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UNDERSTANDING LANGUAGE SERIES

second edition

Understanding

Morphology

Understanding Language Series

Series Editors: Bernard Comrie and Greville Corbett

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Understanding Morphology

2nd edition

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Contents

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Preface to the 2nd edition

Readers who are familiar with the first edition of *Understanding Morphology* (of which Martin Haspelmath was sole author) will find that the book's fundamental character has not changed. This book provides an introduction to linguistic morphology, with a focus on demonstrating the diversity of morphological patterns in human language and elucidating broad issues that are the foundation upon which morphological theories are built.

At the same time, the material in this book has been substantially restructured and some topics have been expanded. The goal was to bring foundational issues to the forefront. This was accomplished mostly by expanding existing chapter sections or creating new chapter sections to centralize and focus discussion that was previously spread throughout a chapter. In some cases, however, the restructuring has been more radical. Notably, Chapter 3 from the first edition ('Lexicon and Rules') has been divided into two chapters, with more attention given to the question of whether the lexicon is fundamentally morpheme-based or word-based. Also, the chapter 'Word-based Rules' (formerly Chapter 9) has been eliminated, with its material redistributed elsewhere, as relevant.

There are also some new and expanded features: answers to each chapter's comprehension exercises can now be found at the back of the book; the glossary has been significantly enlarged; Chapter 5 has a new appendix on notation conventions for inflectional values; and perhaps most notably, nine chapters now contain exploratory exercises. The exploratory exercises are larger in scope than the comprehension exercises and extend the themes of the chapters. They guide readers through research questions in an open-ended way, asking them to gather and analyze data from a variety of sources, such as descriptive grammars, corpora, and native speaker consultants. The exercises are broadly constructed so that they can be tailored to the needs and interests of particular individuals or groups. In a classroom setting, instructors can use them with different levels of

students by adjusting their expectations regarding depth of analysis and methodological rigor.

A number of people have helped to improve this new edition. First and foremost, we thank the series editors, Bernard Comrie and Greville Corbett, whose numerous suggestions and dedication to the project have greatly improved it. (Naturally, all errors remain the fault of the authors.) At Hodder we are also grateful to Bianca Knights and Tamsin Smith for their encouragement and deep well-springs of patience, and to Liz Wilson, for shepherding the project through production.

In the end, textbooks are for students, and we would also like to thank Andrea Sims's morphology students at Northwestern University and The Ohio State University for their feedback. We especially thank Christine Davis, Caitlin Ferrarell, Laura Garofalo, Alexander Obal, Zach Richards, Cenia Rodriguez, and Honglei Wang. They provided extensive, detailed, valuable, and sometimes unexpected perspectives on the first edition. Their critique of some aspects of the second edition (particularly, drafts of the exploratory exercises) also proved crucial.

This second edition contains some new examples, and we thank the following people for their help in understanding the relevant languages and providing appropriate examples: Hope Dawson (Sanskrit), Maggie Gruszczynska (Polish), Jessie Labov (Hungarian), and Amanda Walling (Old English). Any errors remain the fault of the authors.

We are indebted to the various scholars and teachers who wrote reviews of the first edition, or who have passed on their experiences in teaching with the book. We are happy that the book was, on the whole, warmly received. We have tried to improve that which was deemed in need of improvement.

Finally, we thank our families, and especially our partners, Susanne Michaelis and Jason Packer, for all manner of help and support.

Leipzig, Germany
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Preface to the 1st edition

This book provides an introduction to the field of linguistic morphology. It gives an overview of the basic notions and the most important theoretical issues, emphasizing throughout the diversity of morphological patterns in human languages. Readers who are primarily interested in understanding English morphology should not be deterred by this, however, because an individual language can be understood in much greater depth when viewed against the cross-linguistic background.

The focus of this book is on morphological phenomena and on broad issues that have occupied morphologists of various persuasions for a long time. No attempt is made to trace the history of linguists' thinking about these issues, and references to the theoretical literature are mostly confined to the 'Further reading' sections. I have not adopted any particular theoretical framework, although I did have to opt for one particular descriptive format for morphological rules (see Section 3.2.2). Readers should be warned that this format is no more 'standard' than any other format, and not particularly widespread either. But I have found it useful, and the advanced student will soon realize how it can be translated into other formats.

Although it is often said that beginning students are likely to be confused by the presentation of alternative views in textbooks, this book does not pretend that there is one single coherent and authoritative view of morphology. Debates and opposing viewpoints are so much part of science that omitting them completely from a textbook would convey a wrong impression of what linguistic research is like. And I did not intend to remain neutral in these debates, not only because it would have been virtually impossible anyway, but also because a text that argues for a particular view is invariably more interesting than one that just presents alternative views.

A number of people have helped me in writing this book. My greatest thanks go to the series editors, Bernard Comrie and Greville Corbett, who provided countless suggestions for improving the book.

I also thank Renate Raffelsiefen for her expert advice on phonological

Abbreviations

These abbreviations are consistent with the Leipzig Glossing Rules (v. February 2008).

ABE	abessive	DEF	definite
ABL	ablative	DEM	demonstrative
ABS	absolutive	DEOBJ	deobjective
ACC	accusative	DESID	desiderative
ACT	active	DET	determiner
ADJ	adjective	DO	direct object
ADV	adverb(ial)	DU	dual
AFF	affirmative	DUR	durative
AG	agent	ELA	elative
AGR	agreement	ERG	ergative
ALL	allative	ESS	essive
ANTIC	anticausative	EXCL	exclusive
ANTIP	antipassive	F	feminine
AOR	aorist	FOC	focus
APPL	applicative	FUT	future
ART	article	G	gender (e.g. G1 = gender 1)
ASP	aspect	GEN	genitive
AUX	auxiliary	HAB	habitual
CAUS	causative	HYP	hypothetical
CLF	classifier	IMP	imperative
COMP	complementizer	IMPF	imperfect(ive)
COMPL	completive	IMPV	imperative
COND	conditional	INCL	inclusive
CONT	continuative	IND	indicative
CVB	converb	INDF	indefinite
DAT	dative	INESS	inessive
DECL	declarative	INF	infinitive

INS	instrumental	PP	prepositional phrase
INTF	interfix	PRED	predicate
INTR/intr.	intransitive	PREF	prefix
IOBJ	indirect object	PRET	preterite
LOC	locative	PRF	perfect
M	masculine	PRS	present
MASD	masdar	PRIV	privative
N	noun	PROG	progressive
N	neuter	PROPR	proprietive
NEC	necessitative	PST	past
NEG	negation, negative	PTCP	participle
NOM	nominative	PURP	purposive
NP	noun phrase	RECP	reciprocal
OBJ	object	REFL	reflexive
OBL	oblique	REL	relative clause marker
OED	*Oxford English Dictionary*	REP	repetitive
		SBJ	subject
OPT	optative	SBJV	subjunctive
P	patient	SG	singular
PAR	partitive	SS	same-subject
PART	participle	SUBORD	subordinator
PASS	passive	SUF	suffix
PFV	perfective	TOP	topic
PL	plural	TR/tr.	transitive
POSS	possessive	V	verb
POT	potential	VP	verb phrase

Introduction

<div style="text-align: right; font-size: large;">1</div>

1.1 What is morphology?

Morphology is the study of the internal structure of words.[1] Somewhat paradoxically, morphology is both the oldest and one of the youngest subdisciplines of grammar. It is the oldest because, as far as we know, the first linguists were primarily morphologists. The earliest extant grammatical texts are well-structured lists of morphological forms of Sumerian words, some of which are shown in (1.1). They are attested on clay tablets from Ancient Mesopotamia and date from around 1600 BCE.

(1.1)

badu	'he goes away'		*inǧen*	'he went'
baduun	'I go away'		*inǧenen*	'I went'
bašidu	'he goes away to him'		*inšiǧen*	'he went to him'
bašiduun	'I go away to him'		*inšiǧenen*	'I went to him'

<div style="text-align: right;">(Jacobsen 1974: 53–4)</div>

Sumerian was the traditional literary language of Mesopotamia but, by the second millennium BCE, it was no longer spoken as a medium of everyday communication (having been replaced by the Semitic language Akkadian), so it needed to be recorded in grammatical texts. Morphology was also prominent in the writings of the greatest grammarian of Antiquity, the Indian Pāṇini (fifth century BCE), and in the Greek and Roman grammatical tradition. Until the nineteenth century, Western linguists often thought of grammar as consisting primarily of word structure, perhaps because the

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[1] The reader should be aware that this sentence, while seemingly straightforward, conceals a controversy – there is no agreed upon definition of 'word'. The relevant issues are addressed in Chapter 9, but here, and through most of the book, we will appeal to a loose, intuitive concept of 'word'.

classical languages Greek and Latin had fairly rich morphological patterns that were difficult for speakers of the modern European languages.

This is also the reason why it was only in the second half of the nineteenth century that the term *morphology* was invented and became current. Earlier there was no need for a special term, because the term *grammar* mostly evoked word structure, i.e. morphology. The terms *phonology* (for sound structure) and *syntax* (for sentence structure) had existed for centuries when the term *morphology* was introduced. Thus, in this sense morphology is a young discipline.

Our initial definition of morphology, as the study of the internal structure of words, needs some qualification, because words have internal structure in two very different senses. On the one hand, they are made up of sequences of sounds (or gestures in sign language), i.e. they have internal phonological structure. Thus, the English word *nuts* consists of the four sounds (or, as we will say, *phonological segments*) [nʌts]. In general, phonological segments such as [n] or [t] cannot be assigned a specific meaning – they have a purely contrastive value (so that, for instance, *nuts* can be distinguished from *cuts*, *guts*, *shuts*, from *nets*, *notes*, *nights*, and so on).

But often formal variations in the shapes of words correlate systematically with semantic changes. For instance, the words *nuts*, *nights*, *necks*, *backs*, *taps* (and so on) share not only a phonological segment (the final [s]), but also a semantic component: they all refer to a multiplicity of entities from the same class. And, if the final [s] is lacking (*nut*, *night*, *neck*, *back*, *tap*), reference is made consistently to only one such entity. By contrast, the words *blitz*, *box*, *lapse* do not refer to a multiplicity of entities, and there are no semantically related words *blit*, *bok*, *lap.[2] We will call words like *nuts* '(morphologically) **complex words**'.

In a morphological analysis, we would say that the final [s] of *nuts* expresses plural meaning when it occurs at the end of a noun. But the final [s] in *lapse* does not have any meaning, and *lapse* does not have morphological structure. Thus, morphological structure exists if there are groups of words that show identical partial resemblances in both form and meaning. Morphology can be defined as in Definition 1.

> **Definition 1**:
> Morphology is the study of systematic covariation in the form and meaning of words.

It is important that this form–meaning covariation occurs systematically in groups of words. When there are just two words with partial form–meaning resemblances, these may be merely accidental. Thus, one would

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[2]   The asterisk symbol (*) is used to mark nonexistent or impossible expressions.

not say that the word *hear* is morphologically structured and related to *ear*. Conceivably, *h* could mean 'use', so *h-ear* would be 'use one's ear', i.e. 'hear'. But this is the only pair of words of this kind (there is no **heye* 'use one's eye', **helbow* 'use one's elbow', etc.), and everyone agrees that the resemblances are accidental in this case.

Morphological analysis typically consists of the identification of parts of words, or, more technically, **constituents** of words. We can say that the word *nuts* consists of two constituents: the element *nut* and the element *s*. In accordance with a widespread typographical convention, we will often separate word constituents by a hyphen: *nut-s*. It is often suggested that morphological analysis primarily consists in breaking up words into their parts and establishing the rules that govern the co-occurrence of these parts. The smallest meaningful constituents of words that can be identified are called **morphemes**. In *nut-s*, both *-s* and *nut* are morphemes. Other examples of words consisting of two morphemes would be *break-ing*, *hope-less*, *re-write*, *cheese-board*; words consisting of three morphemes are *re-writ-ing*, *hope-less-ness*, *ear-plug-s*; and so on. Thus, morphology could alternatively be defined as in Definition 2.

> **Definition 2:**
> Morphology is the study of the combination of morphemes to yield words.

This definition looks simpler and more concrete than Definition 1. It would make morphology quite similar to syntax, which is usually defined as 'the study of the combination of words to yield sentences'. However, we will see later that Definition 2 does not work in all cases, so we should stick to the somewhat more abstract Definition 1 (see especially Chapters 3 and 4).

In addition to its main sense, where morphology refers to a subdiscipline of linguistics, it is also often used in a closely related sense, to denote a part of the language system. Thus, we can speak of 'the morphology of Spanish' (meaning Spanish word structures) or of 'morphology in the 1980s' (meaning a subdiscipline of linguistics). The term *morphology* shares this ambiguity with other terms such as *syntax*, *phonology* and *grammar*, which may also refer either to a part of the language or to the study of that part of the language. This book is about morphology in both senses. We hope that it will help the reader to understand morphology both as a part of the language system and as a part of linguistics.

