauses which have no overt T constituent contain a covert T which can block cliticisation.

In much the same way, we can argue that so-called **bare infinitive clauses** (i.e. clauses which contain a verb in its uninflected infinitive form, but which lack the overt infinitive particle *to*) contain a covert counterpart of *to*. In this regard, consider the syntax of the bracketed infinitive clauses in (292a, b):

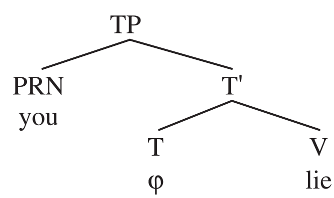
(292) a. I have never known [you to lie]
b. I have never known [you lie]

The two bracketed clauses in (292) are infinitive clauses (since in both cases the verb *lie* is in the infinitive form), and each serves as the complement of the verb *known* (so that each of the bracketed clauses is a complement clause). The bracketed complement clause in (292a) is a TP headed by the infinitival T constituent *to* and has the structure (293a) below. In order to maximise the symmetry between *to* infinitives and bare infinitives, we can analyse the bracketed bare infinitive complement clause in (292b) as a TP headed by a covert infinitive particle (symbolised below as φ) as in (293b):

(293) a.



b.



Evidence in support of positing a covert infinitive particle in bare infinitive clauses comes from the fact that *have* cannot cliticise onto *you* in the bracketed bare infinitive clause in (294) below:

(294) a. I wouldn't let [*you have* my password]
b. *I wouldn't let [*you've* my password]

Why should cliticisation be blocked here? The answer is that bare infinitive clauses are TPs headed by a null infinitival T constituent φ, as shown in simplified form in (295):

(295) I wouldn't let [$_{TP}$you [$_{T}\varphi$] have my password]

The presence of the intervening null infinitive particle is sufficient to prevent *have* from cliticising onto *you*.

The overall conclusion to which our discussion leads us is that all clauses are TPs of the form *subject* + *T* + *complement* (with T being overt or covert, finite or infinitival). However, this assumption proves potentially problematic in respect of certain types of infinitive clause which appear at first sight to be subjectless, and consideration of such cases leads us to another type of empty category.

PRO: the empty subject of infinitive clauses

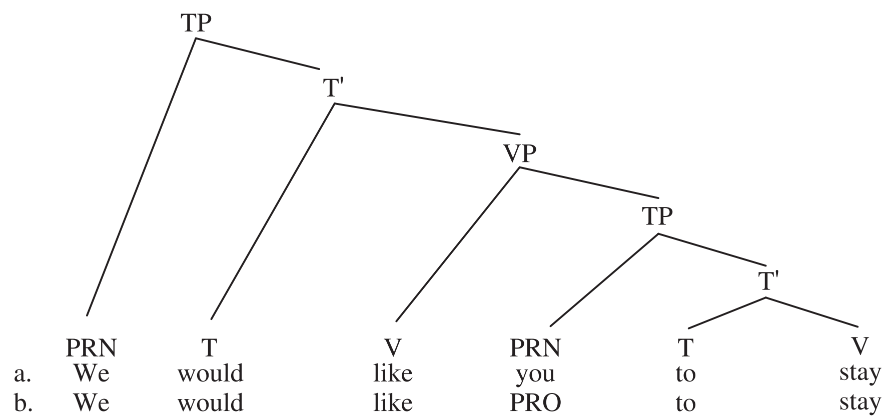
Compare the structure of the bracketed infinitive clauses in (296a, b):

(296) a. We would like [*you* to stay]
b. We would like [to stay]

Each of the bracketed infinitive clauses in (296) is a TP headed by the infinitival T constituent *to*, and each bracketed TP serves as the complement of the verb *like* and so is a complement clause. An apparent difference between the two is that the bracketed infinitive clause in (296a) has an overt subject *you*, whereas its counterpart in (296b) appears to be subjectless. However, we shall argue that apparently subjectless infinitive clauses contain an understood *null* subject. Since the null subject found in infinitive clauses has much the same grammatical properties as pronouns, it is conventionally designated as **PRO**.

Given this assumption, sentence pairs such as (296a, b) have essentially the same structure, except that the bracketed TP has an overt pronoun *you* as its subject in (296a), but a covert PRO as its subject in (296b). These structures appear as (297a, b)s below:

(297)



Introducing the relevant technical terminology, we can say that the null subject PRO in (297b) is **controlled** by (i.e. refers back to) the subject *we* of the *would* clause, or equivalently that *we* (i.e. the expression which PRO refers back to) is the

controller or **antecedent** of PRO. Verbs such as *like* which allow an infinitive complement with a PRO subject are said to function (in the relevant use) as **control verbs**, and the clause containing the PRO subject is said to be a **control clause**.

An obvious question to ask at this juncture is why we should posit that apparently subjectless infinitive complements like that bracketed in (296b) have a null PRO subject. Part of the motivation for positing PRO is semantic in nature. In traditional grammar, it is claimed that subjectless infinitive clauses have an *understood* or *implicit* subject – and positing a PRO subject in such clauses is one way of capturing the relevant intuition. The implicit subject becomes explicit if the relevant clauses are paraphrased by a clause containing an auxiliary like *will*, as we see for the paraphrase for (298a) below given in (298b):

(298) a. The president hopes [to be re-elected]
b. The president hopes [*he* will be re-elected]

The fact that the bracketed clause in (298b) contains an overt (italicised) subject makes it plausible to suppose that the bracketed clause in (298a) has a covert PRO subject.

There is also syntactic evidence in support of claiming that subjectless infinitive clauses have a covert PRO subject. Part of this evidence comes from the syntax of **reflexives** (i.e.-*self*/-*selves* forms such as *myself*/*yourself*/*himself*/*themselves*, etc.). As examples such as the following indicate, a reflexive generally requires a *local* (i.e. 'nearby') antecedent:

(299) a. They want [*John* to help *himself*]
b. **They* want [John to help *themselves*]

In the case of structures like (299), a *local antecedent* means 'an expression which the reflexive can refer back to within the same (bracketed) clause'. Thus, (299a) is grammatical because it satisfies this *locality requirement*: the antecedent of the reflexive *himself* is the noun *John*, and *John* is contained within the same bracketed *help*-clause as *himself*. By contrast, (299b) is ungrammatical because the reflexive *themselves* does not have a local antecedent (i.e. it does not have any expression it can refer back to within the bracketed clause containing it); its antecedent is the pronoun *they*, and *they* is part of the *want*-clause, not part of the bracketed *help*-clause. In the light of this locality requirement, consider how we account for the grammaticality of the following:

(300) John would like [to prove himself]

Given that a reflexive needs a local antecedent, the reflexive *himself* must have an antecedent within its own (bracketed) clause. This requirement will be satisfied if we assume that the bracketed complement clause has a PRO subject, as in (301):

(301) John would like [PRO to prove *himself*]

We can then say that *himself* has an antecedent within the bracketed clause containing it, since *himself* refers back to PRO. Because PRO in turn refers back to *John*, this means that *himself* refers to the same person as *John*.

The claim that apparently subjectless infinitive clauses have a null PRO subject enables us to maintain the definition of a clause as a *subject* + *predicate* structure which we gave earlier. If there were no PRO subject for the bracketed clause in (300), the predicate *prove* would have no subject of its own, and hence it would be impossible to maintain the assumption that every clause contains a subject as well as a predicate.

The overall conclusion to be drawn from our discussion up to now is that clauses are TP structures of the form *subject* + *T* + *complement*: the subject is an overt or covert pronoun or nominal (i.e. noun-containing) expression, T is occupied by an overt or covert auxiliary, affix or infinitive particle, and the complement is a verb or verb phrase. So far, we have not discussed the possibility of complements being covert. We now turn to this.

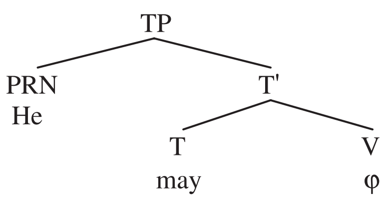
Covert complements

Just as both T and its subject can be covert, so too the complement of T can be covert in structures where it undergoes ellipsis. For example, in a dialogue such as (302) below, speaker B's reply is understood as an elliptical form of *He may resign*:

(302) SPEAKER A: Do you think he will resign?
SPEAKER B: *He may.*

We might accordingly suggest that the auxiliary *may* has a null complement, and that the sentence *He may* has the structure (303):

(303)



In (303), φ is understood as having the same grammatical and semantic features as *resign*, differing from *resign* only in that it has no phonetic features (and so is 'silent'). If this is so, clauses are always TPs of the form *subject* + *T* + *complement*, and the subject may be overt or covert, T may be overt or covert, and the complement may be overt or covert.

Empty complementisers

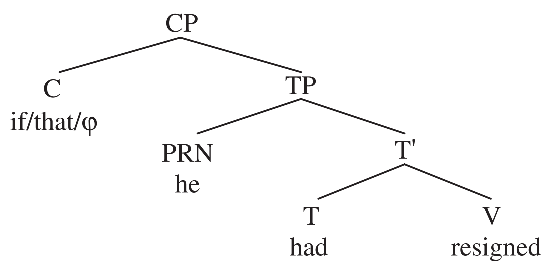
The overall conclusion to be drawn from our discussion to this point is that all clauses contain an overt or null T constituent which marks properties such as tense. However, given that clauses can be introduced by clause-introducing particles such as *if/that/for* (traditionally called conjunctions, but in more recent work termed **complementisers**), a natural question to ask is whether apparently complementiserless clauses can likewise be argued to be CPs headed by a null complementiser. This is what we argue now.

Consider the following:

(304) a. We didn't know [*if* he had resigned]
b. We didn't know [*that* he had resigned]
c. We didn't know [he had resigned]

The bracketed complement clause is interpreted as interrogative in type in (304a) and declarative in type in (304b), and the **force** of the clause (i.e. the type of clause it represents) is determined by the choice of italicised complementiser introducing the clause: in other words, the bracketed clause is interrogative in force/type in (304a) because it is introduced by the interrogative complementiser *if*, and is declarative in force in (304b) because it is introduced by the declarative complementiser *that*.

But now consider the bare (i.e. seemingly complementiserless) clause in (304c): this can only be interpreted as declarative in force (not as interrogative), so that (304c) is synonymous with (304b) and not with (304a). Why should this be? One answer is to suppose that the bracketed bare clause in (304c) is a CP headed by a null variant of the declarative complementiser *that* (below symbolised as φ), and that the bracketed complement clauses in (304a, b, c) have the structure (305) below:

(305)


Given the analysis in (305), we could then say that the force of a clause is determined by the choice of complementiser in the clause; in (304a), the clause is a CP headed by the interrogative complementiser *if* and so is interrogative in force; in (304b), it is a CP headed by the declarative complementiser *that* and so is declarative in force; and in (304c), it is a CP headed by a null declarative complementiser φ and so is likewise declarative in force. More generally, the **null C** analysis would enable us to arrive at a uniform characterisation of all finite clauses as CPs in which the force of a clause is indicated by the force feature carried by an (overt or null) complementiser introducing the clause.

Empirical evidence in support of the null C analysis of bare complement clauses like that bracketed in (304c) comes from co-ordination facts in relation to sentences such as the following:

(306) We didn't know [*he had resigned*] or [**that he had been accused of corruption**]

In (306), the italicised bare clause has been co-ordinated with a bold-face clause which is clearly a CP since it is introduced by the overt complementiser *that*. If we make the traditional assumption that only constituents of the same type can be co-ordinated (see section 19), it follows that the italicised clause *he had resigned* in (306) must be a CP headed by a null declarative complementiser because it has been co-ordinated with a bold-face clause headed by the overt declarative complementiser *that* – as shown in simplified form in (307) below:

(307) We didn't know [φ *he had resigned*] or [**that he had been accused of corruption**]

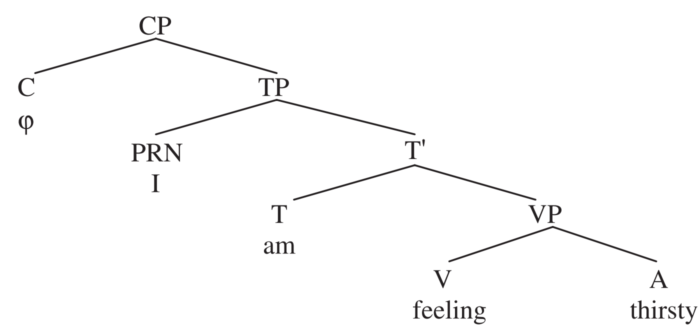
We can then say that (306) is grammatical because it involves the co-ordination of two declarative CPs (more precisely, two CPs headed by a declarative complementiser).

The null C analysis can be extended from finite embedded clauses to **main** (= **root** = **principal** = **independent**) **clauses** like (308) below:

(308) I am feeling thirsty

This sentence is declarative in force (by virtue of being a statement). If the force of a clause is marked by a complementiser introducing it, this suggests that such declarative main clauses are CPs headed by a null complementiser marking declarative force. And indeed, theoretical considerations require us to assume this, if Luigi Rizzi's suggestion that the set of UG principles wired into the Language Faculty include a **Uniformity Principle** is correct. This principle requires that all expressions of the same type belong to a uniform category (so that all clauses with the same force belong to the same category): since a declarative *that*-clause like that bracketed in (304b) is clearly a CP, it follows from the Uniformity Principle that all other declarative clauses (including declarative main clauses) must be CPs. This leads to the conclusion that a declarative main clause like that in (308) is a CP headed by a null declarative complementiser. This means that the relevant clause has the structure shown below:

(309)



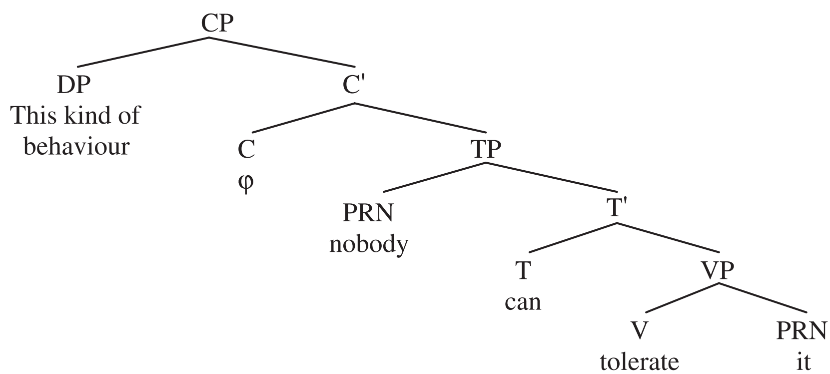
Under the CP analysis of main clauses in (309), the declarative force of the overall sentence is attributed to the fact that the sentence is a CP headed by a null declarative complementiser φ.

It might at first sight seem strange to posit that declarative sentences in English contain an 'empty' or 'silent' CP layer of structure with no overt head or specifier. However, this CP layer is not always empty – as can be illustrated in relation to the following sentence:

(310) *This kind of behaviour*, nobody can tolerate it

As we saw in section 18, the italicised expression in this type of sentence represents the *topic* of the sentence, and the clause following the comma is the *comment clause*. While the comment clause is a simple TP (comprising the pronoun *nobody*, the present tense T-auxiliary *can* and the verb phrase *tolerate it*), the topic *this kind of behaviour* appears to be positioned somewhere outside the comment clause. But where? If we suppose that clauses are CPs, we can say that the topic occupies the specifier position within CP, and hence that (310) has the structure (311) below:

(311)



It follows that the CP 'layer' of clause structure in declaratives is not always empty.

The more general conclusion to which our discussion thus far leads us is that all finite clauses (whether main clauses or complement clauses) are CPs headed by an (overt or null) complementiser which marks the force of the clause. But what about non-finite clauses? It seems clear that *for–to* infinitive clauses such as that bracketed in (312a) are CPs, since they are introduced by the infinitival complementiser *for* – but what about the type of (bracketed) infinitive complement clause found after verbs like *want* in sentences such as (312b)?

(312) a. I will arrange [*for* them to see a specialist]
b. She wanted [*him* to apologise]

At first sight, it might seem as if the bracketed complement clause in sentences like (312b) can't be a CP, since it isn't introduced by the infinitival complementiser *for*. However, it is interesting to note that the complement of *want* is indeed introduced by *for* when the infinitive complement is separated from the verb *want* in some way – e.g. when there is an intervening adverbial expression like *more than anything* as in (313a) below, or when the complement of *want* is in **focus position** in a **pseudo-cleft sentence** as in (313b):

(313) a. She wanted **more than anything** *for him to apologise*
b. What she really wanted was *for him to apologise*

(Pseudo-cleft sentences are sentences such as 'What John bought was *a car*', where the italicised expression is said to be **focused** and to occupy **focus** position within the sentence.) This makes it plausible to suggest that the complement of *want* in structures like (312b) is a CP headed by a null counterpart of the complementiser *for* (below symbolised as φ), so that the complement clause in (312b) has the structure shown in simplified form in (314) below:

(314) She wanted [$_{CP}$ [$_{C}$φ] [$_{TP}$ him [$_{T}$ to] apologise]]

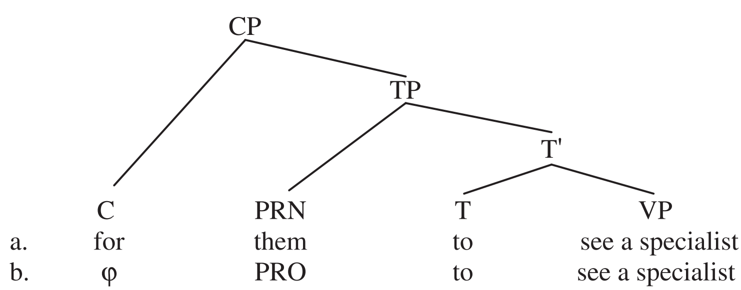
In standard varieties of English, the null variant of the complementiser *for* found in (314) is generally used only when the complementiser immediately follows the verb *want* (with *for* being used where the verb and complementiser are separated by intervening material). The more general conclusion which our discussion here leads us to is that infinitive clauses are CPs, headed either by the overt infinitival complementiser *for* or by a null infinitival complementiser.

Our conclusion that infinitive clauses are CPs has important implications for the syntax of **control** infinitive clauses with a null PRO subject like that bracketed in (315) below:

(315) I will arrange [PRO to see a specialist]

It means that control clauses like that bracketed above must be CPs headed by a null infinitival complementiser. This would mean that there is parallelism between the structure of a *for* infinitive clause like that bracketed in (312a) above, and that of a control infinitive clause like that bracketed in (315), in that they are both CPs and have a parallel internal structure, as shown in (316a, b) below (simplified by not showing the internal structure of the verb phrase *see a specialist*):

(316)



The two types of clause thus have essentially the same CP+TP+VP structure and differ only in that a *for* infinitive clause like (316a) contains an overt *for* complementiser and has an overt accusative subject like *them*, whereas a control infinitive clause like (316b) has a null φ complementiser and a null PRO subject.

Some evidence in support of claiming that a control clause with a null PRO subject is introduced by a null complementiser comes from co-ordination facts in relation to sentences such as the following:

(317) I will arrange [*to see a specialist*] and [**for my wife to see one at the same time**]

The fact that the italicised control infinitive can be conjoined with the bold-face CP headed by *for* suggests that control infinitives must be CPs (given the traditional assumption that only the same types of constituent can be conjoined).

Overall, the conclusion which our analysis leads us to is that all ordinary clauses (whether finite or infinitival) are CPs headed by an overt or null complementiser (C), with C serving to mark the force of a sentence in finite clauses, and serving to mark the clause as non-finite in infinitives.

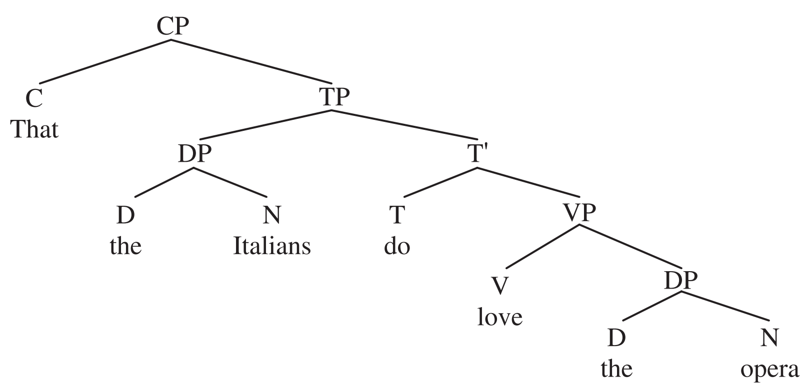
Empty determiners

The kind of reasoning we have used here to argue that all clauses are CPs can be extended to the analysis of nominal (i.e. noun-containing) expressions. In this connection, consider the italicised nominals in the two replies produced by speaker B in the dialogue below:

(318) SPEAKER A: What did you learn from your visit to Milan?
SPEAKER B: That *the Italians* do love *the opera*. (reply 1)
Italians love *opera*. (reply 2)

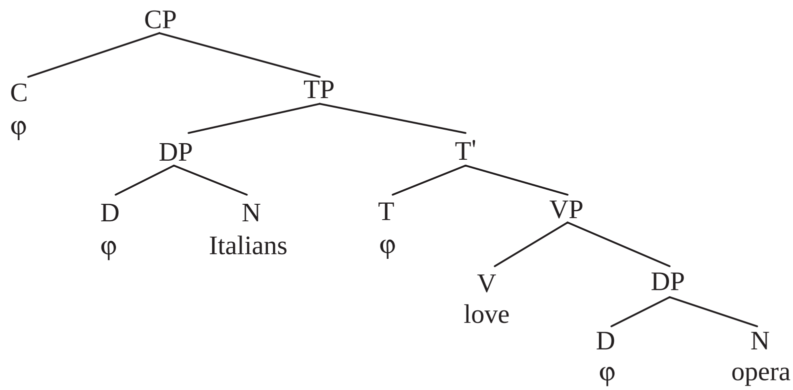
The italicised determinate (i.e. determiner-containing) nominals *the Italians* and *the opera* in the first reply given by speaker B in (318) comprise a determiner (D) *the* and a following noun (N) *Italians*/*opera*, and so can be analysed as **determiner phrases** (**DPs**). This means that the first reply produced by speaker B will have the structure in (319):

(319)



But what of the structure of the indeterminate (i.e. determinerless) nominals *Italians* and *opera* in the second reply produced by speaker B in (318)? In order to maximise the structural symmetry between determinate and indeterminate nominals, we shall suppose that just as clauses which contain no overt complementiser or T constituent contain a covert one, so too indeterminate nominals are DPs and differ from determinate nominals only in that they are headed by a null determiner (symbolised below as φ). If this is so, speaker B's second reply in (318) will have the structure (320):

(320)



Now, (320) is identical to (319), except that the head C position of CP is filled by *that* in (319) but by a null C in (320), the head T position of TP is filled by *do* in (319) but by a null T in (320), and the head D position of the DPs is filled by *the* in (319) but by a null D in (320).

There is evidence to support the postulation of covert determiners which goes beyond a desire to maximise structural symmetry. If English does indeed have a null determiner, we'd expect it to have much the same semantic properties as overt determiners (e.g. quantifying determiners such as *all* or *some*). In this connection, consider the interpretation of the italicised indeterminate nominals in sentences such as (321):

(321)	a.	*Eggs* are fattening	c.	I had *eggs* for breakfast
	b.	*Bacon* is fattening	d.	I had *bacon* for breakfast

The nouns *eggs* and *bacon* in (321a, b) have a **generic** interpretation and hence are interpreted as meaning 'eggs/bacon in general'. By contrast, in (321c, d) they have a **partitive** interpretation, roughly paraphrasable as '*some* eggs/bacon'. If we say that indeterminate nominals are DPs headed by a null generic/partitive determiner φ, we can say that the semantic properties of φ determine that bare nominals will be interpreted as generically or partitively quantified.

Moreover, just like some overt determiners, the null determiner φ can be used to quantify only specific types of nominal expression. For example, as indicated by (322), the overt determiner *enough* can be used to quantify a non-count noun like *machinery* or a plural count noun like *machines*, but not a singular count noun like *machine*:

(322) We don't have [*enough* machinery/machines/*machine]

(*Machine* is a **count noun** in that we can say *one machine* and *two machines*; but *machinery* is a **non-count noun** in that we can't say **one machinery* or **two machineries*.) We can therefore say that *enough* can only be used to quantify a *non-individual* noun expression (i.e. an expression headed by a noun which is not a singular count noun). Significantly, the hypothesised null determiner φ has precisely the same quantificational properties as *enough* and can be used to quantify a non-count noun like *machinery* or a plural count noun like *machines*, but not a singular count noun like *machine*, as we see from (323):

(323) Never trust [φ machinery/machines/*machine]

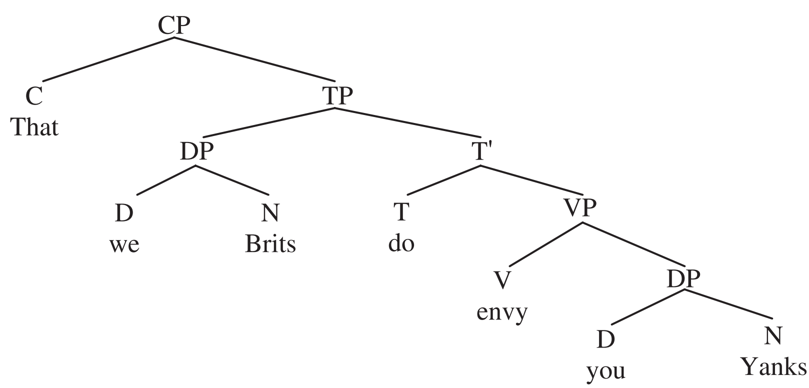
The fact that the covert determiner φ has the same quantificational properties as overt determiners such as *enough* increases the plausibility of a null determiner analysis for indeterminate nominals.

If we conclude that nominal expressions are DPs headed by an overt or covert D, an obvious question to ask is how we deal with so-called 'pronouns'. In this connection, compare the italicised expressions in speaker B's two replies in (324) below:

(324) SPEAKER A: What did our president tell your prime minister?
SPEAKER B: That *we Brits* do envy *you Yanks*. (reply 1)
We envy *you*. (reply 2)

The expressions *we Brits* and *you Yanks* can plausibly be analysed as DPs comprising a D (*we*/*you*) and a noun complement (*Brits*/*Yanks*). Thus, speaker B's first reply in (324) will have the structure (325):

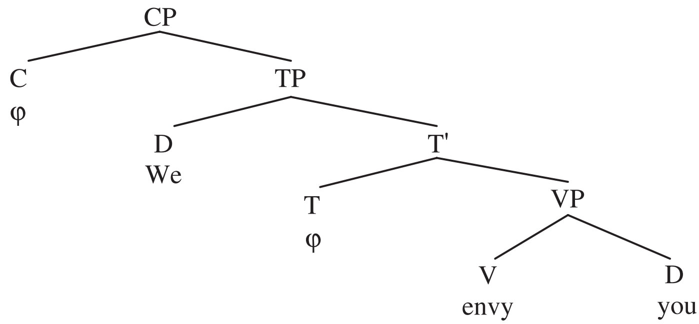
(325)



But what is the structure of the second reply given by speaker B in (324)?

In structures such as *we Brits* and *you Yanks* in (325), the pronouns *we* and *you* function as determiners which take nouns (*Brits* and *Yanks*) as their complements. Simple pronouns such as *we* and *you* in reply 2 in (324) can therefore be plausibly analysed as determiners used without any noun complement. Thus, our earlier category PRN is systematically subsumed under D. With this analysis, reply 2 in (324) has the structure (326):

(326)



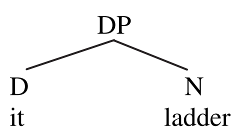
Just as the analysis in (326) enables us to provide a unitary account of the syntax of clauses (as projections of head C, T and V constituents), so too it enables us to provide a unitary account of the syntax of noun and pronoun expressions as projections of a head D constituent (i.e. as D-expressions). In structures such as (325), the determiner *we* is used *prenominally* (with a following noun as its complement), whereas in structures such as (326), it is used *pronominally* (i.e. on its own without any following noun complement). The determiner analysis of pronouns also provides us with a straightforward account of the fact that most determiners can be used either prenominally (*These books are interesting*, *Each child has a desk*) or pronominally (*These are interesting*, *Each has a desk*).

Another advantage of the determiner analysis of pronouns is that it might help us to understand why two-year-old children sometimes produce structures such as that observed by David McNeill in (327):

(327) Get it ladder!

Suppose the child producing (327) analyses *it* as a determiner and wrongly assumes that (like most determiners) it can be used not only pronominally, but also prenominally; this would mean that *it ladder* in (327) is a DP for such a child with the structure in (328):

(328)



The analysis in (328) assumes that the child uses the definite pronoun *it* in (327) in much the same way as an adult would use the definite prenominal determiner *the*.

However, the analysis in (328) raises the interesting question of why *it* can be used pronominally but not prenominally in adult English, and conversely why *the* can be used prenominally but not pronominally – in other words, how we should account for the contrasts in (329):

(329) a. I walked under *the ladder* b. *I walked under *it ladder*
c. I walked under *it* d. *I walked under *the*

The answer lies in idiosyncratic properties of individual words. Although it is a property of most determiners that they can be used with or without a following noun (or noun phrase) complement, a determiner such as *the* has the idiosyncratic property that it requires a complement headed by a noun; and conversely, a determiner such as *it* has the idiosyncratic property that it doesn't allow a complement of any kind. So, what's wrong with (329b) is that the lexical entry for the word *it* specifies that it can only be used pronominally (i.e. without a noun or noun phrase complement), and what's wrong with (329d) is that the lexical entry for the word *the* specifies that it can only be used prenominally (and so must be followed by a noun or noun phrase complement).

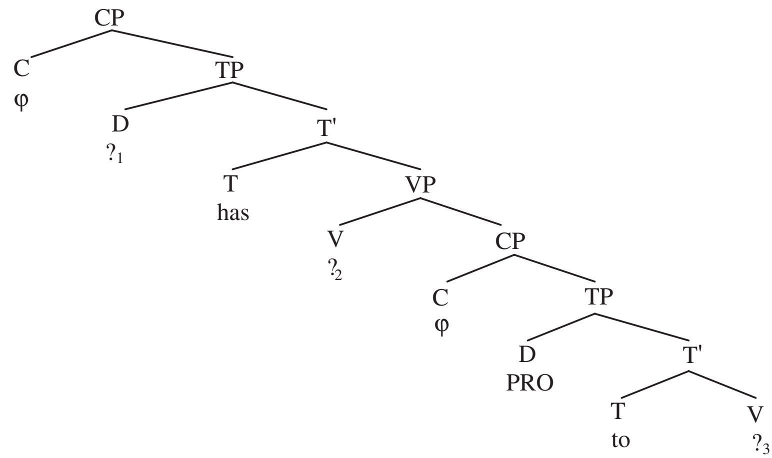
The assumption that pronouns are determiners leads us towards the goal of attaining a unitary characterisation of the syntax of nominal and pronominal expressions as projections of a head determiner constituent: determinate nominals are DPs headed by an overt determiner; indeterminate nominals are DPs headed by a null determiner; pronouns are determiners used without a complement (and, by extension, the null pronoun *PRO* is also a null determiner used without a complement). We can then conclude that all nominal and pronominal expressions are projections of an (overt or covert) D constituent, and so we arrive at a uniform characterisation of nominals as **D-projections** (in much the same way as we earlier analysed all clauses as **C-projections**).

The general approach which we have adopted here should now be clear. We assume that our theory of grammar (UG) provides us with a 'template' for the structure of particular types of expression. So, clauses are universally C-projections, and noun and pronoun expressions are universally D-projections. Clauses which appear to lack a C constituent have a *covert* C; nominals which appear to lack a D constituent have a *covert* D. As will become clearer as our exposition unfolds, *empty categories* play a central role in the theory of syntax which we are outlining here (***exercises 1*** and ***2***).

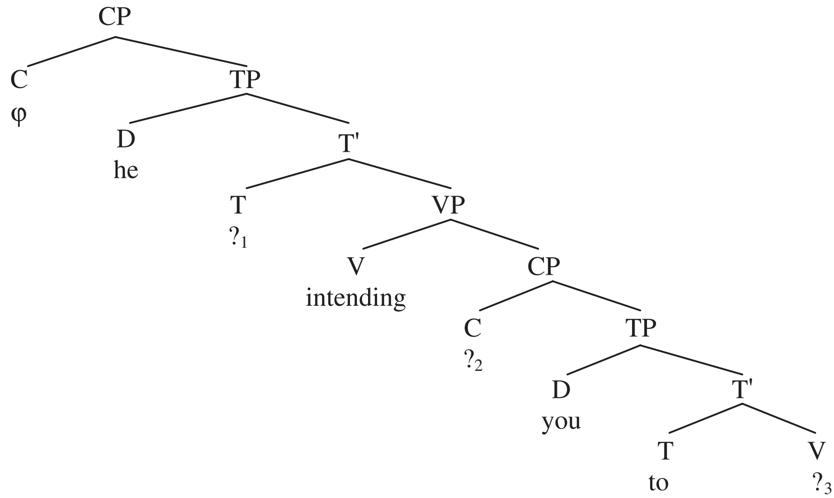
Exercises

1. Below are a number of tree diagrams representing a variety of different types of English sentence structure. For each of the numbered positions designated by a question mark (?) in each structure, say what kind of item (overt or covert) can occupy the position, and what determines the choice of item occupying each position.

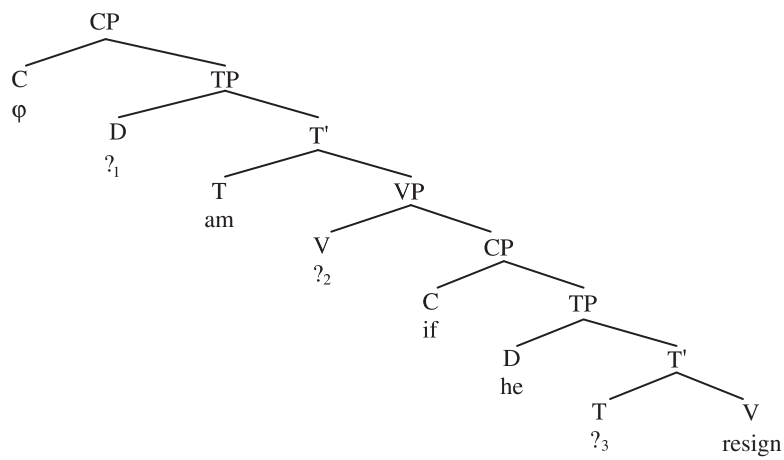
(a)


CP
C
φ
TP
D
?1
T'
T
has
VP
V
?2
CP
C
φ
TP
D
PRO
T'
T
to
V
?3

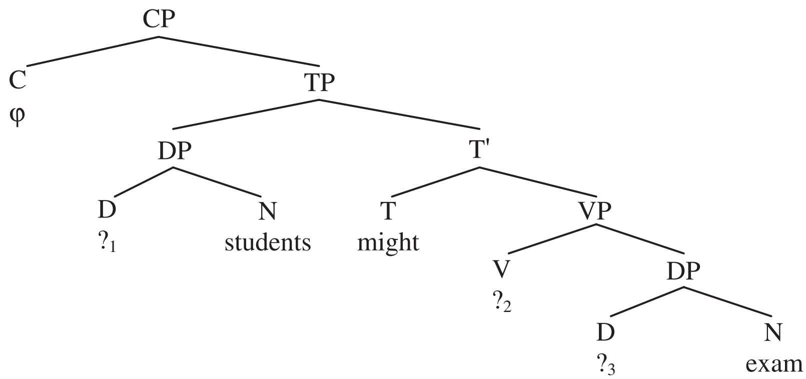
(b)


CP
C
φ
TP
D
he
T'
T
?1
VP
V
intending
CP
C
?2
TP
D
you
T'
T
to
V
?3

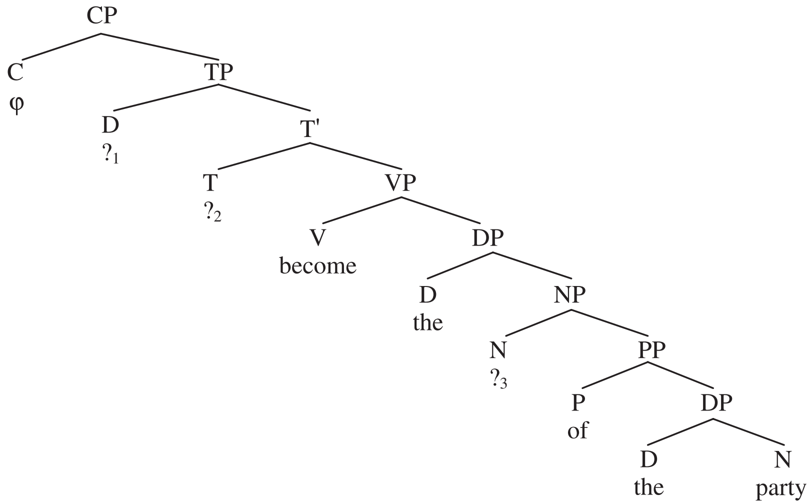
(c)


CP
C
φ
TP
D
?1
T'
T
am
VP
V
?2
CP
C
if
TP
D
he
T'
T
?3
V
resign

(d)



(e)



Model answer for (1a)

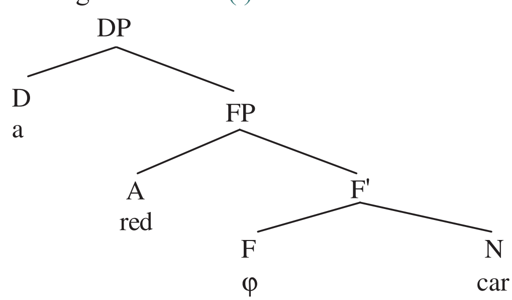
Since a finite T constituent like the third person singular present tense T-auxiliary *has* agrees with – and assigns nominative case to – its subject/specifier, position 1 must be occupied by a third person singular nominative D pronoun like *he/she/it*. Since the perfect auxiliary *has* requires a VP complement headed by a verb in the perfect participle form, position 2 must be filled by a perfect participle form of a verb: and since the verb in question has a control infinitive complement with a PRO subject, the verb occupying position 2 must be a control verb (i.e. one which allows an infinitive complement with a PRO subject); the verb form *promised* would satisfy both criteria (by virtue of being the perfect participle form of the control verb PROMISE. Since infinitival *to* requires a complement with a verb in the infinitive form, position 3 much be occupied by a verb in the infinitive form – and, moreover, by a verb which can be used without any complement of its own. Such a verb form would be *co-operate*, for example. So, one kind of sentence which would have the structure (1a) is *He has promised to co-operate*.