One important limitation of the present book should be mentioned right at the beginning: it deals only with spoken languages. Sign languages of course have morphology as well, and the only justification for leaving them out of consideration here is the authors' limited competence. As more and more research is done on sign languages, it can be expected that these

studies will have a major impact on our views of morphology and language structure in general.

1.2 Morphology in different languages

Morphology is not equally prominent in all (spoken) languages. What one language expresses morphologically may be expressed by a separate word or left implicit in another language. For example, English expresses the plural of nouns by means of morphology (*nut/nuts, night/nights*, and so on), but Yoruba uses a separate word for expressing the same meaning. Thus, *ọkùnrin* means '(the) man', and the word *àwọn* can be used to express the plural: *àwọn ọkùnrin* 'the men'. But in many cases where several entities are referred to, this word is not used and plurality is simply left implicit.

Quite generally, we can say that English makes more use of morphology than Yoruba. But there are many languages that make more use of morphology than English. For instance, as we saw in (1.1), Sumerian uses morphology to distinguish between 'he went' and 'I went', and between 'he went' and 'he went to him', where English must use separate words. In Classical Greek, there is a dual form for referring to two items, e.g. *adelphṓ* 'two brothers'. In English it is possible to use the separate word 'two' to render this form, but it is also possible to simply use the plural form and leave the precise number of items implicit.

Linguists sometimes use the terms **analytic** and **synthetic** to describe the degree to which morphology is made use of in a language. Languages like Yoruba, Vietnamese or English, where morphology plays a relatively modest role, are called analytic. Consider the following example sentences.[3]

(1.2) Yoruba
    Nwọn ó   maa gbà   pṓnùn   mẹ́wǎ   lọ́sọ̀ọ̀sẹ̀.
    they FUT PROG get   pound   ten   weekly
    'They will be getting £10 a week.'

<div align="right">(Rowlands 1969: 93)</div>

(1.3) Vietnamese
    Hai đú.a   bo?   nhau   là   tại   gia-đình thàng chông.
    two individual leave each.other be because.of family   guy   husband
    'They divorced because of his family.'

<div align="right">(Nguyen 1997: 223)</div>

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[3] For each example sentence from an unfamiliar language, not only an idiomatic translation is provided, but also a literal ('morpheme-by-morpheme') translation. The key for abbreviations is found on pp. xv–xvi, and further notational conventions are explained in the Appendix to Chapter 2.

When a language has almost no morphology and thus exhibits an extreme degree of analyticity, it is also called **isolating**. Yoruba and Vietnamese, but not English, are usually qualified as isolating. Languages like Sumerian, Swahili or Lezgian, where morphology plays a more important role, would be called synthetic. Let us again look at two example sentences.

(1.4) Swahili
Ndovu   wa-wili wa-ki-song-ana   zi-umia-zo ni   nyika.
elephants PL-two 3PL-SUBORD-jostle-RECP 3SG-hurt-REL is   grass
'When two elephants jostle, what is hurt is the grass.'

(Ashton 1947: 114)

(1.5) Lezgian
Marf-adi wiči-n   qalin st'al-ra-ldi   qaw   gata-zwa-j.
rain-ERG self-GEN dense drop-PL-INS   roof hit-IMPF-PST
'The rain was hitting the roof with its dense drops.'

(Haspelmath 1993: 140)

When a language has an extraordinary amount of morphology and perhaps many compound words, it is called **polysynthetic**. An example is West Greenlandic.[4]

(1.6) West Greenlandic
Paasi-nngil-luinnar-para   ilaa-juma-sutit.
understand-not-completely-1SG.SBJ.3SG.OBJ.IND come-want-2SG.PTCP
'I didn't understand at all that you wanted to come along.'

(Fortescue 1984: 36)

The distinction between analytic and (poly)synthetic languages is not a bipartition or a tripartition, but a continuum, ranging from the most radically isolating to the most highly polysynthetic languages. We can determine the position of a language on this continuum by computing its degree of synthesis, i.e. the ratio of morphemes per word in a random text sample of the language. Table 1.1 gives the degree of synthesis for a small selection of languages.

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[4] There is another definition of *polysynthetic* in use among linguists, according to which a language is polysynthetic if single words in the language typically correspond to multi-word sentences in other languages. In this book we will not use the term in this sense, but under such a definition, Swahili would be classified as a polysynthetic language.

Language	Ratio of morphemes per word
West Greenlandic	3.72
Sanskrit	2.59
Swahili	2.55
Old English	2.12
Lezgian	1.93
German	1.92
Modern English	1.68
Vietnamese	1.06

Table 1.1 The degree of synthesis of some languages

Source: based on Greenberg (1959), except for Lezgian

Although English has much more morphology than isolating languages like Yoruba and Vietnamese, it still has a lot less than many other languages. For this reason, it will be necessary to refer extensively to languages other than English in this book.

1.3 The goals of morphological research

Morphological research aims to describe and explain the morphological patterns of human languages. It is useful to distinguish four more specific sub-goals of this endeavour: elegant description, cognitively realistic description, system-external explanation and a restrictive architecture for description.

(i) **Elegant description**. All linguists agree that morphological patterns (just like other linguistic patterns) should be described in an elegant and intuitively satisfactory way. Thus, morphological descriptions should contain a rule saying that English nouns form their plural by adding *-s*, rather than simply listing the plural forms for each noun in the dictionary (*abbot, abbots; ability, abilities; abyss, abysses; accent, accents;* …). In a computer program that simulates human language, it may in fact be more practical to adopt the listing solution, but linguists would find this inelegant. The main criterion for elegance is **generality**. Scientific descriptions should, of course, reflect generalizations in the data and should not merely list all known individual facts. But generalizations can be formulated in various ways, and linguists often disagree in their judgements of what is the most elegant description. It is therefore useful to have a further objective criterion that makes reference to the speakers' knowledge of their language.

(ii) **Cognitively realistic description**. Most linguists would say that their descriptions should not only be elegant and general, but they should

also be cognitively realistic. In other words, they should express the same generalizations about grammatical systems that the speakers' cognitive apparatus has unconsciously arrived at. We know that the speakers' knowledge of English not only consists of lists of singulars and plurals, but comprises a general rule of the type 'add -s to a singular form to get a plural noun'. Otherwise speakers would be unable to form the plural of nouns they have never encountered before. But they do have this ability: if you tell an English speaker that a certain musical instrument is called a *duduk*, they know that the plural is (or can be) *duduks*. The dumb computer program that contains only lists of singulars and plurals would fail miserably here. Of course, cognitively realistic description is a much more ambitious goal than merely elegant description, and we would really have to be able to look inside people's heads for a full understanding of the cognitive machinery. Linguists sometimes reject proposed descriptions because they seem cognitively implausible, and sometimes they collaborate with psychologists and neurologists and take their research results into account.

   (iii) **System-external explanation**. Once a satisfactory description of morphological patterns has been obtained, many linguists ask an even more ambitious question: why are the patterns the way they are? In other words, they ask for explanations. But we have to be careful: most facts about linguistic patterns are historical accidents and as such cannot be explained. The fact that the English plural is formed by adding -s is a good example of such a historical accident. There is nothing necessary about plural -s: Hungarian plurals are formed by adding -k, Swedish plurals add -r, Hebrew plurals add -im or -ot, and so on. A frequent way to pursue explanation in linguistics is to analyze universals of human language, since these are more likely to represent facts that are in need of explanation at a deep level. And as a first step, we must find out which morphological patterns are universal. Clearly, the s-plural is not universal, and, as we saw in the preceding section, not even the morphological expression of the plural is universal – Yoruba is an example of a language that lacks morphological plurals. So even the fact that English nouns have plurals is no more than a historical accident. But there is something about plurals that is not accidental: nouns denoting people are quite generally more likely to have plurals than nouns denoting things. For instance, in Tzutujil, only human nouns have regular morphological plural forms (Dayley 1985: 139). We can formulate the universal statement in (1.7).

(1.7)   A universal statement: If a language has morphological plural forms of nouns at all, it will have plurals of nouns denoting people.

<div align="right">(Corbett 2000: ch. 3)</div>

Because of its 'if … then' form, this statement is true also of languages like English (where most nouns have plurals) and Yoruba (where nouns do not

have a morphological plural). Since it is (apparently) true of all languages, it is in all likelihood not a historical accident, but reflects something deeper, a general property of human language that can perhaps be explained with reference to system-external considerations. For instance, one might propose that (1.7) is the case because, when the referents of nouns are people, it makes a greater difference how many they are than when the referents are things. Thus, plurals of people-denoting nouns are more useful, and languages across the world are thus more likely to have them. This explanation (whatever its merits) is an example of a system-external explanation in the sense that it refers to facts outside the language system: the usefulness of number distinctions in speech.

(iv) **A restrictive architecture for description.** Many linguists see an important goal of grammatical research in formulating some general design principles of grammatical systems that all languages seem to adhere to. In other words, linguists try to construct an architecture for description (also called **grammatical theory**) that all language-particular descriptions must conform to. For instance, it has been observed that rules by which constituents are fronted to the beginning of a sentence can affect syntactic constituents (such as whole words or phrases), but not morphological constituents (i.e. morphemes that are parts of larger words). Thus, (1.8b) is a possible sentence (it can be derived from a structure like (1.8a)), but (1.9b) is impossible (it cannot be derived from (1.9a)). (The subscript line __ stands for the position that the question word *what* would occupy if it had not been moved to the front.)

(1.8) a. *We can buy cheese.*
     b. *What can we buy __ ?*

(1.9) a. *We can buy a cheeseboard.*
     b. **What can we buy a __ -board?*

This restriction on fronting (which seems to hold for all languages that have such a fronting rule) follows automatically if fronting rules (such as *what*-fronting) and morpheme-combination rules (such as compounding, which yields *cheeseboard* from *cheese* and *board*) are separated from each other in the descriptive architecture. A possible architecture for grammar is shown in Figure 1.1, where the boxes around the grammatical components 'syntax', 'morphology' and 'phonology' symbolize the separateness of each of the components.
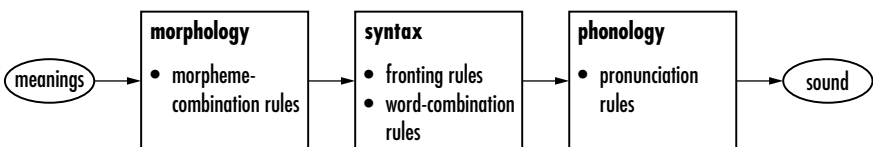
Figure 1.1 A possible descriptive architecture for grammar

This architecture is restrictive because it automatically disallows certain logically possible interactions of rules (see Section 9.4 for more discussion). Many linguists assume that the architecture of grammar is innate – it is the same for all languages because it is genetically fixed for the human species. The innate part of speakers' grammatical knowledge is also called **Universal Grammar**. For these linguists, one goal of morphological research is to discover those principles of the innate Universal Grammar that are relevant for word structure.

The goals (iii) and (iv) are similar in that both ask deeper, theoretical questions, and both exclusively concern universal aspects of morphology. And both are more ambitious than (i) and (ii) in that they involve explanation in some sense. Thus, one might ask questions such as 'Why cannot constituents of words be fronted to the beginning of the sentence?' and answer them from a Universal Grammar-oriented perspective with reference to a hypothesis about the innate architecture of grammar ('Because fronting rules are part of the syntactic component, and morpheme-combinations are part of morphology, and syntax and morphology are separate'). However, explanations of this kind are strictly system-internal, whereas explanations of the kind we saw earlier are even more general in that they link universal properties of grammars to general facts about human beings that are external to the grammatical system.

It is a curious observation on the sociology of science that currently most linguists seem to be concerned either with system-external explanation or with formulating an architecture for grammatical description, but not with both goals simultaneously. There are thus two primary orientations in contemporary theoretical morphological research: the **functionalist** orientation, which aims at system-external explanation, and the **generative** (or **formalist**) orientation, which seeks to discover the principles of the innate grammatical architecture. However, it does not seem wise to divide the labour of morphological research in this way, because neither system-external factors nor innate principles can explain the whole range of morphological patterns. Accordingly, both goals will be simultaneously pursued in the more theoretically oriented parts of this book.

1.4 A brief user's guide to this book

Sources of data

In this book we give examples from many different languages, and attributions for this data follow standard practice. For examples from less widely known languages, the reference is given after the example. However, when the examples are from well-known and widely studied languages such as Modern English, Russian, Standard Arabic or Old English, we

do not give a reference because the data can easily be obtained from any standard reference book.

Sources of ideas

In this book, we focus on morphological data and problems of analysis, not on the history of thinking about these issues in linguistics. Thus, we rarely mention names of particular authors in the text, and references to sources of ideas are given only in a few very specific cases (as in Table 1.1 and example (1.7)). In general, the reader is referred to the section 'Further reading', where important works on theoretical morphology are mentioned.

Comprehension exercises

Each chapter contains exercises designed to help the reader solidify understanding of the material. Answers to these exercises can be found at the end of the book.

Exploratory exercises

Many chapters also contain a longer exercise that extends the chapter material. These are exploratory in nature, so no answers are provided.

Glossary

The glossary contains the technical terms relating to morphology that are used in this book. In addition to giving a brief definition, the glossary also refers the reader to the most important places where the term is discussed in the text. These terms are printed in **bold** where they are first discussed in the text.

Language index

Many languages mentioned in this book will be unfamiliar to the reader. The language index serves to give information on each language, in particular its genealogical affiliation, the place where it is spoken, and its ISO 639-3 code. ISO 639-3 is an international standard that assigns a unique code to every language. The reader is encouraged to use these codes to find more information about the languages discussed in the book; the on-line language encyclopaedia Ethnologue (www.ethnologue.com) is particularly helpful in this regard.

Spelling and transcription

Morphology of spoken languages deals with spoken words, so ideally all the examples should be in phonetic transcription in this book. But since many languages have a conventional spelling that renders the pronunciation more or less faithfully, it was more practical and less confusing to adopt that spelling for the examples here. (Although English spelling is not particularly close to the pronunciation, English examples will usually be given in the

spelling, because it is assumed that the readers know their pronunciation.) Examples cited in the spelling (or conventional transliteration) are always printed in italics, whereas examples cited in phonetic transcription are printed in ordinary typeface and are usually included in square brackets. Readers not familiar with phonetic transcription should consult any phonetics or phonology textbook.

Abbreviations

A list of abbreviations (especially abbreviations of grammatical terms) is found on pp. xv–xvi.

Summary of Chapter 1

Morphology is most simply defined as the study of the combination of morphemes to yield words, but a somewhat more abstract definition (as the study of systematic covariation in the form and meaning of words) will turn out to be more satisfactory. Different languages vary strikingly in the extent to which they make use of morphology. The goals of morphological research are (on the descriptive level) elegant and cognitively realistic description of morphological structures, plus (on the theoretical level) system-external explanation and the discovery of a restrictive architecture for description.

Further reading

For an elementary introduction to morphology, see Coates (1999) or Katamba and Stonham (2006).

Other morphology textbooks that are somewhat similar in scope to the present book are Bauer (2003), Bubenik (1999), and Plag (2003) (as well as Scalise (1994), in Italian, and Plungian (2000), in Russian). Spencer (1991) is a very thorough introduction that concentrates on the generative orientation in morphology. Matthews (1991) puts particular emphasis on the definition of morphological concepts. Carstairs-McCarthy (1991) gives an excellent overview of the theoretical debates in the 1970s and 1980s. Booij (2007) devotes a chapter to the mental processing and storage of words. Aronoff and Fudeman (2005) is a source for techniques of morphological analysis.

The most comprehensive work on morphology that has ever been written by a single author is Mel'čuk (1993–2000) (five volumes, in French). Although its style is somewhat unusual, it is very readable.

Reference works that are devoted exclusively to morphology are Spencer and Zwicky (1998) and Booij, Lehmann and Mugdan (2000–2004). A

bibliography is Beard and Szymanek (1988). Bauer (2004) is a glossary of morphological terms.

The complementarity of the functionalist and the generative approaches to morphology is explained and emphasized in the introductory chapter of Hall (1992).

An introduction to a sign language that also discusses morphology is Sutton-Spence and Woll (1999).

A note on the history of the term *morphology*: in the biological sense ('the study of the form of animals and plants'), the term was coined by Johann Wolfgang von Goethe (1749–1832), and, in the linguistic sense, it was first used by August Schleicher (1859).

Comprehension exercises

1. Which of the following English words are morphologically complex? For each complex word, list at least two other words that provide evidence for your decision (i.e. words that are both semantically and formally related to it).

    nights, owl, playing, affordable, indecent, religion, indolent, bubble, during, searched, hopeful, redo

2. Identify the morphological constituents and describe their meanings in the following Mandarin Chinese nouns.

chàngcí	'libretto'	*dǐngdēng*	'top light'
chàngjī	'gramophone'	*diànchē*	'streetcar, tram'
chuánwěi	'stern'	*diàndēng*	'electric lamp'
cíwěi	'suffix'	*diànjī*	'electrical machine'
diànlì	'electric power'	*qìchē*	'car'
diànshì	'television'	*qìchuán*	'steamship'
dòngwùxué	'zoology'	*shāndǐng*	'summit'
dòngwùyóu	'animal oil'	*shìchàng*	'sightseeing'
dòngwùyuán	'zoo'	*shìlì*	'eyesight'
fángdǐng	'roof'	*shùcí*	'number word'
fángkè	'tenant'	*shuǐchē*	'watercart'
fēichuán	'airship'	*shuǐlì*	'waterpower'
fēijī	'aeroplane'	*shùxué*	'mathematics'
fēiyú	'flying fish'	*wěidēng*	'tail light'
huāchē	'festooned vehicle'	*wěishuǐ*	'tail water'
huāyuán	'flower garden'	*yóudēng*	'oil lamp'
jīchē	'locomotive'	*yóuzhǐ*	'oil paper'
jiǎolì	'strength of one's legs'	*yúyóu*	'fish oil'
kèfáng	'guest house'	*zhǐhuā*	'paper flower'

3. Identify the morphological constituents and their meanings in the following Tzutujil verbs (Dayley 1985: 87) (A note on Tzutujil spelling: *x* is pronounced [ʃ], and *7* is pronounced [ʔ].)

xinwari	'I slept'	*xoqeeli*	'we left'
neeli	'he or she leaves'	*ninwari*	'I sleep'
ne7eeli	'they leave'	*xixwari*	'you(PL) slept'
nixwari	'you(PL) sleep'	*xe7eeli*	'they left'
xateeli	'you(SG) left'	*xwari*	'he or she slept'
natwari	'you(SG) sleep'		

How would you say 'I left', 'he or she sleeps', 'we sleep'?

4. In the following list of Hebrew words, find at least three sets of word pairs whose two members covary formally and semantically, so that a morphological relationship can be assumed. For each set of word pairs, describe the formal and semantic differences.

kimut	'wrinkling'	*maħšev*	'computer'
diber	'he spoke'	*masger*	'lock'
ħašav	'he thought'	*dibra*	'she spoke'
sagra	'she shut'	*milmel*	'he muttered'
ħašva	'she thought'	*kimta*	'she wrinkled'
kalat	'he received'	*milmla*	'she muttered'
maklet	'radio receiver'	*sagar*	'he shut'
kalta	'she received'	*dibur*	'speech'
kimet	'he wrinkled'		

Basic concepts

<div style="text-align: right">**2**</div>

We have seen that morphological structure exists if a group of words shows partial form-meaning resemblances. In most cases, the relation between form and meaning is quite straightforward: parts of words bear different meanings. Consider the examples in (2.1).

(2.1)
read	*read-s*	*read-er*	*read-able*
wash	*wash-es*	*wash-er*	*wash-able*
write	*write-s*	*writ-er*	*writ-able*
kind	*kind-ness*	*un-kind*	
happy	*happi-ness*	*un-happy*	
friendly	*friendli-ness*	*un-friendly*	

These words are easily **segmented**, i.e. broken up into individually meaningful parts: *read + s*, *read + er*, *kind + ness*, *un + happy*, and so on. These parts are called **morphemes**.[1] Words may of course consist of more than two morphemes, e.g. *un-happi-ness*, *read-abil-ity*, *un-friend-ly*, *un-friend-li-ness*.

Morphemes can be defined as the smallest meaningful constituents of a linguistic expression. When we have a sentence such as *Camilla met an unfriendly chameleon*, we can divide it into meaningful parts in various ways, e.g. *Camilla/met an unfriendly chameleon*, or *Camilla/met/an/unfriendly/ chameleon*, or *Camilla/met/an/un/friend/ly/chameleon*. But further division is not possible. When we try to divide *chameleon* further (e.g. *cha/meleon*), we do not obtain parts that can be said to be meaningful, either because they are not found in any other words (as seems to be the case with *meleon*), or because the other words in which they occur do not share any aspect of meaning with *chameleon* (cf. *charisma, Canadian, caboodle, capacity*, in which it would be theoretically possible to identify a word part *cha/ca-*). Thus, *chameleon* cannot

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[1] Some approaches question the usefulness of the notion 'morpheme'. We will discuss these extensively in Chapters 3 and 4, but for the moment it is helpful to begin in this more conventional way.

be segmented into several morphemes; it is **monomorphemic**. Morphemes are the ultimate elements of morphological analysis; they are, so to speak, morphological atoms.

In this chapter we introduce some other fundamental concepts and their related terms, starting with *lexemes* and *word-forms*.

2.1 Lexemes and word-forms

The most basic concept of morphology is of course the concept 'word'. For the sake of convenience, let us assume for the moment that a word is whatever corresponds to a contiguous sequence of letters.[2] Thus, in one sense the first sentence of this paragraph consists of twelve words, each separated by a blank space from the neighbouring word(s). And in another sense the sentence has nine words – there are nine *different* sequences of letters separated by spaces. But when a dictionary is made, not every sequence of letters is given its own entry. For instance, the words *live, lives, lived* and *living* are pronounced differently and are different words in that sense. But a dictionary would contain only a single entry LIVE. The dictionary user is expected to know that *live, lives, lived* and *living* are different concrete instantiations of the 'same' word LIVE. Thus, there are three rather different notions of 'word'. When a word is used in some text or in speech, that occurrence of the word is sometimes referred to as a **word token**. In this sense the first sentence in the paragraph consists of twelve words. The other two senses of the term 'word' are not defined in reference to particular texts; they correspond to the 'dictionary word' and the 'concrete word'. Since this distinction is central to morphology, we need special technical terms for the two notions, *lexeme* and *word-form*, respectively.

A **lexeme** is a word in an abstract sense. LIVE is a verb lexeme. It represents the core meaning shared by forms such as *live, lives, lived* and *living*. In most languages, dictionaries are organized according to lexemes, so it is usually reasonable to think of a lexeme as a 'dictionary word'. Although we must assign names to lexemes to be able to talk about them, lexemes are abstract entities that have no phonological form of their own. LIVE is therefore just a convenient label to talk about a particular lexeme; the sequence of sounds [lɪv] is not the lexeme itself. Sometimes we will use the convention of writing lexemes in small capital letters.

By contrast, a **word-form** is a word in a concrete sense. It is a sequence of sounds that expresses the combination of a lexeme (e.g. LIVE) and a set

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[2]   Of course, we should really define words in terms of *sounds*, since language is primarily a spoken (not written) medium, and there are other problems with this definition as well. But it is sufficient for the present purposes. A more sophisticated approach is deferred to Chapter 9.

of **grammatical meanings** (or **grammatical functions**) appropriate to that lexeme (e.g. third person singular present tense). *Lives* is a word-form. Thus, word-forms are concrete in that they can be pronounced.

Lexemes can be thought of as sets of word-forms, and every word-form belongs to one lexeme. The word-forms *live, lives, lived*, and *living* all belong to the lexeme LIVE. Word-forms belonging to the same lexeme express different grammatical functions, but the same core concept. When a word-form is used in a particular text or in speech, this instance of use is a word token. The first sentence of this paragraph thus has sixteen word tokens, fifteen word-forms (*of* is repeated), and thirteen lexemes (e.g. *lexemes* and *lexeme* both belong to LEXEME).

In the most interesting case, lexemes consist of a fair number of word-forms. The set of word-forms that belongs to a lexeme is often called a **paradigm**. The paradigm of the Modern Greek noun lexeme FILOS 'friend' is given in (2.2). (Earlier we saw a partial paradigm of two Sumerian verb lexemes (Section 1.1).)

(2.2)   The paradigm of FILOS

	singular	plural
nominative	*fílos*	*fíli*
accusative	*fílo*	*fílus*
genitive	*fílu*	*fílon*

This paradigm contains six different word-forms and expresses notions of number (singular, plural) and case (nominative, accusative, genitive).[3] By contrast, English nouns have no more than four word-forms (e.g. ISLAND: *island*, *islands* and perhaps *island's*, *islands'*), but the notional distinction between lexemes and word-forms is no less important when the paradigm is small. In fact, for the sake of consistency we have to make the distinction even when a lexeme has just a single word-form, as in the case of many English adjectives (e.g. the adjective SOLID, which has only the word-form *solid*).