2. Analyse the syntax of the following sentences, drawing a separate tree diagram to represent the structure of each sentence, and discussing the rationale for any empty categories which you posit:
(a) He is hoping to win the race
(b) She was intending to excuse herself
(c) I would prefer you to keep quiet
(d) They have realised they have an infection
(e) I doubt if she understands the situation
(f) Students feel teachers underestimate them
(g) The president made a promise to increase pensions
(h) Sensible people know power corrupts weak politicians

Hints

Remember the core assumptions made in the section, namely that (i) all clauses are CP+TP+VP structures containing an overt or covert C constituent, an overt or covert T constituent and an overt or covert subject (in spec-TP), and (ii) that all noun expressions are DPs containing an overt or covert D constituent, and personal pronouns like *I/you/he* etc. are pronominal D constituents (or D-pronouns, if you prefer). In relation to (2d), consider why *they have* can contract to *they've* in the first clause, but not in the second. In relation to (2h), consider the possibility (suggested by Memo Cinque, but not discussed in the main text) that an adjective which modifies a following noun serves as the specifier of a null functional head F which takes the noun as its complement, so that an expression like *a red car* has a structure along the lines of (i) below:

(i)

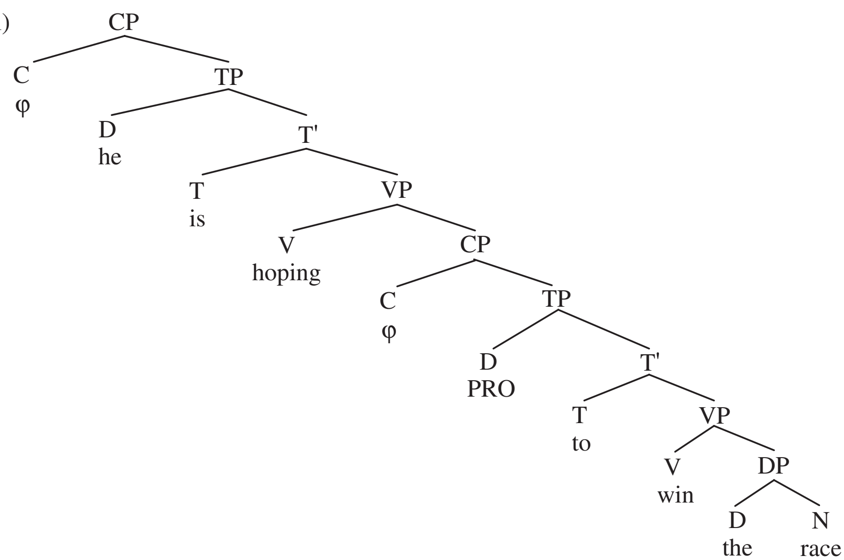


One reason for assuming that an adjectival expression modifying a following noun is the specifier rather than the head of the FP containing it is the fact that the adjectival expression can be a phrase (as in 'an *extremely fast* car' or 'a *better than average* car': the significance of this is that a phrase can occupy a specifier but not a head position.

Model answer for (2a)

The determiner *the* merges with the noun *race* to form the DP *the race*. This is merged with the verb *win* to form the VP *win the race*. This VP is in turn merged with the infinitival T constituent *to*, forming the T′ *to win the race*. Given the assumption made in the main text that seemingly subjectless clauses have a null pronoun subject (=PRO), this T′ is merged with a PRO subject to form the TP *PRO to win the race*. Given the further assumption that all clauses are CPs and that clauses not introduced by an overt complementiser are introduced by a covert one, the resulting TP will be merged with a covert complementiser φ to form the CP *φ PRO to win the race*. This CP is then merged with the verb *hoping* to form the VP *hoping φ PRO to win the race*. The resulting VP is in turn merged with the present tense T constituent *is* to form the T′ *is hoping φ PRO to win the race*. This T′ is then merged with its subject (the D-pronoun *he*) to form the TP *he is hoping φ PRO to win the race*. On the assumption that all sentences are CPs headed by an overt or null force-indicating C, this TP will subsequently be merged with a null C constituent to form the CP shown in (i) below:

(i)



Evidence that the complement clause *to win the race* contains a null complementiser and a null PRO subject comes from co-coordination facts in relation to sentences such as:

(ii) He is hoping [**to win the race**] and [*for you to see him win*]

Since the italicised clause in (ii) contains the overt complementiser *for* and the overt subject pronoun *you*, the assumption that only like constituents can be co-ordinated would imply that the bold-face clause must contain a null complementiser and a null subject. The assumption that the main clause is also a CP headed by a null complementiser is motivated in part by the observation that the force of a finite clause is indicated by the C constituent introducing it: hence, the null C at the top of the tree in (i) marks the main clause as being declarative in force. If the main clause is indeed a CP, we might expect its specifier position to be able to be filled by a topic expression. This seems to be so, as we can see from a sentence like the following (where additional material is added to make the sentence more plausible):

(iii) *The race round the lakes*, he is definitely hoping to win it

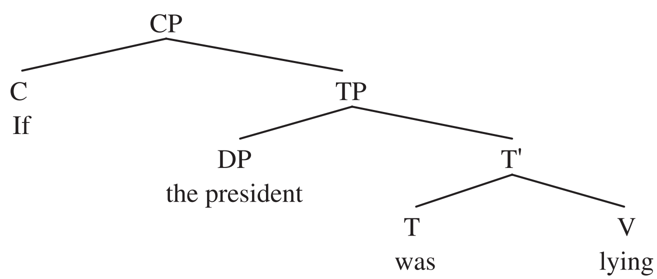
21 Movement

In the previous section, we argued that clauses typically have a CP+TP+VP structure, with the head C of CP marking the force of a clause (e.g. whether it is interrogative). From this perspective, a question like that produced by speaker B in the dialogue below seems to have a relatively straightforward structure:

(330) SPEAKER A: What did he want to know?
SPEAKER B: *If the president was lying*.

Given what we have said so far, we can assume that the (past tense) T-auxiliary *was* merges with the verb *lying* to form the T′ *was lying*; and the resulting T′ in turn merges with the DP *the president* to form the TP *the president was lying*. This TP in turn is merged with the complementiser *if* to form the complementiser phrase (CP) *if the president was lying*. This CP has the structure shown below (simplified by not showing the internal structure of the DP *the president*, since this is irrelevant to the point under discussion):

(331)



The complementiser *if* here serves the function of marking the sentence produced by speaker B as having the force of a question.

Given the analysis in (331), the overall clause has the status of a CP which comprises a head C *if* and a TP complement *the president was lying*. Having noted that questions (and indeed other types of clause) are typically CPs, we are now in a position to introduce a further core syntactic operation (in addition to the *merger* and *agreement* operations discussed in section 19). This is **movement**, and there are several types.

Head movement

Let's begin by comparing the clause *If the president was lying* produced by speaker B in (330) above with the question used by speaker B in (332):

(332) SPEAKER A: What's the question that everyone's asking?
SPEAKER B: *Was the president lying?*

In the question in (332), the auxiliary *was* is traditionally said to have been *inverted* with respect to the subject *the president*. What this means is that although auxiliaries are normally positioned after subjects (e.g. in statements such as *The president was lying*, where the auxiliary *was* is positioned after the subject *the president*), in questions like that in (332), an auxiliary can undergo inversion and *move* into some position in front of the subject. But what position does an inverted auxiliary move into?

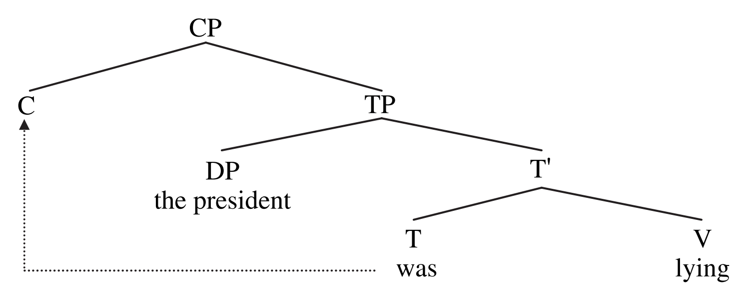
Since the inverted auxiliary *was* appears to occupy the same pre-subject position in B's utterance in (332) that the complementiser *if* occupies in (331), a natural suggestion to make is that the inverted auxiliary actually moves into the head C position of CP. If this is so, we'd expect to find that an inverted auxiliary and a complementiser are mutually exclusive (on the assumption that only one word can occupy a given head word position like C): in other words, if both complementisers and inverted auxiliaries occupy the head C position of CP, we'd expect to find that a clause can be introduced by *either* a complementiser *or* an inverted auxiliary, but not by the two together. In the event, this prediction turns out to be entirely correct, as we see from the ungrammaticality of speaker B's reply in (333):

(333) SPEAKER A: What did the journalist from the *Daily Dirge* ask you?
SPEAKER B: **If was* the president lying.

The fact that no clause can contain both a complementiser and an inverted auxiliary provides us with strong evidence that inverted auxiliaries occupy the same structural position as complementisers – i.e. that both occupy the head C position in CP.

But how can it be that an auxiliary like *was* (which normally occupies the head T position within TP) comes to be positioned in the head C position of CP? The answer is that auxiliaries move out of their normal post-subject position into pre-subject position in structures like (332), by an operation often referred to as *inversion*. In terms of the framework being used here, this means that an inverted auxiliary moves from the head T position in TP into the head C position in CP, in the manner indicated by the dotted line in (334):

(334)



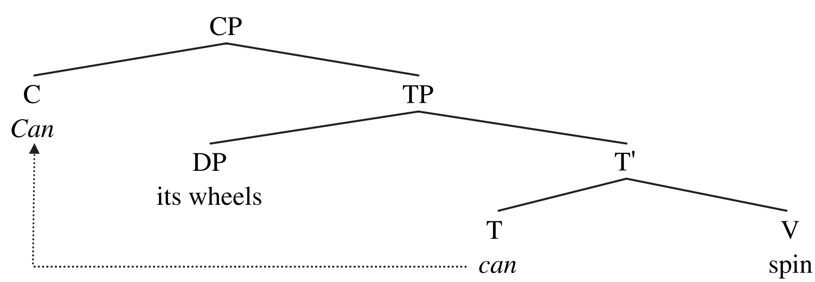
This type of inversion operation involves movement of a word from the head position in one phrase into the head position in another phrase (in this case, from the head T position of TP into the head C position of CP), and so is known as **head movement**.

An important question raised by the T-to-C movement analysis of inversion is what happens to the head T position of TP once it is vacated by movement of the inverted auxiliary into C. What has been argued in work since the 1990s is that when a constituent moves from one position in a structure to another, the position out of which it moves remains intact and is filled by a silent **copy** of the moved constituent (sometimes referred to as a **trace** of the moved constituent, abbreviated to *t*). There is interesting *developmental* evidence in support of the claim that a constituent leaves behind an empty trace copy of itself when it moves to a new position. Two-year-old children often produce *auxiliary copying* structures such as the following (produced by a boy Sam at age two years, nine months, whose father, Ian Crookston, kindly provided the data):

(335) a. *Can* its wheels *can* spin?
b. *Did* the kitchen light *did* flash?
c. *Is* the steam *is* hot?
d. *Was* that *was* Anna?

What is going on here? The answer appears to be that when Sam inverts the italicised auxiliary and thereby moves it from T to C, he leaves behind an *overt* copy of the auxiliary in T, so that the auxiliary appears in both T and C. This means that the derivation (i.e. formation) of a sentence like (335a) involves the kind of head movement operation indicated by the arrow in (336) (the relevant structure being simplified for expository purposes by not showing the internal structure of the DP *its wheels*):

(336)

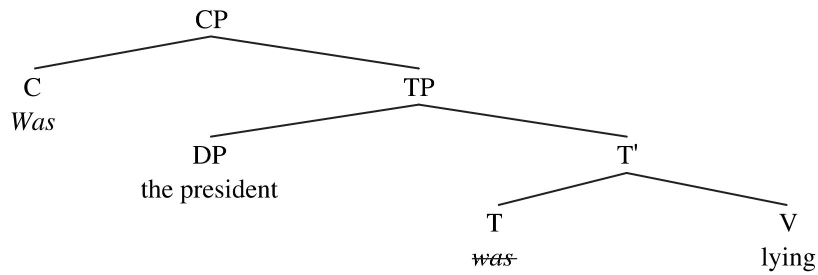


If this analysis is correct, child sentences such as (335) (which have also been reported from other children) lend plausibility to the claim that moved constituents leave behind copies of themselves in the positions out of which they move.

But what are we to say about adult sentences like *Was the president lying?* produced by speaker B in (332), where the inverted auxiliary *was* moves from T to

C without leaving an overt copy of itself behind? The answer suggested in recent work in syntax is that movement universally involves a copying operation, but that the copy left behind in adult grammars is 'silent'. If so, our adult question will have the structure shown in (337):

(337)



where ~~strikethrough~~ is used to indicate a silent copy of a moved constituent. Saying that the T position in (337) is occupied by the silent copy ~~*was*~~ provides us with a way of indicating that the T position 'belongs to' (i.e. was formerly occupied by) *was* and so cannot be filled by another auxiliary (e.g. we can't insert *is* in T in (337), as we see from the ungrammaticality of **Was the president* ***is*** *lying?*).

There are a number of considerations which lend support to the idea that (in adult grammars) a constituent leaves behind a silent trace copy of itself when it moves. One such consideration is theoretical in nature. We have supposed up to now that all phrases and clauses are projections of a head word category. If we are to retain this principle, TP in (337) must be headed by a T constituent: and if there is no overt T constituent in (337), there must be a covert one. The silent copy of the moved auxiliary fulfils this requirement.

Descriptive considerations relating to cliticisation lead us to the same conclusion. In this connection, note that *have* can cliticise to *they* in sentences such as (338) below, but not in (339):

(338) a. *They have* gone
b. *They've* gone

(339) a. Will *they have* gone?
b. *Will *they've* gone?

Why should cliticisation of *have* onto *they* be possible in (338) but not in (339)? We can give a straightforward answer to this question if we suppose that movement of *will* into C in (339) leaves a silent copy behind in the T position out of which *will* moves, i.e. in the position marked by ~~*will*~~ in the structure (340):

(340) [$_{\text{CP}}$ [$_{\text{C}}$ *Will*] [$_{\text{TP}}$ they [$_{\text{T}}$ ~~*will*~~] have gone]]?

We can then say that the presence of the intervening silent copy ~~*will*~~ in T prevents *have* from cliticising onto *they* in inversion structures such as (340).

Operator movement

So far, we have assumed that clauses are CPs, and that a CP comprises a head C constituent (filled by an overt or null complementiser in some structures and by a preposed auxiliary in others) and a TP complement. However, one question which such an analysis raises is where the bold-face pre-auxiliary constituents are positioned in structures such as (341):

(341) a. **What languages** *can* you speak?
b. **No other colleague** *would* I trust

Each of the sentences in (341) contains an italicised inverted auxiliary (*can*/*would*) occupying the head C position of CP, preceded by a bold-face phrase of some kind (namely *what languages*/*no other colleague*). Each of the pre-auxiliary phrases contains a determiner which is said to have the semantic function of being an **operator**: thus, *what* is an *interrogative operator* (or *wh-operator*) and *no* is a *negative operator*. Expressions containing such operators are called *operator expressions*.

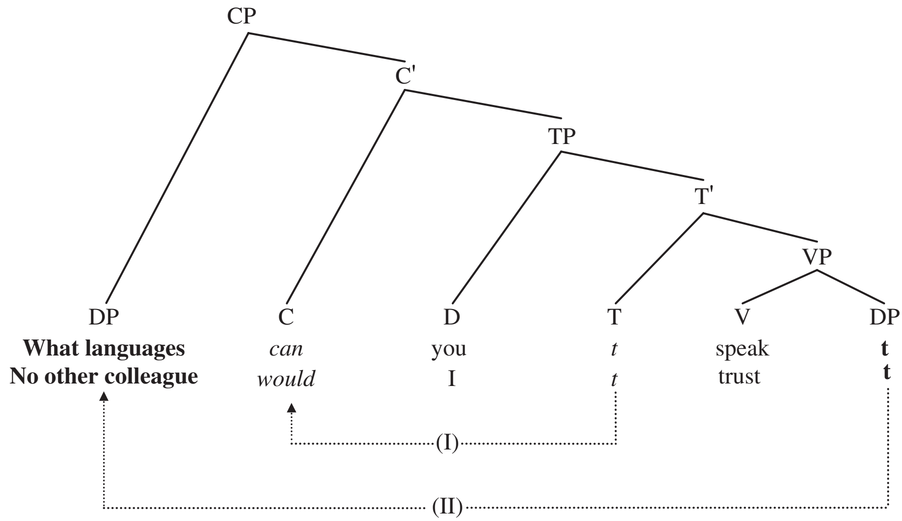
It seems clear that each of the operator expressions in (341), despite its position, functions as the *complement* of the verb at the end of the sentence. One piece of evidence leading to this conclusion is the fact that each of the examples in (341) has a paraphrase in which the operator expression occupies the canonical (i.e. typical) complement position after the relevant verb:

(342) a. You can speak *what languages*?
b. I would trust *no other colleague*

Structures like (342a) are sometimes referred to as *wh-in-situ* questions, since the wh-operator expression *what languages* does not get preposed but rather remains *in situ* (i.e. 'in place') in the canonical position associated with its grammatical function as complement of *speak*. Structures such as these are used primarily as *echo questions*, to echo and question something previously said by someone else (e.g. if a friend boasts 'I just met Elvis Presley', you could reply – with an air of incredulity – 'You just met *who*?'). Sentences such as those in (342) make it plausible to suppose that the operator phrases in (341) originate as complements of the relevant verbs, and subsequently get *moved* to the front of the overall sentence. But what position do they get moved into?

The answer is obviously that they are moved into some position preceding the inverted auxiliary. Now, since inverted auxiliaries occupy the head C position in CP, we might suppose that preposed operator phrases are moved into some pre-head position within CP. Given that *specifiers* are typically positioned before heads, an obvious suggestion to make is that preposed operator phrases occupy *the specifier position within CP* (abbreviated to *spec-CP*). If this is the case, then the derivation of the sentences in (341) will involve the movement operations arrowed below (where, in order to save space, the symbol *t* is used to denote a silent trace copy left behind by a moved constituent):

(343)



(We have assumed in (343) that *what/no* are interrogative/negative determiners, and hence that the phrases *what languages* and *no other colleagues* are DPs – though for simplicity, we do not show their internal structure.) Two different kinds of movement (indicated by the dotted lines) are involved in (343): movement (I) is movement of a *head* (the italicised auxiliary *can/would*) from T to C, and, as already discussed, this type of movement operation is referred to as head movement; movement (II) involves movement of an operator expression into the specifier position within CP, and this very different kind of movement operation is known as **operator movement** (or more specifically as **wh-movement** when it affects wh-expressions).

An assumption made in the analysis of operator movement in structures like (343) is that just as a moved head (e.g. an inverted auxiliary) leaves behind a silent trace copy of itself in the position out of which it moves, so too a moved operator expression leaves behind a trace copy at its *extraction site* (i.e. the position out of which it is extracted or moved). The bold trace (**t**) in (343) makes this explicit: it serves to mark that the DP position containing the trace 'belongs to' (i.e. was formerly occupied by) the preposed complement and so cannot be filled by any other constituent (hence the ungrammaticality of e.g. **What languages can you speak any Italian?*, where the DP *any Italian* illicitly occupies the DP position which belongs to the trace). Evidence in support of positing that a wh-phrase leaves behind a trace copy of itself when it moves comes from facts about *have*-cliticisation. The form *have* of the perfect auxiliary has the clitic variant *'ve* and can cliticise to an immediately preceding word which ends in a vowel or diphthong. Significantly, however, cliticisation is not possible in sentences such as (344a) below, as we see from the fact that the sequence *say have* cannot contract to *say've* in (344b) (and so isn't pronounced in the same way as *save*):

(344) a. Which students would you *say have* got most out of the course?
b. *Which students would you *say've* got most out of the course?

What prevents *have* from cliticising onto *say* here? Let's assume that prior to being moved to the front of the sentence by operator movement, the operator phrase *which students* is the subject of *have*, as in the echo question counterpart to (344a) in (345):

(345) You would say *which students* have got most out of the course?

If we also assume that when the phrase *which students* is fronted, it leaves behind a silent trace copy of itself (= *t*) in the position out of which it moves, then the structure of (344a) will be (346):

(346) *Which students* would you say *t* have got most out of the course?

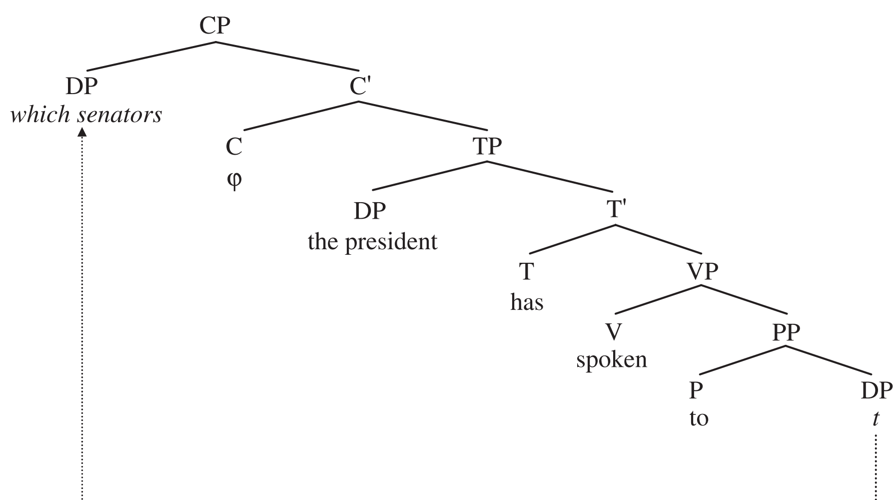
This being so, we can account for why *have* cannot cliticise onto *say*: it is not immediately adjacent to it, the two words being separated by the intervening trace – hence the ungrammaticality of (344b).

An interesting extension to our analysis of the syntax of operators is suggested by complement clause questions such as that bracketed in (347):

(347) I'm not sure [which senators the president has spoken to]

The bracketed interrogative (i.e. question-asking) clause in (347) is a complement clause since it serves as the complement of *sure*. In (347), the wh-operator expression *which senators* clearly originates as the complement of the preposition *to* (as we see from echo questions such as *The president has spoken to* ***which senators***?). But where does it move to? So far we have assumed that wh-operator expressions move into the specifier position within CP, to the left of C. But how can this be the case in (347), since the bracketed complement clause contains no overt C constituent? A natural answer to give to this question within a theory which posits that specific positions in a structure can be occupied by empty categories is to suppose that the head C position in the bracketed CP in (347) is filled by a covert complementiser φ, so that the bracketed clause in (347) is a CP derived as in (348):

(348)



There are a number of reasons for suggesting that the bracketed complement clause in (347) contains a covert complementiser. One is that this enables us to maintain a unitary characterisation of operator movement as involving the movement of an operator expression into a specifier position to the left of an (overt or covert) C constituent. Another is that such an analysis provides a straightforward account of why auxiliary inversion is not permitted in complement clause questions in (standard varieties of) English, as we see from the ungrammaticality of (349):

(349) *I'm not sure [which senators has the president spoken to]

Recall that in relation to the ungrammaticality of speaker B's utterance in (333) above, we suggested that the presence of an overt complementiser like *if* blocks auxiliary inversion: it seems a natural extension of this idea to suppose that the presence of the covert complementiser φ also prevents an auxiliary from moving from T to C. A third reason is that, as observed by Alison Henry for a variety of English spoken in Belfast, we can find complement clause questions which contain an overt complementiser, as in (350) (where the % sign indicates that this type of structure is found only in some varieties of English):

(350) %I'm not sure [which senators *that* the president has spoken to]

Since it is clear that in structures such as (350) the operator expression *which senators* is positioned to the left of the italicised complementiser *that*, it is reasonable to suppose that in structures like (347) *which senators* is positioned to the left of a covert complementiser φ.

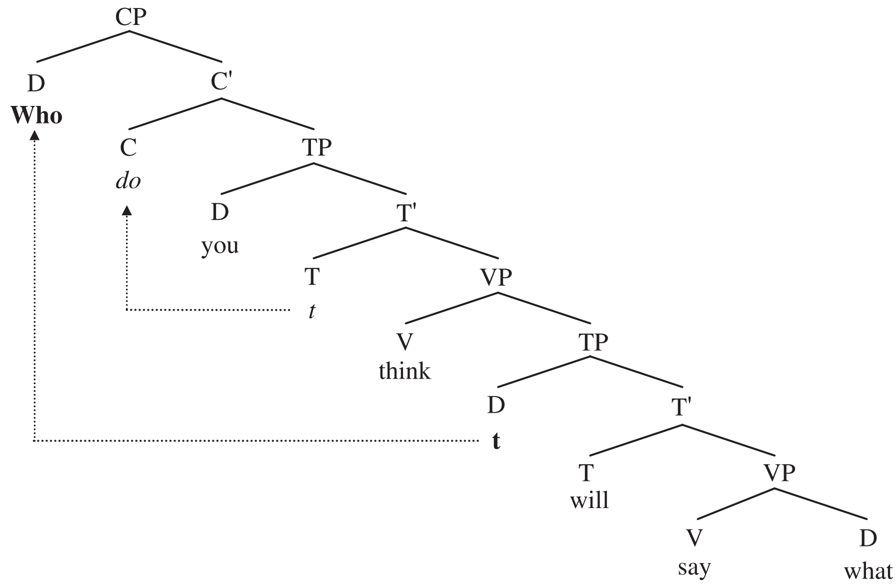
An interesting question to ask at this stage is *why* wh-operators should be moved to the front of the relevant interrogative clause in wh-questions. We can put this question rather differently by asking 'What is it that makes us interpret the bracketed clause in (350) as a question?' The answer clearly isn't the choice of complementiser heading the clause, since *that* isn't interrogative (hence the *that*-clause in *I didn't know* ***that he was cheating*** can't be interpreted as a question in Belfast English). So, it would seem that it is the presence of the interrogative phrase *which senators* in the specifier position of CP which ensures that the bracketed clause is interpreted as interrogative. Generalising, we can hypothesise that a clause is interpreted as a question in English if it has an interrogative specifier. We can then say that the wh-operator expression *which senators* in (348) moves into spec-CP in order to ensure that the clause containing it has an interrogative specifier and so is interpreted as a question.

But why should it be that in questions containing more than one wh-operator, such as (351) below, only one wh-operator can be preposed, not more than one?

(351) a. **Who** do you think will say *what*?
b. **What* **who** do you think will say?

The sentence in (351a) is derived as in (352):

(352)



Following assumptions made in recent work in syntax, let us suppose that our theory of grammar incorporates an **Economy Principle** along the lines of (353):

(353) **Economy Principle**
Minimise grammatical structure and movement operations (i.e. posit as little structure as possible, and move as few constituents as possible the shortest distance possible)

Obviously, (353) is consistent with general scientific guidelines which require us always to seek the simplest and most elegant theory which is consistent with the data we need to explain. Now, if a clause is to be interpreted as a question, it requires an interrogative specifier in spec-CP. It does not require *more than one* such interrogative specifier, and it follows from (353) that we therefore need to prepose only *one* of the two interrogative operators (*who* or *what*) in (352) in order to satisfy the requirement for CP to have an interrogative specifier: preposing both would be superfluous (in that it would involve two applications of wh-operator movement rather than one) and hence is ruled out by the Economy Principle. Furthermore, (353) requires that it is the nearest wh-operator expression which moves to spec-CP in a multiple wh-question (because 353 favours shorter movements over longer ones). Thus, we can account for why it is *who* and not *what* that moves to spec-CP in (352). It is clear from the schematic structures in (354) that *what* must move further than *who* to get to the spec-CP position:

(354) a. Who do you think t will say what?

b. *What do you think who will say t?

Yes–no questions

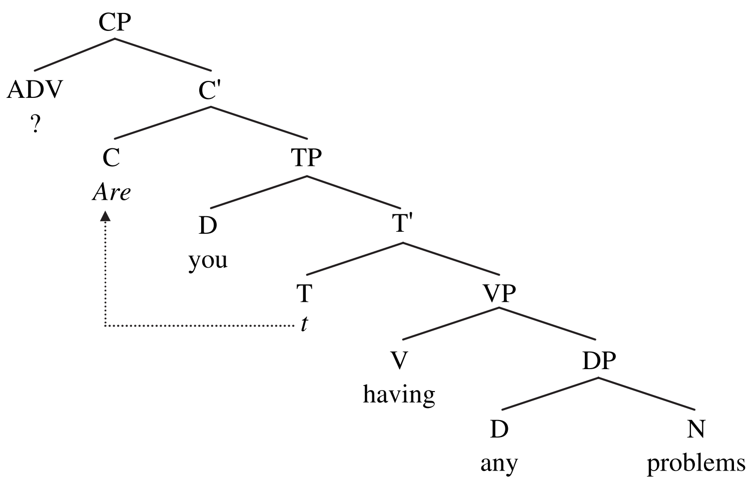
The assumption that questions are CPs which contain an interrogative specifier runs into apparent problems in relation to *yes–no questions* such as (355):

(355) Are you having any problems?

Even though (355) is obviously a question, it doesn't seem to contain an interrogative specifier of any kind. So, it would appear that our existing analysis wrongly predicts that sentences such as (355) can't be interpreted as questions. How can we overcome this problem?

One answer to this question, suggested by Jane Grimshaw and Ian Roberts in independent research, is to suppose that in yes–no questions, the specifier position within CP is filled by a silent yes–no question operator, which we might symbolise as **?** (since the question mark *?* is the conventional way of marking a sentence as interrogative). If we take *?* to be an adverb of some kind, this would mean that (355) has the derivation in (356):

(356)



We can then say that the overall structure is interpreted as a question by virtue of the fact that it contains the covert interrogative operator *?* in spec-CP. In this case, the operator has not moved to this position from elsewhere in the structure; rather, it appears here as a result of our earlier operation of merger (more specifically, by being directly merged with the following C′).

The suggestion that yes–no questions contain an abstract question operator is by no means as implausible at it might at first sight seem. It is noteworthy that yes–no questions in Shakespearean English could be introduced by the overt question operator *whether*, as in (357):

(357) *Whether* had you rather lead mine eyes, or eye your master's heels?
(Mrs Page, *Merry Wives of Windsor*, III. ii)

It seems likely that *whether* occupies spec-CP in (357). If we assume that yes–no questions in present-day English contain a covert counterpart of *whether* in spec-CP, we can argue that questions in present-day English have essentially the same structure as their counterparts in Shakespearean English, the only difference between the two varieties lying in whether the question operator they contain is overt or covert.

A further piece of evidence in support of positing a null interrogative operator in yes–no questions in present-day English comes from facts relating to a class of expressions generally known as **polarity items** (because they seem to have an inherent negative/interrogative polarity). As we see from examples like (358) below, the quantifying determiner *any* (in partitive uses where it means more or less the same as *some*) is generally restricted to occurring after a negative or interrogative expression:

(358) a. *Nobody* has any money b. *How* can any progress be made?
c. *He has any money d. *Any progress can't be made

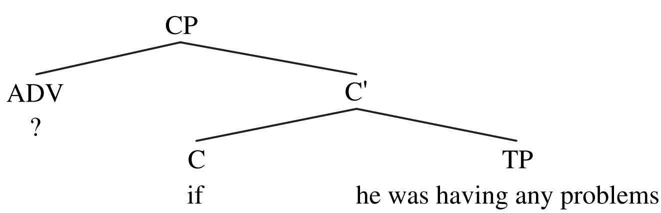
However, as we see from (355) above, the polarity item *any* can occur in a yes–no question such as *Are you having any problems?* How come? If we suppose that (355) has the derivation (356) and contains the null question operator *?* in spec-CP, we can immediately account for the grammaticality of (355) by observing that *any* occurs after the covert interrogative operator *?* in this structure. Thus, our generalisation about the distribution of the polarity item *any* is preserved.

We can extend the null operator analysis to complement clause yes–no questions introduced by *if*, such as that bracketed in (359):

(359) I asked [if he was having any problems]

It will then be the case that the bracketed clause in (359) is a CP which has the partial structure in (360) below (simplified by not showing the structure of the TP complement of *if*):

(360)



We can then say that the interrogative operator *?* licenses (i.e. allows us to have) the polarity item *any* which is contained in the following TP.

From a theoretical perspective, the main advantage of the null operator analysis of yes–no questions is that it enables us to attain a unitary analysis of the syntax of questions (as clauses which contain an overt or covert interrogative specifier), and a unitary analysis of polarity items (as items restricted to occurring after a negative or interrogative operator).

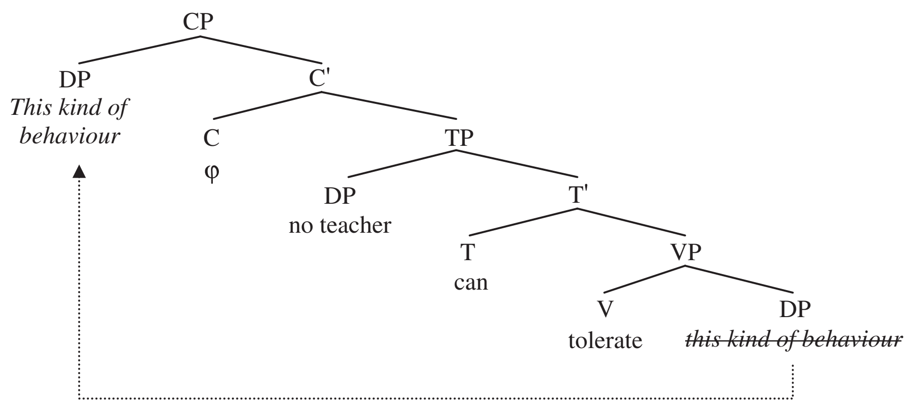
Other types of movement

Having discussed the syntax of head movement and operator movement at some length, we now turn to briefly consider two further types of movement operation. The first of these is topicalisation, and it can be illustrated by a sentence such as the following:

(361) *This kind of behaviour* no teacher can tolerate

Here, the italicised DP *this kind of behaviour* appears to function as the complement of the verb *tolerate*, and we might therefore suppose that it originates in postverbal position (compare *No teacher can tolerate* ***this kind of behaviour***). It is then *topicalised* by being moved into a more prominent position at the front of the clause. But where exactly is the italicised topic phrase moved to? In section 19, we argued that clauses are CPs, and that topic phrases occupy the specifier position within CP. Given this assumption, we can suppose that the italicised expression in (361) originates as the complement of the verb *tolerate* and subsequently gets moved into the specifier position within CP via a movement operation traditionally called **topicalisation**. This means that sentence (361) is derived in the manner shown in simplified form below:

(362)



The DP *this kind of behaviour* is the complement of the verb *tolerate* and so originates in the complement position within VP. A copy of this DP is then moved into the specifier position within CP by topicalisation. As in the case of other movement operations, only the moved copy is overtly spelled out (i.e. 'pronounced'), the original copy being given a null spellout and so being 'silent'. Note that topicalisation shares in common with operator movement the property that it moves a constituent into the specifier position within CP.

However, a very different kind of movement operation is found in the so-called **passive** construction. Traditional grammarians maintain that the italicised verb in a clause like that bracketed in (363a) is in an *active* form, whereas the italicised verb in the corresponding bracketed clause in the (b) sentence is in the *passive* form (see section 9):

(363) a. The press reported [that the thieves *stole* the jewels]
b. The press reported [that the jewels were *stolen* (by the thieves)]

There are four main properties which distinguish passive clauses from their active counterparts. One is that passive (though not active) clauses generally contain some form of the auxiliary *be* – see *were* in (363b). Another is that the verb in passive clauses is in the -*n* participle form (cf. *stolen*), known in this use as the *passive participle* form. A third is that passive clauses may (though need not) include a *by*-phrase, which contains an expression that seems to have much the same role as that of the subject in the corresponding active sentence: for example *the thieves* in the bracketed active clause in (363a) serves as the subject of *stole the jewels*, whereas in the passive clause in (363b) it serves as the complement of the preposition *by* (though in both cases it seems to have the semantic role of *agent* – i.e. the person perpetrating the relevant act; see section 23). The fourth difference is that the expression which serves as the *complement* of the active verb surfaces as the *subject* in the corresponding passive construction: for example, *the jewels* is the complement of *stole* in the active clause in (363a) but is the subject of *were stolen by the thieves* in the passive clause in (363b). Here, we focus on this fourth difference (setting the other three aside).

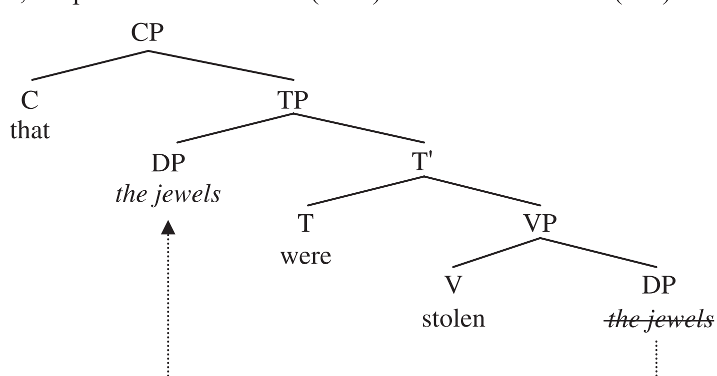
It has often been claimed that passive subjects 'originate' as the complements of their verbs. Alternations such as those in (364) below suggest that this is a plausible assumption:

(364) a. *The names of the directors* are listed below
b. Below are listed *the names of the directors*

In (364a), the italicised passive subject occupies the typical pre-auxiliary subject position, preceding *are*. But in the curious construction in (364b), the italicised expression is positioned after the verb *listed*, suggesting that it does indeed originate as the complement of this verb.

But if the subject of a passive clause originates as the complement of the relevant passive participle, how does it get from complement position into subject position? In the framework we are developing here, it is proposed that passive subjects are *moved* from complement position within VP into subject/specifier position within TP. Given this proposal, the passive *that*-clause in (363b) will be derived as in (365) below:

(365)



The analysis in (365) claims that the DP *the jewels* originates as the complement of the verb *stolen* and is then moved into spec-TP (i.e. the specifier position within TP) to become the subject (and specifier) of the passive auxiliary *were*. The type of movement operation indicated in (365) is traditionally referred to as **passivisation**: however, because the passivised DP moves from complement position to subject position (hence from one argument position to another; see section 18 for the notion of *argument*), this type of movement operation, which moves a constituent into the specifier position within TP where it becomes the subject of the relevant clause, is referred to more generally as **A-movement** (an abbreviation for **argument movement**). By extension of this terminology, movement operations like operator movement and topicalisation which move a constituent to the specifier in CP are said to involve **A-bar movement** – i.e. movement of a constituent to a non-argument position (more specifically, a non-subject specifier position at the beginning of the clause (the term *A-bar position* here meaning 'non-A position').

In this section, we have looked at a number of different types of movement operation. The first of these was a *head movement* operation which moves the head word of one phrase into a position where it becomes the head word of a higher phrase (as in auxiliary inversion moving an auxiliary from the head T position of TP into the head C position of CP). A second was *operator movement*, which moves a (negative or interrogative) operator expression into the specifier position within CP (in some cases requiring concomitant auxiliary inversion). A third was *topicalisation*, which moves an expression which is the topic of a sentence into the specifier position within CP (though without concomitant auxiliary inversion). The fourth operation we looked at was *passivisation*, which moves the complement of a passive participle into the specifier position within TP. Note that all the movement operations we have looked at involve movement to the *edge* (i.e. head or specifier position) of a functional projection: for example, auxiliary inversion involves movement to the head C position of CP; operator movement and topicalisation involve movement to the specifier position within CP; and passivisation involves movement to the specifier position within TP.

Our discussion of movement operations has interesting implications for the overall organisation of a grammar. It means that the **derivation** of a structure (i.e. the way in which a given structure is formed) involves not only a series of *merger* operations combining pairs of categories together to form larger and larger phrases and clauses and *agreement* operations responsible for determining the form of particular constituents, but also, possibly, one or more *movement* operations, moving words or phrases from one position in a structure to another. We shall say a little more about the general structure of a grammar from the perspective we are adopting in section 23 (***exercises 1*** and ***2***).

Exercises

1. Discuss the syntax of the following sentences, drawing a separate tree diagram to represent the structure of each of them (using arrows to show what has moved from where to where):

(a) i. Nobody will say anything
ii. Nothing will anybody say

(b) i. What can anyone do?
ii. Can anyone do anything?

(c) i. Who will he say was talking about what?
ii. *What will he say who was talking about?

(d) i. What you doing? (colloquial English)
ii. You doing anything? (colloquial English)

(e) i. No students were arrested
ii. Were any students arrested?

(f) i. Nobody thinks anyone will support the neofascists
ii. The neofascists, nobody thinks anyone will support

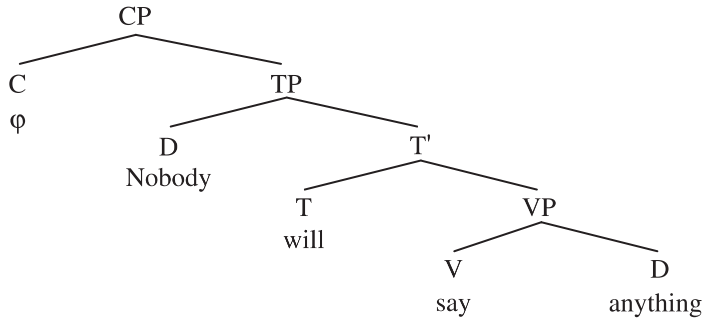
Hints

Remember the core assumptions in section 20, namely that (i) clauses are CP+TP+VP structures containing an overt or covert C constituent and an overt or covert T constituent, and (ii) that noun expressions are DPs (containing an overt or covert D constituent) and pronouns are Ds. Remember, too, the core assumptions of this section, namely (i) that auxiliary inversion moves an auxiliary from T to C, (ii) that yes–no questions contain a null question operator *?* in spec-CP, (iii) that operator movement and topicalisation move an affected constituent into the specifier position within CP, (iv) that passivisation moves an affected constituent into the specifier position within TP, and (v) that polarity items like *any/anyone/anything/anybody* must follow a negative or interrogative operator. In addition, in relation to the sentences in (d), consider the possibility that an inverted auxiliary in C can have a null spellout (pronunciation) in rapid colloquial speech styles if it is a weak form which can be reduced to the vowel schwa /ə/.

Model answer for (1a)

Sentence (i) in (1a) is derived as follows. The verb *say* merges with the D-pronoun *anything* to form the VP *say anything*. This VP is in turn merged with the T-auxiliary *will* to form the T′ *will say anything*. The resulting T′ is then merged with the D-pronoun *nobody* to form the TP *nobody will say anything*. This TP is subsequently merged with a null complementiser, so that the sentence has the following structure:

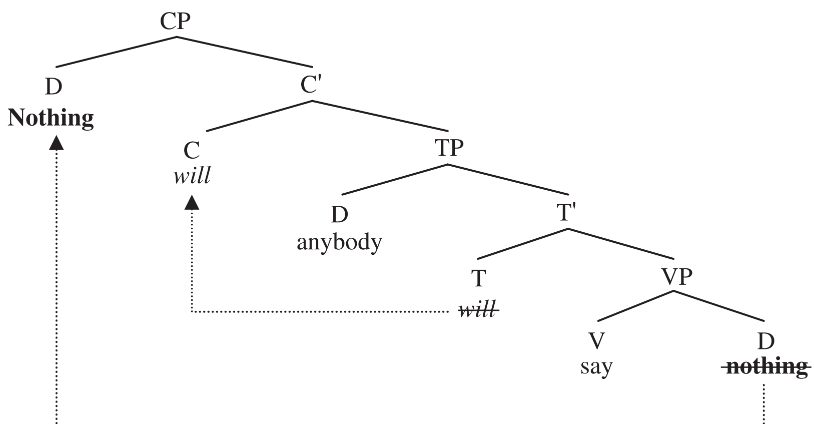
(i)



The null complementiser serves to mark the sentence as declarative in force. The polarity item *anything* is licensed by (i.e. allowed to occur in the structure by virtue of the presence of) the preceding negative pronoun *nobody*.

Sentence (ii) in (1a) has the following derivation. The verb *say* merges with the D-pronoun *nothing* to form the VP *say nothing*. This VP is in turn merged with the T-auxiliary *will* to form the T′ *will say nothing*. The resulting T′ is then merged with the D-pronoun *anybody* to form the TP *anybody will say nothing*. This TP is subsequently merged with a C constituent which attracts a copy of the auxiliary *will* to move from T to C (with the original copy of the auxiliary ultimately being silent), forming the C′ *will anybody ~~will~~ say nothing*. C also attracts a copy of the negative pronoun *nobody* to become its specifier (with the original copy of *nobody* ultimately being silent), so deriving the CP shown below (with arrows indicating movements which take place in the course of the derivation):

(ii)



The polarity item *anybody* is licensed by the preceding negative pronoun *nothing*.

2. In one variety of Belfast English described by Alison Henry, we find complement clause questions such as those italicised below:

(a) I don't know *which exams that he has failed*
(b) I don't know *which exams has he failed*
(c) *I don't know *which exams that has he failed*
(d) I don't know *which exams he has failed*
(e) They didn't know *if he had failed the exam*
(f) *They didn't know *if that he had failed the exam*
(g) *They didn't know *if had he failed the exam*
(h) They didn't know *had he failed the exam*

By contrast, in standard varieties of English only sentences like (d) and (e) are grammatical. Discuss the syntax of the italicised complement clauses, drawing a separate tree diagram to represent the structure of each of them. Try to pinpoint key differences between Belfast English and Standard English.

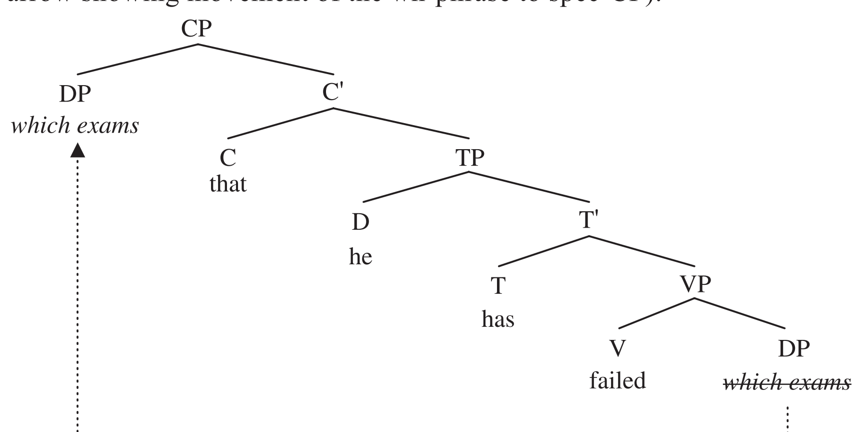
Hints

Assume that the relevant interrogative clauses are CPs whose head C position is filled by an overt or covert complementiser or preposed auxiliary, and whose specifier position is filled by an overt or covert interrogative operator expression.

Model answer for (2a)

Sentence (a) is derived as follows. The wh-determiner *which* is merged with the noun *exams* to form the DP *which exams*. This DP is then merged with the verb *failed* to form the VP *failed which exams*. This VP is in turn merged with the T-auxiliary *has* to form the T′ *has failed which exams*. The resulting T′ is merged with the D-pronoun *he* to form the TP *he has failed which exams*. This in turn is merged with the complementiser *that* to form the C-bar *that he has failed which exams*. A copy of the wh-phrase *which exams* is then moved to become the specifier of C, so forming the CP shown below (with the arrow showing movement of the wh-phrase to spec-CP):

(i)



As (i) shows, only the moved copy of the wh-phrase *which exams* is overtly pronounced, the original copy being silent. An interesting property of complement clause wh-questions in Belfast English is that they can be introduced by the overt complementiser *that*, whereas complement clause wh-questions in many other varieties of English can only be introduced by a null complementiser. The structure (i) is consistent with the claim made in the main text that a clause is interpreted as a question only if it has an interrogative specifier.

22 Syntactic variation

Up to this point, our discussion of syntax has focused largely on a variety of English which we will call Contemporary Standard English (CSE). But since we find numerous dimensions of variation in language (e.g. variation from one style to another, from one regional or social variety to another, from one period in the history of a language to another, and from one language to another), an important question to ask is what range of **syntactic variation** we find in the grammars of different languages or language varieties. Of course, having answered this question, further issues arise. For instance, if we are considering what are regarded as varieties of the same language, we might be concerned with understanding the social and contextual factors which determine when speakers use one variety or another. This is the sort of concern which our discussion of variation in parts I and II focused on, but here we shall adopt the less ambitious goal of seeing how our syntactic framework can come to terms with a small sample of within- and across-language variation.

Inversion in varieties of English

The most obvious manifestation of structural variation in syntax lies in word-order differences. If we suppose that the theory of Universal Grammar incorporated into the language faculty provides human beings with a genetically transmitted template for syntactic structure (so that clauses are universally CP+TP+VP structures, and nominal expressions are universally DPs), we should expect to find that word-order differences are attributable to differences in the movement operations which apply within a given type of structure. In the previous section, we have met one manifestation of auxiliary inversion in CSE questions. Looking at this movement in other varieties of English, we shall see that on the one hand, some such varieties allow auxiliary inversion in contexts where CSE doesn't, and conversely others don't allow inversion in contexts where CSE does.

Let's begin by looking at the following type of inversion structure (the examples are from the research of Peter Sells and his colleagues) found in African American Vernacular English (AAVE) but not in CSE:

(366) a. Can't nobody beat 'em
b. Didn't nobody see it
c. Ain't no white cop gonna put his hands on me

Why should we find inversion in negative structures like these in AAVE, but not CSE? A clue to the answer to this question may lie in a further difference between the two varieties illustrated by the CSE sentence (367a) and its AAVE counterpart (367b):

(367) a. I said nothing (CSE)
b. I didn't say nothin' (AAVE)

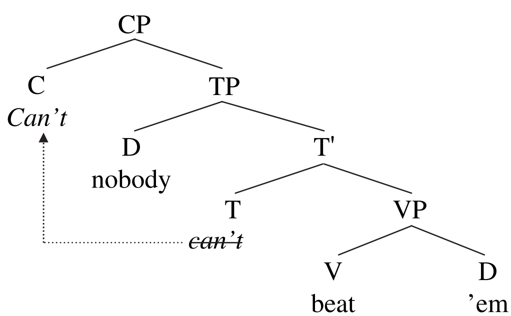
In the CSE structure, the sentence is negated by the single negative expression *nothing*; but in the AAVE structure, the sentence is negated by two negative expressions – *didn't* and *nothin'*. For obvious reasons, therefore, AAVE is popularly said to use *double negation* (or, in the jargon used by linguists, *negative concord*).

If we look at what's going on in AAVE more carefully, we'll see that the essence of negative concord in this variety seems to be a *constraint* (i.e. structural restriction) to the effect that negative expressions like *no/nothin'/nobody* in AAVE must be preceded by a negative auxiliary such as *can't/don't/didn't*, etc. This constraint obviously doesn't operate in CSE, since CSE doesn't use double negatives. In the light of this difference between the two varieties, consider what distinguishes the CSE sentence (368) from its AAVE counterpart (366a):

(368) Nobody can beat them

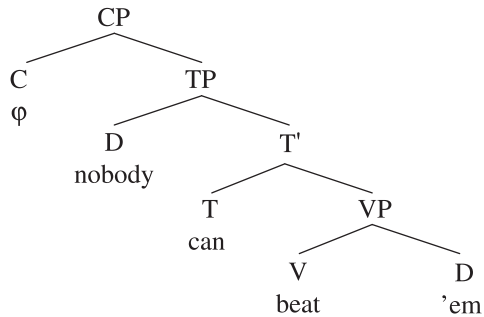
One important difference between the two is that CSE uses the positive auxiliary *can*, whereas AAVE uses its negative counterpart *can't*, this being attributable to the fact that AAVE has negative concord, but CSE does not. But a further difference is that the auxiliary *can't* undergoes inversion in the AAVE structure (366a), whereas *can* does not in the CSE structure (368). More specifically, *can't* in (366a) moves from T to C in the manner shown in (369):

(369)



But why should *can't* undergo inversion in this way? The answer is that *can't* moves from T into C in order to get into a position where it precedes the negative pronoun *nobody* and so can satisfy the constraint that a negative expression like *nobody* should be preceded by a negative auxiliary. Auxiliary inversion is used as a *last resort*, in order to satisfy this requirement. Since the requirement is not operative in CSE, there is no motivation for auxiliary inversion in CSE structures of this type. Instead, as is generally the case in declarative main clauses in CSE, the head C position of CP is filled by a null complementiser. Hence, the corresponding CSE sentence (368) has the structure (370):

(370)



The null complementiser in (370) serves to mark the sentence as declarative in force.

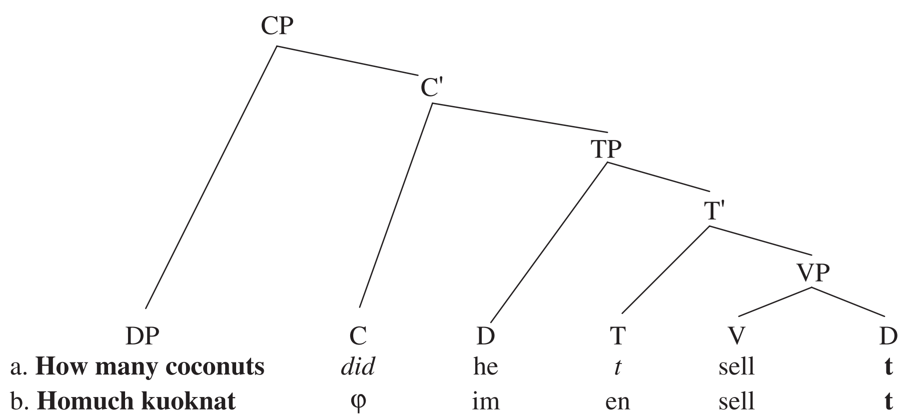
Our brief illustration of negative auxiliary inversion reveals an interesting syntactic difference between AAVE and CSE – namely that negative clauses like (366a) in AAVE are CPs in which the head C position of CP is filled by an inverted auxiliary, whereas their counterparts in CSE are CPs in which the head C position of CP is null. This underlines the point made at the beginning of this discussion, namely that word-order variation is often attributable to differences in movement operations.

So far, we have looked at a case where auxiliary inversion occurs in one variety of English (AAVE) in contexts where it is not allowed in CSE. Now let's look at the opposite kind of variation – namely, where inversion is required in CSE but not in some other variety. In this connection, consider the differences between a CSE question like (371a) below and its counterpart in Jamaican Vernacular English (JVE) in (371b), as reported in research by Beryl Bailey:

(371) a. How many coconuts did he sell?
b. Homuch kuoknat im en sel?
How-much coconut him did sell

The crucial syntactic difference between the two is that in CSE questions, the auxiliary *did* moves from its normal position in T into C, whereas in JVE questions, its counterpart *en* remains *in situ* in T and doesn't move to C. Thus, the two sentences (371a, b) have the respective structures (372a, b) below (to simplify discussion, we don't show the internal structure of the determiner phrases *how many coconuts/homuch kuoknat*):

(372)



In both varieties, the bold wh-operator expression **how many coconuts/homuch kuoknat** moves from complement position in VP into specifier position in CP (leaving behind a silent trace copy of itself, denoted as **t**). However, the two varieties differ in that in the CSE structure (372a), the auxiliary *did* moves from T to C, leaving behind a trace copy *t* in T, whereas in the JVE structure (372b), the corresponding auxiliary *en* remains *in situ* in T, so that the head C position of CP is occupied by a null complementiser φ.

The key question raised by the analysis in (372) is why auxiliaries should move from T to C in CSE questions but remain in T in JVE questions. Using an idea developed by Noam Chomsky in recent research, we might suggest that C in questions is **strong** in CSE but **weak** in JVE, and that a strong head position has to be filled by an overt item. Since main clauses in English can't be introduced by the overt complementisers *that/for/if* (which, as their very name suggests, are typically used to introduce complement clauses), the only way of filling a strong C position in a main clause is by movement of an auxiliary out of T into C as in (372a), thereby satisfying the requirement for the strong C in CSE questions to be filled. By contrast, in JVE, the head C position of CP is a weak position and so doesn't need to be filled by an overt item. Hence, in consequence of the Economy Principle from the previous section, which requires us to minimise movement operations and not move anything unless it is absolutely necessary, there is no auxiliary inversion in JVE questions (***exercise 1***).

Syntactic parameters of variation

What the analysis in (372) claims, then, is that interrogative clauses have the same CP+TP+VP structure in JVE and in CSE (and indeed universally), but that the two languages differ in respect of whether C is a *strong* or a *weak* head in the relevant type of structure. Generalising at this point, we might suggest that languages (and varieties) vary in their structure along a number of specific **parameters** (i.e. 'dimensions'), and that one such parameter of variation (which we might call the **Head Strength Parameter**) relates to whether a given type of functional head is strong or weak in a given language (in the case we are talking about here, the parameter relates to whether or not an interrogative C in a finite main clause is strong or weak, so we might refer to this more specifically as the **C Strength Parameter**). The assumption that a functional head like C is restricted to being *either* strong *or* weak (i.e. there is no third value it can take on) also suggests that parameters may be inherently **binary**, i.e. they have one of two values in any given language.

We can illustrate a related kind of **parametric variation** in relation to word-order differences between negative sentences containing *not* in CSE and Early Modern English (EME), as reflected in Shakespeare's plays written around the year 1600. In EME (as in CSE), clauses containing an auxiliary were typically negated by positioning *not* between the auxiliary and the verb (phrase) following it. The EME examples in (373) illustrate this:

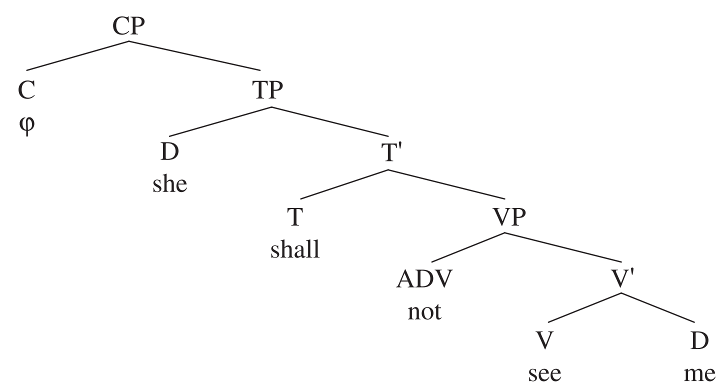
(373) a. She shall *not* see me (Falstaff, *Merry Wives of Windsor*, III. iii)
b. You may *not* deny it (Dumain, *Love's Labour's Lost*, V. ii)
c. I will *not* hear thy vain excuse (Duke, *Two Gentlemen of Verona*, III. i)

Not is traditionally categorised as a negative adverb (or negative particle): but what position does *not* occupy within the structure of clauses?

In order to try and help us answer this question, let's briefly look at the position occupied by *not* in the phrase produced by speaker B in the dialogue below:

(374) SPEAKER A: Is the library open every day of the week?
SPEAKER B: Only on weekdays, not at weekends.

Both of the phrases (*only on weekdays* and *not at weekends*) produced by speaker B are prepositional phrases, and both include a preposition (*on/at*) and its complement (*weekdays/weekends*). But both also include an adverb (*only/not*) which precedes the preposition+complement structure (*on weekdays/at weekends)*. Since specifiers precede head+complement structures, it therefore seems plausible to suppose that *only* and *not* in (374) are adverbs which serve as the specifiers for the relevant prepositional phrases. This being so, it seems equally plausible to suppose that *not* in clauses like those in (373) functions as the *specifier* of the verb phrases containing the expressions *see me*, *deny it*, and *hear thy vain excuse*. On this view, *not see me* in (373a) is a (negated) verb phrase which is formed by merging the verb *see* with its D-pronoun complement *me* to form the V′ *see me*, and then merging the resulting V′ with the negative adverb *not* to form the VP *not see me*. This VP is in turn merged with the T-auxiliary *shall* to form the T′ *shall not see me*, and this T′ is merged with the subject *she* to form the TP *she shall not see me*. This TP is in turn merged with a null complementiser marking the sentence as declarative, so forming the CP below:

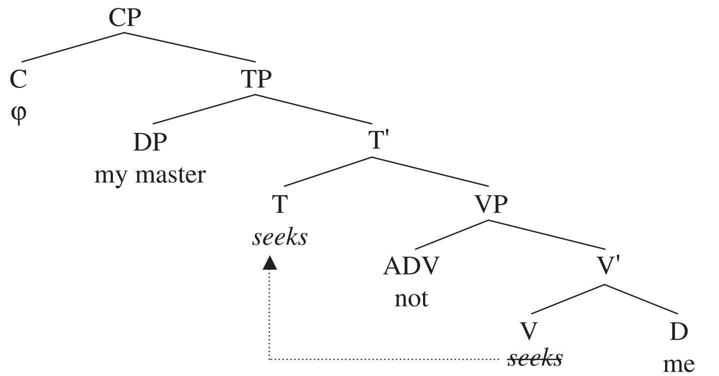
(375)


Now, what is particularly interesting about Shakespearean English is that in auxiliariless finite clauses, the (italicised) finite verb is positioned in front of *not*:

(376) a. My master *seeks* not me (Speed, *Two Gentlemen of Verona*, I. i)
b. I *care* not for her (Thurio, *Two Gentlemen of Verona*, V. iv)
c. Thou *thinkest* not of this now (Launce, *Two Gentlemen of Verona*, IV. iv)

If we take *not* in (376) to be the specifier (and hence leftmost constituent) of the VP in these examples, how can we account for the fact that the verb (which would otherwise be expected to follow the negative *not*) ends up positioned in front of *not* in sentences like (376)? An obvious answer is that when T is not filled by an auxiliary, the verb moves out of the head V position in VP into the head T position in TP, so moving across the negative particle *not* which occupies the specifier position within VP. If this is what happens, (376a) has the derivation in (377):

(377)

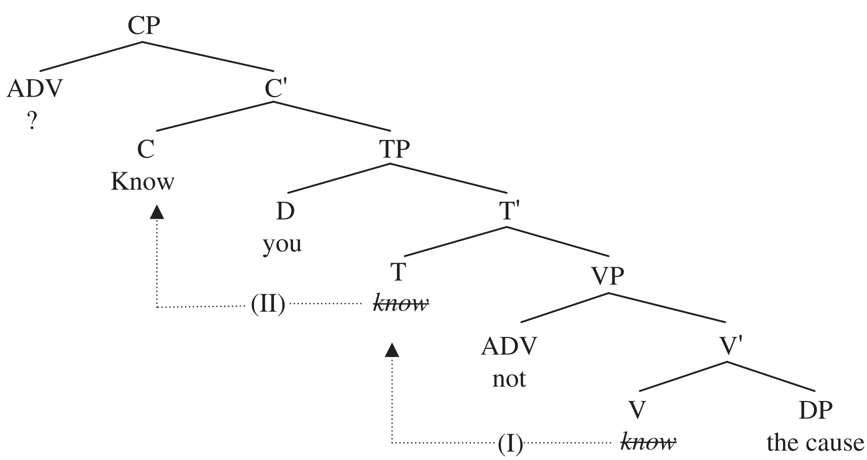


Interestingly, questions in EME seem to have involved the same *inversion* operation as in CSE. Now, if (as we showed in the previous section) inversion in questions involves movement from T to C, an obvious prediction made by the assumption that verbs move from V to T in EME is that they can subsequently move from T to C, so resulting in sentences such as those in (378):

(378) a. *Saw* you my master? (Speed, *Two Gentlemen of Verona*, I. i)
b. *Speakest* thou in sober meanings? (Orlando, *As You Like It*, V. ii)
c. *Know* you not the cause? (Tranio, *Taming of the Shrew*, IV. ii)
d. *Spake* you not these words plain …? (Grumio, *Taming of the Shrew*, I. ii)

It follows from this suggestion that an EME question such as (378c) is derived in the manner represented in (379) (with the question mark in the specifier position of CP denoting a null yes–no question operator):

(379)



The fact that the verb *know* is positioned to the left of the subject *you* indicates that it is raised first from V to T and then from T to C by two successive applications of head movement (numbered I and II respectively in 379).

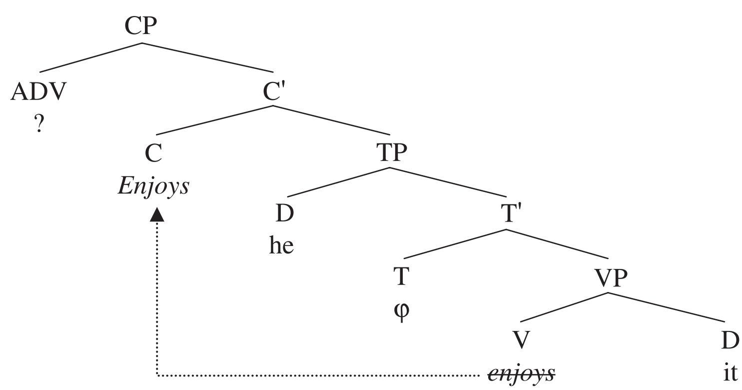
Why should it be that negatives like (376) and interrogatives like (378) are no longer grammatical in CSE? What is the nature of the change that has taken place in the course of the evolution of the language? The answer seems to be that it was possible for finite (non-auxiliary) verbs to move from V to T in EME, but that this is no longer possible in CSE; hence, for example, verbs could move from V to T across an intervening *not* in EME structures such as (377), and from T subsequently move to C, as in interrogatives like (379); but no movement from V to T (and from there to C) is possible for verbs in CSE.

But why should finite non-auxiliary verbs be able to move from V to T in EME, but not in CSE? The answer is that T was *strong* in EME but is *weak* in CSE. A strong T, just like a strong C, has to be filled by an overt item, and so if the T position isn't occupied by an auxiliary, a strong T will 'lure' the verb out of the head V position in VP into the empty head T position in TP, as in EME structures such as (377) above (more precisely, we should say that a strong T has to be filled *at some stage of derivation*, since a verb which moves into T doesn't have to stay there but can go on to move to C, as in 379). By contrast, a weak T does not have to be filled: if it contains an auxiliary, it will be filled, but a weak T doesn't have the strength to 'lure' a non-auxiliary verb out of V into T, so that T in such a language will remain unfilled in auxiliariless clauses.

Generalising at this point, we can say that a further parameter of structural variation between languages (which we might refer to as the **T Strength Parameter**) relates to whether T is strong or weak. Like the C Strength Parameter, this too turns out to be *binary* (in that T can be *either* strong or *weak* – it cannot be both or neither). In EME, T and C are both strong, whereas in CSE, T is weak but C (in main clause questions) is strong.

An interesting question which arises at this point is why we can't form questions in CSE by directly moving a verb from the head V position in VP to the head C position in CP, as in (380):

(380)



After all, C is strong in CSE questions and so needs to be filled: so why can't we fill C by moving the verb *enjoys* directly from V to C? Why is the resulting sentence **Enjoys he it?* ungrammatical?

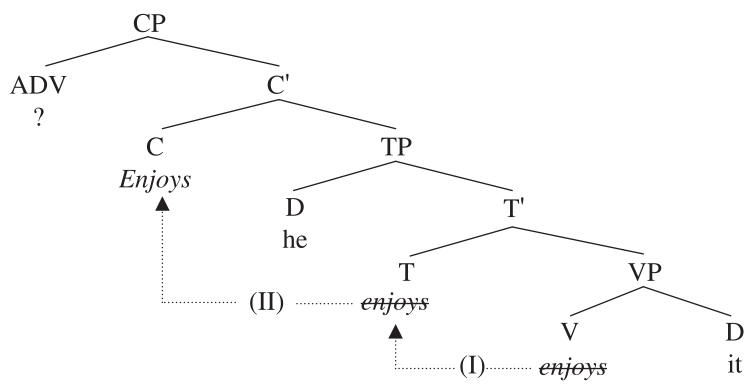
The most satisfying answer we can give to this question is to suppose that some universal grammatical principle rules out the type of movement indicated in (380). But what principle? Some years ago, Lisa Travis suggested that head movement is universally subject to the *constraint* stated informally in (381) (a *constraint* being a principle which imposes restrictions on how grammatical operations work):

(381) **Head Movement Constraint (HMC)**
A moved head can move only into the head position in the next higher phrase containing it.

Given this constraint, we can provide a principled account of why the movement arrowed in (380) leads to ungrammaticality: the movement of *enjoys* from V to C violates HMC because the V *enjoys* is contained within the VP *enjoys it*, the next higher phrase containing this VP is TP, and the head of TP is the unfilled T constituent. This means that HMC rules out the possibility of *enjoys* moving directly from V to C because the verb would thereby be moving too far 'in one go'. In fact, the Economy Principle from the previous section provides us with an alternative account of the same restriction, since the movement from V to C can be regarded as 'too long' in the context of a possible shorter move from V to T.

But this in turn raises the question of why we can't move *enjoys* into C in two successive steps as in (382):

(382)



Here, *enjoys* moves first from V to T, and then from T to C, just as in the EME structure (379). This would involve two successive applications of head movement; each application would itself satisfy HMC since in moving from V to T, *enjoys* moves into the head position in the next higher phrase above VP (namely TP) and in moving from T to C, it moves into the head position within the next higher phrase above TP (namely CP). Equally, these moves are the 'shortest' available, so this proposal appears to be consistent with the Economy Principle.

So why is the resulting sentence **Enjoys he it?* ungrammatical? The answer is in fact provided by the Economy Principle. Movement (I) of *enjoys* from V to T in (382) is ruled out because T is a *weak* head in CSE, and this means that it doesn't have to be filled. Given that it doesn't have to be filled, by the Economy Principle, it *won't* be filled by movement since any move to fill it is unnecessary.

It is interesting to note that the question counterpart of *He enjoys it* in CSE is formed by the use of the auxiliary *do* as in (383):

(383) *Does* he enjoy it?

Why should we require *do* in questions like (383), but not in the corresponding statement *He enjoys it*? The answer is that statements like *He enjoys it* are TPs headed by a weak T which therefore does not need to be filled. In contrast, questions are CPs headed by a strong C which can only be filled by moving an auxiliary like *does* from its normal T position into C. This is shown informally in (384) below (where CP in 384a is headed by a null complementiser marking the sentence as declarative in force, and TP in (384a) is headed by a present tense affix which lowers onto the verb *enjoy* by Affix Attachment, so leaving T empty):

(384) a. $[_{CP}\ [_{C}\varphi]\ [_{TP}$ He $[_{T}\varphi]\ [_{VP}\ [_{V}$ enjoys] it]]]
b. $[_{CP}$? $[_{C}$ *Does*] $[_{TP}$ he $[_{T}$ ~~*does*~~] $[_{VP}\ [_{V}$ enjoy] it]]]

In (384b), the auxiliary *does* (like other auxiliaries) originates in the head T position of TP, and then moves into C because C is strong in main clause questions and so must be filled. Since the auxiliary *do* has no semantic content of its own (and hence is usually called a *dummy* auxiliary), it is used purely as a *last resort*, as a way of satisfying the requirement for a strong C to be filled.

The Null Subject Parameter

Our discussion in this section has focused on two different parameters, both relating to the strength of functional heads. Let's now turn to look at a rather different kind of parametric variation. Early Modern English has the interesting property that it allowed the subject of a finite verb or auxiliary to be *null*, as we see from the fact that the italicised words in (385) below don't have overt subjects:

(385) a. *Hast* any more of this? (Trinculo, *The Tempest*, II. ii)
b. *Sufficeth*, I am come to keep my word (Petruchio, *Taming of the Shrew*, III. ii)
c. *Would* you would bear your fortune like a man (Iago, *Othello*, IV. i)
d. *Lives*, sir (Iago, *Othello*, IV. i, in reply to 'How does Lieutenant Cassio?')

Since the null subject in sentences like (385) occurs in a nominative position (as we see from the fact that we could use nominative *thou* in place of the null subject in 385a), it is generally taken to be a null nominative pronoun and is designated **pro** (affectionately known as 'little pro', in order to differentiate it from the rather different 'big PRO' subject found in infinitives in CSE, see section 20). We say that languages like EME which have a null nominative pronoun are **null subject languages**. By contrast, CSE is not a null subject language, as we see from the fact that the present-day counterparts of (385) given in (386) require (italicised) overt subjects:

(386) a. Have *you* got any more of this?
b. *It's* enough that I have come to keep my word
c. *I* wish you would bear your fortunes like a man
d. *He* is alive, sir

We might therefore say that a further parameter of variation between languages is the **Null Subject Parameter** (NSP) which determines whether finite verbs and auxiliaries do or don't license (i.e. allow) null subjects. Like the two parameters we have already discussed, NSP is binary in nature, so that finite verbs and auxiliaries in a given language either do or do not license null subjects (as well as overt subjects).

But why should it be that finite verbs and auxiliaries licensed null subjects in EME but no longer do so in CSE? There are two differences between EME and CSE which seem to be relevant here. The first is a syntactic one: verbs raise to T in EME (and so come to be contained within the TP constituent which contains the null subject), but not in CSE. The second is a morphological one, in that verbs carried a richer set of agreement inflections in EME than they do in CSE. Whereas third person singular -*s* is the only regular agreement inflection found on present tense verbs in CSE, verbs in EME had both second person and third person inflections (e.g. present tense verbs carried -*st* in the second person singular, -*s* or -*th* in the third person singular and -*n* in the plural). Shakespearean examples illustrating this are given in (387):

(387) a. Thou see'*st* how diligent I am (Petruchio, *Taming of the Shrew*, IV. iii)
b. The sight of lovers feed*eth* those in love (Rosalind, *As You Like It*, III. iv)
c. Winter tame*s* man, woman and beast (Grumio, *Taming of the Shrew*, IV. i)
d. And then the whole quire hold their hips and laugh, and wax*en* in their mirth (Puck, *Midsummer Night's Dream*, II. i)

It is reasonable to suggest that in a language like EME, in which the verb moves into T and so is contained within the same phrase (= TP) as the null subject, the relatively rich agreement inflections carried by verbs and auxiliaries served to **identify** the null subject (e.g. the -*st* inflection on *hast* in (385a) is a second person singular inflection and hence allows us to identify the null subject as a second person singular subject with the same properties as *thou*). But in a language like CSE, there are two factors which prevent the use of null subjects. Firstly, verbs don't raise to T (and we are assuming that only a verb in T can identify a subject in spec-TP); and secondly, agreement morphology is too impoverished to allow identification of a null *pro* subject (since first and second person verb forms aren't generally distinct in CSE).

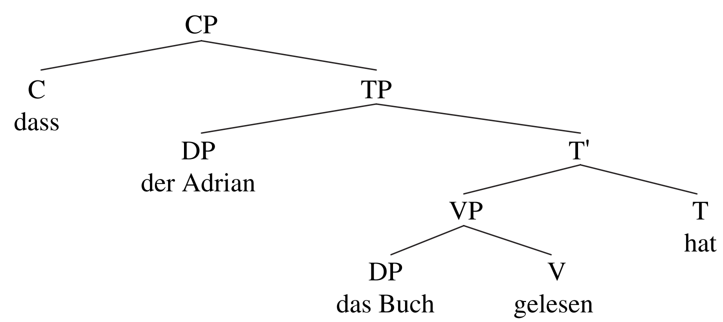
Parametric differences between English and German

Up to now, our discussion of parametric variation has been limited to different varieties of English. What of parametric variation between different languages? To illustrate inter-language variation, we'll conclude this section with a brief look at clause structure in a language, German, which is closely related to English in historical terms, but which is sufficiently different to illustrate further the nature of syntactic variation. As a starting point for our discussion, consider the following sentence:

(388) Ich weiss [dass der Adrian das Buch gelesen hat]
I know [that the Adrian the book read has]
'I know that Adrian has read the book'

(Names – e.g. *Adrian* – in colloquial German can be premodified by a determiner like *der* 'the', suggesting that they are indeed DPs; we can also use a null determiner in place of *der*.) The bracketed clause in (388) has the structure (389) below (we don't show the internal structure of the two DPs *der Adrian* and *das Buch*, since this is of no immediate concern):

(389)



One important word-order difference between German and English, which is immediately apparent from (389), is that verbs and auxiliaries are positioned *after* their complements in German but before their complements in English: so, in English we have ***bought*** *a book* and ***has*** *bought a book*, whereas in German we find (the equivalent of) *a book* ***bought*** and *a book bought* ***has***. This suggests that a further parameter of variation between languages (which we will call the **Head Position Parameter**) relates to the relative ordering of heads with respect to their complements: more specifically, we say that English has **head-first** word order within VP and TP (because a head verb or auxiliary precedes its complement), whereas German has **head-last** order within VP and TP; but both have the same head-first order within CP and DP, since complementisers and determiners in both languages precede their complements. Note that this parameter (like the others we have already examined) is binary, in that heads can *either* precede *or* follow their complements.

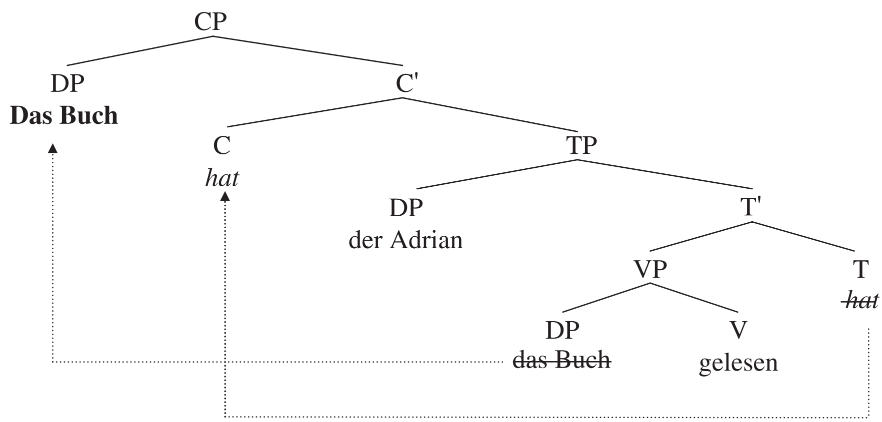
But now contrast the bracketed clause in (388) with the clause in (390):

(390) Das Buch hat der Adrian gelesen
The book has the Adrian read
'The book, Adrian has read'

There are three important differences between the two. Firstly, the clause in (388) contains the complementiser *dass* 'that' (because it is a complement clause, here serving as the complement of the verb *weiss* 'know'), but that in (390) doesn't (because it isn't a complement clause). Secondly, the auxiliary *hat* 'has' is positioned at the end of the clause in (388), but in front of the subject *der Adrian* in (390). And thirdly, the complement *das Buch* 'the book' is positioned immediately in front of the verb *gelesen* 'read' in (388), but in front of the auxiliary *hat* 'has' in (390). How can we account for the change in word order between (388) and (390)?

Given our framework, the obvious analysis is to say that those constituents which have changed their position in (390) relative to the position they occupy in (388) have undergone movement. Thus, the auxiliary *hat* 'has' originates at the end of the clause (as in 389) but is then moved into the complementiser position at the beginning of the clause – precisely as happens in the case of auxiliary inversion in English; and the DP *das Buch* 'the book' is preposed from its original complement position immediately in front of the verb *gelesen* 'read' and moved into the specifier position within CP (in much the same way that topic phrases are in English). As a result, (390) will be derived as in (391):

(391)



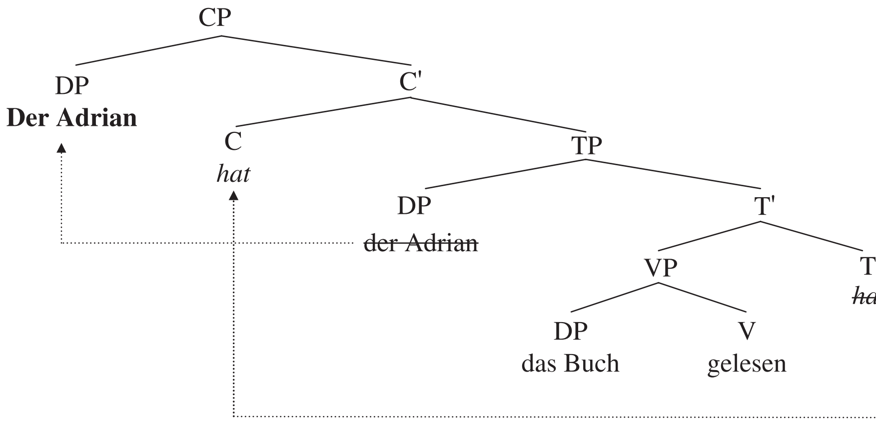
Here, we see that the auxiliary *hat* 'has' originates in T and moves to C, and the DP *das Buch* 'the book' originates in complement position within VP and moves into specifier position within CP.