It is not always immediately clear how many word-forms belong to a lexeme. This is shown by the paradigm of the Latin noun lexeme INSULA 'island' in (2.3). Are there ten word-forms in this lexeme's paradigm, or seven?

(2.3) The paradigm of INSULA

	singular	plural
nominative	*insula*	*insulae*
accusative	*insulam*	*insulās*
genitive	*insulae*	*insulārum*
dative	*insulae*	*insulīs*
ablative	*insulā*	*insulīs*

---

[3]   The meanings of the cases are discussed in Chapter 5. They are also given in the Glossary.

Above we defined a word-form in terms of a lexeme and a set of grammatical functions. The importance of the latter part of the definition is seen in paradigms like INSULA. Although there are only seven *different* sequences of sounds in (2.3), we can still say that the paradigm of INSULA has ten word-forms, because ten different sets of grammatical functions are expressed (e.g. genitive singular and nominative plural are distinct, despite having the same form).

Not all morphological relationships are of the type illustrated in (2.2) and (2.3). Different lexemes may also be related to each other, and a set of related lexemes is sometimes called a **word family** (though it should more properly be called a *lexeme family*):

(2.4) Two English word families
    a.   READ, READABLE, UNREADABLE, READER, READABILITY, REREAD
    b.   LOGIC, LOGICIAN, LOGICAL, ILLOGICAL, ILLOGICALITY

Although everyone recognizes that these words are related, they are given their own dictionary entries. Thus, the difference between word-forms and lexemes, and between paradigms and word families, is well established in the practice of dictionary-makers, and thereby known to all educated language users.

At this point we have to ask: why is it that dictionaries treat different morphological relationships in different ways? And why should linguists recognize the distinction between paradigms and word families? After all, linguists cannot base their theoretical decisions on the practice of dictionary-makers – it ought to be the other way round: lexicographers ought to be informed by linguists' analyzes. The nature of the difference between lexemes and word-forms will be the topic of Chapter 5, but the most important points will be anticipated here.

(i) Complex lexemes (such as READER or LOGICIAN) generally denote new concepts that are different from the concepts of the corresponding simple lexemes, whereas word-forms often exist primarily to satisfy a formal requirement of the syntactic machinery of the language. Thus, word-forms like *reads* or *reading* do not stand for concepts different from *read*, but they are needed in certain syntactic contexts (e.g. *the girl reads a magazine; reading magazines is fun*).

(ii) Complex lexemes must be listed separately in dictionaries because they are less predictable than word-forms. For instance, one cannot predict that the lexeme *illogicality* exists, because by no means all adjectives have a corresponding *-ity* lexeme (cf. nonexistent words like *naturality, *logicality*). It is impossible to predict that a specialist in logic should be called a *logician* (rather than, say, a *logicist*), and the meaning of complex lexemes is often unpredictable, too: a *reader* can denote not just any person who reads, but also a specific academic position (in the

British system) or even a kind of book. By contrast, the properties of word-forms are mostly predictable and hence do not need to be listed separately for each lexeme.

Thus, there are two rather different kinds of morphological relationship among words, for which two technical terms are commonly used:

(2.5) Kinds of morphological relationship

 inflection (= inflectional morphology): the relationship between word-forms of a lexeme

 derivation (= derivational morphology): the relationship between lexemes of a word family

Morphologists also use the corresponding verbs *inflect* and *derive*. For instance, one would say that the Latin lexeme INSULA is inflected (or inflects) for case and number, and that the lexeme READER is derived from the lexeme READ. A derived lexeme is also called a **derivative**.

(Note that we are making a terminological simplification here: a lexeme is an abstract entity without phonological form so, strictly speaking, one lexeme cannot be derived from another. When morphologists talk about *derived lexemes*, they mean that form *a* (e.g. *reader*), corresponding to lexeme A (READER), is derived from form *b* (*read*), corresponding to lexeme B (READ). However, since this phrasing becomes quite clumsy, morphologists commonly simplify the terminology. We will do the same in this book.)

It is not always easy to tell how word-forms are grouped into lexemes. For instance, does the word-form *nicely* belong to the lexeme NICE, or does it represent a lexeme of its own (NICELY), which is in the same word family as NICE? Issues of this sort will be discussed in some detail in Chapter 5. Whenever it is unclear or irrelevant whether two words are inflectionally or derivationally related, the term *word* will be used in this book instead of *lexeme* or *word-form*. And for the same reason even the most technical writings on morphology often continue to use the term *word*.

Some morphologically complex words belong to two (or more) word families simultaneously. For instance, the lexeme FIREWOOD belongs both in the family of FIRE and in the family of WOOD. Such relationships are called **compounding**, and lexemes like FIREWOOD are called **compound lexemes**, or just **compounds**, for short. Compounding is often grouped together with derivation under the category of **word formation** (i.e. lexeme formation). The various conceptual distinctions that we have seen so far are summarized in Figure 2.1.

```
                        morphological relationships


    inflection                              word formation
    ('word-form formation')                 ('lexeme formation')


                                 derivation              compounding


    paradigms:                   word families:
    e.g. live, lives, living, . . .   e.g. LOGIC, LOGICIAN, . . .
    island, islands, . . .                           FIREWOOD
```
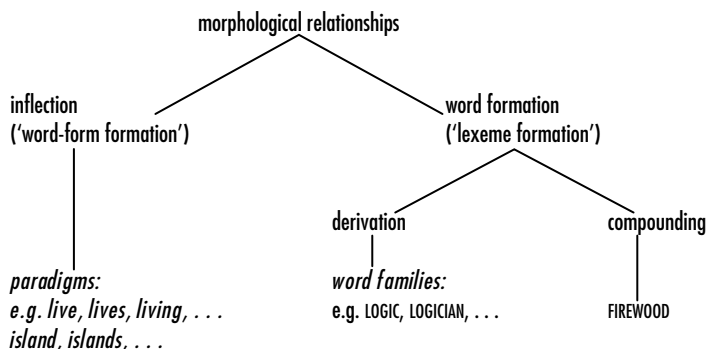
Figure 2.1 Subdivisions of morphology

2.2 Affixes, bases and roots

In both inflection and derivation, morphemes have various kinds of meanings. Some meanings are very concrete and can be described easily (e.g. the meanings of the morphemes *wash, logic, chameleon, un-*), but other meanings are abstract and more difficult to describe. For instance, the morpheme *-al* in *logic-al* can perhaps be said to mean 'relating to' (cf. *logic-al, mathematic-al, physic-al, natur-al*), *-able* in *read-able* can be said to mean 'capable of undergoing a process', and the meaning of *-ity* is 'quality' (e.g. *readability* is 'the quality of being readable'). Some meanings are so abstract that they can hardly be called meanings. For example, the Latin morpheme *-m* in *insula-m* (see (2.3)) serves to mark the direct object in a sentence, but it is difficult to say what its meaning is. And English *-s* in *read-s* is required when the subject is a third person singular noun phrase, but again it is unclear whether it can be said to have meaning. In such cases, linguists are more comfortable saying that these morphemes have certain *grammatical functions*. But, since the ultimate purpose of grammatical constructions is to express meaning, we will continue to say that morphemes bear meaning, even when that meaning is very abstract and can be identified only in the larger grammatical context.

Word-forms in an inflectional paradigm generally share (at least) one longer morpheme with a concrete meaning and are distinguished from each other in that they additionally contain different shorter morphemes, called affixes. An **affix** attaches to a word or a main part of a word. It usually has an abstract meaning, and an affix cannot occur by itself. For instance, Russian nouns have different affixes in the paradigm in (2.6), which have case meaning (*-a* for nominative, *-u* for accusative, etc.), and Classical Nahuatl nouns have different affixes in the paradigm in (2.7) that indicate a possessor (*no-* for 'my', *mo-* for 'your', etc.).

(2.6) Russian case inflection (singular forms)
      nominative   *ruk-a*   'hand'
      accusative   *ruk-u*
      genitive   *ruk-i*
      dative   *ruk-e*
      locative   *ruk-e*
      instrumental *ruk-oj*

(2.7) Nahuatl possessor inflection
      1sg   *no-cal*   'my house'
      2sg   *mo-cal*   'your (sg) house'
      3sg   *i-cal*   'his/her house'
      1pl   *to-cal*   'our house'
      2pl   *amo-cal* 'your (pl) house'
      3pl   *in-cal*   'their house'

                                              (Sullivan 1988: 26)

Morphologists often use special terms for different kinds of affixes, depending on their position within the word. Affixes that follow the main part of the word are called **suffixes** (e.g. the Russian case suffixes in (2.6)), and affixes that precede it are called **prefixes** (e.g. the Classical Nahuatl possessor prefixes in (2.7)). The part of the word that an affix is attached to is called the **base**, e.g. *ruk-* in Russian, or *-cal* in Classical Nahuatl. Affixes and bases can, of course, be identified both in inflected word-forms and in derived lexemes. For instance, in *read-er, read-able* and *re-read, read* is the base, *-er* and *-able* are suffixes, and *re-* is a prefix. A base is also sometimes called a **stem**, especially if an inflectional (as opposed to derivational) affix attaches to it.

There are still other kinds of affixes, besides prefixes and suffixes, which are briefly described and illustrated in Table 2.1.

Types of affixes		Examples
suffix:	follows the base	Russian *-a* in *ruk-a* 'hand' English *-ful* in *event-ful*
prefix:	precedes the base	Classical Nahuatl *no-* in *no-cal* 'my house' English *un-* in *unhappy*
infix:	occurs inside the base	Arabic *-t-* in (*i*)*š-t-aġala* 'be occupied' (base: *šaġala*) Tagalog *-um-* in *s-um-ulat* 'write' (base: *sulat*)
circumfix:	occurs on both sides of the base	German *ge-…-en*, e.g. *ge-fahr-en* 'driven' (base: *fahr*)

Table 2.1 Types of affixes

Bases or stems can be complex themselves. For instance, in *activity*, *-ity* is a suffix that combines with the base *active*, which itself consists of the suffix *-ive* and the base *act*. A base that cannot be analyzed any further into constituent morphemes is called a **root**. In *readability*, *read* is the root (and the base for *readable*), and *readable* is the base for *readability*, but it is not a root. Thus, the base is a relative notion that is defined with respect to the notion 'affix'. (We will refine this definition of 'base' in the next chapter to account for words which are difficult to describe in terms of morphemes, but will keep the idea that bases are relative notions.) Affixes are similar to roots in that they cannot be further analyzed into component morphemes; they are primitive elements.

A base may or may not be able to function as a word-form. For instance, in English, *cat* is both the base of the inflected form *cats* and itself a word-form (*active* is a word-form and the base for the derived form *activity*, etc.). However, in Italian word-form *gatti* ('cats') can be broken up into the suffix *-i* ('plural') and the base *gatt-* ('cat'), but *gatt-* is not a word-form. Italian nouns must inflect for number, and even in the singular, an affix is required to express this information (e.g. *gatt-o* 'cat', *gatt-i* 'cats'). In this respect Italian differs from English. Bases that cannot also function as word-forms are called **bound stems**.

Roots and affixes can generally be distinguished quite easily, but sometimes there are problems. For example, the Salishan language Bella Coola has a number of suffix-like elements that do not seem to have an abstract meaning (see 2.8). In (2.9), we see two examples of how these elements are used.

(2.8) *-us* 'face'   *-lik*   'body'
       -an 'ear'   *-altwa* 'sky, weather'
       -uc 'mouth'   *-lt*   'child'
       -ał 'foot'   *-lst*   'rock'
       -ak 'hand'   *-lx̣s*   'nose'

(2.9) a.   *qućʼ-ał-ic*
            wash-foot-I.him
            'I am going to wash his foot' (lit.: 'foot-wash him')

       b.   *kma-lx̣s-c*
            hurt-nose-I
            'my nose hurts' (lit.: 'I nose-hurt')

(Mithun 1998: 300–5)

In these cases, it is not immediately clear whether we are dealing with suffix–root combinations or with root–root combinations, i.e. compounds. The elements in (2.8) do not occur as lexemes by themselves but must always be combined with other roots. In this respect they have a property that is typical of affixes, and scholars of Salishan languages have generally regarded them as such. However, if affixes are defined as 'short morphemes with an abstract meaning', then these elements are very atypical affixes, to say the least.

English has a number of morphemes that are similarly difficult to classify as roots or affixes. Some examples are given in (2.10).

(2.10) *biogeography   aristocrat*
          bioethics   autocrat
          bioengineering   democrat
          biorhythm   Eurocrat
          bioterrorism   plutocrat
          biomedicine   technocrat
          biochip   theocrat

The elements *bio-* and *-crat* could be regarded as affixes because they do not occur as independent lexemes, but their very concrete meaning and also their (not particularly short) form suggest that they should be regarded as bound stems that have the special property of occurring only in compounds.