Now consider the following sentence:

(392) Der Adrian hat das Buch gelesen
The Adrian has the book read
'Adrian has read the book'

Since the auxiliary *hat* 'has' doesn't occupy its normal position at the end of the clause here, it seems once again to have moved from T to C. And this time, the subject *der Adrian* is positioned in front of the auxiliary, so seems to have moved from specifier position in TP into specifier position within CP. This means that (392) has the derivation in (393):

(393)



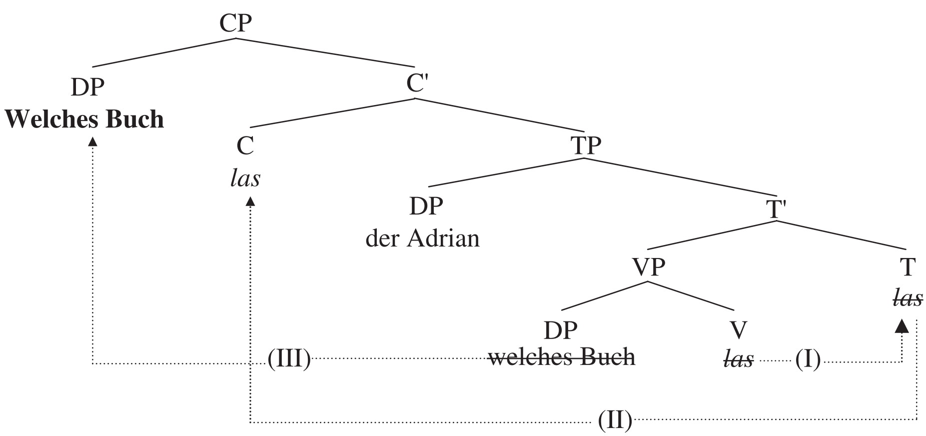
This structure shows that the auxiliary *hat* 'has' has moved from T to C, and the subject *der Adrian* has moved from spec-TP to spec-CP.

Next consider (394):

(394) Welches Buch las der Adrian?
which book read the Adrian
'Which book did Adrian read?'

What's going on here? It seems clear that the operator phrase *welches Buch* 'which book' has moved into the specifier position within CP (as in English). But how does the verb come to be positioned after it and in front of the subject *der Adrian*? The obvious answer is that (much as in Early Modern English), the verb moves out of the head V position in VP, into the head T position in TP, and from there into the head C position in CP, as indicated in (395):

(395)



Movement (I) in (395) is head movement of the verb *las* 'read' from V to T; movement (II) is again head movement of the verb *las* 'read' from T to C; and movement (III) is wh-operator movement of the DP *welches Buch* 'which book' from complement position within VP into specifier position within CP. Since the verb *las* can move from V to T and from there to C, it follows that both T and C must be strong in finite clauses in German (and hence have to be filled at some stage of the derivation). Note that in consequence of the head movement constraint (381) (or the Economy Principle requiring 'short' moves), the verb *las* cannot move directly from V to C, but rather must move first to T, and then from T to C.

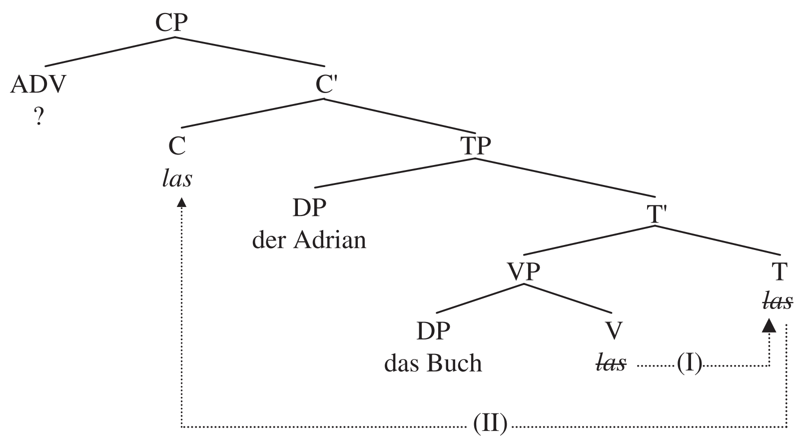
An interesting property which the German CPs in (391), (393) and (395) share is that in each case the specifier position within CP must be filled – though this is not true of (389) where *dass* 'that' appears to have no specifier. This means that where the head C of CP is filled by a preposed verb or auxiliary (as in 391, 393 and 395), CP must have a specifier.

The assumption that clauses in which C is occupied by a preposed verb or auxiliary require a specifier has interesting implications for how we analyse yes–no questions such as (396):

(396) Las der Adrian das Buch?
Read the Adrian the book
'Did Adrian read the book?'

Here, the overall clause (like all clauses in German) is a CP, and the head C position of CP is filled by the preposed verb *las* 'read'. If we posit that CPs headed by a preposed verb or auxiliary require a specifier, how can we account for the fact that there appears to be no CP-specifier preceding the verb *las* in (396)? Recall that in section 20 we suggested that yes–no questions contain an abstract question operator *?* which occupies the specifier position within CP, and which is required if a sentence is to be interpreted as a question. This being so, (396) will have the derivation in (397):

(397)



The verb *las* originates in the head V position of VP and then moves from there firstly into the head T position of TP, and then into the head C position of CP (since C is strong in all finite main clauses in German and so always has to be filled). The requirement for the specifier position within CP to be filled where C contains a preposed verb or auxiliary is satisfied by the null question operator *?* which occupies spec-CP, and which serves to mark the clause as a yes–no question.

Our discussion of structural variation in this section has important implications for the development of a theory of grammar. In previous sections, we have assumed that principles of Universal Grammar (UG) determine that certain aspects of syntactic structure are invariant across languages (e.g. every phrase or clause is a projection of a head; clauses are universally CPs; questions universally contain an interrogative operator in spec-CP; subjects are universally positioned in spec-TP; categories can universally be overt or covert, etc.). But in this section, we have seen that there is a certain amount of structural variation across languages and language varieties, and that this can be characterised in terms of a set of binary parameters. This leads us towards the **Principles and Parameters Theory** (PPT) developed by Noam Chomsky and many others over the past three decades, in which those aspects of syntactic structure which are invariant across languages are attributable to principles of UG, while those aspects of structure which vary from one language to another are described in terms of a set of (binary) parameters (***exercises 2*** and ***3***).

Exercises

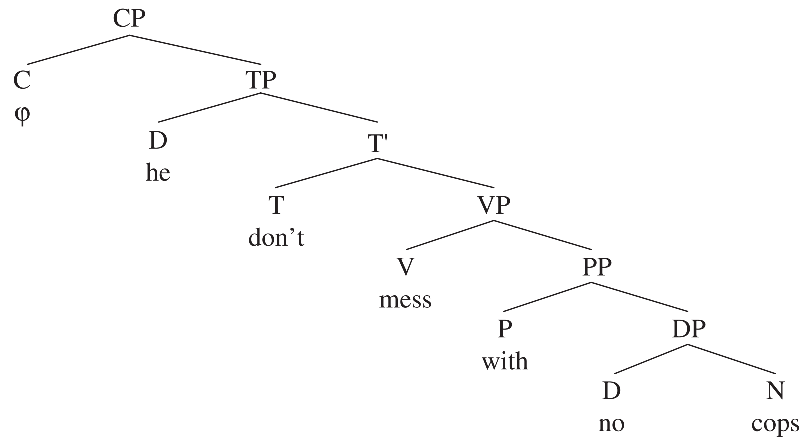
1. Discuss the structure of the following sentences in African American Vernacular English (AAVE) and how they differ from their Contemporary Standard English counterparts:
   (a) He don't mess with no cops
   (b) Don't nobody mess with the cops
   (c) Everybody know [don't nobody mess with the cops]
   (d) *Everybody know [that don't nobody mess with the cops]
   For the purposes of this exercise, assume that the bracketed structures in (c, d) are CPs which serve as the complement of the verb *know*. Can you suggest a structural reason why (d) is ungrammatical?
   In addition, discuss the syntax of the following yes–no question in Jamaican Vernacular English (JVE):
   (e) Yu en si eniting?
   You did see anything
   'Did you see anything?'
   How can we account for the use of the polarity item *eniting* in (e)?

Model answer for (1a)

Sentence (1a) is derived as follows. The determiner (negative operator) *no* merges with the noun *cops* to form the DP *no cops*. The preposition *with* merges with this DP to form the PP *with no cops*. The verb *mess* merges with this PP to form the VP *mess with no cops*. The resulting VP is merged with the negative T-auxiliary *don't* to form the T′ *don't mess with no cops*. This T′ is in turn merged with the D-pronoun *he* to form the TP *he don't mess with no cops*. The resulting

TP is subsequently merged with a null complementiser (marking the sentence as declarative in force), so forming the CP below:

(i)



AAVE is a variety of English which shows *negative concord*. This means that a negative determiner like *no* and a negative D-pronoun like *nobody* are negative polarity items which must be used after a preceding negative auxiliary. Since *no* in (i) is preceded by the negative T-auxiliary *don't*, this requirement is met in (i), without the need to move the negative auxiliary *don't* from T to C: hence, the Economy Principle requires *don't* to remain *in situ* in T.

2. Draw tree diagrams showing the derivation of the following Early Modern English sentences, giving arguments in support of your analysis. In what ways is EME similar to German?

(a) Who overcame he? (Boyet, *Love's Labour's Lost*, IV. i)
(b) Came you from the church? (Tranio, *Taming of the Shrew*, III. ii)
(c) What, canst not rule her? (Leontes, *Winter's Tale*, II. iii)
(d) Knows he not thy voice? (Second Lord, *All's Well That Ends Well*, IV. i)
(e) And that letter hath she delivered (Speed, *Two Gentlemen of Verona*, II. i)
(f) Fear you not him (Tranio, *Taming of the Shrew*, IV. iv)
(g) Of her society be not afraid (Iris, *The Tempest* IV. i)
(h) What a head have I! (Nurse, *Romeo and Juliet*, II. v)

Hints

Ignore *what* in (c) and *And* in (e). Assume that all the clauses in (a)–(h) are CPs, that *thy voice* in (d), *her society* in (g) and *what a head* in (h) are DPs (though do not concern yourself with their internal structure). As noted in section 18, sentences like (f, g), which are used to issue an order, are *imperatives*, while sentences like (h), which are used to exclaim surprise or delight, are *exclamatives*. In relation to (g), assume that *afraid* is an adjective, and the prepositional phrase *of her society* originates as its complement.

If all the sentences in (a)–(h) are CPs, it might be suggested that all finite clauses in Shakespearean English are CPs, and that they require the head and specifier positions within CP to be filled. What implications would this have for the analysis of sentences such as the following:

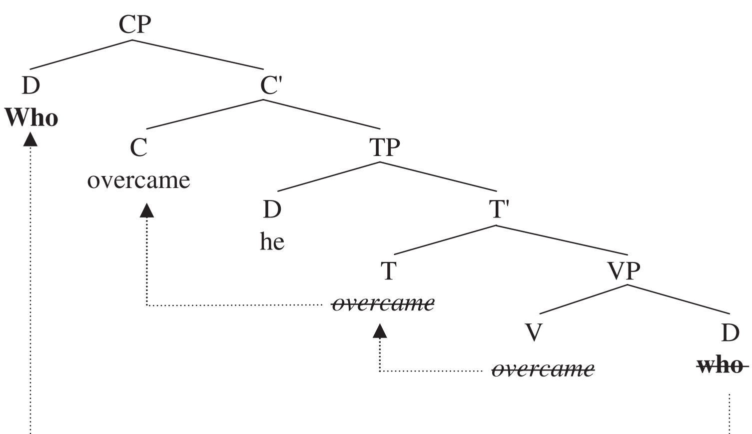
(i) She lov'd not the savour of tar (Stephano, *The Tempest*, II. ii)

What would then be the difference(s) between sentences like (a)–(i) in EME and their CSE counterparts? (In relation to (i), take *the savour of tar* to be a DP, but don't concern yourself with the internal structure of this DP.)

Model answer for (2a)

The verb *overcame* merges with the D-pronoun *who* to form the VP *overcame who*. This VP is merged with a null T constituent which (being strong in EME) attracts the verb *overcame* to move from V to T. The resulting T′ is merged with the D-pronoun *he* to form a TP. This TP is in turn merged with a null C constituent which (like C in main clause questions in present-day English) is strong and so attracts the verb *overcame* to move from T to C. C also attracts the wh-pronoun to move to spec-CP, so that the sentence has the derivation shown below:

(i)



Movement of the verb *overcame* from V to T and subsequently from T to C are two instances of head movement, and both satisfy the Head Movement Constraint (requiring a head to move to the next highest head position in a structure). Movement of *who* to the specifier position within

CP is an instance of a movement operation which can variously be referred to as A-bar movement, operator movement or wh-movement.

3. Discuss the derivation of the following German sentences, commenting on points of interest (italics mark emphasis):

(a) Er ist nach Berlin gefahren
He is to Berlin gone
'He has gone to Berlin'

(b) Nach Berlin ist er gefahren
To Berlin is he gone
'He has gone *to Berlin*'

(c) Er fährt nicht nach Berlin
He goes not to Berlin
'He's not going to Berlin'

(d) Nach Berlin fährt er nicht
To Berlin goes he not
'He isn't going *to Berlin*'

(e) Fährt er nicht nach Berlin?
Goes he not to Berlin
'Isn't he going to Berlin?'

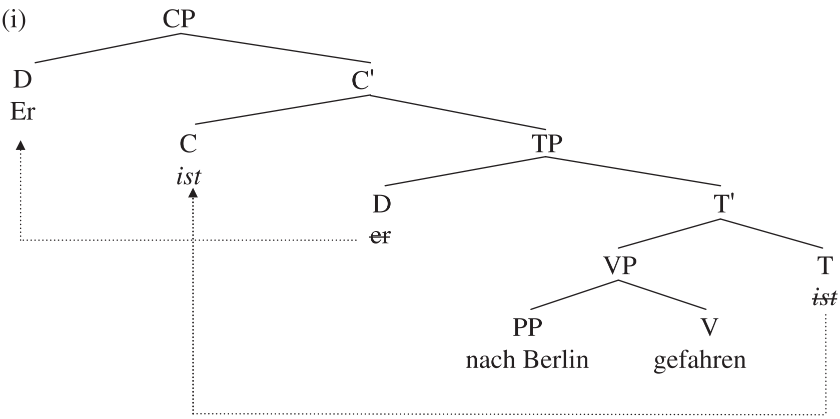
Hints

Note that with many verbs of motion, German uses the counterpart of *be* as a perfect auxiliary, rather than the counterpart of *have*. Recall from the discussion in the main text that T and C are strong in finite clauses in German, and that German shows head-final word order in VP and TP, but head-initial order in other types of structure. Assume that *nicht* (like *not* in English) is a VP-specifier.

Model answer for (3a)

The verb *gefahren* 'gone' merges with its prepositional phrase complement *nach Berlin* 'to Berlin' (whose internal structure need not concern us) to form the VP *nach Berlin gefahren* 'to Berlin gone', VPs being verb-final in German. This VP is then merged with the T-auxiliary *ist* 'is' to form the T′ *nach Berlin gefahren ist* 'to Berlin gone is', with T (like V) being head-final in German. The resulting T′ is merged with the D-pronoun *er* 'he' to form the TP *er nach Berlin gefahren ist* 'he to Berlin gone is'. This TP is subsequently merged with a null C constituent which (being strong) attracts the auxiliary *ist* 'is' to move into C and likewise attracts a pronoun or phrase of some kind to move into spec-CP – in (3a), attracting the pronoun *er* 'he' to move into spec-CP in the manner shown below:

(i)



Movement of the auxiliary *ist* ‘is’ from T to C is a particular instance of head movement, and obeys the Head Movement Constraint (which only allows a head to move into the head position in the next highest phrase in the structure). Movement of *er* ‘he’ from spec-TP to spec-CP is similar to topicalisation in English, and more generally is an instance of A-bar movement.

23 Sentence meanings and Logical Form

To date, we have had nothing systematic to say about how sentences are interpreted, but, as pointed out in the main introduction, an adequate grammar of a language should contain a component which specifies how the **Logical Form (LF)** of a sentence is derived. In this section, we shall not seek to present a comprehensive description of such a component, as such descriptions do not exist and there is a great deal of uncertainty in the primary research literature. Our aim will be the more modest one of introducing some of the considerations that arise once the task of describing sentence meanings is taken seriously. Specifically, following some preliminary remarks, we shall say a little about the way in which nominals express a range of roles filled by individuals or sets of individuals in events that are described by sentences and then rather more about the interpretive properties of sentences including quantified DPs such as *all the men*, *most boys*. This latter will enable us to introduce a further variety of movement.

Preliminaries

Consider the simple sentences in (398):

(398) a. The king smokes
b. The queen snores

It is obvious that (398a, b) differ in interpretation, and to some extent, this is determined by the words they contain. To see this, we simply note that if we substitute the noun *queen* for the noun *king* in (398a), the interpretation of the sentence we thereby produce (399) differs from that of (398a):

(399) The queen smokes

On this basis, we can formulate a first version of **The Principle of Compositionality** as in (400):

(400) The interpretation of a sentence is determined by the interpretations of the words the sentence contains.

Now, it is easy to see that (400) is not adequate. Consider, for example, the sentences in (401):

(401) a. The dog chased a rabbit
b. The rabbit chased a dog

These two sentences are differently interpreted, yet each of them contains exactly the same words. In this case, we can readily see what this difference in meaning rests on: the words in the two sentences occur in different orders, with different sequences fulfilling different grammatical functions (see section 18). For instance, the sequence *the dog* constitutes a subject in (401a), whereas this function is fulfilled by the sequence *the rabbit* in (401b). In drawing attention to these differences, we focus on the *syntax* of the two sentences, and this suggests that a more adequate version of the Principle of Compositionality might be formulated as in (402):

(402) The interpretation of a sentence is determined by the interpretations of the words occurring in the sentence *and* the syntactic structure of the sentence.

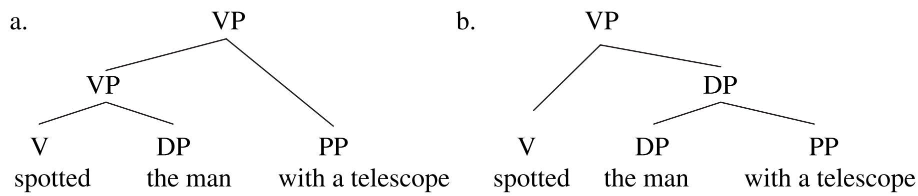
If we understand *the*, *dog*, *chased*, *a* and *rabbit*, and if we know that *the dog* serves as subject, *chased* as predicate and *a rabbit* as complement in (401a), then we are equipped to understand the sentence, we might suppose.

The Principle of Compositionality in (402) is vital in understanding the phenomenon of **structural ambiguity**, illustrated by examples such as those in (403) (see also section 10, p. 149):

(403) a. Frank spotted the man with a telescope
b. Frank spotted the man with a wooden leg

While it may not be immediately obvious, each of these sentences has two different interpretations. For (403a), the most likely interpretation is that Frank looked through a telescope and spotted the man. However, it is easy to see another interpretation, whereby the man had a telescope and Frank spotted him (by some means or other). Here, then, we have a single sequence of words with two interpretations, and (402) suggests that this is possible so long as the sequence can be associated with two syntactic structures. In section 18, we said that certain expressions which serve to modify other expressions have the function of being **adjuncts**. Accordingly, let us suppose that the *with*-phrases in (403) are adjuncts, and that the ambiguity of (403a) lies in whether the PP/prepositional phrase *with a telescope* is an adjunct to (and hence modifies) the VP/verb phase *spotted the man*, or whether it is an adjunct to (and hence modifies) the DP/determiner phrase *the man*. If we further assume that an adjunct has the syntactic property that it attaches to a constituent to expand it into an even larger constituent *of the same type*, adjoining the PP *with a telescope* to the VP *spotted the man* will form the even larger VP *spotted the man with a telescope*, whereas adjoining the PP *with a telescope* to the DP *the man* will form the even larger DP *the man with a telescope*. It would then follow that the two different interpretations of the VP *spotted the man with a telescope* have the two different syntactic structures shown below, and that these arise from merging constituents in different orders:

(404)



(Here, we do not specify the internal structure of the DP *the man* and the PP *with a telescope*, both of which are irrelevant to the point under discussion.) For (404a), having formed the DP *the man*, we merge this as a complement with the head V *spotted* to give the VP *spotted the man*; then having formed the PP *with a telescope*, this is merged as an adjunct with the VP *spotted the man* to form the larger VP *spotted the man with a telescope*. This structure corresponds to the interpretation in which the telescope is used for spotting. The operations involved in producing (404b) are different. Here, having formed *the man* and *with a telescope*, these are merged with the PP serving as an adjunct to the DP, so as to form the larger DP *the man with a telescope*. Then, this DP, functioning as a complement, is merged with the head V *spotted* to give the VP *spotted the man with a telescope*. This structure is appropriate for the interpretation where the man who is spotted has a telescope.

What of (403b)? At first sight, you may feel that this sentence is unambiguous, its only interpretation being that the man has a wooden leg and Frank spotted him (by some means or other) – equivalently, the only structure for (403b) is one analogous to (404b). However, we suggest that a second interpretation, parallel to that readily available for (403a), can be provided for (403b). To get this interpretation, all we need to do is suspend our beliefs about what people *typically* use as aids for looking at the world and imagine that a wooden leg is equipped with a hidden telescope, so that Frank's spotting works better if he looks through it. In short, as far as *language* is concerned, (403b) is every bit as ambiguous as (403a); however, beliefs we hold about the world make the ambiguity *less accessible* in the case of (403b), a fact to always bear in mind when investigating the interpretive possibilities for particular sentences.

On the basis of our discussion so far, we can see that any theory of the interpretation of sentences is going to have at least two prerequisites: an account of the semantic contributions of the words appearing in sentences and an account of the syntactic structure of sentences. In section 12, we examined some of the issues which arise in the study of word meaning, and previous sections of this part of the book have developed a syntactic theory to a point where we can associate semantically appropriate syntactic structures with examples such as (401) and (403). However, consideration of a wider range of examples indicates the need to further extend our resources.

Thematic roles

Consider first the simple sentences in (405):

(405) a. The Dark Destroyer cracked the nut
b. The hammer cracked the nut

In both cases, we have a simple declarative clause, and section 20 has provided considerable detail on how such clauses should be analysed syntactically. Nothing has been proposed there to suggest that there is any syntactic distinction between (405a) and (405b), and it would appear to follow by the Principle of Compositionality that the *only* semantic distinction between the clauses is due to the presence of the DP *the Dark Destroyer* in (405a) as opposed to *the hammer* in (405b). But is this correct? Some evidence to suggest that it might not be arises if we embellish the examples in (405) with an adverb such as *deliberately*.

(406) a. The Dark Destroyer cracked the nut deliberately
b. ?The hammer cracked the nut deliberately

Here, the question mark preceding 406b corresponds to the judgement that there is *something* odd about this sentence – we are not claiming that it is ungrammatical. The oddness can be identified with the fact that hammers are not the sort of things that act deliberately, intentionally, etc. This, in turn, is linked to the fact that if we consider the events portrayed by (406a, b), the individuals designated by the DPs *the Dark Destroyer* and *the hammer* play different **roles** in those events. For (406a), the Dark Destroyer is an **Agent**, who, by virtue of his (or her) own volition, acts in such a way as to crack the nut. This may involve crushing it in the hand, stamping on it, throwing it against a wall or, indeed, hitting it with a hammer. By contrast, in (406b), the hammer, unless personified in a science fiction context, is an **Instrument** lacking independent volition, used by an Agent to achieve the cracking. And, of course, we can easily construct a sentence in which both the Agent and Instrument roles are explicitly expressed:

(407) The Dark Destroyer cracked the nut with a hammer

There is a further observation that lends support to the claim that *the Dark Destroyer* in (406a) is importantly different to *the hammer* in (406b). It will be recalled from section 19 (p. 263) that the co-ordination test is a useful means for checking the status of sequences of words as constituents in a syntactic representation. This test referred to constituents ‘of the same type’ and, in this context, we can consider (408):

(408) ?The Dark Destroyer and the hammer cracked the nut

Once more, we are not claiming that (408) is ungrammatical, and we are certainly not suggesting that *the Dark Destroyer* and *the hammer* are anything other than DPs, but we are claiming that there is something odd about it. It should be readily apparent now where we are locating this oddness: (408) involves the conjunction of two DPs, but whereas one of these DPs fulfils the role of Agent, the other is an Instrument, and this difference in roles is sufficient to induce the oddness of the co-ordinate structure in (408). Agent and Instrument are referred to as **thematic roles**, usually abbreviated to **θ-roles** (θ being the Greek letter 'theta').

Having introduced two θ-roles in the context of some simple examples, we can now ask whether there are additional θ-roles that play a part in the semantic representation of sentences. In fact, there have been a number of proposals for such an inventory, and here we shall simply mention and illustrate some of the most common members of such inventories.

Alongside Agent and Instrument, it has been customary to propose a role of **Affected Object** or **Patient**, illustrated by the *the nut* in (405a, b) and (407), as well as the italicised DPs in (409):

(409) a. The paediatrician examined *the baby*
b. The postman delivered *the letter*

Often, those affected objects undergoing a change of state involving location or movement, as in (409b), are seen as instantiating a distinct thematic role, designated **Theme**, and if we take this step, *the baby* will be a Patient in (409a), but *the letter* will be a Theme in (409b). Obviously, given such a characterisation of Themes, some DPs in subject position, such as that in (410), might also be seen as expressing this role:

(410) *The letter* arrived

It is customary to recognise a set of θ-roles linked to spatial notions, these being expressed by DPs occurring as the complements of different prepositions in English. Thus, we see the roles of **Location, Source** and **Goal**, expressed by the italicised DPs in (411a, b, c), respectively:

(411) a. The train is in *the station*
b. The train came from *St Pancras*
c. The train travelled to *Lille*

And there are more, but it would be of dubious value to try to offer a complete review of possibilities, along with uncertainties, in this introductory context. Rather, we shall conclude this brief discussion of θ-roles by raising an issue of major importance if we take seriously the matter of determining a semantic representation for a sentence.

Supposing that we are persuaded that a semantic representation for a sentence must include an indication of (a) the thematic roles expressed by the sentence and (b) how those roles are expressed. Specifically, if we take, say, (409a), how can we ensure that our semantic representation of this sentence includes the information that Agent and Affected Object are expressed, that Agent is expressed by *the paediatrician*, and that Affected Object is expressed by *the baby* (for present purposes, we are not distinguishing between Patient and Theme).

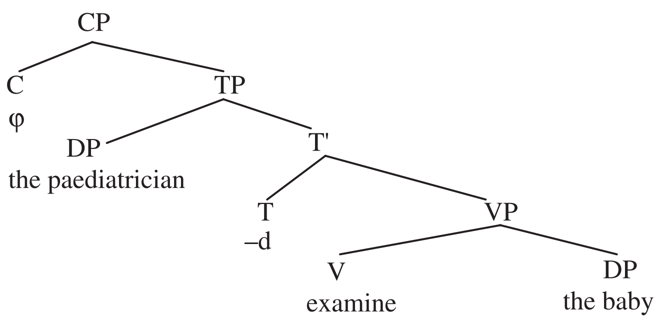
Let's take the *presence* of the two θ-roles first. Clearly, these can't be associated with the nominals themselves as inherent properties, since the fact that *the* *paediatrician* is an Agent and *the baby* is an Affected Object in (409a) is a fact about *that sentence*: in (412), the thematic roles of the two DPs are reversed.

(412) The baby examined the paediatrician

However, it does seem plausible to suggest that the two θ-roles are due to the presence of the verb *examine*. Any examining event will necessarily involve some entity doing the examining and another entity, not necessarily distinct (*the paediatrician examined himself*), being examined. Accordingly, we can suggest that it is a lexical property of the verb *examine* that it requires an Agent and an Affected Object, this information being part of the lexical entry for the verb (see 115 in section 10).

So how do the two θ-roles that the lexical representation of *examine* brings to the sentence get properly linked to the DPs, *the paediatrician* and *the baby*? One possibility that has been explored is that this linking could be straightforwardly determined by syntactic structure. Thus, for (409a), on the basis of the system that has been developed in previous sections, we have the structure in (413) (we do not represent the internal structure of the DPs, as these are not relevant to the issue being considered):

(413)



Here, we can see that *the paediatrician* occupies a specific position in the structure, the specifier of T, and *the baby* occupies the position of complement of V. What we might suggest, then, is that the thematic roles Agent and Affected Object, which will be included in the structure as part of the lexical representation for the verb *examine*, are explicitly related to the two positions in question via what are often referred to as **Linking Rules**. Thus, part of what is involved in taking a syntactic representation like (413) and converting it to a semantic representation or Logical Form for a sentence involves the application of Linking Rules, which will explicitly assign thematic roles to the expressions occupying specific positions in the structure. Obviously, the example we have described here is extremely simple, and it is easy enough to begin to pose difficult questions for the approach, many of which have been pursued in the research of the last twenty years (***exercises 1***, ***2*** and ***3***).

We now turn to a rather different aspect of the semantic interpretation of sentences, and in order to pursue this matter, it will be necessary firstly to say something about one way in which philosophers have studied the meanings of sentences.

A philosophical diversion

Consider the sentence in (414) and suppose, for the sake of argument, that the name *Shirley* is the name of a specific sheep:

(414) Shirley snores

A view adopted by many philosophers and linguists is that at least part of what is involved in understanding a sentence in a language (i.e. grasping its interpretation) is knowing what the world *would* be like if the sentence were *true*; to know this is to know the **truth conditions** of the sentence. Note that knowing the truth conditions of a sentence does not require that we know that the sentence *is* or *is not* true; to know this latter for every sentence you understand would be to approach omniscience, and it would be absurd for linguistics to claim that knowledge of a language has (near-)omniscience as a consequence.

You can persuade yourself that the position outlined in the previous paragraph is plausible by considering a small experiment that you might undertake. Suppose you take a picture and construct some simple English sentences which are true or false of the picture; then you present the sentences and the picture to someone in whose linguistic competence you are interested, asking them to respond with ‘true’ or ‘false’ to each of the sentences. If their responses were incorrect in some cases, you would probably conclude that they did not *understand* those particular sentences; if their responses appeared to be random across the set of sentences, you would probably conclude that they did not understand English at all – imagine the responses you would get from a monolingual French speaker who is told (in French) to respond with *vrai* (‘true’) or *faux* (‘false’) to a set of *English* sentences.

At least part of what (414) means, then, can be identified with its truth conditions. What might these conditions look like? Well, *Shirley* is a particular type of DP (with a null determiner), a proper name, and, we might suppose for simplicity, that it names a unique individual, the sheep called Shirley. The verb *snores* names a property, the property of snoring. Then, we might state the truth conditions for (414) as in (415):

(415) The sentence *Shirley snores* is true just in case the individual named by *Shirley* has the property of snoring

At this point, you may feel that while (415) is itself true, it is pretty unhelpful, since what it says is so trivial. But this reaction, while understandable, is misplaced and is due to the fact that in (415) we are using English to talk about English – more technically, we are using English as a **metalanguage** to talk about English as an **object language**. Obviously, if we are going to present the truth conditions for a sentence, we are going to have to use some language or other to do this. Readers of this book understand English, so our metalanguage is English throughout, but now suppose that we want to consider the truth conditions for the French sentence in (416):

(416) Delphine ronfle
'Delphine snores'

And suppose, again for simplicity, that the DP *Delphine* names a unique individual. Using English as our metalanguage, the truth conditions for (416) appear in (417):

(417) The sentence *Delphine ronfle* is true just in case the individual named by *Delphine* has the property of snoring

Now, if you don't know French, but you do understand English, (417) will tell you *something* about the interpretation of (416); the reason you feel that (415) tells you nothing about the interpretation of (414) is entirely due to the fact that (415) uses English to tell you something about English, a language you understand.

It is easy now to generalise on the basis of additional examples of sentences consisting of a proper name and an intransitive verb that we might care to construct. Some such sentences appear in (418) and a generalisation is formulated in (419):

(418) a. Smythe smokes
b. Jones jogs
c. Stevens stammers

(419) For any sentence consisting of a DP α followed by an intransitive verb β, the sentence is true just in case the individual named by α has the property named by β.

Note how (419) begins to acknowledge the Principle of Compositionality in (402), by stating how the interpretation of a sentence (its truth conditions) is determined by the semantic properties of its component words (names refer to individuals and intransitive verbs to properties) and the sentence's syntax (the DP precedes the intransitive verb). Obviously, we have deliberately chosen a very simple type of sentence, and the only aspects of syntax to which we have referred are the categorial status of the constituents and their order. However, this is sufficient to enable us to contrast the sentences in (414) and (418) with those in (420):

(420) a. Every sheep snores
b. Most sheep snore
c. No sheep snores
d. Which sheep snores?

Take (420a); as *every sheep* is a DP, consisting of the D *every* and its complement N *sheep*, and *snores* is an intransitive verb, its syntactic structure fits the description in (419), but if we try to apply (419) to formulate the truth conditions of (420a), we run into a major problem. This problem concerns the DP in subject position, *every sheep*. The question (419) raises is that of what individual is named by *every sheep*? But it is not sensible to ask this question of this expression.

Arguably, it is even less sensible to ask it of *most sheep* in (420b), and just plain nonsense to ask it of *no sheep* in (420c) and *which sheep* in (420d). These expressions, while evidently DPs, do not name individuals in the straightforward way that proper names do, and it appears that (419) is simply not applicable to sentences containing such phrases.

The problem we have arrived at here was already appreciated at the end of the nineteenth century by the German philosopher Gottlob Frege and his British contemporary Bertrand Russell. The solution to it that they developed can be sketched by talking informally about the truth conditions for (420a). We have seen that we cannot formulate these truth conditions in terms of an individual named by *every sheep* which has the property of snoring. Instead, what we need to do is examine each individual sheep (none of which is every sheep) in turn, checking whether *it* has the property of snoring. If the answer is 'Yes' for every sheep, the sentence is true. But this seems to require that *from a semantic perspective*, the simple syntactic representation of (420a), whereby it contains just a DP subject and an intransitive verb, is not appropriate (we are simplifying our syntactic assumptions by ignoring T and its projections – taking account of these would not affect the point under discussion). What we appear to need is a representation which enables us to make it explicit that in determining the truth conditions of (420a), we have to consider a number of individuals in turn, checking whether each of them has the relevant property. We can achieve this by introducing into the representation an expression which, unlike a proper name, does not pick out a unique individual but instead can *vary* in the individuals it picks out. Such an expression is a **variable**, and the sort of representation we need for semantic purposes appears in (421):

(421) (every sheep x)(x snores)

Here *x* is a variable, and (421) is read as 'for every individual *x* which is a sheep, *x* snores'. If we now suppose that (420a) can be somehow linked to (421), the truth conditions of (420a) can be formulated as in (422):

(422) *Every sheep snores* [or *(every sheep x)(x snores)*] is true just in case every *x* which is a sheep has the property of snoring

In (421), *every sheep x* looks like some kind of DP and *x snores* is a clause with the variable *x* functioning as its subject and *snores* as its verbal predicate. However, at this stage, we are not concerned with the details of this structure – what is important is that, taking account of the Principle of Compositionality in (402), it is appropriate for determining the truth conditions of (420a). By contrast, the *superficial* syntax of (420a) is inappropriate for this purpose. As we have noted, (420a) contains nothing beyond a subject DP and an intransitive verb; specifically, nothing corresponding to a variable appears in this structure, and thus it is not possible to see this structure as providing the appropriate basis for the operation of the Principle of Compositionality.

Now, (420b, c) will yield to this sort of informal treatment readily enough, to give us the representations in (423) and (424), respectively:

(423) (most sheep x)(x snores)

(424) (no sheep x)(x snores)

And, each of (423) and (424) can be integrated into the statements of truth conditions in (425) and (426) – remember that the apparent triviality that we perceive in such examples is due to the fact that English is serving as both object language and metalanguage:

(425) *Most sheep snore* or [*(most sheep x)(x snores)*] is true just in case most *x* which are sheep have the property of snoring

(426) *No sheep snores* or [*(no sheep x)(x snores)*] is true just in case every *x* which is a sheep does not have the property of snoring

To summarise up to this point, and putting (420d) to one side for the moment, we are suggesting that the superficial syntactic form of the other sentences in (420) is not appropriate for revealing their semantic properties.

For (414) *Shirley snores* and similar sentences, there is a straightforward relationship between syntactic form and the computation of truth conditions; in the syntax, there are two entities, the subject DP and the intransitive verb, which are matched directly by the individual picked out by the name and a property in the semantics. In (420a, b, c), however, we find a different situation: again, there is a subject DP – in each case a **quantificational** DP – and an intransitive verb, but, in these cases, there is no individual picked out by the former; instead, the semantics requires some means of considering a range of objects, and this is achieved by introducing a variable into the representation. Accordingly, for these sentences, the representations we need for semantic interpretation do not appear to be directly reflected in their syntactic structures. For Frege, who was concerned to develop a *semantic* account of quantification for use in logical inference, this was of no concern, and he was at liberty to *stipulate* whatever representations were necessary and to rely on his own skill in ensuring that the representations he stipulated were appropriate. For a linguist, however, confronted with trying to produce an explicit theory of human linguistic competence, such stipulation and reliance on the skill of a nineteenth-century German logician is not comfortable; at this point, we must acknowledge an unacceptable gap between what syntax provides and what semantics needs in the case of sentences containing quantified noun phrases.

Covert movement and Logical Form

A resolution to the dilemma posed above is approached via (420d). An obvious point is that, as (420d) is an interrogative, it doesn't make much sense to talk about its truth conditions, but putting this to one side, we can ask whether the representation we need for its semantic interpretation is more appropriately construed along the lines of (414) or similarly to (420a, b, c). Specifically, we can ask whether its interpretation involves reference to an individual picked out by the phrase *which sheep* or whether we need representations like those in (421), (423) and (424) to make this interpretation more transparent. The answer is obvious. There is no *which sheep* being referred to in (420d), just as there is no *no sheep* being referred to in (420c), in contrast to the individual picked out by *Shirley* in (414). We are therefore led to the representation for (420d) in (427):

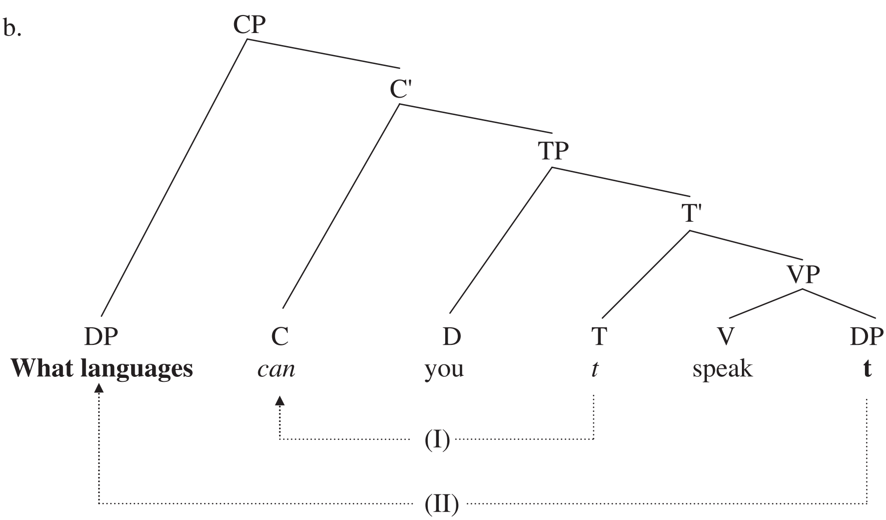
(427) (which sheep x)(x snores)

We can immediately note that (427) captures something important about the interpretation of (420d); someone who understands (420d) knows that it asks for a search through a set of sheep looking for one (or more) which has the property of snoring. The fact that we have a variable in (427) taking as values individual sheep provides us with a device for conducting such a search.

But now, for this example at least, we can note an interesting and important correspondence between what semantics requires and what syntax supplies. Recall our discussion of movement in section 21 and the observation made there that members of a class of *operator expressions*, including wh-phrases, move from the position they occupy as a result of merger operations to a clause-initial position, namely spec-CP. In the earlier discussion, the moved wh-phrases originated in complement position as in (341a) repeated as (428a) with the derivation in (428b):

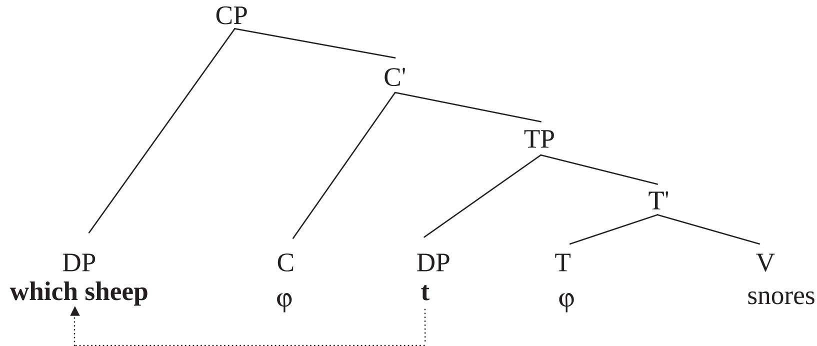
(428) a. What languages can you speak?

b.



Furthermore, it was argued in section 21 that this movement leaves behind a *trace copy* (**t** in 428b) of the moved operator expression in the argument position, and that the appearance of a wh-operator in spec-CP is necessary if this clause is to be interpreted as interrogative. Now, (420d) is interrogative, and we can propose that *which sheep* moves in this example from its original position in spec-TP to the spec-CP position as indicated in (429):

(429)



Obviously, in (429) the final position occupied by *which sheep* and its initial argument position are linked, and we can make this linking explicit by the notational device of **co-indexing** the moved item and its trace copy (up to now, we have used either bold or italic type to perform this function). If we do this, (429) can be roughly represented as in (430) (ignoring the covert C and T positions):

(430) (Which sheep$_i$) (t$_i$ snores)

But now reverting to (427), we can see that precisely the same link is signalled by use of the variable *x* in that representation. In other words, it turns out that if we suppose that wh-phrases move into spec-CP, we derive a *syntactic* representation which has characteristics that are similar to that required by the semantics – effectively, we interpret a trace copy as a variable. It is important to be clear that this conclusion has been reached by relying on a generalisation of the empirical argumentation from section 21 (that wh-phrases move to spec-CP leaving behind a trace copy) and not by arbitrary stipulation.

This is progress, but where does it leave us with (420a, b, c), examples where the semantics again seems to require something like (427), but where there is nothing in the overt syntax to suggest anything beyond what a superficial syntactic analysis would produce? Or is there? We conclude this section by sketching just one of the many arguments for there being a *syntactically motivated* level of **Logical Form** for sentences including quantified noun phrases, a level at which the syntax provides the right sort of structures for the semantics to work as outlined above. It should be noted that when we offer syntactic arguments for this level of representation, we use initial capitals for Logical Form; this distinguishes it from the philosopher's stipulated representations, often referred to as logical forms.

Consider the examples in (431):

(431) a. Frank loves his hamster
b. Who loves his hamster?
c. Every boy loves his hamster

The pronoun *his* can be interpreted in two distinct ways in each of these sentences. Take (431a): *his* can refer either to Frank or to some other male human being, say, George. In the former case, we say that *Frank* and *his* are **co-referential**.

For (431b), we again have an interpretation with *his* referring to, say, George, and in this case, the sentence means: 'for which person *x* does *x* love George's hamster?' Additionally, however, *his* can have what is referred to as a **bound variable interpretation**, in which case the sentence has the interpretation: 'for which person *x*, does *x* love *x*'s hamster?' Note that co-reference is an inappropriate notion in this case, as *who* (just like *which sheep* in 420d) does not *refer* to anyone.

Finally, (431c) is similar to (431b): *his* can refer to, say, George, or it can have a bound variable interpretation. In the former case, the sentence means 'for every boy *x*, *x* loves George's hamster'; in the latter, 'for every boy *x*, *x* loves *x*'s hamster'.

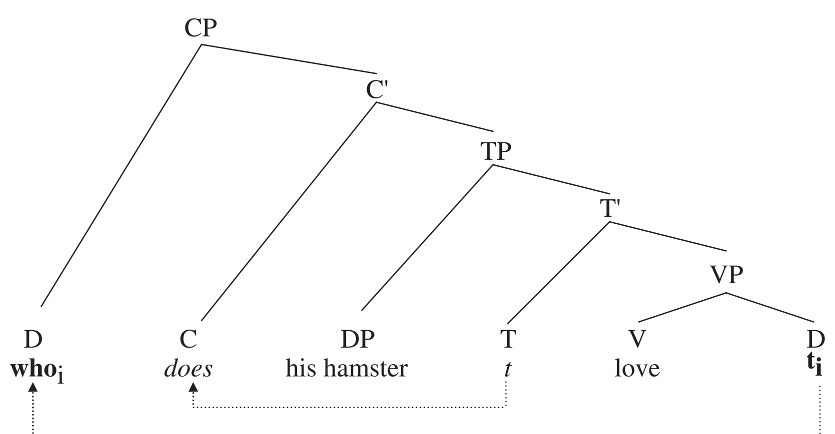
Now, alongside the examples in (431), consider those in (432):

(432) a. His hamster loves Frank
b. Who does his hamster love?
c. His hamster loves every boy

Two interpretations are available for (432a), just as for (431a): the sentence can mean that, say, George's hamster loves Frank, or, with the co-referential interpretation, Frank's hamster loves Frank. However, the bound variable interpretation of *his* is not an option in either (432b) or (432c). That is to say, (432b) cannot be interpreted as meaning 'for which person *x*, does *x*'s hamster love *x*' and (432c) cannot be interpreted as meaning 'for every boy *x*, *x*'s hamster loves *x*' (of course, if *his* were to be interpreted as referring to, say, George in (432b, c) the sentences are fine). The challenge, then, is to account for these observations: why can we not have the bound variable interpretation of *his* in (432b, c)?

We start by applying our assumptions about movement to (432b). After *who* has moved to spec-CP and *does* has moved to C, we have the structure in (433):

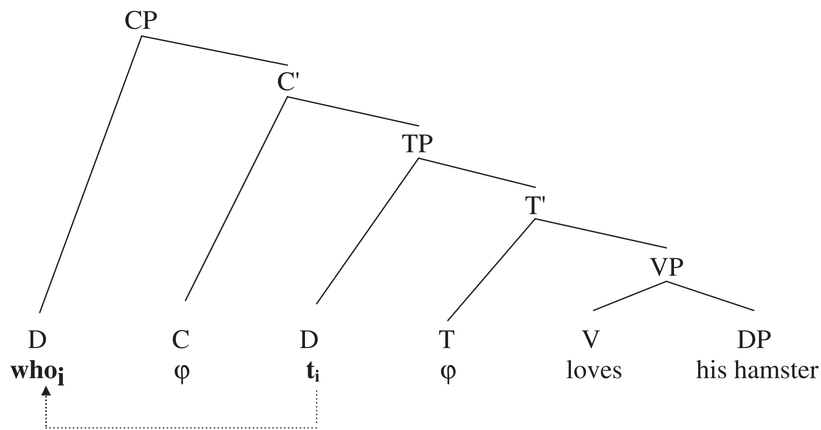
(433)



In (433), the moved auxiliary *does* and its trace are italicised, whereas the moved wh-operator *who* and its trace are bold-face. Additionally, we have co-indexed *who* and its trace in accordance with the convention introduced above.

Now, we know that (433) does not allow the bound variable interpretation for *his*. Why might this be? Note that in this derivation the movement of *who* has *crossed over* the position occupied by *his*, the pronoun with which it must be interpretively connected for the bound variable interpretation. In this respect, (433) contrasts with (434), which indicates how (431b) is derived:

(434)



In (434), *who* does not cross *his* in moving to spec-CP, and the bound variable interpretation of the pronoun (*his*) is possible.

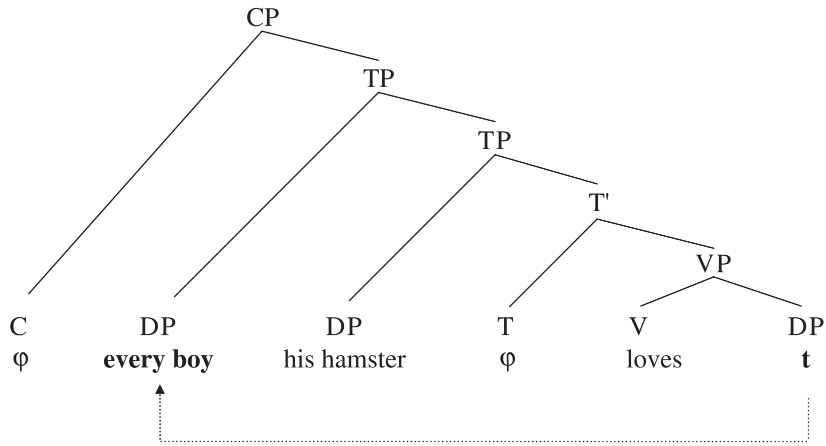
On the basis of these observations, we can formulate the **Crossover Principle** in (435) as a descriptive generalisation:

(435) If an operator expression moves across a pronoun, the bound variable interpretation of that pronoun is not possible.

This principle now accounts for the unavailability of the bound variable interpretation in (432b), and the availability of this interpretation in (431b). Furthermore, it is consistent with the fact that co-reference is possible in both (431a) and (432a), since these structures do not involve operator movement.

At this point, (432c) falls outside the Crossover Principle, yet it appears to exhibit the same sort of phenomenon as (432b) – the impossibility of a pronoun being interpreted as a bound variable. We can accommodate it to (435), however, if we suppose that there is, at some level of representation, **covert** (i.e. invisible) movement of the quantified DP *every boy* to some clause-initial position. For concreteness, suppose that this DP is moved to become an adjunct to TP (in much the same way as we earlier saw that a PP such as *with a telescope* can be *adjoined* to a VP). After this covert movement of *every boy* in (432c), we obtain the structure in (436) (the null complementiser serving to mark the declarative force of the sentence):

(436)



The derivation in (436) requires reference to the Crossover Principle in (435) as the postulated movement takes an operator expression (*every boy*) across a pronoun (*his*). As a consequence, this pronoun cannot be interpreted as a bound variable. Thus, so long as we see (435) as applying to *all* movements, overt and non-overt, we extend its coverage and we ensure that the identical interpretive restrictions in (432b, c) (no possibility of a bound variable interpretation of the pronoun) are accounted for *in the same way*. From the point of view of standard scientific practice, this is a positive result. Furthermore, there is a bonus which is particularly important in the current context. The representation in (436), with the quantified DP moved out of its argument position and a co-indexed trace in this argument position, has the right sort of form for understanding the truth conditions of sentences which contain quantified DPs; and, rather than being *stipulated*, as it was by Frege, the representation is *justified by independent syntactic argumentation*.

To be entirely clear about what is being suggested here, consider (437), a sentence which contains the quantified DP *many sheep* in complement position:

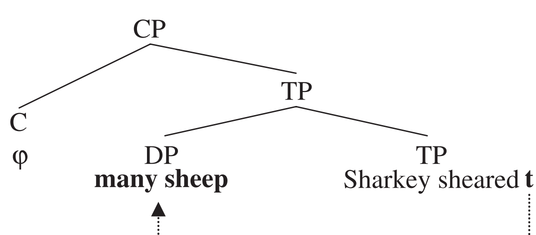
(437) Sharkey sheared many sheep

Semantic considerations require that this sentence should have a logical form (note the lower case) along the lines of (438):

(438) (many sheep *x*)(Sharkey sheared *x*)

Syntactic arguments have now been advanced to suggest that quantified DPs (covertly) adjoin to TP at the *covert* syntactic level of Logical Form (LF). For (437), this gives the (partial) LF in (439):

(439)



And (439), because of its similarity to (438), provides an appropriate representation for the semantics of quantified DPs to proceed in the required fashion.

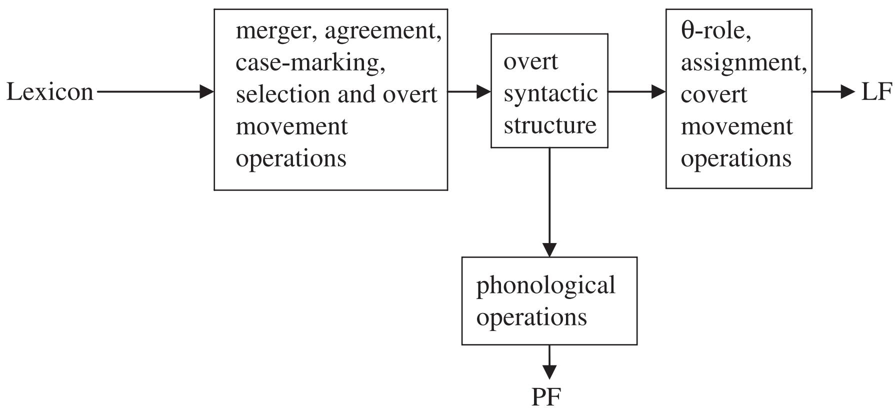
If, finally, we return to our set of examples in (420), we can see that in all cases, their LFs will be semantically appropriate. These appear in schematic form in (440):

(440) a. every sheep$_i$ [t$_i$ snores]
b. most sheep$_i$ [t$_i$ snore]
c. no sheep$_i$ [t$_i$ snores]
d. which sheep$_i$ [t$_i$ snores]

The only relevant difference in these examples is that for (440d) the movement of the operator phrase is overt to spec-CP, whereas for (440a, b, c) the movement of the quantified DP is covert in the derivation of LF and involves adjoining the quantified DP to TP (***exercises 4***, ***5*** and ***6***).

Having introduced the possibility of covert movement into our theory of grammar, we can now sketch the overall organisation of a grammar as in (441):

(441)



According to this organisation, a derivation starts with a selection of items from the lexicon. These then undergo merger, agreement, case-marking, selection and overt movement, as described in sections 19 and 21. When these operations are complete, the resulting structure is passed to the phonological component which determines how a structure is pronounced, taking account of issues which have been introduced in parts I and II of this book – obviously, the phonological component must have access to the results of overt movements. Additionally, however, this structure is passed on to the semantic component, which maps it to an appropriate Logical Form. This process will assign thematic roles to DPs and also include covert movements (operations not seen by the phonology and not 'heard' by native speakers).

Exercises

1. In the text, we introduced the following θ-roles with illustrative examples:

Agent; **Instrument**; **Affected Object** (sometimes differentiated into **Patient** and **Theme**); **Location**; **Source**; **Goal**

This list is by no means complete, and the following additional two θ-roles appear in Saeed (2003, 149–50):

Experiencer: 'the entity which is aware of the action or state described by the predicate but which is not in control of the action or state'.
Beneficiary: 'the entity for whose benefit the action was performed'.

For each of the following sentences, try to decide what θ-role should be assigned to the italicised DPs, commenting on any difficulties you encounter.
(a) *Superman* found *the solution* for *Lois Lane*
(b) *The Nile* flows from *Lake Victoria* to *the Mediterranean Sea*
(c) *The Dark Destroyer* fears *order*
(d) *Order* frightens *the Dark Destroyer*
(e) *The dog* is under *the table*
(f) *Papa Lazaru* attached *the washing* to *the line* with *pegs*
(g) *The Ming vase* broke
(h) *The mallet* broke *the Ming vase*
(i) *Jackson* broke *the Ming vase*
(j) *Jackson* broke *the Ming vase* with *a mallet*
Discuss what you can conclude about the lexical representation of the lexeme BREAK from (g)–(j).

2. In the text, we suggested that the complement of V position might be linked to the θ-role Affected Object. It has sometimes been suggested that **argument structure alternations** such as those in the pairs below cast doubt on this simple identification:
(a) i. Smith loaded hay onto the cart
    ii. Smith loaded the cart with hay
(b) i. Jones taught Swahili to Brown
    ii. Jones taught Brown Swahili
If we suppose that (ai) and (aii) describe exactly the same event, it is difficult to reconcile this with *hay* being the Affected Object in (ai) and *the cart* being the Affected Object in (aii). By carefully considering the circumstances where such pairs of examples might be appropriately used, come to a view on whether the claim that the Affected Object role should be linked to the complement of V position can be defended.
HINT: It has been suggested that appropriate use of (aii) requires the cart to be filled with hay, whereas this is not the case for (ai).

3. In the text, we have suggested that the thematic role of Agent might be linked to the specifier of T position. Can this suggestion be maintained in the light of examples such as (405a, b)?
HINT: You should consider carefully the consequences of adopting this view for the correctness of the syntactic representations we have introduced in previous sections.

4. Consider the sentence in (a):
(a) John visited London after Mary did
It is often assumed that the interpretation of such a sentence involves 'copying' the VP from the clause *John visited London* into the position of *did* in the second clause to give (b) and that this 'VP-copying' process is part of the procedure of deriving the LF for such a sentence.
(b) John visited London after Mary visited London
Suppose that this is correct, and consider (c) with the partial labelled bracketing as indicated:
(c) John [$_{VP}$ saw [$_{DP}$ everything that Mary did]]
In (c), we have the VP *saw everything that Mary did* which is produced by merging the head V *saw* with the complex quantificational DP *everything that Mary did*. What problem arises if you apply VP-copying to (c)? Does the same problem arise if VP-copying takes place *after* covert movement? Using these questions, you should be able to construct another argument for the necessity of covert movement.

5. A common observation is that a sentence such as (a) is ambiguous:
(a) Some student voted for every candidate
The interpretations are: (i) there is some particular student who voted for all candidates; (ii) for each candidate, it is possible to find a student who voted for that candidate. This ambiguity is referred to as a **scope ambiguity**, and we say that for (i), *some student* has wide scope and *every candidate* narrow scope. These relative scopes are reversed for (ii). It is a common approach to scope to suppose that it can be linked to 'height' in the structure of LF, with 'higher' operator expressions having wider scope. Try to develop an account of how the ambiguity in (a) might be represented using the ideas developed in this section.

6. Contradicting the claim appearing in exercise 5, it has sometimes been suggested that the relative scope of quantified DPs can be read directly off their *surface order*. Thus, (a) in exercise 5 has been claimed to be unambiguous, allowing only the interpretation where *some student* has wide scope and *every candidate* has narrow scope. Certainly, this interpretation appears to be *preferred*, and we can, it seems, reverse this preference by passivising the sentence, as in (a′) below:

(a′) Every candidate was voted for by some student

Here the interpretation where every candidate is voted for but not by the same student (the second interpretation from exercise 5) is strongly preferred. Use the examples in (b) and (c) below and any others you consider relevant to assess the generality of this ‘surface’ account of scope:

(b) Some worker in every factory likes ice cream

(c) Every voter in some constituency voted for Pratt

24 Children's sentences

The Principles and Parameters Theory (PPT) outlined at the end of section 22 has interesting implications for the development of a theory of language acquisition, and in particular raises the question of what it is that children have to learn about the syntax of their native language? Clearly, a major part of the task of acquiring a first language involves **lexical learning** (i.e. learning words and their idiosyncratic properties, see section 13). However, the question we shall focus on here is what **structural learning** is involved in first language acquisition – i.e. what children have to learn about the structure of sentences in the language they are acquiring. (Note that we shall be concerned here only with how children acquire their native languages, not with the very different question of how children or adults acquire foreign languages.)

Within the PPT model, certain aspects of sentence structure are assumed to be determined by UG principles (i.e. principles of Universal Grammar) and hence are invariant across languages. If we further assume that principles of UG are part of the child's innately endowed language faculty, it follows that universal aspects of sentence structure will not have to be learned (see the Introduction, pp. 7–8). For example, if clauses are universally CP+TP+VP structures and this is part of the child's innate linguistic competence at birth, it will not have to be learned. Similarly, if noun/pronoun expressions are universally D-projections (and hence comprise either a pronominal determiner, or a prenominal determiner with a noun or noun phrase complement) and this is also part of the child's innate knowledge, this too will not have to be learned. In other words, the child does not have to learn those aspects of sentence structure which are universal by virtue of being determined by innately endowed UG principles.

So what *do* children have to learn about sentence structure in their native language? The answer is that they have to learn those aspects of structure which vary in a parametric fashion from one language to another. A key assumption of the PPT model is that all structural variation between languages can be characterised in terms of a set of parameters, each of which is binary and hence has two possible values (e.g. the *Head Position Parameter*, which specifies that a particular type of phrase has head-first or head-last word order, the *T Strength Parameter*, which indicates whether T is strong or weak, the *Null Subject Parameter*, which states that finite verbs do or do not license null subjects). It follows from this that the only *structural learning* which children face in acquiring their native language is the task of determining the appropriate value of each of the structural parameters along which languages vary.

If our reasoning here is along the right lines, it leads us to the following view of the language acquisition process. The central task which the child faces in acquiring the structural properties of a language is to construct a grammar of the language. The child's language faculty incorporates a theory of Universal Grammar which includes (i) a set of universal *principles* of grammatical structure, and (ii) a set of structural *parameters* which impose severe constraints on the range of structural variation permitted in natural languages (perhaps limiting the range of variation to a series of binary choices). Since universal principles of grammatical structure don't have to be learned, the child's structural learning task is limited to that of **parameter-setting** (i.e. determining an appropriate *setting* for each of the relevant structural parameters).

The assumption that acquiring the syntactic structure of a language involves the relatively simple task of setting a number of structural parameters at their appropriate value provides a natural way of accounting for the fact that structural learning is a remarkably rapid and error-free process in young children.

Setting parameters: an example

A good example to illustrate the approach we have just outlined is provided by examining the acquisition of word order. Young children acquiring English as their native language show evidence from the very earliest two- and three-word sentences they produce of knowing (tacitly, not explicitly, of course) that phrases in English uniformly have head-first word order. Accordingly, the earliest verb phrases and prepositional phrases produced by English children consistently show verbs and prepositions positioned before their complements, as structures such as the following illustrate (produced by a young boy called Jem at age one year, eight months; head verbs or prepositions are italicised):

(442) a. *Touch* heads. *Cuddle* book. *Want* crayons. *Want* malteser. *Open* door. *Want* biscuit. *Bang* bottom. *See* cats. *Sit* down

b. *On* mummy. *To* lady. *Without* shoe. *With* potty. *In* keyhole. *In* school. *On* carpet. *On* box. *With* crayons. *To* mummy.

So, children acquiring English set the *Head Position Parameter* at the head-first setting appropriate to all types of phrases in English from the very earliest multi-word utterances that they produce. They do not use different orders for different words of the same type (e.g. they don't position the verb *see* after its complement but the verb *want* before its complement), or for different types of words (e.g. they don't position verbs before and prepositions after their complements).

A natural question to ask at this juncture is how we can account for the fact that from the very outset of multi-word speech, we find English children correctly positioning heads before their complements. The Principles and Parameters model enables us to provide a principled explanation for how children manage to learn word-order properties like these in such a rapid and error-free fashion. The answer provided by the model is that learning these aspects of word order involves the comparatively simple task of setting a binary parameter at its appropriate value. This task will be a relatively straightforward one if the Head Position Parameter determines that the only possible choice is for a given type of phrase in a given language to be uniformly head-first or uniformly head-last. Given such an assumption, once a child hears (and can parse) a verb phrase such as *help daddy*, the child will immediately be able to infer that English is a head-first language. So, child structures like those in (442) are consistent with the parameter-setting model of acquisition outlined above. However, there is what at first sight appears to be some puzzling counter-evidence to the claim that children set parameters at their appropriate value at a very early age.

Null subjects in early Child English

In influential research carried out in the early 1980s, Nina Hyams observed that children acquiring English at around two years of age frequently omit sentence subjects and produce sentences such as those in (443):

(443) Play it. Eating cereal. Shake hands. See window. Want more apple. No go in.

Hyams maintained that sentences like these have an *implicit* (i.e. 'understood') subject, a claim which is made more plausible by the fact that when children produce a seemingly subjectless sentence, they sometimes produce an expanded variant of the sentence immediately afterwards in which the 'understood' subject is made explicit – as in the following examples (collected by Martin Braine) produced by Stevie between the ages of two years, one month and two years, two months:

(444) a. Go nursery … Lucy go nursery
b. Push Stevie … Betty push Stevie
c. No touch … This no touch
d. Want that … Andrew want that
e. Plug in … Andrew plug in

Hyams went on to argue that apparently subjectless child sentences such as those in (443) have null nominative 'little *pro*' subjects (like those found in Early Modern English, see section 22), so that a child sentence such as *Want more apple* would have the fuller structure indicated informally in (445):

(445) *pro* want more apple

Here, the child is viewed as using the null nominative pronoun *pro* where an adult would use the overt nominative pronoun *I*. The more general conclusion which Hyams drew was that Child English (at the relevant stage) is a *null subject language* – i.e. a language which allows finite verbs to have a null *pro* subject. If this were so, it would provide an obvious challenge to the claim that children correctly set parameters from the outset, since adult English is not a null subject language.

However, there are reasons to be sceptical of Hyams' claim that English children initially mis-set the Null Subject Parameter and hence misanalyse English as a language which allows finite verbs to have a null nominative *pro* subject like that found in Early Modern English (EME). We saw in our earlier discussion of EME (section 22, pp. 314ff.) that null nominative *pro* subjects are only licensed in EME because finite verbs raise to T and (by virtue of the rich agreement inflections they carry) can locally identify a null *pro* subject in spec-TP. However, in Child English, verbs never raise to T (as we see from the fact that children never produce sentences like **Teddy likes not spaghetti* in which the verb *likes* moves from V to T across the intervening negative particle *not*), and often children's verbs carry no agreement inflection at all (e.g. they may say *Teddy want ice-cream* rather than *Teddy wants an ice-cream*). For reasons such as these, it is unlikely that children's 'missing' subjects are instances of the null nominative pronoun *pro* found in EME.

An alternative analysis has been put forward in more recent work by Luigi Rizzi, who argues that omission of the subject in child sentences like (443) is attributable to a separate phenomenon of **truncation** whereby one or more (weak or unstressed) constituents at the beginning of a sentence can be 'silent' (and so have a null spellout/realisation). This phenomenon of truncation is also found in colloquial adult English, e.g. in sentences such as (446):

(446) a. Can't find it (= *I* can't find it)
b. Know anything about it? (= *Do you* know anything about it?)
c. Time is it? (= *What* time is it?)
d. Nice day, isn't it? (= *It's a* nice day, isn't it?)

As these examples illustrate, truncation affects one or more unstressed words at the very beginning of a sentence (*I* in 446a, *do you* in 446b, *what* in 446c and *it's a* in 446d). In children's grammars, it even seems to extend to wh-pronouns, which are sometimes omitted from questions (resulting in *null operator* questions). So, alongside overt operator questions like (447), a girl called Claire, aged two years to two years, one month, produced null operator questions such as those in (448) (the recordings were made by Jane Anne Collins Hill):

(447) Where girl go? Where pencil go? Where cow go? Where the horse go? What kitty doing? What squirrel doing? What lizard doing? What the dog doing? What the cow say?

(448) a. Bunnies doing? (= *What are the* bunnies doing?)
b. Mommy gone? (= *Where has* Mommy gone?)
c. This go? (= *Where does* this go?)

If children's null operator questions like (448) are the result of truncation, a natural suggestion to make is that children's null subject sentences like (443) are also the result of truncation (and not of a mis-setting of the Null Subject Parameter).

Empirical evidence in support of the *truncation* analysis of children's 'missing' subjects comes from research done by Virginia Valian. She noted that English children omit subjects only in main clauses, never in complement clauses. If Child English were a genuine null subject language which allowed any finite verb to have a null subject, we should expect that children would omit subjects in finite complement clauses just as frequently as they omit them in finite main clauses. But Valian's study showed that while English children frequently omit subjects in finite main clauses, they never do so in finite complement clauses (whereas a group of young Italian children she studied frequently omitted subjects in finite complement clauses, as we would expect if they had correctly identified Italian as a null subject language). This seems to provide us with conclusive evidence that the null subjects used by English children are not the result of mis-setting the Null Subject Parameter but rather are the consequence of some independent process such as truncation. And this in turn enables us to continue to maintain the parameter-setting model of acquisition under which children from the very outset quickly arrive at a correct setting for each parameter.

But there is a further complication which we need to take account of before we can be sure that our conclusion is correct, and this relates to the fact that children often omit subjects in wh-questions. So, for example, alongside wh-questions with overt subjects such as (447) and (448), Claire (at the same age) produced wh-questions with null subjects like (449):

(449) a. What doing? (= What are *you* doing?)
b. Where go? (= Where did *it* go?)
c. What do? (= What shall *I* do?)

The null subject in such sentences cannot be the result of truncation, since a subject pronoun can be truncated only if it is the first word in a sentence (or if any word preceding it has itself been truncated, as with *do* in 446b), and it seems reasonable to assume that the wh-pronouns *what*/*where* are the first words in the sentences here, not the 'missing' subject pronouns *you*/*it*/*I*. So what precisely is the nature of the null subject in the examples in (449)?

An important clue comes from the fact that the clauses in (449) appear to be *non-finite*, in the sense that they contain no finite verb or auxiliary (e.g. they lack the finite auxiliaries *are*/*did*/*shall* which appear in their adult counterparts). Now, we already know from our earlier discussion in section 20 that non-finite clauses in adult English (such as those bracketed below) allow a null 'big PRO' subject:

(450) a. I intend [PRO going to Sri Lanka for my holidays]
b. I intend [PRO to go to Sri Lanka for my holidays]

This suggests that the 'missing' subject in the non-finite wh-questions in (449) may also be PRO, and hence that (449a), for example, has the simplified structure (451):

(451) What PRO doing?

Evidence in support of this analysis comes from the fact that English children typically don't use null subjects in finite wh-questions – i.e. they don't produce sentences such as the following (the asterisk here serves to indicate a non-occurring structure):

(452) a. *What are doing? (= What are *you* doing?)
b. *What did say? (= What did *he* say?)
c. *Where have been? (= Where have *you* been?)

Why not? The answer is that children's null subjects in wh-questions are instances of PRO, and PRO can occur only as the subject of a non-finite clause, not as the subject of a clause containing a finite auxiliary such as *are/did/have*) (***exercise 1***).

Non-finite clauses in Child English

Having argued that English children produce non-finite wh-questions like (449) with a null PRO subject, let's take a closer look at the structure of such sentences. In keeping with the assumptions underlying the Principles and Parameters model, we will assume that UG principles determine that wh-phrases must move to spec-CP, and wh-questions like (447) show that children's grammars recognise this from the earliest stages. We can maintain, then, that the wh-pronoun *what* (which originates as the complement of *doing*) moves to spec-CP in (449a). Hence, (449a) must contain a CP-projection. If we make the standard assumption that C universally selects a TP complement, and if we also assume (as we have throughout) that subjects occupy spec-TP, it follows that (449a) will also contain TP. Finally, since (449a) contains the lexical verb *doing* (and since T selects a VP complement), it will also contain VP. So, our assumptions lead us to the conclusion that (449a) is a CP+TP+VP structure derived in the manner outlined (in simplified form) in (453):

(453) $[_{CP}$ **What** C $[_{TP}$ PRO T $[_{VP}$ doing **t**]]]

Its adult counterpart *What are you doing?* will have the derivation in (454):

(454) $[_{CP}$ **What** $[_{C}$ *are*] $[_{TP}$ you $[_{T}$ *t*] $[_{VP}$ doing **t**]]]

An important difference between the two structures is that the adult structure (454) is a *finite* clause (headed by the finite auxiliary *are*) with a nominative *you* subject, whereas its child counterpart (453) is a non-finite clause with a null PRO subject. Since T in English can be filled only by a finite auxiliary (and only finite auxiliaries can move from T to C), it is scarcely surprising that (453) contains no overt auxiliary.

There are two interesting conclusions which our discussion of children's non-finite questions lead us to. The first is that there is essential **structural continuity** between adult and child grammars: this (in a fairly obvious sense) is what the Principles and Parameters model would lead us to expect. After all, if some aspects of sentence structure are determined by innate UG principles and so do not have to be learned, and if other (language-specific) aspects of structure involve children in the comparatively simple learning task of parameter-setting, we should expect to find that the very earliest sentences children produce are similar in structure to their adult counterparts.

A second conclusion which we can draw is that children sometimes use non-finite clauses such as *What doing?* in contexts where adults require a finite clause such as *What are you doing?* More specifically, young children tend to alternate between finite and non-finite clauses in finite contexts (i.e. in contexts where adults require a finite clause). We can illustrate this in terms of the negative sentences in (455) below, produced by a girl called Kathryn between the ages of one year, ten months and two years (the data are from a study by Lois Bloom):

(455) a. Can't see. I can't open it. I don't go sleep. I don't need pants off. I don't want those shoes. This one don't fit.
b. No like celery, Mommy. No want this. No go outside. Not going away. No going home. Man no go in there. Kathryn not go over here. Kathryn no fix this. Kathryn no like celery. Mommy no play 'corder. Kathryn not quite through.

Sentences in colloquial English are usually negated by a finite negative auxiliary such as *don't*, *won't*, *can't*, *isn't*, etc., and it is clear from the examples in (455a) that Kathryn already knows this. However, alongside the finite negative sentences in (455a), she produces non-finite auxiliariless negatives like (455b), sometimes negated by *no*, sometimes by *not* (confusion between *no* and *not* being typical of young children).

So, in contexts where adults require a finite clause, young children alternate between finite and non-finite clauses. An interesting reflex of the difference between these two types of child clause is that their subjects are differentially case-marked, as examples such as those below illustrate:

(456) a. *I*'m pulling this
b. *Me* going make a castle (Holly; two years)

(457) a. *She*'s gone
b. *Her* gone school (Domenico; two years)

(458) a. *He*'s kicking a beach ball
b. *Her* climbing up the ladder there (Jem; two years)

(459) a. *I* can mend it
b. *Me* finding something (Adam; two years, two months)

(460) a. *I*'m having this
b. *Me* driving (Rebecca; two years, two months)

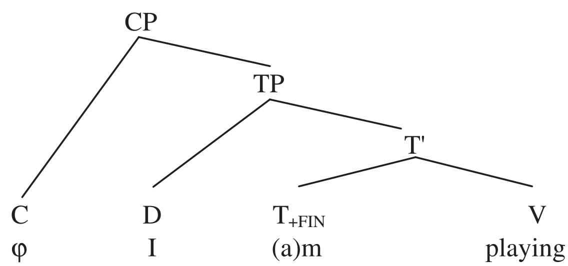
In finite clauses like the (a) examples, we find nominative subjects, whereas in non-finite clauses like the (b) examples, we find accusative subjects: for example, nominative *I* is used as the subject of the finite contracted auxiliary *'m* in (456a), but accusative *me* is used as the subject of the non-finite verb *going* in (456b). Why should this be?

Interestingly, these case-marking errors turn out to be predictable if we assume that by the age of two, children have acquired the adult English case-marking system. Adult English is said to have **structural case**, in that the case carried by a pronoun is determined by the position it occupies in the structure containing it. In section 19, we suggested that the grammar of English incorporates a set of case assignment conditions along the lines of those given in a simplified form below:

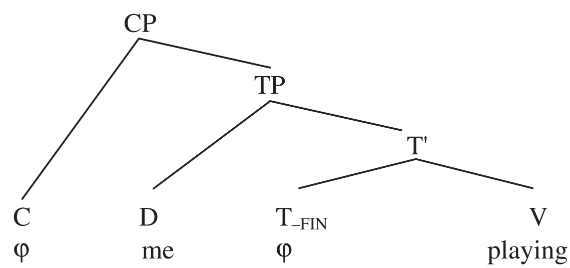
(461) Case assignment conditions in English
A noun or pronoun expression is assigned
a. nominative case if the specifier of a finite T (i.e. the subject of a finite clause)
b. genitive case if a possessor (i.e. an entity possessing something)
c. accusative case otherwise (by default, if ineligible for nominative or genitive case)

In the light of the case conditions in (461), let's look at how we account for the fact that children alternate between structures like *I'm playing* and *Me playing*. Given our assumption that subjects are in spec-TP, both clauses will contain a TP (which, given the assumption that UG requires all clauses to be CPs containing a force-indicating C, will serve as the complement of a null declarative C). Since *I'm playing* contains a finite auxiliary in T but *Me playing* does not, let's assume that T is finite in the first case and non-finite in the second. Using the feature [± FIN] as a convenient way of marking the difference between a finite and a non-finite T, we can say that the two have the respective (simplified) structures indicated in (462):

(462) a.



b.



T is filled by *'m* in (462a) but is null in (462b) because only a finite T can be filled by an auxiliary, not a non-finite T (and we can assume that children leave a given position empty when they have no suitable overt lexical item which can fill it). Let's further assume that by the age of two, children have acquired the adult English case-marking system in (461), so that (at the relevant stage) there is continuity between adult and child case systems. It follows that the subject in (462a) will have nominative case by (461a) and so appear as *I*; and conversely that the subject in (462b) will have default accusative case by (461c) and so appear as *me*.

We can extend the analysis proposed here to account for the fact that many two-year-olds alternate between saying, for example, *I want one* and *Me want one*. Let's suppose that when *want* is used with an accusative subject such as *me*, it is a non-finite form (i.e. the same non-finite form that we find in adult infinitive structures such as the italicised clause in 'Have you ever known *me want one*?'). In terms of the analysis outlined here, this means that the two sentences have the respective structures in (463) below (with *want* being a finite form in 463a and a non-finite infinitive form in 463b):

(463) a. $[_{CP}\ [_{C}\varphi]\ [_{TP}$ I $[_{T}\varphi_{+FIN}]\ [_{VP}\ [_{V}$ want $]$ one$]]]$
b. $[_{CP}\ [_{C}\varphi]\ [_{TP}$ me $[_{T}\varphi_{-FIN}]\ [_{VP}\ [_{V}$ want$]$ one$]]]$

On this view, children alternate between using finite verbs and infinitives in contexts where adults use finite verbs: for this reason, Ken Wexler and his co-researchers have dubbed the relevant stage the **Optional Infinitive stage** (sometimes abbreviated to **OI stage**). This stage typically lasts until around the child's fourth birthday (with the use of non-finite clauses in finite contexts gradually becoming less and less frequent as the child gets older).

A related phenomenon which we find during the relevant stage is that children alternate between using tensed and untensed verb forms in contexts where adults require tensed verbs (i.e. verbs inflected for present/past tense). This pattern is illustrated by the sentences in (464) below (produced by Claire at ages two years to two years, one month):

(464) a. David did it. Claire did it. Bear did it. Claire fell down. Claire woke up. Happened the hammer? Look I found. That goes little one. That one goes another one. There goes another one. Goes there. Goes here.
b. Pixie eat dinner. Jane help dinner time. Bunny stand up. Cow fall down. Claire close it. Claire do puzzle. Jane do it. That go there. Chair go there. That one fit. Daddy sit in chair. Raggedy Ann sit down. Raggedy Ann lie down. Porcupine lie down. Raggedy Ann stay there. Raggedy Ann to wake up. Jane see Mommy. Pig say oink (reply to 'What does the pig say?')