2.3 Morphemes and allomorphs

While the distinction between roots on the one hand and affixes on the other is by itself quite useful, these concepts turn out to be more complicated than the simple picture that we have seen so far. One of the most common complications is that morphemes may have different phonological shapes under different circumstances. For instance, the plural morpheme in English is sometimes pronounced [s] (as in *cats* [kæts]), sometimes [z] (as in *dogs* [dɒgz]), and sometimes [-əz] (as in *faces* [feisəz]). When a single affix has more than one shape, linguists use the term **allomorph**. Affixes very often have different allomorphs – two further cases from other languages are given in (2.11).

(2.11) a. Korean accusative suffix (marker of direct object): two allomorphs

-ul	*ton*	'money'	*ton-ul*	'money-ACC'
	chayk	'book'	*chayk-ul*	'book-ACC'
-lul	*tali*	'leg'	*tali-lul*	'leg-ACC'
	sakwa	'apple'	*sakwa-lul*	'apple-ACC'

b. Turkish first person possessive suffix: five allomorphs

-im	*ev*	'house'	*ev-im*	'my house'
	dil	'language'	*dil-im*	'my language'
-üm	*köy*	'village'	*köy-üm*	'my village'
	gün	'day'	*gün-üm*	'my day'
-um	*yol*	'way'	*yol-um*	'my way'
	tuz	'salt'	*tuz-um*	'my salt'
-ım [4]	*ad*	'name'	*ad-ım*	'my name'
	kız	'girl'	*kız-ım*	'my daughter'
-m	*baba*	'father'	*baba-m*	'my father'

---

[4]   The Turkish letter *ı* corresponds to IPA [ɯ] (high back unrounded vowel).

Not only affixes, but also roots and stems may have different allomorphs (or, as linguists often say, 'exhibit allomorphy'). For instance, English verbs such as *sleep, keep, deal, feel, mean*, whose root has the long vowel [i:] in the present-tense forms, show a root allomorph with short [ɛ] in the past-tense forms (*slept, kept, dealt, felt, meant*). Cases of stem allomorphy from other languages are given in (2.12).

(2.12) a. German: a voiced obstruent becomes voiceless in syllable-final position

Tag	[ta:k]	'day'	*Tage*	[ta:gə]	'days'
Hund	[hʊnt]	'dog'	*Hunde*	[hʊndə]	'dogs'
Los	[lo:s]	'lot'	*Lose*	[lo:zə]	'lots'

   b. Russian: when the stem is followed by a vowel-initial suffix, the vowel *o/e* is often dropped if it is the last vowel in the stem

zamok	'castle'	*zamk-i*	'castles'
kamen'	'stone'	*kamn-i*	'stones'
nemec	'German'	*nemc-y*	'Germans'
nogot'	'nail'	*nogt-i*	'nails'

The crucial properties which define the German stems [ta:k] and [ta:g] or the Korean suffixes [-ul] and [-lul] as being allomorphs are that they have the same meaning and occur in different environments in **complementary distribution**. Additionally, all our examples so far have shown only fairly small differences in the shapes of morphemes, which can by and large be regarded as mere differences in pronunciation. Being phonologically similar is a common property of allomorphs, but is not a necessary one. Allomorphs that have this property are **phonological allomorphs**. The formal relation between two (or more) phonological allomorphs is called an **alternation**.

Linguists often describe alternations with a special set of **morphophonological rules**, which were historically phonetically motivated, but affect morphology. Morphophonological rules and the difference between them will be discussed more extensively in Chapter 10, and we will consider them only briefly here.

Metaphorically, it is often convenient to think about phonological allomorphy in terms of a single **underlying representation** that is manipulated by rules under certain conditions. The end result, i.e. what is actually pronounced, is the **surface representation**. For instance, the alternations in (2.12a, b) can be described by the underlying representations in the (a) examples below, and by the respective rules in the (b) examples. The surface representations (resulting word-forms) are given in (c).

(2.13) a. underlying: [ta:g] 'day.sɢ'
   b. rule: a voiced obstruent becomes voiceless in syllable-final position (application: [ta:g] → [ta:k])[5]
   c. surface: [ta:k] 'day.sɢ'

---

[5]   In this (morpho)phonological context, the arrow ('X→Y') means that X turns into Y.

(2.14) a. underlying: [taːg-ə]   'day-PL'
     b. rule: a voiced obstruent becomes voiceless in syllable-final
          position (doesn't apply)
     c. surface: [taːg-ə]   'day-PL'

(2.15) a. underlying: [zamok]   'castle.SG'
     b. rule: *o/e* in the final stem syllable disappears when the stem is
          followed by a vowel-initial suffix (doesn't apply)
     c. surface: [zamok]   'castle.SG'

(2.16) a. underlying: [zamok-i] 'castle-PL'
     b. rule: *o/e* in the final stem syllable disappears when the stem is
          followed by a vowel-initial suffix (application: [zamok-i] →
          [zamk-i])
     c. surface: [zamk-i]   'castle-PL'

Notice that for (2.13) and (2.14), the underlying representation (morpheme) meaning 'day' is the same, and the rule applies only when its conditions are met. The same is true for (2.15) and (2.16). That the alternation is produced by the morphophonological rule is made particularly clear in this way: the underlying representation shows no allomorphy at all.

In many cases of phonological allomorphy, it is evident that the historical reason for the existence of the morphophonological rule and thus for the allomorphy is to facilitate pronunciation. For instance, if the English plural were uniformly [-z], words such as *cats* and *faces* would be almost unpronounceable (try to pronounce [kætz] and [feisz]!). Since this is a textbook on morphology, we cannot go into greater phonological detail here, but phonological allomorphs will be taken up again in Chapter 10.

Overall, the main point here is that at some level, phonological allomorphs represent a single morpheme whose form varies slightly depending upon the phonological context created by combining morphemes. For this reason, it is common to think of the morpheme as the more abstract underlying representation, rather than the more concrete surface word-form. The underlying and surface representations may be the same, or they may differ as a result of the application of morphophonological rules. However, it is important to remember that the underlying representation is a tool used by linguists. It may or may not reflect the kinds of generalizations that language users make. There are examples where it seems unlikely that there is a single underlying representation in the minds of speakers; we see this in another type of allomorphy: **suppletion**.

Besides phonological allomorphs, morphemes may also have allomorphs that are not at all similar in pronunciation. These are called **suppletive allomorphs**. For instance, the English verb *go* has the suppletive stem *wen* in the past tense (*wen-t*), and the English adjective *good* has the suppletive stem *bett* in the comparative degree (*better*). The Russian noun *čelovek* 'human being' has the suppletive stem *ljud'* in the plural (*ljud-i* 'people').

The Spanish verb *ir* 'go' has the suppletive stem *va-* in the present tense (*vas* 'you go', *va* 's/he goes', *vamos* 'we go', etc.). The term *suppletion* is most often used to refer to stem shape (*ir* and *va-* are both verbal stems), and some linguists reserve the term for this use, but others also talk about affixes as being potentially suppletive (see (2.17) later in this chapter for an example from Persian).

It is not always easy to decide whether an alternation is phonological or suppletive, because the categories are end points on a continuum of traits, rather than a clear-cut binary distinction. Some examples are therefore intermediary. For instance, what about English *buy/bought, catch/caught, teach/taught*? The root allomorphs of these verbs ([bai]/[bɔː], [kætʃ]/[kɔː], [tiːtʃ]/[tɔː]) are not as radically different as *go/wen-t*, but they are not similar enough to be described by phonological rules either. In such cases, linguists often speak of **weak suppletion**, as opposed to **strong suppletion** in cases like *go/went, good/better*.

For both weak and strong suppletion, it is theoretically possible to posit an underlying representation from which suppletive allomorphs are derived by rule. However, considering that suppletive allomorphs share little or no form, the underlying representation would need to be very abstract, and the rules converting the underlying representation to surface representations could not exist to make pronunciation easier. There is no evidence that language users make such abstractions, so underlying representations are perhaps best treated as useful metaphors.

Type of allomorphy	Description	Example
Phonological allomorphy	Alternation could be described by a rule of pronunciation	English plural [-z], [-s],[-əz]; Russian *zamok/zamk-*
Weak suppletive allomorphy	Allomorphs exhibit some similarity, but this cannot be described by phonological rules	English *buy/bough-, catch/ caugh-*, etc.
Strong suppletive allomorphy	Allomorphs exhibit no similarity at all	English *good/bett-*

Table 2.2 Types of allomorphy: summary

When describing the allomorphy patterns of a language, another important dimension is the conditioning of the allomorphy, i.e. the conditions under which different allomorphs are selected. Phonological allomorphs typically have **phonological conditioning**. This means that the phonological context

determines the choice of allomorph. For instance, the English plural allomorphs [-z], [-s] and [-əz] are strictly phonologically conditioned: [-əz] appears after a sibilant (i.e. [s], [z], [ʃ], [ʒ], [tʃ] or [dʒ], e.g. *face-s, maze-s, bush-es, garage-s, church-es, badge-s*), [-s] appears after a voiceless non-sibilant obstruent (e.g. *cat-s, book-s, lip-s, cliff-s*) and [-z] appears elsewhere (e.g. *bag-s, bell-s, key-s*). The Korean accusative allomorphs *-ul/-lul* (see (2.11a)) are also phonologically conditioned: *-ul* appears after a consonant, *-lul* after a vowel.

By contrast, stem suppletion usually has **morphological conditioning**, meaning that the morphological context (usually, grammatical function) determines the choice of allomorph (e.g. Spanish *ir* 'go' in the infinitive and future tense, *va-* in the present and imperfective past tense and *fu-* in the perfective past tense).[6]

And, finally, we find **lexical conditioning**, where the choice of a suppletive affix allomorph is dependent on other properties of the base, for instance semantic properties as in (2.17).

(2.17) Persian plural marking: human nouns *-an*, non-human nouns *-ha*

-an	*mœrd*	'man'	*mœrd-an*	'men'
	geda	'beggar'	*geday-an*	'beggars'
-ha	*gorbe*	'cat'	*gorbe-ha*	'cats'
	ettefaq	'incident'	*ettefaq-ha*	'incidents'

(Mahootian 1997: 190)

Lexical conditioning is also involved where the choice of allomorph cannot be derived from any general rule and must be learned individually for each word. This is the case for the English past participle suffix *-en*: speakers must simply learn which verbs take this suffix and not the more common suffix *-ed*.

Type of conditioning	Description	Example
Phonological conditioning	Choice of allomorphs depends on phonological context	English plural depends on final sound in stem
Morphological conditioning	Choice of allomorphs depends on the morphological context	Spanish *ir*, *va-* or *fu-*, depending on tense
Lexical conditioning	Choice of allomorphs depends on the individual lexical item	English past participle *-en*/*-ed* is unpredictable and depends on individual verbs

Table 2.3 Types of conditioning: summary

[6]   It is clear that phonological allomorphs can also have morphological conditioning. However, whether suppletive allomorphs can have phonological conditioning is subject to ongoing debate.

Summary of Chapter 2

This chapter introduced several concepts that are basic to morphology. Three different notions of word have to be distinguished: the word token ('use of a word in a text or in speech'), the lexeme ('abstract, dictionary word') and the word-form ('concrete word'). Inflectional morphology describes the relationship between the word-forms in a lexeme's paradigm, and derivational morphology describes the relation between lexemes. Complex words can often be segmented into morphemes, which are called affixes when they are short, have an abstract meaning, and cannot stand alone, and roots when they are longer and have a more concrete meaning. When two or more morphemes express the same meaning and occur in complementary distribution, they are often considered allomorphs. Allomorphs come in two types, phonological and suppletive, depending on the degree to which they are similar in form. Suppletive allomorphs are further subdivided into examples of strong suppletion and weak suppletion. The distinction between strong suppletion, weak suppletion and non-suppletion is a continuum. Allomorphs may have phonological, morphological, or lexical conditioning.

Appendix. Morpheme-by-morpheme glosses

When presenting longer examples (such as sentences or entire texts) from a language that the reader is unlikely to know, linguists usually add **interlinear morpheme-by-morpheme glosses** to help the reader understand the structure of the examples. We saw instances of such glosses in (1.2)–(1.6), and we will see more examples later in this book. Interlinear morpheme-by-morpheme glosses are an important aspect of 'applied morphology', and they are needed in other areas of linguistics as well (e.g. by syntacticians and fieldworkers). We will therefore explain the most important principles involved.

The conventions used in this book are based on the Leipzig Glossing Rules (www.eva.mpg.de/lingua/resources/glossing-rules.php; accessed July 2010). The Leipzig Glossing Rules are more detailed than the principles presented here, but include the following:

(i) One-to-one correspondence. Each element of the object language is translated by one element of the metalanguage (in the present context, this is English). Hyphens separate both the word-internal morphemes in the object language and the gloss, e.g.