The sentences in (464a) are finite clauses containing a finite verb like *happened/goes* overtly inflected for tense, but those in (464b) appear to be non-finite clauses containing an untensed verb like *eat/go*. In terms of the framework we are using here, *Claire fell down* and *Claire fall down* will have the respective simplified structures (465a, b):

(465) a. $[_{CP}\ [_{C}\varphi]\ [_{TP}\ \text{Claire}\ [_{T}\varphi_{+FIN}]\ [_{VP}\ [_{V}\ \text{fell}\ ]\ \text{down}]]]$
b. $[_{CP}\ [_{C}\varphi]\ [_{TP}\ \text{Claire}\ [_{T}\varphi_{-FIN}]\ [_{VP}\ [_{V}\ \text{fall}]\ \text{down}]]]$

Both clauses are CP+TP+VP structures, but they differ in that T is finite in (465a) and so the verb *fell* is overtly inflected for past tense, whereas T is non-finite in (465b) and so the verb remains in the uninflected form *fall* (i.e. the same form as we find in infinitives). Once again, we see the familiar pattern of children alternating between finite and non-finite forms in finite contexts.

Children's nominals

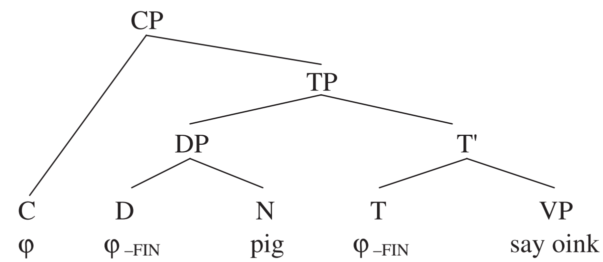
Up to this point, we have concentrated on the clause structures produced by young children, noting that they sometimes produce non-finite clauses in finite contexts, and so, for example, omit auxiliaries (or finite verb inflections like present/past tense *-s*/*-d*) where adults require them. We find a similar pattern of development in relation to children's nominal structures. From around two years of age, children start to produce adult-like DP structures of the form *determiner* + *noun*, using both definite determiners like *the*/*this*/*that* and indefinites such as *a*/*another*/*some*. However, alongside determinate nominals containing overt definite or indefinite determiners, we also find children producing bare nominals which contain a noun but no determiner (in contexts where adults would require a determiner), as illustrated by the following sentences produced by Claire at ages two years to two years, one month:

(466) a. There's *the hat*. Piggie see *the water*. Baby drink *the coffee*. Daddy sitting in *the chair*. Horsie swimming in *the pool*. Do *the green one*. Put *that mommy* in *the carriage*.
b. It's *a baby*. It's *a dolly*. It's *a girl*. There's *a spider*. There's *a bunny*. There's *another one*. There goes *another one*. Put *another fence*.
c. Daddy sit in *chair*. *Girl* sleeping. *Baby* eating *dinner*. *Baby* eating *juice*. Claire do *puzzle*. *Pig* say oink. Read *book*. Ring *bell*. See *flower*.

The italicised nominals in (466a) are DPs headed by the definite determiners *the*/*that*, and likewise those in (466b) are DPs headed by the indefinite determiners *a*/*another*. Since Claire is clearly able to form DPs at this stage, it seems reasonable to assume that all her nominals are DPs (as indeed must be the case if principles of UG specify that all nominals are D-projections). But this in turn means that bare nominals such as those italicised in (466c) must also be DPs; and since they contain no overt determiner, they must be headed by a null determiner. Note that Claire doesn't just use null determiners in contexts where adults do (e.g. with proper names like *Claire*), but also in contexts where adults require an overt determiner (e.g. modifying a singular count noun like *chair*/*girl*/*puzzle*, etc.). In other words, just as she omits auxiliaries in obligatory contexts, so too she omits determiners in obligatory contexts (i.e. in contexts where adults would require an overt determiner).

Research conducted by Teun Hoekstra and Nina Hyams has suggested that there are systematic parallels between the role of T in clauses and the role of D in nominals. They note that just as the tense specification of T serves to anchor a clause in time, so too the definiteness specification of D serves to anchor a nominal in space. On this basis, they argue that definiteness and tense are two different manifestations of a single common property, which they refer to as *finiteness*. In the terminology of Hoekstra and Hyams, nominals which contain an overt determiner are finite, whereas those which lack an overt determiner in a context where adults would require one are non-finite. This means that a sentence such as *Pig say oink* (which Claire used in reply to 'What does the pig say?') will have the structure (467) (simplified by not showing the internal structure of the VP *say oink*):

(467)



In the same way as the overall clause is non-finite by virtue of containing a TP headed by a non-finite T, so too the subject DP is non-finite by virtue of being headed by a non-finite D.

Hoekstra and Hyams argue that children's finite clauses always have finite subjects (so that they say *The doggy is barking* but not **Doggy is barking*), but that their non-finite clauses can have either finite or non-finite subjects (so that they say both *The doggy barking* and *Doggy barking*). They maintain that this follows from UG principles – more specifically from the specifier-head agreement relation which holds (universally) between a finite T and its subject. Since there is no agreement relation between a non-finite T and its subject, there are no finiteness restrictions on the choice of subject in a non-finite clause.

Hoekstra and Hyams's claim that children sometimes use a non-finite D in contexts where adults use a finite D can be extended in interesting ways to account for the fact that young children often alternate between producing genitive and accusative possessors – as the following examples produced by a three-year-old boy called Nicholas illustrate (the data kindly being provided by Joseph Galasso):

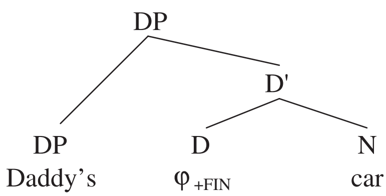
(468) a. I want *my* key
b. I want *me* duck

(469) a. What's *his* name?
b. What's *him* name?

(470) a. Where's *Zoe's* bottle?
b. Where *Daddy* car?

In the (a) examples in (468–70), the italicised possessor *my/his/Zoe's* has genitive case, whereas in the (b) examples the possessor *me/him/Daddy* is accusative. Why should young children alternate between genitive and accusative possessors? In some other languages (e.g. Hungarian), we find possessive structures of the form POSSESSOR+DETERMINER+POSSESSUM (where the possessum is the possessed object), so that in such languages the counterpart of *Daddy's car* would be a structure which can be translated literally as *Daddy's the car*. Suppose that (as Steven Abney has argued in his influential work on the syntax of DPs) the same is true of English, and that an English DP like *Daddy's car* has the structure:

(471)



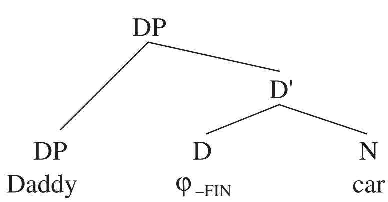
An expression such as *Daddy's car* is interpreted as having definite reference (in the sense that it is paraphraseable as '*the* car belonging to Daddy', not as '*a* car belonging to Daddy'), and this can be accounted for by assuming that the null determiner heading a possessive structure is definite in interpretation. Suppose that (as happens overtly in some languages) D agrees in person and number with its specifier – albeit invisibly in English. We can then say that D (by virtue of its definiteness and agreement properties) is *finite* in a structure like (471) – as indicated by the subscript +FIN feature on D in (471). Suppose that we now revise our earlier case assignment conditions in (461) along the following lines (replacing 461b by 472b):

(472) Case assignment conditions in English (revised)
A noun or pronoun expression is assigned
a. nominative case if the specifier of a finite T (i.e. the subject of a finite clause)
b. genitive case if the specifier of a finite D which marks possession
c. accusative case otherwise (by default, if ineligible for nominative or genitive case)

We can then say that the possessor *Daddy's* in (471) is assigned genitive case under condition (472b) by virtue of being the specifier of a finite D which marks possession.

In the light of Hyams and Hoekstra's claim that young children sometimes use a non-finite D in contexts where adults require a finite D, now consider what would happen if D in a structure like (471) were non-finite, as in (473):

(473)



The answer is that the possessor in spec-DP would no longer be eligible to receive genitive case (since this can only be assigned by a finite D under condition 472b) and would instead receive accusative case by default (under condition 472c). Accordingly, the possessor would be spelled out as the accusative form *Daddy* rather than as the genitive form *Daddy's*. It should be clear how the analysis sketched above could be extended to deal with the alternation between genitive *my/his* possessors and accusative *me/him* possessors in (468) and (469) (***exercises 2***, ***3*** and ***4***).

What our discussion here shows is that just as children alternate between finite and non-finite clauses, so too they alternate between finite and non-finite DPs. One way in which this has been described is to say that children sometimes leave functional categories **underspecified** with respect to the features they encode. So, for example, T can be underspecified for its tense/agreement features, and D can likewise be underspecified for its definiteness/agreement features. An underspecified functional category will be null where children have no suitable overt item in their lexicon which can fill the relevant slot – as we can see from the fact that D and T are null in (467). For obvious reasons, this proposal is generally known as the **underspecification** analysis of child grammars (see section 6 for a similar sense of underspecification in child phonology).

The overall conclusion we arrive at in this section is that there is essential structural continuity between child and adult grammars. Innate principles of Universal Grammar determine that clauses are universally CP+TP+VP structures, and that nominal expressions are D-projections; and we have evidence that children as young as two years of age are able to produce CP and DP structures. There is also evidence that parameters like the Head Position Parameter and the Null Subject Parameter are correctly set from the very earliest stages of acquisition (with apparent null subject sentences found in child English being instances of either truncation or sentences with PRO subjects). The principal difference between adult and child structures is that children sometimes omit functional elements in obligatory contexts (e.g. they omit auxiliaries, determiners and tense/agreement inflections where adults require them). They thus alternate between finite and non-finite clauses, and between finite and non-finite nominals. As we noted, one way of describing this is to say that functional categories in child grammars may optionally be underspecified (i.e. they may lack some of the features they have in adult grammars) (***exercise 5***).

Exercises

1. The sentences below illustrate typical null subject sentences which English children do and don't produce (a star indicates a non-occurring structure):
   (a) Can't find it (= I can't find it)
   (b) Goes in there (= It goes in there)

(c) Raining (= It's raining)
(d) Gone home (= He's gone home)
(e) What doing? (= What are you doing?)
(f) *Has gone home? (= Has she gone home?)
(g) *What are doing? (= What are you doing?)
(h) *Daddy says can fetch me (= Daddy says he can fetch me)

Discuss the nature of the null subject in each case, and say why the subject can be omitted in some of the sentences but not others. What conclusions about parameter-setting can we draw from the relevant data?

Model answer for (1a)

Nina Hyams argued that two-year-old children acquiring English initially treat English as a null subject language which (like Italian) allows any finite verb or auxiliary to have a null *pro* subject. Accordingly, one possibility is that (1a) has an (Italian-style) null *pro* subject, and so is of the form *pro can't find it*: this would mean that English children go through an initial stage when they misanalyse English as a null subject language. However, since (as Luigi Rizzi pointed out) adult English allows a subject pronoun to be truncated when it is unstressed and not preceded by any other overt constituent within the same sentence, a more plausible possibility is that the child in (1a) simply truncates the subject pronoun *I* in the same way as adult English speakers sometimes do, so that the sentence has the structure *~~I~~ can't find it,* where ~~strikethrough~~ indicates that the pronoun *I* is present in the syntax, but not pronounced in the phonology. This second view offers the advantage that it obviates the need to say that children sometimes mis-set parameters.

2. The sentences below illustrate ways in which two-year-olds typically do (and don't) use case-marked pronouns (adult equivalents are given in parentheses where these differ from their child counterparts; a star marks a structure which children don't generally produce):

(a) I'm driving my car
(b) Him driving Daddy car (= He's driving Daddy's car)
(c) They wanna play with me
(d) Her like me shoes (= She likes my shoes)
(e) *Me am helping he (= I am helping him)
(f) *Him likes we (= He likes us)
(g) *Them aren't playing with my (= They aren't playing with me)
(h) *Her is driving I car (= She can drive my car)

Analyse each of the sentences, and say why children do or don't produce them. Are such sentences consistent with the view that by two years of age children have generally acquired the adult case conditions outlined in (472) in the main text?

Model answer for (2a)

Given the assumption that UG principles determine that child clauses (like their adult counterparts) are CP+TP+VP structures, (2a) will have the following structure:

(i) $[_{CP}\ [_{C}\ \varphi]\ [_{TP}\ I\ [_{T}\ \text{'m}]\ [_{VP}\ [_{V}\ \text{driving}]\ [_{DP}\ \text{my}\ [_{D}\ \varphi]\ \text{car}]]]]$

If adult case conditions operate in child grammars, the subject *I* will be assigned nominative case by virtue of being the specifier of the finite T constituent *(a)m*, in accordance with condition (472a). If the null D heading the DP *my φ car* is finite, the possessor *my* will be assigned genitive case by virtue of being the specifier of a finite D, in accordance with condition (472b). On this view, sentence (2a) shows adult-like case assignment, lending plausibility to the claim that children generally acquire the adult case conditions by around two years of age.

3. The sentences below illustrate the kinds of sentence structures in which children do or don't omit determiners in contexts where adults require them:

(a) The boy's eating popcorn
(b) The boy eating popcorn
(c) Boy eating popcorn
(d) The boy eats popcorn
(e) The boy eat popcorn
(f) Boy eat popcorn
(g) *Boy's eating popcorn
(h) *Boy eats popcorn

How can we account for these data?

Model answer for (3a)

If UG principles determine that adult and child clauses alike are CP+TP+VP structures, (3a) will have the following structure in both adult and child English:

(i) $[_{CP}\ [_{C}\ \varphi]\ [_{TP}\ \text{the boy}\ [_{T}\ \text{'s}]\ [_{VP}\ [_{V}\ \text{eating}]\ \text{popcorn}]]]$

Since the head T constituent of TP is finite by virtue of containing the third person singular present tense auxiliary *(i)s*, it follows from Hoekstra and Hyams's observation (that a finite T requires a finite DP as its subject/specifier) that the subject of *(i)s* must be a DP like *the boy* headed by the finite determiner *the*, and not a DP like *φ boy* headed by a non-finite null determiner.

4. Corresponding to adult questions like *What's the man/he doing?*, two-year-olds typically produce structures such as the following:

(a) What's the man doing?
(b) What the man doing?
(c) What man doing?

(d) Man doing?
(e) What's he doing?
(f) What him doing?
(g) What doing?
By contrast, they don't generally produce questions like those below:
(h) *What's man doing?
(i) *What's him doing?
(j) *What's doing?

Analyse the syntax of the child question structures in (a)–(g), and try to explain why children don't generally produce sentences like those in (h)–(j).

Hints

Bear in mind that a finite T allows as its subject a finite DP such as *the man*, or a nominative subject pronoun like *he*; whereas a non-finite T allows as its subject a finite DP such as *the man*, or a non-finite DP such as *φ man*, or a default accusative pronoun like *him*, or a null PRO subject. Bear in mind also that children sometimes give a sentence-initial wh-word a null spellout/realisation.

Model answer for (4a) and (4b)

Sentence (4a) is derived as follows. The verb *doing* merges with the D-pronoun *what* to form the VP *doing what*. This VP is then merged with the T-auxiliary *is* to form the T′ *is doing what*. The resulting T′ its merged with the DP *the man* (itself earlier formed by merging the determiner *the* with the noun *man*) to form the TP *the man is doing what*. This TP is in turn merged with a strong interrogative C which attracts *is* to move to C and attracts *what* to move to spec-CP, so forming the structure shown below:

(i) [$_{CP}$ What [$_{C}$ is] [$_{TP}$ the man [$_{T}$ ~~is~~] [$_{VP}$ [$_{V}$ doing] ~~what~~]]]

In the PF component, the inverted auxiliary *is* can cliticise onto *what*, and if this happens it is spelled out in its clitic form *'s*.

The derivation of sentence (4b) is similar to that of (4a) in many respects but differs in that the former contains no finite auxiliary *is* and so is a non-finite clause which shows wh-movement but no auxiliary inversion (because it contains no auxiliary). This being so, (4b) will have the structure (ii):

(ii) [$_{CP}$ What [$_{C}$ φ] [$_{TP}$ the man [$_{T}$ φ] [$_{VP}$ [$_{V}$ doing] ~~what~~]]]

Given Hoekstra and Hyams's claim that a non-finite T allows a finite or non-finite DP as its subject, we precisely expect that the null non-finite T in (ii) can have a finite DP subject like *the man* – as in (4b).

5. Children sometimes produce auxiliary/verb structures which are different in nature from their adult counterparts. Below are listed examples of a variety of such structures produced by a number of different two- and three-year-old children (the children's names being indicated in parentheses):

(a) What did you doed? (Eve)
(b) I did locked it (Peter)
(c) He doesn't likes to be unhappy (Ross)
(d) He was cried (Nina)
(e) Don't know who is she (Adam)
(f) Does it be around it? (Adam)
(g) Would I may be excused? (Mark)
(h) Is the clock is working? (Shem)
(i) Does it doesn't move? (Nina)
(j) Did you made a mistake? (Adam)
(k) Where this comes from? (Jessie)
(l) What number I'm gonna be on my birthday? (Abe)

Identify the nature of the errors made by the children in the above sentences.

Hints

Each of the above sentences involves one or more of the following errors.

1. Wrongly assuming that a verb has to agree in person/number/tense with an auxiliary.
2. Wrongly using Do-support in a context where it is not allowed, or not using it in a context where it is required.
3. Wrongly using auxiliary inversion in a complement clause question, or failing to use it in a main clause question.
4. Wrongly assuming that a modal auxiliary has non-finite (e.g. infinitival) forms.
5. Failing to delete a copy of a moved constituent.
6. Overregularisation – i.e. treating an irregular verb as if it were regular.

25 Sentence processing

In section 14, we discussed how words are accessed and retrieved from the mental lexicon. In this section, we shall look into the processing of sentences, focusing on sentence comprehension. Notice firstly that there is a fundamental difference between lexical and syntactic processing: the lexemes in a language, being finite in number, are *stored* in the mental lexicon. Sentences, however, typically are not stored (if they were, then we would be unable to produce any new sentences, i.e. sentences that we have never heard or read before). Indeed, sentence repetition and sentence recognition experiments have shown that normally syntactic structures are extremely transient: memory for syntax is unreliable only half a minute after a sentence has been heard or read (was the second sentence in this paragraph *Focusing on sentence comprehension, in this section, we shall look into the processing of sentences* or *In this section, we shall look into the processing of sentences, focusing on sentence comprehension*?). Hence, whereas word recognition can be described as a retrieval process with the goal of finding an entry in the mental lexicon, sentence processing does not involve accessing and retrieving entries from a mental repository.

If the representations of sentences are not retrieved from a memory store, this means that they are constructed on-line (in a step-by-step fashion) in accordance with syntactic principles or rules. It follows that sentence comprehension involves segmenting the sentence into relevant processing units and constructing a syntactic representation for the sentence (the technical term for this is **parsing**).

But how do we go about processing sentences? According to one view (which is favoured by many psychologists), speakers/listeners rely on parsing and production strategies that have nothing much to do with the units and operations that linguists employ in their syntactic analyses of sentences. On this view, the detailed tree structures we have been associating with sentences throughout this part of the book bear no relationship to the procedures native speakers employ when parsing. Alternatively, it has been suggested that such structures do play an important role in sentence processing, to an extent to be determined by psycholinguistic research. Proponents of this alternative view claim that when producing or comprehending a sentence, we make use of essentially the same processing units and operations as are used in linguistic analysis, such as constituents, tree structures and movement operations. If this is correct, it means, for example, that listeners segment sentences into VPs, TPs, CPs, etc., and that linguistically complex sentences are more difficult to comprehend than simple ones. In other words, the more complex the syntactic derivation (in terms of the operations it involves), the more difficult the sentence is to process. This view came to be known as the **Derivational Theory of Complexity (DTC)**, and many psycholinguists have explored the extent to which the DTC actually holds. When this research began, in the late 1960s, the idea that a generative grammar could provide not just a theory of syntactic knowledge (competence), but at the same time a theory of syntactic processing (a central aspect of performance) was adopted with considerable enthusiasm. Subsequently, however, these rather naïve ideas have been abandoned, and more complex questions are now being asked. In what follows, we will look at two sets of experimental results which suggest that the syntactic constructs theoretical linguists have postulated are in fact used by normal listeners when they process sentences. Positive results of this kind do not, of course, constitute a comprehensive theory of sentence perception. They do, however, indicate that a grammar, as we have understood this notion throughout this book, will be a central component of such a theory.

Click studies

The purpose of click studies is to determine whether listeners segment sentences to which they are listening into units similar to those postulated in syntactic theory, namely phrases and clauses. In this type of experiment, sentences such as (474) are recorded, and superimposed on each sentence is a 'click' or 'beep', i.e. a short acoustic signal, which may be located at any one of a number of different places within the sentence.

(474) The man [who nobody likes] is leaving soon

Immediately after hearing the sentence (including the superimposed 'click'), subjects are given a written copy of it and are asked to indicate the point in the sentence at which they perceived the click. In sentences like (474), the bracketed clause is a *relative clause*, in which the relative pronoun *who* 'relates to' the preceding expression *the man* (see section 18, p. 253). The possible locations of the click for subjects hearing this sentence are indicated by + in (475):

(475) a. The $^{+}$ man [who nobody likes] is leaving soon
b. The man [who $^{+}$ nobody likes] is leaving soon
c. The man $^{+}$ [who nobody likes] is leaving soon

In (475a), the click occurs *before* the relative clause boundary, in (475b), it occurs *after* this boundary, and in (475c), it is located *exactly at* the boundary. Subjects hear a range of sentences of this (and other) structural types with the position of the click systematically varied.

The basic finding in such studies is that subjects misplace clicks *towards or into major clause boundaries*. An early click, which in the stimulus is objectively located immediately before the noun *man* in (475a), is reported as occurring towards or at the clause boundary (i.e. in the word *man* or between *man* and *who*). Similarly, a late click located after the clause boundary in (475b) is reported as occurring earlier, again towards or at the clause boundary. By contrast, clicks objectively located at the clause boundary are accurately perceived as having occurred in this position. Similar results have been obtained with respect to the second clause boundary position in (474), i.e. between *likes* and *is*, and using a variety of different clause types.

Click experiments are deliberately constructed in such a way as to overstretch a subject's processing capacity. The task is extremely demanding as it involves two processing tasks to be undertaken simultaneously, the comprehension of the sentences (which can be tested by asking subjects questions) and the location of the clicks. The idea is that because of the demands of the task, the experiment produces errors in click location, and this is in fact what happens. What is most interesting here is the types of errors that the subjects make, which are not random. Firstly, of the three possibilities, click misplacements tend not to occur for (475c) and other sentences, where the click is located at the clause boundary. By contrast, errors are common in the 'early' and 'late' conditions of respectively (475a, b). Secondly, click mislocations tend to go into the clause boundary. These results suggest two things, namely (i) that the placement errors reflect the way the stimulus sentences are segmented into structural units, and (ii) that the clause is the major sentence-processing unit. Using the same technique with different stimuli has yielded evidence for perceptual segmentation at constituent boundaries within clauses, too, specifically for a constituent boundary before VP, but these clause-internal boundaries give rise to a weaker effect than do major clause boundaries such as that in (474).

Finally, it is important to be clear that 'common sense' does not provide an explanation of these findings. For instance, it might be thought that there is a clear 'acoustic gap' between *man* and *who* in (474) and that it is this superficial aspect of the signal which is 'attracting' clicks. But this is not so: acoustic analysis of stimuli used in these experiments indicates that there is no such 'acoustic gap' – the speech signal is continuous – and reinforces the conclusion that subjects are relying on a *linguistic* segmentation of the input signal in their perception of the sentence.

Processing empty categories

As we have seen in section 20, syntactic theory postulates a range of so-called empty categories, phonetically null place-holders that occupy specific phrase-structure positions. Among these are the trace copies left behind by syntactic movement, discussed at some length in section 21. In fact, it is more accurate to refer to such objects as *covert categories*, since – if the theory is correct – they are not in fact empty of syntactic information. For example, PRO has the categorial status of a D and traces, by virtue of being silent copies of moved items, retain the syntactic characteristics (as a DP-trace, V-trace, etc.) of those items. Is there any evidence from psycholinguistic experiments which independently confirms that empty categories are involved in the processing of sentence structure?

The answer to this question is 'yes'. Before we turn to experimental results, consider (476), which contains a covert category, namely a silent copy of the bracketed wh-phrase *which paintings*

(476) [*Which paintings*] did you speak to Mary about [~~*which paintings*~~]?

In this structure, the wh-phrase originates as the complement of the preposition *about*, and then moves to spec-CP, leaving a trace behind in the prepositional complement position. The trace is an invisible 'copy' of the wh-phrase and so has the same grammatical properties as the phrase. Psycholinguists refer to the relationship between the moved wh-element and its trace as a **filler-gap dependency**: the higher overt wh-phrase *which paintings* is regarded as the filler for the lower gap, i.e. the position occupied by the trace.

To study filler-gap dependencies experimentally, psycholinguists have used several different techniques. One such technique is the *probe-recognition task*. In a study employing this task, subjects are asked to read sentences such as (476) from a computer screen, and are then asked to determine as quickly as possible whether certain probe words (e.g. *did* or *to)* appeared in the sentence – typically the probe word is displayed by subjects pressing a button as soon as they have read the sentence on the screen, and they then press further buttons to indicate whether the word displayed occurred in the sentence or not. The result for a sentence like (476) is that reaction times (RTs) for more recent items such as *to* are shorter than for more distant elements such as *did*. In other words, subjects show a faster reaction time in recognising elements they have recently perceived (probably because they are still present in short-term memory) than for those which are further away from the end of the sentence.

This kind of *recency effect* can be used to investigate the role of trace copies of moved constituents. Consider the following examples:

(477) a. John argued that Alex had seen the **boys**
b. The **boys** argued that Alex had seen John
c. The **boys** argued that Alex had seen *them*
d. [Which **boys**] did Alex argue that he had seen [~~which **boys**~~]?

In all cases, the probe is the word *boys*, i.e. subjects have to decide as quickly as possible whether *boys* has occurred in the sentence they have just read (of course in an actual experiment, there will be many different sentences with many different probes, and the order of presentation of examples will be carefully controlled). For (477b), RTs are significantly longer than they are for (477a). This can be put down to the recency effect we have just described. Interestingly, RTs to (477c) are also significantly faster than they are to (477b), despite the fact that *boys* is equally distant from the end of the sentence and the appearance of the probe in both cases. However, (477c) contains *them*, which can be interpreted as co-referential with *the boys*, as a very recent item. It is plausible, therefore, to suppose that *the boys* in (477c) behaves *as if* it were in the position occupied by *them*, thereby giving rise to a recency effect. The most interesting result, however, is that RTs to the probe *boys* in (477d) are similar to those in (477c), and again significantly shorter than those in (477b). This means that there is a recency effect in (477d), too – and the only candidate for explaining this in (477d) is the trace copy of the moved wh-expression.

What this finding shows is that when subjects process wh-questions such as (477d) and reach the position from which the wh-expression has been extracted (i.e. the position occupied by ~~which **boys**~~ in 477d), the syntactic information contained in the wh-phrase is *reactivated*. Otherwise, there would be no recency effect for the probe word *boys*. This can be accounted for straightforwardly if we suppose that movement is a copying operation, and that a silent copy of the moved wh-expression *which boys* remains *in situ* (as the complement of *seen*) in (477d). The experiment shows that listeners reconstruct the relationship between a trace and its antecedent (i.e. the moved item to which it is related). (***exercises 1*** and ***2***).

Strategies of sentence processing

So far, in this section, we have shown that some notions from syntactic theory such as constituent structure and empty categories are useful for understanding human sentence processing. This, of course, is consistent with the theory of grammar being directly interpreted as a theory of linguistic performance. However, we shall now see that certain *processing principles* or *strategies*, which have no place in a theory of competence, must also be operative when we process sentences. Specifically, we will look at three types of processing difficulties (involving structural ambiguities, centre-embeddings and garden-path sentences), which demonstrate that some sentences are difficult to process even though they are perfectly grammatical and do not contain any difficult words.

Structural ambiguity (see section 23) may cause processing difficulties. In fact, many of the sentences that we hear in our everyday conversations are ambiguous. Typically, however, these ambiguities do not impede communication. Indeed, we are rarely even aware of the occurrence of an ambiguity, and we generally come up with only one interpretation for each sentence, which, in the vast majority of cases, is the correct one.

Suppose, for example, that somebody who knows the grammar of English but who is unfamiliar with regional British culture is confronted with the following sentence:

(478) Scotsmen like whisky more than Welshmen

This sentence has two interpretations, which can be paraphrased as (479a, b):

(479) a. Scotsmen like whisky more than Scotsmen like Welshmen
b. Scotsmen like whisky more than Welshmen like whisky

The question of which interpretation is the appropriate one cannot be decided by just looking at the individual words in (478), as their meaning remains the same on both readings. The ambiguity of (478), then, must be a structural one. In other words, the grammar of English allows two different syntactic representations to be assigned to (478), each of which is associated with a different interpretation. Hence, the difficulty of comprehending (478) results from its structural ambiguity, and since in the case of (478) there is no preferred interpretation, people typically rely on non-linguistic clues that indicate to them which interpretation is the intended one. For the case under discussion, if we equip our listener with the knowledge that whisky is the national drink of Scotland, this might be sufficient to establish a preference for the interpretation in (479b). However, this preference would not be strong and would almost certainly be overridden in a context where Scotsmen were observed fighting Welshmen (***exercise 3***).

To understand how the ambiguity of (478) arises, consider again (479a, b). Now assume that there exists a process of *ellipsis* which can erase words in the second clause that have already occurred in the first clause, but that these deleted elements remain visible to interpretation. Under these assumptions, (478) can be seen as a 'shortened' version of either (479a) or (479b). The two options are illustrated below, with ~~strikethrough~~ used to mark material which undergoes ellipsis (notice that *Welshmen* functions as the complement of the verb *like* in 480a, but is subject of *like* in 480b):

(480) a. Scotsmen like whisky more than [~~Scotsmen like~~ Welshmen]
b. Scotsmen like whisky more than [Welshmen ~~like whisky~~]

In other cases of structural ambiguity, we seem to strongly prefer one interpretation over the other quite independently of linguistic and non-linguistic context, and it is in connection with examples of this type that perceptual strategies become very significant. Consider the example in (481):

(481) John helped the students who lost out

This sentence again has two interpretations, paraphrases of which are given below:

(482) a. John supported the students who *lost out*
b. John *helped out* the students who lost

The first interpretation (482a), in which the preposition *out* is associated with the verb *lose*, is clearly preferred by most listeners, but the second interpretation (482b), in which *out* is associated with *help*, is also perfectly grammatical. Ambiguities such as those in (481) are less likely to occur in spoken language comprehension, as different stress patterns lead hearers to prefer certain interpretations; for example, if the speaker introduces a noticeable pause after *lost* in (481), then the particle *out* is likely to be understood as linked to the main verb *helped*. Obviously, such cues are not available in written language comprehension. Notice also that the separation of a particle from the verb is actually quite common in English and does not normally produce any processing difficulties. Compare, for example, (481) and (483):

(483) Betty *put* the big Persian cat *out*, before she left the house.

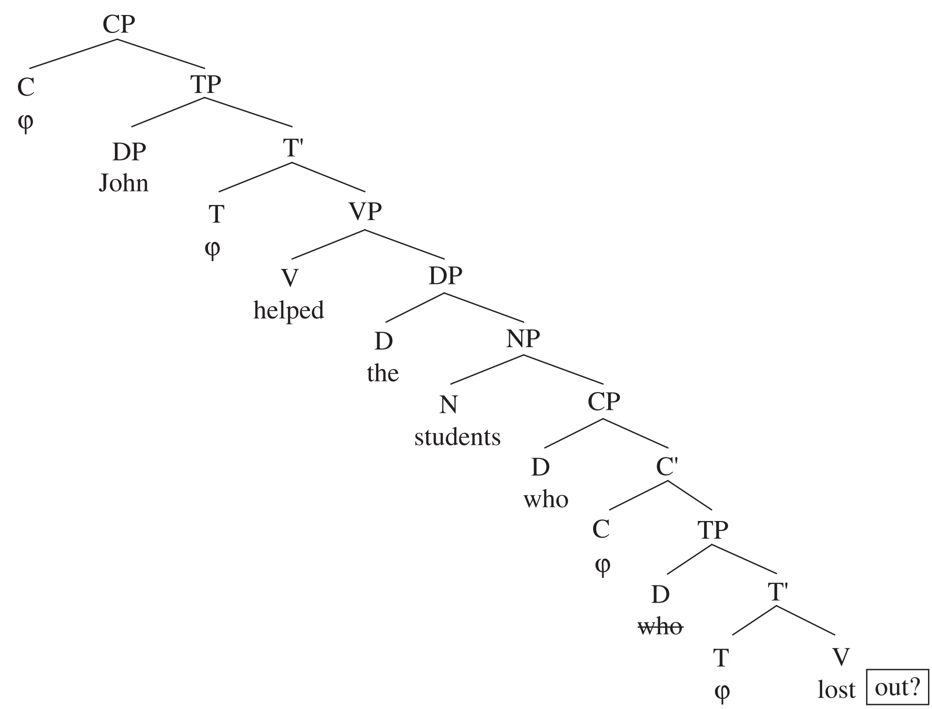
We can roughly indicate the structural ambiguity of (481) by the different bracketings in (484a, b):

(484) a. John helped [the students who lost] out
b. John helped [the students who lost out]

But why do listeners prefer the bracketing in (484b) to that in (484a)? Given that both structures are equally grammatical, we have to look beyond mere structural descriptions to find an answer to this question. Recall that syntactic theory accounts for the existence of certain types of structural ambiguity by deriving them from different structural representations, as, for example, in (480a, b). But syntactic analysis itself cannot explain how it is that people resolve such ambiguities in the way they do on specific occasions, nor why they often prefer one structure over another in a manner independent of context, as, for example, with (481). In short, we need to find out what additional strategies or principles listeners employ when they parse sentences.

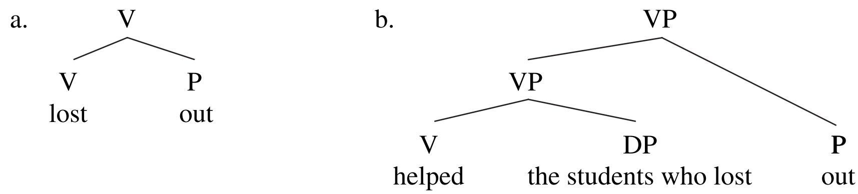
The fact that listeners prefer interpretation (484b) over (484a) is indicative of a fairly general property of sentence processing: the idea is that as the parser builds a structure, whenever there is a choice between a local and a distant attachment possibility, as in the case of *out* in (481), it favours the more local one. Put differently, listeners prefer to construe any given word *as part of the constituent being processed at that time*, rather than as part of a different constituent. With respect to (481), this means that the preposition *out* is construed as a constituent of the nearest VP, which is the VP headed by the verb *lose*, rather than of the VP headed by *help*, which is further away from *out*. The structure in (485) illustrates this:

(485)



The structure in (485) is based on the assumption that syntactic parsing is like reading or speaking in that it proceeds from left to right and that it is done on-line, i.e. whenever the parser comes across a new word in its left-to-right journey through the sentence, it has to incorporate the word into the tree which is available at that point. In (485), we have got to the point where the parser encounters *out*, and the options for the attachment of this item are indicated in (486a, b) – we assume that *out* adjoins (see section 23) either to the verb *lost* (486a) or to the verb phrase *helped the students who lost* (486b):

(486)



The listener's *grammar* provides the information that *out* can adjoin to either *lost* or *helped*. However, attaching *out* to the verb *lost* as in (486a) is a **local attachment** and is therefore preferred. The alternative of attaching *out* to the verb phrase *helped the students who lost* as in (486b) involves the parser in looking back earlier in the sentence and reconsidering the structure of the higher VP (a procedure known as *backtracking*). In general, the parser will avoid backtracking and rearrangement of constituents as much as possible. With (486a), no such backtracking is required, and this parse is consistent with the local nature of human parsing.

Another type of grammatical sentence which does not involve structural ambiguity but which yields considerable processing difficulties is one which includes **centre-embedding**. Compare the sentences in (487):

(487) a. The pen the author the editor liked used was new
b. The pen which the author whom the editor liked used was new
c. The editor liked the author who used the pen which was new

These sentences are paraphrases of each other, with no significant meaning differences, and none of them violates any grammatical requirements of English. But on several processing measures (e.g. RTs, accuracy of paraphrasing, etc.), (487a) proves more difficult to parse than (487b), and (487b) proves more difficult than (487c). Notice that this holds despite the fact that in terms of the number of words involved, (487a) is actually shorter than both (487b) and (487c). How do we explain these processing differences?

The main factor distinguishing (487a) from (487c) is that, in the latter, parsing can proceed locally, whereas this is not possible in the former. In (487c), the three basic clauses (*the editor liked the author*, *the author used the pen* and *the pen was new*), separated by commas, can be straightforwardly parsed from left to right. Thus, when the parse for the first clause is closed, it can be cleared from short-term memory, as can that for the second clause. In (487a), however, the three basic clauses must all be kept in short-term memory until the end of the sentence is reached; only at this point can the listener attach the appropriate verb to each of the three sets of arguments to form the three basic clauses. A very fundamental finding in research on short-term memory is that its capacity is severely limited (see how many digits you can remember in the sequence in which they are presented to you), so we might plausibly suppose that one difficulty with (487a) is that its processing overloads short-term memory – importantly, this is not a *linguistic* difficulty. Another aspect of (487a) that prevents local parsing decisions being taken is that the sequence *the pen the author the editor* does not contain any cues as to the grammatical function (subject or complement) fulfilled by these DPs in the various clauses of the sentence. Compare this with (487b). In this case, the relative pronouns *which* and *whom* provide cues which allow the parser to assign grammatical functions to these elements. As the parser can make some decisions early on in (487b), which cannot be made in (487a), parsing (487b) is more local than parsing (487a), and hence again is less burdensome for short-term memory (***exercise 4)***.

We consider finally a phenomenon touched on briefly in our introduction (p. 10), that of garden-path sentences or **syntactic illusions**, as this also requires a processing explanation. In syntactic illusions, a certain decision about interpreting a sentence which is locally tenable leads to the (incorrect) conclusion that a grammatical structure is ungrammatical. Consider, for example, (488a) which is a perfectly grammatical sentence as can be seen from inserting the relative pronoun *which* and the auxiliary verb *was* in the appropriate positions (488b):

(488) a. The elephant squeezed into a telephone booth collapsed
b. The elephant which was squeezed into a telephone booth collapsed

Despite their well-formedness, many listeners are confused by garden-path sentences such as (488a). The illusion can be explained in terms of processing considerations, specifically by the parser's preference for making local processing decisions. To be maximally efficient the parser attempts to close phrases and clauses as soon as possible. In the case of (488a), however, this strategy leads the parser up a garden path: taking the sequence *the elephant squeezed into a telephone booth* from (488a), the parser assumes that the clause is closed, and this requires that *the elephant* is the (logical) subject of *squeezed*, a clear mistake – in fact, *the elephant* has to be interpreted as the complement of the passive participle form *squeezed*, and to have undergone movement from complement to subject position, as described in section 21. Thus, when the parser reaches the second verb (*collapsed* in this case), time-consuming and laborious reprocessing is necessary to escape from the illusion. Indeed, such is the strength of this illusion that some native speakers experience considerable difficulty in escaping from it at all (***exercise 5***).

In this section, we have looked at some aspects of how people assign structures to strings of words with two main themes in mind. Firstly, we wanted to establish that the grammatical constructs developed by linguists as part of their theory of grammar do play a role in sentence processing. Of course, it would be a puzzling situation if a mentally represented grammar (theory of competence) were not put to work in sentence perception and production (linguistic performance). Nevertheless, it is reassuring to find experimental evidence which indicates that constituent structure and antecedent–trace relations are actively involved in processing.

Secondly, we have acknowledged that the theory of grammar does not provide a *complete* account of sentence processing, and we have looked at different kinds of sentences that cause processing difficulties, even though they are perfectly grammatical. Processing considerations which go beyond the rules and principles of grammar are necessary to understand these phenomena. The idea that the human parser has a strong preference for operating with local operations is a key idea in this area of research.