Japanese

Taroo	*ga*	*hana*	*o*	*migotoni*	*sak-ase-ta.*
Taro	NOM	flower	ACC	beautifully	bloom-CAUS-PST

'Taro made the flowers bloom beautifully.'

(Shibatani 1990: 309)

Object-language words and their glosses are aligned at their left edges. The interlinear gloss is usually followed by an idiomatic translation in quotation marks.

(ii) Grammatical-value abbreviations. Grammatical elements (both function words and inflectional affixes) are not translated directly, but are rendered by grammatical-value labels, generally in abbreviated form (see the list of abbreviations on pp. xv–xvi). To highlight the difference between the value labels and the ordinary English words, the value labels are usually printed in small capitals, as seen in the above example.

(iii) Hyphens and periods. Hyphens are used to separate word-internal morphemes in object-language examples, and each hyphen in an example corresponds to a hyphen in the gloss. Periods are used in the gloss when two gloss elements correspond to one element in the example. This may be when a single example element corresponds to a multi-word expression in the gloss, e.g.

Turkish
çık-mak
come.out-INF
'to come out'

or it may be when a single example element corresponds to several inflectional meanings:

Latin
insul-ārum
island-GEN.PL
'of the islands'

or it may be when an inflectional meaning is expressed in a way that cannot be segmented, e.g.

Albanian
fik   *fiq*
fig.SG   fig.PL
'fig'   'figs'

(The Albanian letter *q* corresponds here to IPA [c] (voiceless palatal stop), and *k* corresponds to [k] (voiceless velar stop).)

The period is omitted when the two meanings are person and number, e.g.

Tzutujil
x-in-wari
COMPL-1SG-sleep
'I slept'

(Dayley 1985: 87)

Here '1sg' is used instead of '1.sg'. (The period is felt to be redundant because person and number combine so frequently.)

(iv) Possible simplifications. Sometimes the precise morpheme division is irrelevant or perhaps unknown. Authors may still want to give information on the inflectional meanings, and again periods are used to separate these elements, e.g.

Japanese	Latin
sakaseta	*insulārum*
bloom.CAUS.PST	island.GEN.PL
'made to bloom'	'of the islands'

Sometimes morpheme-by-morpheme glosses are used also when the example is not set off from the running text. In such cases the gloss is enclosed in square brackets, e.g. 'the Japanese verb *saka-se-ta* [bloom-CAUS-PST] "made to bloom" ….'.

Comprehension exercises

1. Somali exhibits a great amount of allomorphy in the plural formation of its nouns. Four different allomorphs are represented in the following examples. Based on these examples, formulate a hypothesis about the phonological conditions for each of the plural allomorphs. (In actual fact, the conditions are more complex, but for this exercise, we have to limit ourselves to a subset of the data and generalizations.)

SINGULAR	PLURAL	
awowe	*awowayaal*	'grandfather'
baabaco	*baabacooyin*	'palm'
beed	*beedad*	'egg'
buug	*buugag*	'book'
cashar	*casharro*	'lesson'
fure	*furayaal*	'key'
ilmo	*ilmooyin*	'tear'
miis	*miisas*	'table'
qado	*qadooyin*	'lunch'
shabeel	*shabeello*	'leopard'
waraabe	*waraabayaal*	'hyena'
xidid	*xididdo*	'eagle'

    Based on the generalizations found, form the plural of the following nouns:

tuulo	'village'
tog	'river'

albaab	'door'
buste	'blanket'

<div align="right">(Berchem 1991: 98–117)</div>

2. The English past participle suffix spelled *-ed* has three different alternants: [d], [t], and [əd]. Are these phonologically or morphologically conditioned? Try to describe the conditioning factors in an approximate way.

3. Italian inhabitant nouns (e.g. *Anconetano* 'person from Ancona') exhibit different degrees of similarity to the corresponding city names. Order the following pairs of city names and inhabitant names on a scale from clear suppletion in the base form to clear non-suppletion, depending on the number of segments in which the base for the inhabitant noun differs from the base for the city name (see Crocco-Galèas 1991). Assume that word-final vowels are suffixes in Italian; the base for *Ancona* would thus be *Ancon-*. Additionally, inhabitant nouns contain the suffixes *-an*, *-in*, or *-es*, so the base for *Anconetano* is *Anconet-*.

CITY NAME	INHABITANT NOUN	
Ancona	*Anconetano*	
Bologna	*Petroniano*	
Bressanone	*Brissinese*	
Domodossola	*Domese*	
Gubbio	*Eugubino*	
Ivrea	*Eporediese*	
Milano	*Milanese*	'Milan'
Napoli	*Partenopeo*	'Naples'
Palermo	*Palermitano*	
Palestrina	*Prenestino*	
Piacenza	*Piacentino*	
Savona	*Savonese*	
Trento	*Trentino*	
Treviso	*Trevigiano*	
Venezia	*Veneziano*	'Venice'
Volterra	*Volaterrano*	

Exploratory exercise

This chapter introduced the idea that the set of word-forms belonging to the same lexeme is known as a *paradigm*. Readers may have noticed that a table-like format was used to list members of paradigms. The Modern Greek noun paradigm that we encountered in (2.2) is repeated below as (2.18). Here, the rows list cases and the columns list numbers. This format is sometimes called a **grid**. The grid format will be used elsewhere in the book, especially in Chapters 5 and 8, where inflectional morphology is discussed.

(2.18) The paradigm of FILOS 'friend'

	singular	plural
nominative	*fílos*	*fíli*
accusative	*fílo*	*fílus*
genitive	*fílu*	*fílon*

The grid format subtly implies that for a given lexeme there should be a word-form corresponding to each combination of case and number. The format makes sense because the expectation is usually fulfilled; in Greek, noun lexemes almost always have six word-forms corresponding to the six **cells** in the grid. There is thus some sense in which paradigms can be 'complete' or 'incomplete'.

In this exercise, you will explore whether the same notion applies to word families. Do word families usually have an equal number of members and parallel content? For instance, if the verb lexeme READ has READABLE, UNREADABLE, READER and REREAD in its word family, does every other verb lexeme X also have XABLE, UNXABLE, XER and REX? Or do word families often have some lexemes, but not others that seem equally possible? Finally, does the notion of 'completeness' apply to word families? Is it reasonable to talk about a word family as being incomplete? We will address some of these questions in Chapters 5 and 6, but in this exercise you will anticipate that discussion with some exploratory analysis.

English is used here for demonstration purposes because it is familiar to all readers, but you are encouraged to investigate your native language, whatever that might be.

Instructions

Step 1: Create a list of at least 20 adjectival (or nominal, verbal…) lexemes, e.g. CLEAR, FALSE, HAPPY. For each one, list all of the lexemes belonging to its word family. Use a dictionary to prod your memory if needed, but do not rely on dictionary entries when they contradict your own judgements. For instance, the *Oxford English Dictionary* lists the following entries (among others) as being related to the adjective *happy*: *happify, happiless, happily, happiness, happious, happy-go-lucky, happy-slappy, enhappy, mishappy,* and *trigger-happy*. Some of these, like *happiness*, are quite normal, but others, like *happify*, *happious*, and *enhappy*, seem odd at best. For the authors, the word family of HAPPY does not contain these three lexemes. For each word family in your data set, decide its content for yourself, according to your own usage and judgements about whether a given lexeme is possible.

Step 2: Compare the sets. The lexeme CLEAR is in the same set as CLARIFY, and FALSE is related in a parallel fashion to FALSIFY, but the word family for HAPPY does not contain HAPPIFY (despite being in the dictionary). Do the word families in your data set mostly have parallel content, or mostly not?

Step 3: Discuss the content of these word families in terms of the following questions:

1) In your data, was it ever hard to decide whether two lexemes belong to the same word family? If so, why? Discuss the issues surrounding any choices you had to make.

2) What kinds of meanings are expressed by the derivationally related lexemes? It is not important at this stage to be precise about terminology – describe them as best you can. How do these compare to the inflectional meanings that you have seen in this chapter? Can derivationally related lexemes be organized into grids in the way inflectionally related word-forms are? Why or why not?

3) Does it make sense to talk about word families as complete, or at least potentially complete? Are paradigms and word families similar or different in this respect? Explain your reasoning. (Both a 'yes' and a 'no' answer to the question is probably possible. The important part is that you explain and justify your answer.)

Rules

<div style="text-align: right; font-size: xx-large;">**3**</div>

So far we have talked about morphological structure in mostly static terms: words 'have' affixes or 'share' parts, they 'exhibit' resemblances and they 'consist of' a base and an affix. However, it is often convenient to describe complex words as if they were the result of a process or event. Thus, we said that affixes 'are attached' to the base or that they 'combine' with it. Linguists use such process terms very frequently. They talk about elements 'being affixed' to bases, or about a complex word 'being **derived** from' (i.e. built on the basis of) a simpler one.[1]

Most linguists agree that complex words need not be derived from simpler ones each time they are used. Instead, frequently used words are probably listed in the **lexicon**. The lexicon is the linguist's term for the mental dictionary that language users must be equipped with, in addition to the grammatical rules of their language. When a linguist says that something is listed in the lexicon, this means that it must be stored in speakers' memories. If a complex word has its own **lexical entry** (i.e. listing in the lexicon), it does not need to be actively derived from a simpler form; it can simply be retrieved from memory when needed. (The content of the lexicon will be discussed in Chapter 4.)

Still, speakers have the capacity to create, and hearers can understand, an almost unlimited number of new words. The set of words in a language is never quite fixed. There must therefore be some processes by which new complex words are created. And even when a complex word is likely to be listed in the lexicon, it is useful to think of the relationship between it and its base in terms of these same processes. These processes, and how they can be formally described using **morphological rules**, are the topic of this chapter.

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[1]   The term *derive* is somewhat confusing because it is also commonly applied to inflectional morphology, not just to derivational morphology. Thus, one would say that the comparative form *warmer* is derived from the positive form *warm*, or that the past-tense form *played* is derived from the present-tense form *play*.

3.1 Morphological patterns

Morphological structure is much more various than simply affixes combining with bases. For example, in German, one way of forming the plural of a noun is by replacing a back vowel of the singular form (e.g. [ʊ], [aː], [ɔ]) by a front vowel (e.g. [ʏ], [eː], [ø], spelled *ü, ä, ö*). Some examples are given in (3.1).

(3.1) singular   plural
       Mutter   *Mütter*   'mother(s)'
       Vater   *Väter*   'father(s)'
       Tochter   *Töchter*   'daughter(s)'
       Garten   *Gärten*   'garden(s)'
       Nagel   *Nägel*   'nail(s)'

Here, we have a clear-cut example of morphological structure in that a recurrent aspect of meaning ('plural') corresponds to a recurrent aspect of form (vowel quality), but the plural word-forms cannot be segmented into two morphemes. Intuitively, it is easier to think of the stem vowel having been changed, rather than a morpheme having been added. We will use the term **morphological pattern** to cover both examples in which morphological meaning can be associated with a segmentable part of the word, and examples where this is not possible. A morpheme, then, is a frequently occurring, special subtype of morphological pattern. We begin by examining a range of morphological patterns, both common and uncommon, from various languages.

3.1.1 Affixation and compounding

Linguists often distinguish two basic types of morphological patterns: concatenative, which is when two morphemes are ordered one after the other, and non-concatenative, which is everything else. Most of the examples of morphologically complex words that we have seen so far can be neatly segmented into roots and affixes, and are therefore concatenative patterns. In process terms, these can be described as derived by **affixation** (subtypes **suffixation**, **prefixation**, etc.) and **compounding**.

Affixation involves more than just combining two morphemes. A rule of affixation is also a statement about which *types* of morphemes may combine. This is the **combinatory potential** of the affix. (Other terms that are widely used are **subcategorization frame** and **selectional restriction.**) For example, *un-* and *intelligent* may combine via affixation to form *unintelligent*, but it is not the case that any affix and any base can combine. The suffix *-able* attaches only to verbs; *intelligentable* is not a potential word of English because *intelligent* is an adjective, not a verb. And *un-* can attach

to adjectives, but does not generally attach to nouns; *ungrass* is also not a possible word of English (although the soft drink company 7UP played on this restriction to grab attention with the slogan '7UP: the uncola').

The combinatory potential of an affix cannot be entirely predicted from its meaning. For example, the prefix *non-* is virtually identical in meaning to *un-*, but it commonly attaches to nouns (e.g., *non-achiever*) and less readily to adjectives (*non-circular*, but **non-kind, ??non-intelligent*). Combinatory potential must therefore be specified along with other information about the affixation process. As with *un-*, *non-* and *-able*, the **word-class** of the base (noun, verb, adjective, etc.) is an important factor for combinatory potential. Linguists thus sometimes say that affixes 'select' a particular word-class to attach to.