Exercises

1. Most psycholinguistic studies on the processing of empty categories have been done on English. Cross-modal priming experiments, for instance, have shown that a moved constituent is reactivated at the hypothesised trace position in sentences such as (a).

   (a) *Which book* did you buy [~~*which book*~~] last week?

   Some researchers have argued, however, that such reactivation effects do not necessarily indicate that a trace copy must be present in the listener's mental representation of the sentence but can equally well be explained in terms of *direct lexical association*: on encountering the verb *buy*, listeners automatically reconstruct all the verb's arguments, including the displaced direct object *which book*. How (if at all) might it be possible to dissociate the *Trace Reactivation Hypothesis* and the *Direct Association Hypothesis* empirically? Consider, for example, how a sentence such as (b) might be processed on-line.

   (b) To which butcher did the woman who had just inherited a large sum of money give the very expensive gift the other day?

2. Object relative clauses (i.e. those where the relative clause modifies a direct object, as in b below) are more difficult to process than subject relative clauses (i.e. those where the relative clause modifies a subject, as in (a) below):

   (a) The reporter who attacked the senator admitted the error

   (b) The reporter who the senator attacked admitted the error

   How can we explain this difference?

3. Compare the sentence pairs in (a), (b) and (c) and explain why the sentences in (i) are more difficult to process than those in (ii). Discuss what these contrasts might mean for the idea that syntactic parsing is

autonomous, i.e. independent of other sources of information (e.g. lexical information); see also section 14.

(a) i. John warned his mother was dangerous
ii. John knew his mother was dangerous

(b) i. Even before the police stopped the driver was getting nervous
ii. Even before the truck stopped the driver was getting nervous

(c) i. The secretary didn't quit because of her large raise
ii. The secretary didn't quit because of her low salary

4. What problems do sentences like the following pose for sentence processing, and how can they be explained?
(a) Mary figured that Susan wanted to take the train to Liverpool out
(b) The woman the man the girl loved met died of cholera
(c) The brother of the girl who was famous came to visit us

5. Explain why and how garden-path sentences pose processing problems for sentence comprehension. Consider the following sentences and any others that might be useful in your discussion:
(a) While Mary was mending the sock fell off her lap
(b) John told the girl that Bill liked about the problem
(c) Sue gave the man the dog bit the package
(d) The dealer sold the forgery complained

26 Syntactic disorders

The study of syntactic errors in language-disordered patients is an area in which linguists, psychologists and speech therapists have collaborated extensively. Recent syntactic theories have been applied to neurolinguistic data and have led to a better understanding of patients' linguistic problems; in turn, theoretical linguists have gained a new source of data from syntactic errors to test their theories.

Generative linguists in particular have shown interest in syntactic disorders. Recall that many generative linguists (particularly Noam Chomsky and his followers) claim that humans possess a language-specific cognitive system (embodying principles of Universal Grammar) that underlies the production and comprehension of sentences. Syntactic principles are said to be unique to language, and autonomous of non-linguistic cognitive systems such as vision, hearing, reasoning, or memory (see the introduction, p. 11). This view of syntax makes two interesting predictions about language disorders. Firstly, we would expect to find cases of language disorders in which knowledge of syntax is impaired while other cognitive systems remain unaffected: if the syntactic system is indeed autonomous, then it should be possible for it to be selectively impaired, for example as a result of brain lesions or genetic deficits. The second prediction is that syntactic disorders should involve impairments of both language production and language comprehension. If the linguistic view is correct, and there is indeed only one underlying system of syntactic principles which is crucially involved in both sentence production and sentence comprehension, then an impairment of the underlying system should manifest itself not only in sentence production but also in sentence comprehension and in grammaticality judgement tasks.

These predictions have mainly been tested in the context of the phenomenon of agrammatism, which typically occurs in Broca's aphasics, and (to a lesser extent) on the so-called **paragrammatic errors** from Wernicke's aphasics. In addition to these two areas of enquiry, some years ago psycholinguists started to investigate developmental language disorders, particularly Specific Language Impairment (SLI), from a syntactic perspective. These three cases of language disorders are unique, in that patients show syntactic impairment while, at the same time, other cognitive functions seem to be unimpaired. In this section, we will describe the syntactic errors that typically occur in agrammatism, paragrammatism and SLI, and we will show what we can learn from applying syntactic theory, as it has been introduced in this part of the book, to the study of these disorders.

Agrammatism

Recall from the section 15 (p. 214) that according to the classical clinical description of aphasias, the sentences Broca's aphasics produce in spontaneous speech are characterised by their simplicity or reduced syntactic complexity. These sentences are often incomplete, with functional elements (including grammatical inflections) being omitted. These problems also usually occur in writing, whereas sentence comprehension is said to be more or less unaffected. Consider (489), where we see examples of Broca's aphasics' attempts to produce some simple English sentences, for illustration:

		Reconstruction of target	Realisation
(489)			
	a.	He*'s* going *on the* bus	He going bus
	b.	*When did* this happen?	This happened?
	c.	*The* woman is packing the case	Woman is packing the case
	d.	*I* only passed my test *in the* afternoon	Only passed my test afternoon
	e.	*They are* pulling it	Pulling it

As is shown by the reconstructions of the targets in (489), we can paraphrase the deviant or simplified utterances produced by Broca's aphasics by normal English sentences which differ only minimally from the actual realisations. In all cases, the realisations are syntactically less complex than the target reconstructions, and omissions and simplifications typically affect functional projections (DP, TP and CP). For example, in (489a), the head T position of TP is left empty instead of being filled by the auxiliary *is*, and the determiner *the* is omitted from the head D position of the target DP *the bus* (in addition, the preposition *on* is omitted from the target PP *on the bus*). Similarly, in (489b), the wh-operator *when* is omitted from spec-CP, and the preposed auxiliary *did* is omitted from C. In (489c) and (489d), the determiner *the* is omitted from the head D position of the target DPs *the woman* and *the afternoon*, and in the latter, the pronominal D *I* in spec-TP is missing (and the preposition *in* is omitted from the target PP *in the afternoon*). And finally, in (489e), the auxiliary *are* is omitted from the head T position of the target TP *They are pulling it*, along with the D-pronoun *they* in spec-TP.

According to the clinical definition, agrammatism in Broca's aphasics is modality-specific. That is, agrammatic errors are believed to occur in one modality only, namely in language production, with sentence comprehension unimpaired. If this were correct, then agrammatism would be a disorder of some peripheral language-production mechanism, with the central cognitive system underlying the knowledge of grammar still being intact. Research in linguistic aphasiology, however, provides us with a somewhat different picture. It has been shown, for example, that Broca's aphasics have problems in comprehending functional categories as well as in producing them. Such findings suggest that the agrammatic deficit involves impairment of the underlying linguistic system as well, and not just a disturbance in one modality.

Sentence comprehension in Broca's aphasics can be studied only through structured experiments. Aphasiologists have recently begun to adopt different psycholinguistic techniques, e.g. linguistic judgement tasks, lexical decision experiments and reaction-time techniques in order to assess agrammatics' knowledge of grammar. Let's look in some detail at one experiment which investigated a single, well-defined syntactic phenomenon, namely the fact that sentences like (490a, b), differing only in the positioning of the definite article *the*, have quite distinct interpretations:

(490) a. The man showed her baby the pictures
b. The man showed her the baby pictures

In (490a), the DP *her baby* functions as what is sometimes known as the 'recipient' complement of the verb (it refers to the individual who receives something – in this case, visual stimulation – in the action referred to by the verb) and the DP *the pictures* is the 'theme' complement, referring to whatever is generally affected in the action referred to by the verb (see section 23). By contrast, in (490b), *her* is the 'recipient' complement and *the baby pictures* is the 'theme' complement. The crucial factor underlying this distinction is the determiner *the*. Since in (490a) *the* appears between *baby* and *pictures*, we cannot analyse these two nouns as parts of a noun compound in this structure. (Note that noun compounds don't allow determiners between the two nouns: we have such compounds as *loft space* and *armchair*, but not **loft-the-space* and **arm-the-chair*.) In (490b), however, the compound-based interpretation is possible, due to the absence of *the* between *baby* and *pictures*.

Returning now to agrammatism, in the study we are concerned with, the contrast between (490a) and (490b) was exploited to conduct an interesting experiment on sentence comprehension in agrammatic patients. It was argued that if sentence comprehension was unimpaired in agrammatic aphasics and patients were relying on syntactic clues to process sentences – *such as the presence and position of a determiner* – then sentences like (490a, b) should be correctly interpreted by these patients, just as they are by normal adult speakers of English. If, however, the agrammatic deficit also affects comprehension, and if agrammatics ignore the function word *the* in comprehension in the same way as they omit it in production, as in (489c), then (490a, b) should be ambiguous for them in the same way as (491) is for normal adults:

(491) The man showed her baby pictures

A moment's reflection should reveal that either *her* or *her baby* can be interpreted as the recipient, with the theme being correspondingly either *baby pictures* or *pictures*.

To test this prediction, a sentence–picture matching task was used in which subjects had to choose from four alternative pictures that were presented for each sentence. Suppose the presented sentence was (490a). Then one picture (the correct one) illustrated a man showing pictures to a woman's baby, while a second (incorrect) contained a man showing pictures of a baby to a woman. Two further pictures (both incorrect) were included to test for lexical comprehension, examples being appropriate pictures for the sentences in (492):

(492) a. The man showed her girls the hats
b. The man showed her the girls' hats

The results of this experiment demonstrated that agrammatics made few lexical errors, i.e. they hardly ever chose pictures appropriate to (492a, b) when the presented sentence was (490a), but in nearly half of the trials, they picked the picture portraying the nominal-compound reading, i.e. the picture appropriate for (490b). In other words, the agrammatic patients appeared to treat (490a) and (490b) as *ambiguous*, an interpretation which is consistent with them failing to process the definite article *the* and thus treating both sentences as if they were (491). Given that the comprehension disorder found in this experiment is parallel to the syntactic errors that occur in agrammatic production, in that both involve errors with function words, we may conclude that agrammatism is a fundamental disorder of the linguistic representational system (i.e. the grammar), rather than a peripheral impairment to one specific modality only.

But how can we characterise agrammatism? The most widely known syntactic theory of agrammatism is Yosef Grodzinsky's hypothesis of an impairment to the internal feature specification of functional projections. This theory is controversial, but it provides a very clear and explicit account. Recall from section 15 (p. 215) that in languages such as Hebrew and Italian, in which many inflections cannot be dropped without violating word-structure properties, agrammatics produce many inflectional errors, e.g. gender errors, number errors, etc. A typical example of such an inflectional error from an Italian agrammatic patient appears in (493):

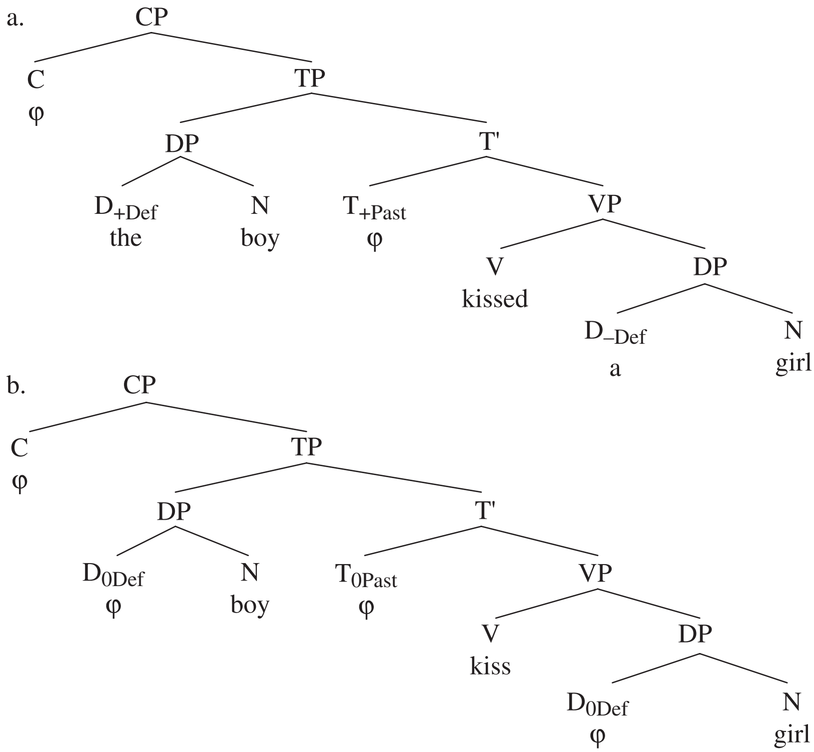
(493)	quest-o	macchin-a
	this-masc.	car-fem.
	'this car'	

Notice, however, that in this error (and others like it), the categorial identity of the inflections in question is always respected; that is, agrammatics do not, for example, attach verbal affixes (e.g. infinitive endings) to nouns or adjectives and vice versa. How can we account for such a selective impairment in syntactic terms?

Like all heads, functional categories are each associated with a set of properties. A general syntactic property of the category T, for example, is that it always takes a VP as its complement. In addition, as we have seen in section 20, T is specified for abstract grammatical features such as tense ([+Past] or [–Past]), which determine the temporal value of the sentence (e.g. past or present). D, on the other hand, which requires a nominal complement, is associated with features such as number, gender and definiteness. The basic idea is that, in agrammatism, the specific values of the features associated with functional categories are lost or unspecified – in other words, although categories like T or D are present, they are underspecified (see section 24 for a similar idea in connection with the early speech of children).

Consider, for illustration, the syntactic representation of the sentence *The boy kissed a girl* in normal Standard English (494a) and in agrammatic English (494b):

(494)



Compare the feature contents of the D- and T-heads in (494a) and (494b). Grodzinsky argues that the crucial property in (494b) is that the internal feature specifications of these two heads have unspecified feature values, indicated by the ‘0’ (we adapt the notation to make it consistent with earlier parts of this book). This means that the D-head and the T-head are left unspecified with respect to definiteness and tense: in contrast to unimpaired English, the head D position of DP in agrammatism is *not* specified for a definite [+Def] or an indefinite [–Def] determiner, and likewise the head T position of TP is not specified as carrying a past tense feature [+Past] or a present tense feature [–Past] (this feature ultimately being realised on the main verb if T does not contain an auxiliary). As a consequence, English-speaking agrammatics leave the functional category heads empty, which results in ‘telegraphic’ sentences such as *Boy kiss girl*.

In languages such as Hebrew, Russian and Italian, in which the option of omitting inflections is not generally available, agrammatics randomly choose some inflectional element to fill the slot, and this choice typically results in inflectional errors. Consider the gender error in (493) above. In Italian, DPs have to be specified for gender features such as [Masc-Gen] or [Fem-Gen], and an expression such as *questa macchina* (‘this car’) has the structure in (495):

(495) DP

$D_{\text{Fem-Gen}}$ questa — N macchina

Agrammatic patients have lost the values of syntactic features such as gender, and in their grammars, the features have no specifications; see the structure in (496).

(496) DP

$D_{\text{0-Gen}}$ questo/questa — N macchina

This means that agrammatics can attach any kind of gender inflection to the determiner in the D position. This sometimes produces gender errors as in (493), although Italian agrammatics will also produce the correct agreement pattern *questa macchina* on occasions. But the option of omitting gender affixes entirely is not available in this case, as this would produce illicit words such as **quest*- in Italian, and agrammatics do not violate word-structure contraints of their particular language.

Thus, despite performance differences, i.e. *omissions of functional elements* in English-speaking agrammatics and *inflectional errors* in Hebrew- and Italian-speaking agrammatics, the underlying deficit is the same: the functional categories in their syntactic representations have lost their internal feature specification (***exercises 1*** and ***2***).

Paragrammatism

At first sight, the spontaneous speech of Wernicke's aphasics appears to be fluent, with normal prosody and syntactic structure. However, although the sentences these patients produce are quite long and complex, they are not always syntactically well formed and contain various kinds of errors, e.g. word exchanges and exchanges of whole constituents as well as blends of different constituents. This cluster of properties is called paragrammatism in the clinical literature. Consider as an illustration the various attempts in (497) by a Wernicke's aphasic to name a lady's shoe that was shown to him.

(497) EXPERIMENTER: What is this? (= a lady's shoe)
PATIENT: Yes sir. Now there there I remember. I have you there what I thought was the … a lady. one. another. with a very short. very very clever done. do that the one two. go. but there's the liver. and there is the new. and so on. It is a document. late …

These utterances are spoken at a very high speed with only a few pauses, and the sentences are not so much characterised by a reduction of syntactic complexity (as in the case of agrammatism), as by the juxtaposition of incompatible sequences. There seems to be a consensus among aphasiologists that paragrammatic errors do not result from an independent syntactic disorder, but that they are symptomatic of patients' lexical problems, specifically their word-finding difficulties which we briefly examined in section 15. It has been found that blends and syntactic errors typically occur at points at which the patient is trying to retrieve content words, particularly nouns. They start to produce a sentence, and at points at which they experience word-finding problems, change the sentence plan or start again. Crucially, however, the syntactic structure of the various fragments including the internal structure of functional projections is the same as that of normal subjects. Thus, paragrammatism is not a genuine syntactic disorder, but rather a secondary effect of patients' lexical disorder (***exercise 3***).

Specific Language Impairment (SLI)

Finally, we will look at the syntactic errors in the speech of specifically language-impaired children. We will focus on word order, and we will also briefly comment on SLI therapy. In corpora of English-speaking SLI children who experience great difficulty with inflection and omit functional elements such as determiners or subject–verb agreement markers (see section 15), errors in word order are hard to find. Does that mean that word order is relatively well preserved in SLI? This is not necessarily the case as the word-order system of English is rather simple, and it might well be that SLI subjects do show word-order problems in a language which has a more complex system. Hence, the questions we are going to consider are as follows: do SLI children have genuine word-order problems? And does the picture we get from English-speaking SLI children hold in general, so that SLI can be said to affect inflection, but not word order?

Let us look at German-speaking SLI children in the light of these questions. Speech therapists have noticed that the most salient syntactic error in the speech of German SLI children is that they almost always place the verb at the end of the clause, as, for example, in (498a, b):

(498)

	Reconstruction of target	Realisation
a.	Ich *fahre* auch ein Auto	is auch ein auto *fahr*
	I drive also a car	I also a car drive
	'I also drive a car'	
b.	Einen Sitz *brauche* ich	ein titz is *brauch*
	A seat need I	a seat I need
	'I need a seat'	

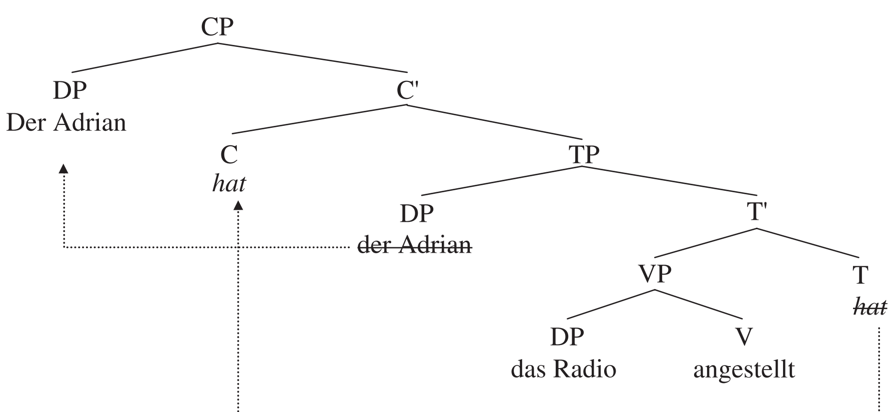
The speech therapists' view has been confirmed by several empirical studies, where it has been found that between 60 per cent and 70 per cent of the main clauses produced by German SLI children have the verb in clause-final position. Similar results have been obtained in sentence-imitation tasks; when SLI children have been asked to imitate German sentences such as the targets in (498), in 60 per cent of cases they have changed the given word orders to patterns with the verb appearing at the end of the clause.

Speech therapists have taken the frequent use of verb-final patterns by SLI children as an indication of a severe word-order deficit and have developed sentence-pattern drills and other therapeutic techniques for teaching the children 'proper' German word order. However, this therapy has turned out to be unsuccessful, suggesting that the supposed word-order deficit is resistent to therapy.

At this point, a linguistic perspective can help to resolve the issue and may in fact contribute to specifying appropriate therapeutic goals for children suffering from SLI. A syntactic analysis of the verb-final patterns German SLI children produce shows that their sentences are not in fact as deviant as might be thought at first sight. Verb-final patterns are in fact possible in German main clauses, but *only for non-finite verbs*; see the discussion of German word order in section 22. For illustration, consider the example in (499). Note that verbs can, in principle, appear in two different positions in German main clauses: finite verbs must appear in the second structural position, such as, for example, *hat* in (499), whereas non-finite verbal elements (i.e. infinitives or participles) appear in final position, like *angestellt* in (499). In syntactic terms, we say that VP and TP in German are head-final, whereas the functional projection that hosts the finite verb (i.e. CP) is head-initial (cf. the tree diagram in 500 and section 22):

(499)	Der	Adrian	*hat*	das	Radio	*angestellt*
	The	Adrian	has	the	radio	on-turned
	'Adrian has turned on the radio'					

(500)



In terms of this analysis, it might be suggested that SLI children have in fact acquired the correct word-order system, that is, they know that VP in German is head-final. Recall that SLI children typically produce non-finite verb forms, like infinitives or simple verbal stems, as in the realisations in (498a, b), and that these appear in clause-final position. The few finite verb forms they produce are correctly placed in second position. Note, for example, that the same child who produced the verb-final patterns in (498) also produced sentences such as (501) with the finite modal auxiliary *will* 'want' in second position and the infinitive *haben* 'to have' in clause-final position, the correct pattern for German:

(501)	ich	will	auto	haben
	I	want	car	have
	'I want to have the car'			

Thus, it seems that with respect to word order, the grammar of SLI subjects is in fact identical to that of unimpaired speakers, as all the verbs they use appear in the correct positions. The only difference between SLI subjects and normal children is that SLI children do not produce as many finite verb forms as the language requires. This is why sentence-pattern drills aimed at teaching SLI subjects verb-second patterns, in which the finite verb has moved to C, fail to show any effect: they simply miss the point. A more sensible goal for therapy would be to help the SLI subjects overcome their problems with finite verb formation.

We conclude that the grammatical problems of SLI subjects lie mainly with inflection, and that word order is in fact unimpaired. Within the area of inflection, subject–verb agreement, case-marking, gender and auxiliaries appear to be more strongly affected than, for example, noun plurals (***exercises 4*** and ***5***).

In this section, we have looked at different language disorders from a syntactic perspective. The phenomenon of agrammatism is perhaps the clearest case of an impairment to the central cognitive system that underlies the production and comprehension of sentences. We saw that agrammatism affects both sentence production and comprehension, and that the deficit can be characterised in syntactic terms, namely as an impairment to the internal feature specification of functional categories. The phenomenon of paragrammatism, by contrast, does not seem to involve a genuine syntactic deficit. Rather, the paragrammatic errors such as blends, constituent substitutions, etc. that Wernicke's aphasics typically produce result from a lexical disorder, specifically from word-finding problems. We also saw that in SLI subjects, the normal development of grammar is selectively impaired, and that the impairment mainly affects inflection. Word order, on the other hand, appears to develop normally in SLI subjects. The importance of the properties of functional categories and inflection which has emerged in this discussion is, of course, reminiscent of what we saw in our discussion of the syntax of normal children. The view that these aspects of linguistic structure hold the key to the essential nature of language and the human language faculty is one which is informing a great deal of current work, and we fully expect this to continue to be the case for the foreseeable future.

Exercises

1. Grodzinsky (1990) proposed a syntactic theory of agrammatism according to which the phrase-structure representations of these patients lack syntactic features. Discuss this claim in the light of the findings below from an elicitation experiment in which patients with agrammatism were asked to complete sentences testing for tense and subject–verb agreement marking. The following table shows percentages of incorrect responses in these two conditions for simple verbs and for auxiliaries.

	Agreement	Tense
Verb	3.2%	38%
Auxiliary	0%	70%

What do these results indicate?

2. Friedmann (2001) elicited wh-questions from agrammatic Broca's aphasics. Overall, the patients produced only 23 per cent correct wh-questions involving wh-movement. The most typical response was an inappropriate yes–no question which was just marked by intonation, e.g. *You have hammer*? intead of *Which hammer do you like to have*? Explain how this finding can be accounted for in terms of a syntactic feature deficit account.

3. Compare agrammatism and paragrammatism using the following data in which two patients are trying to describe a picture illustrating various household dangers. (Note: Pauses are indicated by dots.)
(a) *You never do that with a place there, you push it and do that ... That is the same thing underneath; there's a little one to that as well. That you don't have to do either. I don't know what's happened to that, but it's taken that out. That is mm there without doing it, the things that are being done.*
(b) *Fire ... open ... matches ... light matches ... naughty boy ... ha, ha, shut the door ... knife ... water ... tablets ... shut [pointing to high shelf] up*

Analyse and evaluate the errors in these responses, determine the type of aphasia in (a) and (b) and justify your choice by outlining how these two types differ from one another.

4. Below are a number of sentences produced by a four-year-old American boy with SLI called JC (with their adult counterparts shown in parentheses). Identify the errors he makes in each of the sentences, and discuss the nature of these errors.
(a) That me friend (That's my friend)
(b) When I go ice-skate, me fall (When I go ice-skating, I fall)

(c) Me have different puzzle (I have a different puzzle)
(d) Took it off, then he eat it (He took it off, then he ate it)
(e) Me daddy like mustard (My daddy likes mustard)
(f) Why her need this? (Why's she need this/Why does she need this?)
(g) Me teacher make cake (My teacher made a cake)
(i) He lost him duck (He lost his duck)
(j) Long time ago, I have a big eye (A long time ago, I had a swollen eye)
(k) It look like a lobster (It looks like a lobster)
(l) He got old one (He's got an old one)

5. Consider the following somewhat simplified data from a German SLI child (age seven years, five months):

(a) *Ich das Buch les-en
I the book read-infinitive
(b) Paul soll das Buch lesen
Paul should the book read
(c) *Maria das Buch les-en
Maria the book read-infinitive
(d) Das Buch ist auf dem Schrank
The book is on the cupboard
(e) *Wenn Maria das Buch les-en, ich geh-en.
if Maria the book read-inf., I go-inf.

The * indicates that a string produced by the child is ill-formed in adult German.

(i) Characterise the linguistic impairment(s) illustrated in these examples by providing tree diagrams for sentences (a) to (e).
(ii) Does this child have genuine word-order problems? (HINT: analyse the form of the verbs in connection with their position in the sentence.)
(iii) Sketch some goals for language therapy based on your linguistic analysis.

27 Using sentences

In our introduction (pp. 2–3), we drew a fundamental distinction between competence and performance, identifying the latter with the perception and production of speech and other forms of language, and suggesting that its study falls in the domain of psycholinguistics. We have now seen ample illustration of what this study involves and the insights that it can provide. In the introduction to part III of the book (section 17), we briefly alluded to conversations and other extended sorts of text, and a moment's thought should be sufficient to persuade us that here we meet a rather different, more familiar, notion of performance that we all indulge in on a daily basis without being subject to the psycholinguist's experimental investigations. We all *use* language in a wide range of communicative contexts, and it would be remiss of us not to include discussion of some of the issues that arise if we adopt this broader perspective in an introductory book of this nature. In what follows, we introduce some of the core ideas in **pragmatics**, and we begin by looking at one rather obvious way in which context plays an important role in understanding aspects of language.

Context and pronouns

In sections 12 and 23, we introduced some of the key notions of meaning or semantics, including that of the *truth conditions* for a sentence: a sentence such as *every sheep snores* is true if and only if for every one of the sheep under consideration it is true that it snores, otherwise the sentence is false. Truth conditions are seen by many as providing the core of the meaning of a sentence, but the examples we used to illustrate this notion earlier were carefully chosen so as to avoid any explicit reference to the **context** in which a sentence might be used. In many cases, however, it is easy to see that we can begin to formulate appropriate truth conditions only by taking this context into account.

Suppose that John owns a cat, but Mary doesn't. If John utters (502), then his utterance will be true, but an utterance of the same sentence by Mary will express a falsehood:

(502) I own a cat

The reason for this shift in truth value is clear: the pronoun *I* refers to whoever happens to utter the sentence, and we can make this explicit in terms of truth conditions as in (503):

(503) a. Where the speaker of 'I own a cat' is John, 'I own a cat' is true if and only if John owns a cat.

b. Where the speaker of 'I own a cat' is Mary, 'I own a cat' is true if and only if Mary owns a cat.

Another way of thinking about this is to draw a distinction between a **sentence**, an **utterance** and a **proposition**. A sentence is a (grammatical) string of words. When a sentence is spoken or written on an occasion, we have an utterance (of that sentence). Sentences are abstract objects which exist outside of time and place. Utterances are concrete manifestations of sentences and each utterance is unique. A proposition is the meaning expressed by (some utterance) of the sentence. To get a complete specification of the proposition expressed by an utterance of a sentence containing a pronoun, such as (502), we need to take into account an aspect of the context, namely, the identity of the person making the utterance. This is summed up in (504) for the example introduced above:

(504)

Utterance	Sentence	Proposition	Truth-value
1. Mary: 'I own a cat'	I own a cat	Mary owns a cat	False
2. John: 'I own a cat'	I own a cat	John owns a cat	True

Words like personal pronouns, which require context for their interpretation, are known as **deictic** words (from the Ancient Greek word meaning 'point'). This term itself originates with another type of deictic word, the demonstratives *this* 'near to the speaker' and *that* 'distant from the speaker', and it is noteworthy that we often accompany such words with a pointing gesture. Some languages (for instance, Spanish) have a third demonstrative which is used to refer to an entity that is near the addressee and other languages have more complex systems. Inflectional categories can be deictic too. For instance, the tense category is sensitive to the context of utterance: if John says 'Mary is writing a letter' when in fact she has already finished, then the proposition expressed by John's utterance of that sentence is false; if, however, she were still writing the letter, the expressed proposition would be true. Equally, if John had said 'Mary was writing a letter' in circumstances where she had finished, the expressed proposition would have been true (***exercises 1*** and ***2***).

Topic/focus

A quite distinct sense in which context is important in understanding the structure of language and the interpretation of sentences in use is illustrated in (505):

(505) SPEAKER A: Who has written two books on linguistics?
SPEAKER B: MARY has written two books on linguistics.

The capital letters on MARY indicate that this word is pronounced with more emphasis: it's slightly louder and relatively longer than the accompanying words and it starts at high pitch and falls rapidly to low pitch. In fact, the rest of B's utterance in (505) is completely redundant and could easily be omitted. Now consider (506), a slight variant on (505) in which speaker B emphasises a different word:

(506) SPEAKER A: Who has written two new books on linguistics?
SPEAKER B: ?Mary has written TWO books on linguistics.

Speaker B's contribution to (506) sounds very odd (indicated by the preceding question mark) and might be seen as signalling B's mishearing or misunderstanding of what A has said.

The reason for the oddness of B's utterance in (506) is intuitively clear: A and B both know that the conversation is about two books on linguistics and A wants to know the author of two such books. But the reply in (506) makes it sound as if A needs to know the precise number of books on linguistics that Mary has written. Of course, B's response in (506) would be a perfectly fine answer to the question in (507):

(507) How many books on linguistics has Mary written?

Phenomena of this sort are often studied under the heading of **information structure**. We can say that B's utterance in (505) is articulated into two components: MARY, which is **new information**, and the rest of the sentence, which is **old information** or **given information**. We can make this more explicit by 'translating' (505) into the representation in (508):

(508) SPEAKER A: Given: x has written two books on linguistics, x = ?
SPEAKER B: Given: x has written two books on linguistics, x = MARY

In (508), we use a variable *x* to represent unknown information (notice that this is a somewhat different use from that introduced in section 23), and B's reply is seen as providing a value for that unknown. Clearly, the 'given' component comprises old information and is the part that can be safely omitted. Similarly, the question in (507) can be represented as in (509):

(509) Given: Mary has written x number of books on linguistics, x = ?

We can now see what is wrong with the dialogue in (506). The answer provided by B is supplying a value for the wrong variable. (Check that you understand exactly how this works by translating the ill-formed dialogue in 506 and comparing it with an appropriate dialogue based on 507.)

Above, we've illustrated the contrast between given (old) and new information using the traditional device of question–answer pairs, sometimes called the 'commutation test' for given/new information. However, the question part can remain implicit and this is illustrated in (510):

(510) Hey, I've just heard that Mary has written ANOTHER book on linguistics.

An utterance of (510), in which *another* bears the main emphasis, is only felicitous if the speaker believes that the addressee already knows that Mary has written at least one book on linguistics. For this reason, the 'given' portions of the representations in (508) and (509) are often known as the **presupposition** (note that this term has a number of other, slightly different, uses, as we shall see below).

By varying the position of emphasis in a sentence such as (510), we can vary the articulation into given/new information. In principle, *any* of the content words of a sentence can be emphasised in this way and thereby appropriately convey new information. However, we can emphasise more than just individual words. Consider (511):

(511) SPEAKER A: What topic has Mary written a new book on?
SPEAKER B: (Mary has written a new book on) LINGUISTICS.

The information structure appropriate for (511) is essentially the same as that for (505), except that $x =$ *linguistics*, as indicated by (512).

(512) SPEAKER A: Given: Mary has written a book on x, x = ?
SPEAKER B: Given: Mary has written a book on x, x = linguistics

But now consider (513):

(513) SPEAKER A: What has Mary written?
SPEAKER B: (Mary has written) a new book on LINGUISTICS.

Here, the new information is conveyed by the whole phrase *a new book on linguistics*. The placement of emphasis in B's utterance in (513) is exactly the same as in B's utterance in (511), but the extent of the new information in (513) is the whole phrase, not just a single word. In fact, this extent can constitute a whole utterance, as illustrated in (514):

(514) Hey, guess what! Mary has written a book on LINGUISTICS

Closely related to the notion of given information is the notion of **topic** (for the syntactic notion of topicalisation, see section 21). Broadly speaking, the topic of a sentence (or utterance of a sentence) is what the sentence is about. In English, identity of the topic tends to be implicit, though we can sometimes explicitly announce a topic, as in (515):

(515) As for Mary, she's written a book on linguistics

We can divide a sentence such as (515) into two parts, the topic, *Mary* and what we say about Mary, the **comment**:

(516) TOPIC: Mary
COMMENT: has written a book on linguistics

The division represented in (516) is known as the **topic–comment articulation**.

In some languages, marking of the topic is an obligatory part of the grammar and there are various devices for achieving this. A well-known example is that of Japanese, which uses a particle, *wa*, after a phrase to mark that phrase as the topic (in 517, *o* is similar to an accusative case suffix in languages like Turkish and Latin, as described in section 11):

(517)

Mary	wa	gengokaku	natsu ite no	hon	o	kaita
Mary	WA	linguistics	about	book	ACC	wrote

‘Mary wrote a book on linguistics’

It might look rather as though *wa* marks *Mary* as the subject of (517), but this is misleading. In Japanese, it’s perfectly possible to omit a subject DP if the identity of the subject can be recovered from the context (see the discussion of null subjects in sections 22 and 24). The English sentence in (515) is therefore a reasonably accurate translation of (517). Japanese, like many Asian languages, is often referred to as a ‘topic-centred’ language, as opposed to languages such as English which are ‘subject-centred’. This is because languages such as Japanese require a sentence to have an articulation into topic and comment, though they don’t require that there be any grammatical relation between the topic and the rest of the sentence. This can be illustrated by a famous Japanese sentence (518) (here *ga* is viewed as a subject marker, and it is sometimes regarded as a nominative case suffix):

(518)

zoo	wa	hana	ga	nagai
elephant	WA	nose	SUBJ	long

‘As for an elephant, nose is long’ or more idiomatically, ‘Elephants have long noses’

It’s very difficult to convey the true structure of a sentence such as (518) in a language like English, because English very much prefers there to be some grammatical relation between the topic and some element in the comment. Other languages don’t impose such a restriction, however (***exercise 3***).

Presuppositions

In our discussion of given or old information above, we pointed out that such information is sometimes identified with presuppositions. We shall now introduce a different, though related, use of this terminology.

In section 12, we encountered the notion *entailment* in connection with such examples as (519):

(519) a. Tom managed to finish the book
b. Tom finished the book
c. Tom didn’t manage to finish the book
d. Tom didn’t finish the book

Here, (519a) entails (519b) – in any circumstances in which (519a) is true, (519b) is also true. Similarly, (519c) entails (519d). However, rather different entailment relationships from those we see in (519) are also possible. Consider the examples in (520):

(520) a. Tom stopped reading the book
b. Tom didn’t stop reading the book
c. Tom was reading the book earlier

Here, if (520a) is true, then (520c) must also be true, i.e. (520a) entails (520c). But it might also be suggested that (520b), the negation of (520a), entails (520c), and this is a very different pattern to what we see in (519). The constellation of entailments we have just described for (520) illustrates the relation of **logical presupposition**, and a general definition of this appears in (521):

(521) A sentence S_1 logically presupposes a sentences S_2 if and only if:
- (a) S_1 entails S_2
- (b) the negation of S_1 entails S_2

Now, supposing that (520a) logically presupposes (520c), we can ask what the truth-value of (520a) is in circumstances where (520c) is false. It is easy to see that in such circumstances, (520a) is *neither true nor false*, since (520c) is entailed by both (520a) and its negation (520b). If (520a) were true, then (520c) would be true; if (520a) were false, then (520b), the negation of (520a), would be true and (520c) would also be true. But we are supposing that (520c) is false, and it follows that (520a) can be neither true nor false in these circumstances.

Are there cases of logical presupposition, as defined above, in language? The commonly held view is that there are not because, in general, sentences such as (520b) do *not* entail sentences like (520c). Notice that if this entailment obtained, it should not be possible for (520c) to be false in circumstances where (520b) is true. But this requires that (522) is a contradiction:

(522) Tom didn't stop reading the book; in fact, he never even started it

And it is clear, we maintain, that (522) is *not* contradictory.

Suppose, then, that *logical* presupposition is not a useful descriptive notion in the study of natural language. The fact remains that there is *something* odd about an utterance of (520b) in circumstances where the truth of (520c) is not assumed. This gives rise to a somewhat looser notion of presupposition, sometimes called **pragmatic presupposition**, where the truth of a presupposed proposition must *normally* be assumed or taken for granted if a presupposing proposition is to be readily intelligible. Thus, we can now maintain that (520b) (along with 520a) pragmatically presupposes (520c), since someone uttering (520b) would normally be taking the truth of (520c) for granted. From this perspective, what is unusual about (522) is that it makes it clear that the normal situation governing the utterance of the first clause is not in place.

The notion of pragmatic presupposition, understood as above, is prevalent in language use, extending to function words and even entire constructions. Thus, consider (523):

(523) Harriet fed the cat

We can readily see that an utterance of this sentence would be odd (infelicitous) if Harriet owned more than one cat (and the addressee knew she did), and on this basis we may wish to suggest that use of such phrases as *the X* is associated with the pragmatic presupposition that speaker and addressee are familiar with only one

X in the circumstances. Obviously, we would not wish to say, however, that a multiplicity of Harriet's cats suffices to make an utterance of (523) false.

Likewise, (524) would be infelicitous if Harriet didn't actually feed (any of) the cats, even if she had several cats and one of them was a ginger tom.

(524) One of the cats that Harriet fed was a ginger tom

This is because the expression *one of the cats that Harriet fed* in (524) presupposes that Harriet fed at least two cats. If we negate (524) and consider *One of the cats that Harriet fed wasn't a ginger tom*, this presupposition remains.

The type of presupposition we have been considering here is independent of information structure, being linked instead to the meaning of individual words and constructions. It is important to keep these different senses of the term in mind in considering accounts of sentence use.

Doing things with words

Around the middle of the twentieth century, the Oxford philosopher John Austin made a simple but very important point about examples such as (525) and (526):

(525) I want to read your new book

(526) I promise to read your new book

In uttering (525), speakers are simply registering a desire, while in uttering (526), they are committing themselves to doing something, namely reading the book. Just uttering (526) in appropriate circumstances constitutes a promise, and Austin designated examples such as (526) **performatives**. Further examples appear in (527), with the **performative verbs** in italics:

(527) a. I *order* you to complete the exercise
b. I *assure* you of my loyalty
c. I hereby *conclude* that the earth is flat

Austin's work sparked interest in the way that we can use language to perform certain types of act, **speech acts**.

English, like many languages, tends to distinguish certain broad classes of speech act in its grammatical system, **mood** being the traditional term for designating the relevant grammatical types. Thus, we have the correspondences set out in (528):

(528)

		Speech act	Mood
a.	John has read Mary's book	Statement	Declarative
b.	Read Mary's book	Command	Imperative
c.	Has John read Mary's book?	Question	Interrogative

However, there are other types of speech act that don't correspond to grammaticalised categories of this sort, for instance, suggestions, illustrated by (529):

(529) Why don't you read Mary's book?

Of course, (529) *can* be used to ask a question, but forms such as this are much more commonly used to make suggestions. Indeed, mismatches between the speech-act types in (528) and the standard way of expressing such speech acts are common, and this was one of the first topics in ancient and medieval linguistics (studied under the heading of 'rhetoric'). Here are some simple examples:

(530) Since when has John been able to speak Japanese?
Meaning: 'John has never been able to speak Japanese'
Type: Interrogative Mood used to make a statement – a rhetorical question

(531) Could you make a little less noise in there?
Meaning: 'Make less noise in there'
Type: Interrogative Mood used to issue a command

(532) The hat stand goes by the front door (to furniture removers)
Meaning: 'Put the hat stand by the front door'
Type: Declarative Mood used to issue a command

(533) I'm afraid I don't know your name
Meaning: 'What's your name?'
Type: Declarative Mood used to ask a question

There are also more complex instances of mismatch between form and function, as in (534), where the imperative mood is typically interpreted as a conditional statement, 'If you do that once more, I will hit you', and certainly not as an imperative:

(534) Do that once more and I'll hit you!

Speech acts of this sort in which the usual interpretation expected in conversation is at odds with the literal interpretation are often called **indirect speech acts**. Thus, to take an example, the interrogative form in (531) *can* be used literally to perform the direct speech act of asking a question but typically will be used to perform the indirect speech act of issuing a command

The logic of conversation

Consider the following four examples of language in use:

(535) a. We've had the most wonderful weather!
(written on a postcard reporting on a vacation marred by continual wind, rain and storms):

b. The weather could have been better
(written on postcard reporting the same vacation as in a):

c. SPEAKER A: Was the President lying?
SPEAKER B: Is the Pope a Catholic?

d. SPEAKER A (a journalist): Do you think the President was telling the truth?
SPEAKER B (a government official): I have no evidence which would demonstrate conclusively that he was not telling the truth.

These examples are all a little odd in some way if taken at face value. The writer in (535a) expresses a straightforward falsehood. But is it a lie? That depends on the context. If the writer is trying to put a brave face on a bad vacation decision, it could be a deliberate attempt to mislead by telling an untruth. On the other hand, if the writer knows that the recipient of the postcard has been following the weather forecasts, it will be properly interpreted as ironic. In (535b), the writer is expressing something that, at first blush, appears to be completely uninformative. The weather 'could have been better' most days. As for (535c), we might ask what relationship there could possibly be between the President's probity and the religious affiliation of the Holy Father. And in (527d), did the official accuse the President of lying?

In a boring and logical world (Mr Spock's Vulcan world perhaps), we should replace the examples in (535) with those in (536):

(536) a. We've had very bad weather
b. We've had very bad weather
c SPEAKER A: Was the President lying?
SPEAKER B: Yes.
d. SPEAKER A (a journalist): Do you think the President was telling the truth?
SPEAKER B (official): No.

However, given the right context, the examples in (535) get across the same message as those in (536), only more vividly. How is this possible?

In the 1960s, the philosopher Paul Grice drew attention to examples like those in (535) and argued that ordinary conversation must be governed by a **Co-operative Principle** according to which interlocutors are required to be helpful to each other. This rules out lying (even white lies) and other deliberate attempts to mislead, as well as boasting, false modesty and so on. Grice maintained that the overriding Co-operative Principle is reflected by conversationalists' adherence to four **conversational maxims** governing the way we interact in conversation. These maxims are as in (537):

(537) a. **Maxim of Quality**: try to make your contribution one that is true, specifically
(i) do not say what you believe to be false;
(ii) do not say that for which you lack adequate evidence.
b. **Maxim of Quantity**:
(i) make your contribution as informative as is required for the current purposes of the exchange;
(ii) do not make your contribution more informative than is required.
c. **Maxim of Relation**: make your contributions relevant.

d. **Maxim of Manner**: be perspicuous, and specifically
(i) avoid obscurity;
(ii) avoid ambiguity;
(iii) be brief;
(iv) be orderly.

The point of the Co-operative Principle and the maxims is not to tell people how to behave, of course. The point is that speakers are permitted to *flout* the maxims in order to convey something over and above the literal meaning of their utterance. The example in (535a), in circumstances where the recipient of the postcard is assumed to be familiar with the bad weather, flouts the Maxim of Quality, and the consequence is that the intended meaning is the opposite of the literal meaning giving the effect of irony. In example (535b), the writer flouts (i) of the Maxim of Quantity, giving rise to understatement or litotes. In (535c), speaker B's response to A's query appears to be a completely irrelevant question, violating the Maxim of Relation. But *via* this flouting – an *obvious* violation – B invites A to conclude that the President was lying just as surely as the Pope is a Catholic. Finally, (535d) relies for its effect on the fact that the official's prolixity flouts the Maxim of Manner, and this again invites the addressee to seek an interpretation beyond the literal meaning of what B says.

It is useful to have some way of referring to the kinds of proposition that a speaker intends to convey in this implicit fashion, and the standard term for this is **conversational implicature**. The implicature is conversational because it only arises in an appropriate conversational context. In different contexts, the relevant utterances in (535) might be given their literal interpretations. For instance, if the official speaking in (535d) had just presided over an exhaustive and independent inquiry into the President's testimony and wished to convince the audience that the President had in fact (despite all the rumours) told the truth, the utterance in (535d) might be used to support the President (***exercises 4*** and ***5***).

Context and coherence

Earlier in this section, we saw how the context of utterance is important for determining the interpretation of deictic words such as personal pronouns. Moreover, it should be clear that context is crucial in the operation of Gricean maxims. A graphic illustration of the importance of context is illustrated by the following interchange which took place between one of the authors (A) and a colleague (D):

(538) D: Hmph! If I'd known it was going to be fish, I'd have put in my contact lenses.
A: You don't like kippers, then.

In (538), A has interpreted D's utterance in exactly the manner intended by D, because the context provided ample clues. Actually, A then continued 'Do you realise how incomprehensible your last statement would sound out of context?' The contextual knowledge needed to interpret D's utterance is that D was late arriving for breakfast at a conference and had not put in his contact lenses in order to save time, only to discover that the only food left was something he didn't like. It will probably not surprise readers to learn that we have yet to find anyone who can construct this context without a lot of hints.

One reaction to an interaction like that in (538) is that it is incoherent. A's response does not seem to fit D's utterance. We feel that the utterances that make up a discourse should be coherent, though it's rather difficult to define exactly what we mean by that. In (539), we see another (more famous) example, which in its original form, was presented by the American sociologist, Harvey Sacks:

(539) MRS SMITH: I have a fourteen-year-old son.
MR JONES: Well, that's all right.
MRS SMITH: I also have a dog.
MR JONES: Oh I'm sorry.

This discourse seems hopelessly incoherent, until we learn that Mrs Smith is trying to rent an apartment and Mr Jones is a landlord.

Various groups of linguists, psychologists, philosophers, computer scientists and others have tried to provide a definition of textual or discourse **coherence**, and it seems that the essential feature of this property refers to what speakers and hearers believe and what they can sensibly infer. In the dialogue in (539), both participants understood perfectly well that Mrs Smith was looking to rent an apartment from Mr Jones and so Mr Jones's final response would be taken to mean something along the lines of 'I can't rent the apartment to you'. But this comes about as a result of our knowledge of the restrictions on property rentals. Notice that this sense of 'context' is more general than that we referred to in our discussion of the interpretation of deictic expressions. All that was relevant in the earlier case was readily identifiable factors such as the identity of the speaker and the time of utterance. Here, however, context seems to be embracing the full set of beliefs that speakers and hearers have and inferences that they might make on the basis of those beliefs. Importantly, however, when computing the full meaning of a discourse, we obviously don't try to deploy *everything* we know or believe about the world or all the possible inferences that we could draw. We only make use of beliefs and inferences which are relevant to us, and, as we have seen, the notion of 'relevance' is appealed to in one of Grice's maxims. Now, Grice himself devoted little time to his Maxim of Relation, but over the last twenty years, Dan Sperber and Deirdre Wilson have argued that relevance, when properly characterised, is the key to understanding coherence and utterance interpretation generally, and we shall now introduce this perspective.

Relevance Theory

The least clear of Grice's maxims is that of Relation: what does it mean for an utterance to be relevant? Utterances are typically very uninformative out of context and can be interpreted in all sorts of different ways. For instance, if someone says (540), do they mean the power cut happened a few minutes ago, yesterday, last year? Was it here in the speaker's neighbourhood, or the hearer's neighbourhood, or place of work, or the airport at the other side of the world to which the hearer expects to be flying?

(540) There's been a power cut

However, the fact is that we use such simple utterances all the time and they can be very informative given the right context.

A central idea of Relevance Theory is that an utterance is relevant to a hearer when the hearer can gain *positive cognitive effects* from that utterance, that is some useful information. There are two aspects to this. Firstly, the most relevant interpretation of an utterance must lead to inferences that the hearer would not otherwise have been able to make. Secondly, these inferences must be accessible to the hearer in the sense that it must be possible to draw those inferences in a short space of time with relatively little effort. If the inferential process requires *too much effort*, then the inferences cannot be drawn.

Relevance Theory maintains that speakers comply with a **Communicative Principle of Relevance**, which states that when someone communicates in some way, that communicative act brings with it a guarantee of its own optimal relevance. A hearer, on the other hand, computes relevance by selecting the most obvious (accessible) interpretation, and this process stops when the hearer achieves some kind of relevant interpretation (or gives up). For instance, suppose Mary is working at her computer one sunny afternoon and the screen suddenly goes blank for no apparent reason. John then comes into the room and utters (540). The Communicative Principle of Relevance leads Mary to assume that John's utterance is maximally relevant to her, and she will therefore assume that the power cut has affected her house. She will deploy her knowledge of the world to conclude that such a power cut would affect the operation of the computer and, in fact, would account for the machine's failure. This would be very relevant information to her. For instance, it would mean she wouldn't waste time trying to re-boot the machine. Of course, speakers and hearers can make mistakes. Suppose John is very anxious about his impending flight to New York and has just learned that the airport he is to fly to has suffered a power cut, possibly jeopardising his visit. Then his utterance of (540) will have entirely different intended effects, and Mary is highly likely to be misled.

Relevance theoreticians argue that the other three Gricean maxims follow from the Principle of Relevance. Recall that the maxims have their communicative effects because hearers recognise when they are being flouted. Thus, B's response in (535c) is obviously irrelevant in the context of A's question. Yet, B's utterance is supposed to come with a guarantee of its own optimal relevance. Apparently, the maximally relevant answer to A's question would be 'Yes', and this, in fact, is the only sensible answer to B's counter-question. Why ask such a question if B is observing the Principle of Relevance? Only in order to suggest to A that the answer 'Yes' applies to A's question, *and*, because it requires additional processing over and above that necessary for dealing with 'Yes', to impart *further (relevant)* information to A. In this case, we might suppose that is in the form of the additional suggestion that the answer is pretty obvious and doesn't brook contradiction (a way of emphasising B's confidence in his own response). Relevance-Theoretic considerations can also easily account for discourses such as (539), which aren't directly amenable to an analysis solely in terms of the flouting of maxims.

Central to Relevance Theory is the idea that we perform inferences all the time in order to understand utterances, and it is interesting that languages have special grammatical devices that can be seen as facilitating this inferencing. Thus, many languages have a grammatical category (for instance a set of verb forms) which indicates that the speaker didn't witness the event they are reporting. Such devices are called **evidentials**. And probably all languages have **conversational particles** which guide the hearer in interpreting utterances. One such particle in English is *after all*. What does this particle mean in (541)?

(541) Natasha can do the Russian interpreting. After all, she's from Moscow.

A speaker would normally use *after all* in a sentence such as (541) only if they believed that the hearer already knew the content of the proposition which *after all* introduces. This is clearly seen in (542):

(542) We MUST go out somewhere nice tonight, after all it is your birthday

It's hardly likely that the speaker would use (542) to *inform* the hearer that it was his or her birthday (or even to remind the hearer of this fact).

But why should anyone tell the hearer something they already obviously know? In particular, how can such an utterance ever be relevant to the hearer (in any sense, but especially in the technical sense of Relevance Theory)? The answer is that *after all* serves to tell the hearer that the speaker believes that this (shared) fact provides crucial evidence to back up what the speaker has just claimed. The fact that the proposition which is introduced by *after all* is presented as unequivocal shared knowledge therefore makes it difficult for the hearer to disagree. As a result, even an apparently wholly redundant utterance can be relevant (***exercises 6***, ***7*** and ***8***).

Taking turns

So far, our discussion in this section has involved only very short stretches of speech, and in general we've been able to make our points using constructed examples. However, there is another aspect to the act of talking which isn't covered by the perspective we gain from pragmatics. When we listen to a group of people in conversation, we generally find that the talk is *organised* in a rather efficient fashion. And yet conversation usually involves at least two people who may each want to speak, and who don't necessarily want to listen. How then do people negotiate who is to 'have the floor' and when that privilege can be ceded to another participant in the conversation? It turns out that there is a host of more or less subtle linguistic signals that we use for this purpose. In addition, talkers often need to convey their attitude to the conversation without explicitly discussing it. For instance, there may be topics which a talker doesn't want to discuss in detail, or alternatively there may be topics which the hearer wishes to know more about. Languages have a variety of means to allow talkers to give each other information of this kind. The study of these various devices is conducted under the rubric of **Conversation Analysis (CA)**.

CA originated in the work of social psychologists and sociologists and for a long time was poorly integrated into the kinds of mainstream linguistics we have been discussing in this book. Even studies of pragmatics tended to ignore CA. However, recently specialists in a variety of areas of linguistics, including phonetics, pragmatics and language disorders, have been looking in detail at the way talk is managed (or mismanaged).

The prototypical, and in some sense simplest, kinds of interchange are paired utterances, such as pairs consisting of question–answer or offer–acceptance, but including more or less formulaic pairs such as greeting–greeting. Such pairs are called **adjacency pairs**. The key fact about such pairs is that the first utterance virtually demands a response. In other kinds of talk, however, it may not always be so obvious who should talk and for how long. To manage the progress of talk we need to manage who takes a turn at talking at various stages; in other words, we need to understand the mechanics of **turn-taking**. Talkers don't take up their turn at random places. Rather, there are **transition relevance places** (TRPs), that is, places where a second person can take up the talk. One obvious TRP is when there is a noticeable silence, but this is not the only type. Whenever such a place occurs in the talk, the current speaker has the option of selecting the next talker. If the speaker doesn't make a specific selection, then anyone can take over. If no one takes over, the speaker has the option of continuing.

One of the implications of this is that silence can be very informative. In the sequence shown in (543), speaker A offers an invitation to B, who doesn't reply at once (the numbers in parentheses designate the length of pauses in seconds):

(543) SPEAKER A: Would you like to meet now, (0.3)
SPEAKER A: [or late-
SPEAKER B: [Well, not just now. (0.1) Maybe in about ten minutes?

A's question invites an immediate response, which isn't forthcoming. In other words, B fails to take his or her turn. Therefore, A tries again with a modified version of the original invitation. The square brackets in A's second contribution and that of B indicate that A and B start talking simultaneously. This means that before B has had the chance to hear A's alternative offer, he or she makes explicit the implication of the silence after A's first turn.

A second feature of the interaction in (543) is B's use of the conversational particle *well*. Words such as this have been studied in some detail by pragmaticians and conversation analysts. In some cases, their function is to indicate to the hearer how to process the utterance (we saw this above in our discussion of *after all*). In other cases, however, a particle may be used to indicate the speaker's attitude to some aspect of the conversation. A particle that has been studied in some detail is *oh*. This particle has a number of uses, and its precise function depends on a variety of factors, especially intonation. However, when pronounced with a high falling intonation, it generally indicates that the speaker acknowledges receipt of a piece of news. In (544), for instance, speaker B is effectively acknowledging that she didn't know before about Mary's new job:

(544) SPEAKER A: Mary's got a new job.
SPEAKER B: Oh!

On the other hand, in (545), speaker B uses a different conversational particle, *that's right*, and thereby is signalling that Mary's having got a new job is already known. In CA, this implication is known as a claim to epistemic priority (roughly, 'I got there first, actually'):

(545) SPEAKER A: Mary's got a new job.
SPEAKER B: That's right!

By using conversational particles such as *that's right* (rather than *oh*), speakers can try to manipulate their position in the conversation and make it less easy for others to disagree with them (as we saw in the case of *after all*) (***exercise 9***).

Pragmatic theories such as that of Grice or Sperber and Wilson's Relevance Theory don't have anything to say about such conversational practices as turn-taking or establishing prior rights to knowledge. On the other hand, CA doesn't deal with the matters of inference and conversational implicatures in the same degree of detail as, say, Relevance Theory. While pragmaticians and conversational analysts would not all share this optimism, taken together the pragmatic approach and the CA approach can be thought of as complementing each other and providing a rich model of the way that talkers interact with each other, a fundamental aspect of language use.

Exercises

1. Taking (503) as a model, write out explicit truth conditions for the following sentences
   (a) You own a cat
   (b) He owns a cat
   (c) She owns a cat
   (d) They own a cat
   (e) We own a cat
   (f) That girl (over there) owns a cat
   (g) These girls own a cat

2. The following words are further instances of deictics. Explain exactly how they are used. What is the crucial dimension of deixis for each of the words?
   (a) here/there
   (b) come/go
   (c) now/then
   (d) today/yesterday/tomorrow
   Can you think of any other words in these classes which behave in a similar fashion?

3. The following sentences illustrate grammatical devices which manipulate information structure in various ways. Provide an informal description of the effects of each of these devices.
   (a) It's Bill who Sally was meeting up with last night
   (b) The one who Sally was meeting up with last night was Bill
   (c) Bill, Sally would never go out with
   (d) What with the accident, Sally's been getting very behind with her work
   (e) As for Sally, she'd never go out with Bill
   (f) As for dinner tonight, is Sally still going to the cinema with Bill?
   (g) Max and me, we just can't see what Sally sees in Bill
   (h) They're nice, these pears

4. For the examples in (535), explain in detail how Grice's Co-operative Principle and Maxims account for the way the utterances are interpreted. Set out the shared background knowledge and background assumptions, and identify the inferences the hearer is able to make (note that the hearer is simply the recipient and reader of the postcard for 535a, b).

Model answer for (a)

Background knowledge

K1 The weather was bad on the speaker's vacation

Background assumptions

A1 People prefer the weather to be good when they are on vacation.
A2 The speaker knows that the hearer knows K1.
A3 The speaker knows that the hearer knows A2.

Hearer's inferences

I1 The literal content of the speaker's utterance is incompatible with K1.
I2 Given A2 and A3, the speaker will know that the hearer can infer I1.
I3 Given I1, the speaker has violated the Maxim of Quality.
I4 Given I2, the speaker will assume that the hearer can infer I3.

I5 Therefore, the speaker's violation of the maxim is a *flouting*.
I6 Given I5 and A1, the speaker is intending to convey a non-literal meaning.
I7 Given I6 and K1, the speaker is intending to convey the content of K1 (but emphatically).

5. We have cited Grice's four maxims in (529) as they are presented in Steven Levinson's influential textbook on pragmatics. However, in Grice's original text, point (iii) of the Maxim of Manner reads '(iii) be brief (avoid unnecessary prolixity)'. Why the difference?

6. In a well-known play by Shakespeare with a Scottish theme, three weird sisters tell a politically ambitious warlord that he won't suffer military defeat until Burnham Wood comes to his fortress, Dunsinane, and that he himself cannot be killed by any man of woman borne. Are the sisters complying with the Principle of Relevance?

7. Discuss the ways that the four Gricean maxims can be reinterpreted in terms of Relevance Theory.

8. Provide an explanation of (539) in terms of Relevance Theory.

9. Provide an informal characterisation of the functions of the following discourse particles:
(a) anyway
(b) apparently
(c) by the way
(d) you see
(e) whatever

Further reading and references

The model of syntax presented in sections 18–22 is a simplified version of a framework, first presented in an extensive way in Chomsky (1995b). This framework has subsequently been developed in a number of highly technical works by Chomsky and his associates, but Radford (2004a) is a readable introduction, using similar terminology to that which appears in this book. Radford (2004b) is a much longer, more comprehensive account of the syntactic properties of English from this same theoretical perspective. Other introductory texts include Adger (2003), Hornstein, Nunes and Grohmann (2005) and Boeckx (2007), but readers must be aware that, though introductory in some respects, these books are very demanding and technical in places. Somewhat more traditional introductions are Poole (2002) and Carnie (2006), but these operate with less modern frameworks. As a consequence, relating them directly to what we cover here is not always straightforward.

As regards some of the more particular issues on which we touch, the DP analysis of nominals is based on Abney (1987). The null operator analysis of yes–no questions is inspired by Grimshaw (1993) and Roberts (1993). Our discussion of African American Vernacular English is based on research by Labov (1969), Fasold (1980) and Sells, Rickford and Wasow (1994), and the analysis of Jamaican Creole questions is adapted from Bailey (1966). References to Belfast English questions rely on Henry (1995) and the Head Movement Constraint is taken from Travis (1984). All the textbooks mentioned in the previous paragraph introduce some version of an economy principle. The observation that children produce sentences like *Get it ladder* is taken from McNeill (1966).

Saeed (2003, chapter 6) is a descriptive introduction to thematic roles, a topic that is usually acknowledged to a greater or lesser extent in the textbooks mentioned earlier. Dowty (1991) is a seminal article on thematic roles but is difficult for a beginner. For the semantics of quantified noun phrases, Saeed (2003, chapter 10) is a useful introduction, and relevant discussion appears in Allwood, Andersson and Dahl (1977). The argument for covert movement in section 23 is based on the classic treatment of LF in May (1985), which is very technical. A summary of this and several other arguments can be found in Hornstein (1995, chapter 2), a work which goes on to develop a view of LF linked to an early version of the framework outlined in sections 18–22. Textbook treatments of LF are Chierchia and McConnell-Ginet (1990, particularly chapter 3) and Larson and Segal (1995).

The Claire data in section 24 are taken from the Appendix to Hill (1983); the Kathryn data are from Bloom (1970); the analysis of English as a null subject language is from Hyams (1986) and the comparison between early English and early Italian is reported in Valian (1990); the truncation analysis of children's clauses is adapted from Rizzi (1994); the optional infinitive stage is discussed in Wexler (1994) and Hoekstra and Hyams (1998); the underspecification analysis of child grammars is outlined in Schütze (1997). All the works on acquisition cited above are technical: for a recent textbook study of children's syntactic development, see O'Grady (1997).

For section 25, Harley (2001, chapter 9) and Ingram (2007, chapter 12) provide overviews of sentence-processing research. Townsend and Bever (2001) is a more specialised but readable account of human sentence parsing.

For section 26, papers by Clahsen and Marinis in Ball, Perkins, Mueller and Howard (2008) provide reviews of research on syntactic disorders in aphasia and Specific Language Impairment respectively. The account of agrammatism in this section is largely based on Grodzinsky (1990, chapter 3), an often-quoted piece of work in the field of aphasiology which is, however, somewhat difficult to read.

There are a number of good reviews of pragmatics. These include Levinson (1983), Blakemore (1992) and Grundy (2000). The major work introducing Relevance Theory is Sperber and Wilson (1995), but a more recent and shorter account is Wilson and Sperber (2004).

Conclusion

As we arrive at the end of the book, it is perhaps appropriate to take stock of what we have achieved with respect to the issues raised in our main introduction.

It will be recalled that there (p. 4) we offered an initial sketch of a grammar as a system containing at least four components: a lexicon, a syntactic component, a component dealing with phonetic form (PF) and a component deriving the semantic (logical) form of a sentence (LF). The way these various components fit together is illustrated in (441) (p. 345), and we have provided extensive discussion of each of these components in the preceding sections. Thus, the syntactic component, with its core operations of merger and overt movement (along with agreement, etc.) and its reliance on a variety of empty categories has been described in detail in sections 18–22; LF and its employment of covert movement has been the topic of section 23; the structure of the lexicon and the nature of lexical entries was our theme throughout much of part II; and PF, as a system linking levels of phonological representation via phonological processes has been illustrated in part I, particularly section 5.

It would be misleading to suggest that we have presented a complete and final picture of the organisation of linguistic knowledge in the course of these discussions, and there are a number of factors which justify modesty in this connection. Firstly, like any science, linguistics is a vibrant and developing discipline, with new ideas and novel observations continuing to make their impact on a regular basis. Undoubtedly, the future will see some of what we have presented here replaced by more adequate approaches, but this is inevitable and should be positively regarded as symptomatic of a continued deepening of understanding, itself a trait which appears to be unique to human beings as they pursue scientific activity. Secondly, as noted in our Introduction, our discussion of the theory of grammar and its impact on language acquisition, psycholinguistics and neurolinguistics has been greatly influenced by the ideas of Noam Chomsky. We hope that the preceding pages provide some justification for this emphasis, but we must also acknowledge that there are other approaches to the study of language which may ultimately prove to be more fruitful. However, we also believe that much of what we have presented could be reformulated within different frameworks; to the extent that this is true, the book will have provided a valuable foundation for students who subsequently wish to pursue alternative approaches. Finally, even within the approach we have adopted, there are many outstanding problems which we have deliberately avoided. To offer just one example, we have remained reticent on the location of the morphological processes described in sections 10 and 11 within the model in (441). In some cases, such as compounding, it seems most appropriate to see these processes as taking place within the lexicon, thereby giving rise to new lexemes; in others, it seems more plausible to locate the processes in the syntactic component itself or in PF. As we write, it remains the case that there are no comprehensive and compelling views as to whether the grammar should contain a single morphological component; as a consequence we have felt justified in restricting ourselves to providing the basic descriptive apparatus which will enable readers to recognise different morphological processes, while leaving the major theoretical stone unturned.

Whatever the long-term fate of the Chomskian view of linguistic theory, the coherence which this view has established for the related studies of language acquisition, linguistic processing and language disorders is an impressive achievement. As for language acquisition, we have seen in the relevant sections of the book (6, 13 and 24) that proper consideration of children's achievements leads, almost inexorably, to the conclusion that they approach first language acquisition with remarkably sophisticated knowledge of phonological, morphological, syntactic and semantic representations. All of this points strongly to the correctness of the view that an innate system of UG provides the child with tightly constrained (and, therefore, useful) information about the form of a grammar for a possible human language.

Turning to the *use* of language, particularly sentence comprehension, experimental demonstrations of the need to refer to such theoretical grammatical constructs as empty categories (see section 25) are now plentiful. Overall, there is considerable justification for the view that an individual's mentally represented grammar is normally involved in language use. Note that this does not amount to the claim that the grammar provides a complete theory of language use – garden-path sentences argue against this – nor that the grammar is the *only* route to comprehension (for instance, suitable lists of words, such as *car*, *tree, bang*, *blood*, *ambulance*, *hospital* exhibiting no syntactic structure, can be interpreted as conveying messages). However, if it is plausible to posit a grammar as a model of native-speaker *competence*, it would be perverse to deny this grammar a role in accounting for normal linguistic *performance*, and the discussions we have provided suggest that such perversity is not at play.

As regards our understanding of language disorders, we have argued (sections 15 and 26) that the postulation of a mentally represented grammar, broken down into various components and distinguished from the general conceptual system, allows us to formulate views of some disorders which go much deeper than noting that patients have general difficulties with language comprehension or global production problems. As we have seen, the major problem for agrammatics appears to be the selection of appropriate inflectional forms within otherwise intact grammars, and the locus of difficulty for SLI patients is a subset of inflections. We firmly believe that without the modular, autonomous view of language adopted in this book, such insights and their interpretation in terms of selective impairment would remain remote.

As we noted in section 17, our discussion of syntactic variation in section 22 was very different in character to those of sound variation in section 3 and lexical variation in section 16. Whereas sound and lexical variation were both approached from a sociolinguistic perspective, whereby values of variables are correlated with specific social factors, our discussion of syntactic variation was restricted to using our adopted theoretical framework to *describe the variants*, e.g. Modern English v. Shakespearian English or English v. German. We did not focus on factors determining the *choice* of these variants, since we did not consider the situation of one individual simultaneously having access to both variants. However, in a world where the majority of people are (at least) bilingual, such a choice is often available, although the factors determining it may sometimes be rather obvious – an English–German bilingual will normally use English in London when addressing monolingual William and German in Berlin when addressing monolingual Wilhelm. But, of course, this can be seen as a case of *audience design*, a concept introduced in section 3 to account for choice between the values of phonological variables, and there is no reason to believe that other *social variables*, which have arisen in our discussions of language varieties, will not also play a role in the syntactic domain, particularly when we focus attention on bidialectalism.

Reference to social variables and their role in determining the linguistic features that an individual will employ on an occasion brings us quite naturally to questions of language use, and our book closed with a review of some of the issues that arise once the fact that language is often used to communicate in a specific context is seen as worthy of study.

We will end with two final remarks of considerable importance. Firstly, there is no conflict between recognising the important role of language in structuring conversations and the alternative that has directed us through the earlier parts of the book, namely an emphasis on language as an internalised cognitive system that can be studied in abstraction from its role in communication and social interaction. Of course, it may prove to be the case that a full understanding of the use of language is a prerequisite to coming to terms with its structure, but this is not inevitable, and we hope that this book will have persuaded readers that the alternative strategy of abstraction from use is a valuable one from which insights can flow. Only additional research conducted from a variety of perspectives will push us towards the deeper understanding that we all seek. The second final point brings together the issues we introduced in section 27 and the fundamental distinction between competence and performance that we raised in our Introduction. Section 27 was, of course, concerned with sentence use, but it is important to realise that there is a role for a competence/performance distinction in this domain of use too, that is, it is necessary to distinguish between an individual's implicit knowledge of, say, the Gricean maxims or the principles of Relevance Theory, and that individual's employment of that knowledge on an occasion. In short, just as one can perform in such a way as not to accurately reflect one's phonological or syntactic knowledge (speech errors, syntactic illusions), so one can be pragmatically inept on an occasion. The *idealisation* that is involved in the focus on knowledge is a necessary strategy in any scientific enquiry, and we maintain that the successes which have been achieved by adopting this idealisation amply justify it. This is no less true in sociolinguistics or in pragmatics than it is in morphology or syntax, and we believe that the successes of contemporary linguistics, limited as they may be, provide ample illustration of this.

Appendix 1
The International Phonetic Alphabet (revised to 1993, updated 1996)

THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993, updated 1996)

CONSONANTS (PULMONIC)

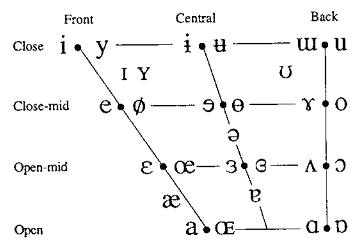
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap				ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks		Voiced implosives		Ejectives	
ʘ	Bilabial	ɓ	Bilabial	ʼ	Examples:
ǀ	Dental	ɗ	Dental/alveolar	pʼ	Bilabial
ǃ	(Post)alveolar	ʄ	Palatal	tʼ	Dental/alveolar
ǂ	Palatoalveolar	ɠ	Velar	kʼ	Velar
ǁ	Alveolar lateral	ʛ	Uvular	sʼ	Alveolar fricative

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

OTHER SYMBOLS

- ʍ Voiceless labial-velar fricative
- w Voiced labial-velar approximant
- ɥ Voiced labial-palatal approximant
- ʜ Voiceless epiglottal fricative
- ʢ Voiced epiglottal fricative
- ʡ Epiglottal plosive
- ɕ ʑ Alveolo-palatal fricatives
- ɺ Alveolar lateral flap
- ɧ Simultaneous ʃ and x

Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary. k͡p t͜s

DIACRITICS Diacritics may be placed above a symbol with a descender, e.g. ŋ̊

̥ Voiceless	n̥ d̥	̤ Breathy voiced	b̤ a̤	̪ Dental	t̪ d̪
̬ Voiced	s̬ t̬	̰ Creaky voiced	b̰ a̰	̺ Apical	t̺ d̺
ʰ Aspirated	tʰ dʰ	̼ Linguolabial	t̼ d̼	̻ Laminal	t̻ d̻
̹ More rounded	ɔ̹	ʷ Labialized	tʷ dʷ	̃ Nasalized	ẽ
̜ Less rounded	ɔ̜	ʲ Palatalized	tʲ dʲ	ⁿ Nasal release	dⁿ
̟ Advanced	u̟	ˠ Velarized	tˠ dˠ	ˡ Lateral release	dˡ
̠ Retracted	e̠	ˤ Pharyngealized	tˤ dˤ	̚ No audible release	d̚
̈ Centralized	ë	̴ Velarized or pharyngealized	ɫ		
̽ Mid-centralized	e̽	̝ Raised	e̝ (ɹ̝ = voiced alveolar fricative)		
̩ Syllabic	n̩	̞ Lowered	e̞ (β̞ = voiced bilabial approximant)		
̯ Non-syllabic	e̯	̘ Advanced Tongue Root	e̘		
˞ Rhoticity	ɚ a˞	̙ Retracted Tongue Root	e̙		

SUPRASEGMENTALS

- ˈ Primary stress
- ˌ Secondary stress ˌfoʊnəˈtɪʃən
- ː Long eː
- ˑ Half-long eˑ
- ̆ Extra-short ĕ
- | Minor (foot) group
- ‖ Major (intonation) group
- . Syllable break ɹi.ækt
- ‿ Linking (absence of a break)

TONES AND WORD ACCENTS

LEVEL			CONTOUR		
e̋ or	˥	Extra high	ě or	˩˥	Rising
é	˦	High	ê	˥˩	Falling
ē	˧	Mid	e᷄	˦˥	High rising
è	˨	Low	e᷅	˩˨	Low rising
ȅ	˩	Extra low	e᷈	˧˦˧	Rising-falling
↓		Downstep	↗		Global rise
↑		Upstep	↘		Global fall

Appendix 2
Phonological distinctive features

The information that is contained in appendices 2 and 3 is a slightly modified version of material appearing in Andrew Spencer's *Phonology* (Oxford: Blackwell, 1996). The authors are grateful to Blackwell for their permission to use this material.

List of distinctive features

This list includes definitions of the binary features used in this book as well as a number of others in common use which you will come across in wider reading.

consonantal [±cons] The [+cons] sounds are the obstruents, nasals and liquids, in which there is a relatively tight constriction in the vocal tract, compared with the [−cons] sounds, the glides and vowels.

approximant [±approx] In [+approx] sounds the constriction is not very great; the class includes liquids as well as glides and vowels. Fricatives and stops (including nasal stops) are [−approx].

sonorant [±son] The [+son] sounds are the [+approx] sounds (vowels, glides and liquids) together with the nasals. The [−son] sounds are called obstruents (plosives, affricates and fricatives).

continuant [±cont] A non-continuant sound or a *stop* ([−cont]) is one in which there is a constriction in the *oral* tract which prevents the air from passing through. The plosives are [−cont] as are the nasals, in which the air passes through the nose and not the mouth. All other sounds (including fricatives) are continuants. (Affricates begin as [−cont] and then become [+cont].)

strident [±strid] Stridency is relevant only for fricatives and affricates. A strident sound is relatively noisy when compared to a non-strident one. Labiodentals, sibilants and uvulars (fricatives/affricates) are [+strid]; all other fricatives/affricates are [–strid].

nasal [±nas] Nasal sounds are produced by lowering the velum and allowing air to pass through the nasal passages. Nasal stops and nasalised vowels are [+nas]. Sounds made by raising the velum and thus preventing air from passing through the nasal cavity are called 'oral' sounds and have the feature specification [–nas].

lateral [±lat] In a [+lat] sound such as [l] the air is made to pass round the sides of the tongue instead of flowing over the top of the tongue as with all other sounds.

anterior [±ant] This feature is relevant only for coronal sounds. An anterior ([+ant]) sound is made by bringing the tongue towards or onto the alveolar ridge or the teeth. If a sound is produced with the tongue placed further back than the alveolar ridge, then it will be a posterior sound, [−ant]. The anteriors are the dentals and alveolars, the posterior sounds are the retroflex, palato-alveolar and palatal sounds.

voiced [±voiced] In voiced sounds the vocal folds can vibrate during the articulation of the sound; in voiceless sounds the configuration of the larynx doesn't permit this. In English the only sounds which are phonemically voiceless are the voiceless obstruents (plosives, fricatives and affricates) [p t k f s ʃ h tʃ]. Sonorants, including vowels, in English are all voiced.

aspiration [±asp] This feature doesn't distinguish phonemes in English. Aspirated consonants are those which are followed by a slight puff of breath (due to a relatively long VOT). The [−asp] sounds lack this puff of breath.

Vowel features: some of the following features are also applied to consonants, but for the purposes of this introduction we will regard them as applying just to vowels and glides.

high [±high] The [+high] vowels include [i y ɨ u j w]; vowels such as [e, o, a, ɑ] are [−high]. The body of the tongue (dorsum) is raised close to the roof of the mouth in high sounds, whereas it occupies a more mid or low position for [−high] sounds. NB: just because a sound is [−high] doesn't mean to say that it's also [+low] (see below).

back [±back] The [+back] vowels and glides include [u o ɔ ɑ ɒ ʌ w], while the front ([–back]) sounds include [i, y, e, œ, ø, æ, j]. To make a [−back] sound, the tongue body (dorsum) is brought forward, whereas it is retracted for the back sounds, such as [u, o, ɔ, ʌ, ɑ, ɒ, w]. The central vowels such as [ɨ, ə, a] are generally taken to be [+back].

low [±low] The low vowels include [æ a a ɒ]. To produce these the tongue body is brought close to the floor of the mouth. This means that mid vowels such as [e, o, ɛ, ɔ] are [−low]. (See also [±high] above.)

rounded [±rounded] Rounded sounds are produced by contracting the lips as for the sound [u]. Vowels and glides such as [u y œ ɒ ɔ o w] are all [+rounded].

Appendix 3
Distinctive feature matrix for English consonant phonemes

	p	b	t	d	k	g	f	v	θ	ð	s	z	ʃ	ʒ	h	m	n	ŋ	w	l	r	j	tʃ	ʤ
cons	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	−	+	+
approx	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	−	−
son	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	+	+	−	−
cont	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+	−	−	−	+	+	+	+	−/+	−/+
strid							+	+	−	−	+	+	+	+	−								+	+
nas	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	−	−	−	−	−	−
lat	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	−	−	−
voiced	−	+	−	+	−	+	−	+	−	+	−	+	−	+	−	+	+	+	+	+	+	+	−	+
[PLACE]	L	L	C	C	D	D	L	L	C	C	C	C	C	C	G	L	C	D	L	C	C	C	C	C
ant			+	+					+	+	+	+	−	−			+			+	+	−	−	−

Note: L = LABIAL, C = CORONAL, D = DORSAL, G = GUTTURAL

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