The combinatory potential of the prefix *un-* can be expressed with the notation in (3.2a), where '—' stands for the affix and 'A' indicates both the word-class of the base and the position of the base relative to the affix.

(3.2) a. Combinatory potential of *un-*   [— A]
       b. Combinatory potential of *-able*   [V —]
       c. Combinatory potential of comparative *-er*   [A —]
       d. Combinatory potential of *-ful*   [N —]

Affixation is thus a process that has a number of important parameters (we will encounter more later in the book), but which can nonetheless be described in a fairly straightforward way.

3.1.2 Base modification

At the same time, a range of morphological patterns exists that cannot be straightforwardly segmented into two meaningful parts. As with the German example in (3.1), it is often easiest to describe non-concatenative patterns as results of processes or operations that apply to a base form. Some non-concatenative patterns exist in a wide variety of languages, including English, and will probably be familiar to the reader. Others may seem more 'exotic'. Example (3.3) shows a non-concatenative pattern in Albanian. Here, a stem-final [k] in the singular becomes [c] in the plural, [g] becomes [ɟ], and [ɫ] becomes [j]:

(3.3) SINGULAR   PLURAL
       armik […k]   *armiq* […c]   'enemy/enemies'
       fik […k]   *fiq* […c]   'fig(s)'
       frëng […g]   *frëngj* […ɟ]   'Frenchman/-men'
       murg […g]   *murgj* […ɟ]   'monk(s)'
       papagall […ɫ]   *papagaj* […j]   'parrot(s)'
       portokall […ɫ]   *portokaj* […j]   'orange(s)'
                                    (Buchholz and Fiedler 1987: 264–5)

Non-concatenative patterns force us to revise our original definition of base ('the part of a word that an affix is attached to'; Section 2.2). We want to say that *armik* is the base for *armiq,* but our earlier definition is adequate only in the context of concatenation. Thus, (3.4) is a better definition of *base*.

(3.4)   The **base** of a morphologically complex word is the element to which a morphological operation applies.

This subsumes the earlier definition and allows us to also talk about non-concatenative patterns in a satisfactory way.

One important class of non-concatenative patterns is **base modification** (or **stem modification/alternation**). This is a collective term for morphological patterns in which the shape of the base is changed without adding segmentable material. A common type of base modification pattern results from changing place of articulation. For example, the Albanian example in (3.3) involves **palatalization** of the last consonant of the base (producing the sound at the palate), and the German example in (3.1) consisted of **fronting** of the stem vowel (changing the place of articulation so that the vowel is pronounced more towards the front of the mouth). We can also find examples of morphological patterns involving changed manner of articulation. In Scottish Gaelic, indefinite nouns undergo **weakening** of word-initial obstruent consonants in the genitive plural. Here, stop consonants become fricatives: [b] becomes [v], [kʲ] becomes [ç], [g] becomes [ɣ], and [tʰ] becomes [h]. (Note that for some pairs, a change in place of articulation also occurs.)

(3.5)   NOM SG INDF   GEN PL INDF
         [b…] *bard*   [v…] *bhàrd*   'bard'
         [kʲ…] *ceann*   [ç…] *cheann*   'head'
         [g…] *guth*   [ɣ…] *ghuth*   'voice'
         [tʰ…] *tuagh*   [h…] *thuagh*   'axe'
         [b…] *balach*   [v…] *bhalach*   'boy'

                                    (Calder 1923: 81–93)

Standard Arabic, Quechua and Hindi/Urdu have morphological patterns involving length. In Standard Arabic, a causative verb is formed by **gemination**. This means that a consonant becomes lengthened, in this case the second consonant in the root (e.g. *darasa* 'learn' → *darrasa* 'teach', *waqafa* 'stop (intr.)' → *waqqafa* 'stop (tr.)', *damara* 'perish' → *dammara* 'annihilate').[2] In Huallaga Quechua, the first person singular of verbs is formed in part by **lengthening** the final stem vowel (in phonology, long vowels are usually indicated by a colon).

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[2]   The arrow symbol (→) is used to express a relationship of derivation: 'A → B' means that B is derived from A.

(3.6)   2ND SINGULAR   1ST SINGULAR
    aywa-nki   'you go'   *aywa:*   'I go'
    aywa-pti-ki   'when you went'   *aywa-pti:*   'when I went'
    aywa-shka-nki 'you have gone'   *aywa-shka:* 'I have gone'
                                  (Weber 1989: 99, 118)

By contrast, in Hindi/Urdu, intransitive verbs are formed from transitive verbs by **shortening** the stem vowel (e.g. *ma:r-* 'kill' → *mar-* 'die', *kho:l-* 'open (tr.)' → *khul-* 'open (intr.)', *phe:r-* 'turn (tr.)' → *phir-* 'turn (intr.)').

Base modification also commonly takes the form of a **tonal change** or **stress shift**. For example, in Chalcatongo Mixtec, adjectives are formed from nouns by changing the tone pattern of the base to a high–high pattern (indicated by two acute accents):

(3.7)   NOUN   ADJECTIVE
    káʔba   'filth'   *káʔbá*   'dirty'
    žuù   'rock'   *žúú*   'solid, hard'
    xaʔà   'foot'   *xáʔá*   'standing'
                                  (Macaulay 1996: 64)

Somewhat similarly, English has verbs that differ from their corresponding nouns only by stress placement (e.g. *díscount* (noun) ↔ *discóunt* (verb), *ímport* (noun) ↔ *impórt* (verb), *ínsult* (noun) ↔ *insúlt* (verb)). English also has a few cases where a verb is derived from a noun by a different operation – **voicing** the last consonant of the root (e.g. *hou*[s]*e* (noun) → *hou*[z]*e* (verb), *thie*[f] (noun) → *thie*[v]*e* (verb), *wrea*[θ] (noun) → *wrea*[ð]*e* (verb)).

Finally, two interesting but less commonly attested morphological patterns result from **subtraction** (the signalling of a morphological relationship by deleting one or more segments from the base), and **metathesis** (switching of two or more segments within the base). For example, one way of forming the plural in Murle is by subtracting the last consonant:

(3.8)   SINGULAR   PLURAL
    nyoon   *nyoo*   'lamb(s)'
    wawoc   *wawo*   'white heron(s)'
    onyiit   *onyii*   'rib(s)'
    rottin   *rotti*   'warrior(s)'
                                  (Arensen 1982: 40–1)

And Clallam marks a distinction between actual and non-actual events by metathesis of the first vowel with the preceding consonant. (Clallam verbs must have suffixes marking the agent, but only the stem is given here to keep the data simple.)

(3.9) NON-ACTUAL　　　ACTUAL

qq'í-	*qíq'-*	'restrain'
pkʷ'ə́-	*pə́kʷ'-*	'smoke'
t'cə́-	*t'ə́c-*	'shatter'
kʷsə́-	*kʷ'ə́s-*	'count'

(Thompson and Thompson 1969: 216)

The examples in this section show that while many base modification patterns may seem odd to the English speaker, there are few inherent restrictions on how morphological relationships can be signalled. In addition to adding segments, morphological patterns can be formed by deleting, rearranging, lengthening, shortening, weakening, palatalizing, etc. Also, non-concatenative morphological processes are similar to concatenative processes in having restrictions that are equivalent to combinatory potential. For example, the tonal change pattern shown in (3.7) applies only to nouns, and the resulting complex word is an adjective. This is comparable to *-able* applying only to verbs, with the resulting complex word being an adjective. We can therefore think of combinatory potential as a restriction that applies broadly to all morphological processes, and not only to affixation.

3.1.3 Reduplication

A very common morphological operation is reduplication, whereby part of the base or the complete base is copied and attached to the base (either preceding or following it). In Malagasy, adjectives with stress on the first syllable copy the entire base. In the reduplicated form the meaning of the adjective is less intense.

(3.10) Reduplication of entire stem: Malagasy

be	'big, numerous'	*be-be*	'fairly big, numerous'
fotsy	'white'	*fotsi-fotsy*	'whitish'
maimbo	'stinky'	*maimbo-maimbo*	'somewhat stinky'
hafa	'different'	*hafa-hafa*	'somewhat different'

(Keenan and Polinsky 1998: 571)

In Ponapean and Mangap-Mbula, only part of the base is copied. In Ponapean a consonant + vowel (CV) sequence is prefixed to the stem, whereas in Mangap-Mbula a vowel + consonant (VC) sequence is suffixed to the stem.

(3.11) Reduplication of a CV sequence before the base: Ponapean

duhp	'dive'	*du-duhp*	'be diving'
mihk	'suck'	*mi-mihk*	'be sucking'
wehk	'confess'	*we-wehk*	'be confessing'

(Rehg 1981: 78)

(3.12) Reduplication of a VC sequence after the base: Mangap-Mbula
>| *kuk* | 'bark' | *kuk-uk* | 'be barking' |
>| *kel* | 'dig' | *kel-el* | 'be digging' |
>| *kan* | 'eat' | *kan-an* | 'be eating' |

(Bugenhagen 1995: 53)

The element that is attached to the base often consists of both copied segments and fixed segments, so that a kind of mixture between affix and reduplicant results. Such elements may be called **duplifixes**.

(3.13) Plurals in Somali: duplifix *-aC*
>| *buug* | 'book' | *buug-ag* | 'books' |
>| *fool* | 'face' | *fool-al* | 'faces' |
>| *koob* | 'cup' | *koob-ab* | 'cups' |
>| *jid* | 'street' | *jid-ad* | 'streets' |

(Berchem 1991: 102)

(3.14) 'Sort of' adjectives in Tzutujil: duplifix *-Coj*
>| *saq* | 'white' | *saq-soj* | 'whitish' |
>| *rax* | 'green' | *rax-roj* | 'greenish' |
>| *q'eq* | 'black' | *q'eq-q'oj* | 'blackish' |
>| *tz'iil* | 'dirty' | *tz'il-tz'oj* | 'dirtyish' |

(Dayley 1985: 213)

Linguists often treat reduplication as affixation of a template and copying of the root as needed to fill out the segments of that template. For Ponapean, the template is CV-, where C and V stand for 'empty' slots that can be filled with a consonant and vowel, respectively. The prefixation of the template itself is easily understood as concatenation, and it is reasonable to think of the template as a kind of morpheme. However, it is less clear that the copying process is concatenative; it seems to have more in common with gemination or vowel lengthening.

3.1.4 Conversion

Finally, the limiting case of a morphological pattern is <mark>conversion</mark>, in which the form of the base remains unaltered. A standard example is the relationship between some verbs and nouns in English:

(3.15)
>| NOUN | VERB |
>| --- | --- |
>| *hammer* | *hammer* |
>| *plant* | *plant* |
>| *ship* | *ship* |
>| *walk* | *walk* |
>| *drink* | *drink* |

Since we defined morphological patterns as partial resemblances in form and meaning among groups of words, conversion can be regarded as morphological in nature only if this definition is relaxed somewhat, because the resemblance in form is total here. Conversion is generally invoked only for derivational morphology, and primarily for relating two lexemes that differ only in lexical class.

3.1.5 Outside the realm of morphology

Sometimes a number of additional types are given under the heading of morphological operations, such as alphabet-based abbreviations (**acronyms** such as *NATO*, and **alphabetisms** such as *CD* (pronounced [si:'di:]), *Ph.D.* (pronounced [pi:eitʃ'di:])), **clippings** (e.g. *fridge* from *refrigerator*, *pram* from *perambulator*) and **blends** (e.g. *smog* from *smoke* and *fog*, *infotainment* from *information* and *entertainment*). These are clearly operations that can be used to create new words. However, they do not fall under morphology, because the resulting new words do not have different meanings to the longer words from which they are formed. Thus, not all processes of word-creation fall into the domain of morphological structure, and abbreviations and clippings will play no role in this book.

3.2 Two approaches to morphological rules

Taking this range of observed phenomena, we can now turn our attention to analysis and ask what these morphological patterns indicate about morphological structure. The ultimate goal is to create a system of **morphological rules** that mimics speakers' linguistic knowledge, but this is not always a straightforward process. In addition to accurately representing morphological generalizations, rules should be elegant and cognitively realistic (see Section 1.3 for discussion of these goals). Moreover, the generalizations that we consider important to describe with morphological rules depend in part on the kinds of explanations that we posit.

For instance, concatenative patterns are more common in the world's languages than non-concatenative patterns. Why is this? And is it important that this generalization be directly reflected by the system of morphological rules that we formulate? One possibility is that languages favour concatenative morphological patterns due to some inherent property of the language system, perhaps because morphological structure is fundamentally similar to syntactic structure. If so, our system of morphological rules should be structured in such a way that it places restrictions on non-concatenative patterns, and maximizes similarity to syntactic structure. Alternatively, concatenative patterns might be more common for reasons external to the morphological system, for example, having to do with how languages

change. This would suggest that morphological rules themselves need not be highly restrictive because the frequency of concatenative patterns does not result directly from the structure of the morphological system. The preponderance of concatenative patterns thus provides one example of how the type of explanation that we pursue, system-external explanation versus inherently restrictive architecture, affects our approach to morphological rules. There are many such issues.

On the whole, the emphasis in this book is on questions of substance rather than questions of formal description. But in this section, two representative formalisms for morphological rules will be presented and contrasted, to help bring two major approaches into clear focus. One emphasizes commonalities between morphology and syntax and favours a restrictive architecture of description. The other tends to minimize the importance of parallels between syntax and morphology and invests in system-external explanations. As such, it sees a restrictive formal architecture as less important. We will call these the **morpheme-based model** and the **word-based model**, respectively. The morpheme-based model is associated with the morpheme-combination approach to morphology: 'Morphology is the study of the combination of morphemes to yield words' (Section 1.1). The word-based model represents a view of morphology consistent with the following definition: 'Morphology is the study of systematic covariation in the form and meaning of words' (also from Section 1.1). As we shall see, each approach has its own advantages and disadvantages.

3.2.1 The morpheme-based model

In the morpheme-based model, morphological rules are thought of as combining morphemes in much the same way that syntactic rules combine words. To see how this works, we can use the syntactic **phrase structure rules** in (3.16) to create a sentence by replacing elements on the left of the '=' by elements on the right. In this notation, elements in parentheses are optional; curly brackets and commas represent a choice between alternative options.

(3.16) Phrase-structure rules in syntax
     a. sentence   = noun phrase + verb phrase
     b. noun phrase   = (i)   ⎰determiner (+ adjective) + noun⎱
                          (ii) ⎱sentence⎰
     c. verb phrase   = verb (+ noun phrase)
     d. determiner   = *the, a, some, …*
     e. noun   = *cat, rat, bat, …*
     f. verb   = *chased, thought, slept, …*
     g. adjective   = *big, grey, …*

To produce the sentence *A big cat chased the bat*, we need the following individual steps, utilizing the rules in (3.16) ('X → Y' means 'insert Y for X').

(3.17) sentence → noun phrase + verb phrase   (by 3.16a)
        noun phrase → determiner + adjective + noun   (by 3.16b)
        verb phrase → verb + noun phrase   (by 3.16c)
        noun phrase → determiner + noun   (by 3.16b)
        determiner + adjective + noun → *a big cat*   (by 3.16d, g, e)
        verb → *chased*   (by 3.16f)
        determiner + noun → *the bat*   (by 3.16d, e)
        sentence: *A big cat chased the bat.*

Likewise, in order to describe the structure of English words like *cheeseboard, bags, unhappier, eventfulness*, one could make use of the **word-structure rules** in (3.18), which are analogous to the syntactic phrase structure rules above.

(3.18) Word-structure rules
        a. word-form   = stem (+ inflectional suffix)
        b. stem   = (i) ⎧ (deriv. prefix +) root (+ deriv. suffix) ⎫
                                 (ii) ⎩ stem+stem   ⎭
        c. inflectional suffix = -s, -er, …
        d. derivational prefix   = un-, …
        e. root   = *bag, event, cheese, board, happy*, …
        f. derivational suffix   = -*ful*, -*ness*, …

We can use these word-structure rules to create complex words. In the following, we see the individual steps by which the words *bags*, *unhappier* and *cheeseboard* can be created using the rules in (3.18).

(3.19) word-form → stem + inflectional suffix   (by 3.18a)
        stem → root → *bag*   (by 3.18bi, 3.18e)
        inflectional suffix → -*s*   (by 3.18c)
        word-form: *bag-s*

(3.20) word-form → stem + inflectional suffix   (by 3.18a)
        stem → derivational prefix + root   (by 3.18bi)
        derivational prefix → *un*-   (by 3.18d)
        root → *happy*   (by 3.18e)
        inflectional suffix → -*er*   (by 3.18c)
        stem: *un-happy*
        word-form: *un-happi-er*

(3.21) word-form → stem   (by 3.18a)
        stem → stem + stem   (by 3.18bii)
        stem → root   (by 3.18bi)
        root → *cheese*   (by 3.18e)
        root → *board*   (by 3.18e)
        stem: *cheese-board*
        word-form: *cheese-board*

There are several ways to modify this general approach. For example, many linguists argue that we should dispense with word-structure rules in (3.18) and put all the relevant information, including combinatory potential, into lexical entries. This parallels an argument within syntactic theory. Many syntacticians have called into question the need for phrase-structure rules like (3.16a–c), on the grounds that the same information is already contained in words' lexical entries, making the general rules redundant.

In line with this approach, an alternative formalism to (3.18) is illustrated in (3.22). These lexical entries contain information on the pronunciation, properties and meaning of the morpheme. The pronunciation is given between slashes in phonetic transcription, the properties consist of the word-class (for roots) or the combinatory potential (for affixes), and a rough indication of the meaning is given in quotation marks. (Naturally, a lot more needs to be said on the semantics of morphemes, but the details can be ignored for present purposes; see Section 11.1.1 for some aspects of the semantics that are relevant to morphology.)

(3.22) proposed lexical entries for some morphemes:

a. *bag* $\begin{bmatrix} /\text{bæg}/ \\ \text{N} \\ \text{'bag'} \end{bmatrix}$ b. *-s* $\begin{bmatrix} /\text{z}/ \\ \text{N}— \\ \text{'plural'} \end{bmatrix}$ c. *happy* $\begin{bmatrix} /\text{hæpi}/ \\ \text{A} \\ \text{'happy'} \end{bmatrix}$ d. *un-* $\begin{bmatrix} /\text{ʌn}/ \\ —\text{A} \\ \text{'not'} \end{bmatrix}$

When lexical entries of roots and affixes are enriched in this way, morphological description seems to reduce largely to the description of the lexical entries of morphemes. Concatenation becomes a property of the lexical entry itself, all but removing the distinction between rules and morphemes.

Despite this difference, the core principle is the same in both (3.18) and (3.22): morphology consists of one basic type of lexical entry (morphemes) and one type of process that operates on those entries (concatenation). And by doing so, the morpheme-based model maximizes the formal similarity between morphology and syntax.

The morpheme-based model raises two questions. First, what are the advantages and disadvantages, both empirical and theoretical, of reducing morphological structure to morpheme concatenation? Second, can this model account for base modification, reduplication and conversion, and if so, how?

There are at least two good reasons to favour a theory of purely concatenative rules. First, as noted above, morpheme concatenation is the most common kind of morphological pattern cross-linguistically. By treating concatenation as the fundamental (or only) type of morphological rule, the morpheme-based model provides a natural explanation for this fact. Second, so far we have compared morphology to syntax by noting that the morpheme-based model treats morphological structure as a string

of morphemes in much the same way that syntax consists of a string of words. However, morphology and syntax are similar in other respects as well. Much of the data is too complicated to consider here, but we can focus on one basic principle: **hierarchical structure**.

Consider the sentence *We need more intelligent leaders*. It consists of a string of words, but it also has internal structure that is not necessarily reflected in the linear order of words. We know this is true because this sentence can have two possible interpretations, either 'We need more leaders who are intelligent', or 'We need leaders who are more intelligent.' Each interpretation corresponds to a different hierarchical structure. In the first interpretation, *intelligent leaders* forms a subgroup (called a syntactic **constituent**), which is modified by *more*. In the second interpretation, *more intelligent* forms a constituent, and collectively modifies *leaders*. This hierarchical structure is represented using the (simplified) formalism of syntactic **tree diagrams** in Figure 3.1.
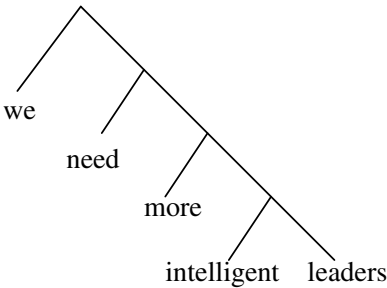
Figure 3.1 Hierarchical structure in syntax

Not all sentences have more than one possible interpretation, but all have hierarchical structure.

Important here is that concatenative morphology also (arguably) has hierarchical structure, and words like *undoable* also have two possible interpretations: 'unable to be done' (*do* and *-able* form a constituent), or 'able to be undone' (*un-* and *do* are a constituent). These are represented in Figure 3.2 using simplified morphological tree diagrams.

Inasmuch as morphology and syntax exhibit fundamental similarities of this type, we can hypothesize that morphology and syntax operate according to shared principles due to some innate property of language architecture, and that this is perhaps the reason that concatenative patterns are more commonly found. If so, it is desirable to posit a model that

Interpretation 1   Interpretation 2

un-

        do   -able   un-   do   -able

Figure 3.2 Hierarchical structure in morphology

maximizes the formal similarity between morphology and syntax. For these and other reasons, the morpheme-based, concatenation-only approach to morphological analysis has been popular. (See Chapter 7 for a more thorough and critical discussion of hierarchical structure in morphology and its relation to syntactic structure.)

Still, there are some disadvantages to positing that concatenation is the only rule type. Most notably, base modification and conversion are difficult to accommodate. Consider again Albanian plural nouns, e.g. *armik* 'enemy', *armiq* 'enemies'. In principle, a morpheme-based model can account for this pattern by positing lexical entries as in (3.23):

(3.23) a. *armik*   b. *'plural'*
$$\begin{bmatrix} /\text{armik}/ \\ \text{N} \\ \text{'enemy'} \end{bmatrix} \qquad \begin{bmatrix} /\,\varnothing\,/ \\ \text{N}\,— \\ \text{'plural'} \end{bmatrix}$$

The entry in (3.23b) means that there is a suffix that contributes the meaning 'plural', but which has no phonological form. This is a **zero affix** (or **zero expression**). To get the right phonological form, the morpheme-based model must assume that the zero affix has some property that triggers palatalization on the final consonant of the root. This amounts to treating palatalization as morphologically conditioned allomorphy: the allomorph *armiq* is selected by the zero plural affix. This analysis allows us to avoid violating the fundamental principles of the morpheme-based model. Formally, it is the suffix in (3.23b), not the process of palatalization, that expresses plurality.

While this is a possible analysis, it is not a very satisfactory one. Why should the zero plural affix trigger palatalization? There is no motivation for this. Moreover, in a language with several different base modification patterns, there would be several different zero affixes in the lexicon, each of which would trigger allomorphy differently. In short, zero morphemes

are ad hoc devices that are posited for no purpose other than to save the principle of a concatenation-only model. Inasmuch as base modification and conversion represent common morphological patterns, this is a significant flaw of the morpheme-based model.

3.2.2 The word-based model

In the word-based model, the fundamental significance of the word is emphasized and the relationship between complex words is captured not by splitting them up into parts and positing a rule of concatenation, but by formulating **word-schemas** that represent the features common to morphologically related words.

For instance, the similarities among the English words *bags, keys, gods, ribs, bones, gems* (and of course many others) can be expressed in the word-schema in (3.24c).

(3.24) a. Words: *bags, keys, gods, ribs, bones, gems,* …

b. Lexical entries for words

$\begin{bmatrix} /\text{bægz}/_\text{N} \\ \text{'bags'} \end{bmatrix}$ $\begin{bmatrix} /\text{k}^\text{h}\text{ijz}/_\text{N} \\ \text{'keys'} \end{bmatrix}$ $\begin{bmatrix} /\text{gadz}/_\text{N} \\ \text{'gods'} \end{bmatrix}$ $\begin{bmatrix} /\text{ribz}/_\text{N} \\ \text{'ribs'} \end{bmatrix}$

c. Word-schema

$\begin{bmatrix} /\text{Xz}/_\text{N} \\ \text{'plurality of } x\text{s'} \end{bmatrix}$

A word-schema is like the lexical entries in (3.24b) in that it contains information on pronunciation, syntactic properties and meaning. But a word-schema may additionally contain variables. In this way, it abstracts away from the differences between the related words and just expresses the common features. The schema in (3.24c) expresses the fact that all words in (3.24a,b) end in /z/, that they all denote a plurality of things and that they are all nouns (indicated by subscript N after the phonological representation). The phonological string preceding the /z/ is quite diverse and is thus replaced by the variable /X/. Likewise, semantically these words share nothing besides the plurality component, so again the semantic part of the schema contains a variable ('x'). We will use the terms *match* and *subsume* for the relation between concrete words and the abstract schema: words match a schema, and a schema subsumes words (for example, the schema in (3.24c) subsumes the nouns in (3.24a, b) and many others, but not all English plural nouns match it; for instance, the plural *feet* does not match its phonological part).

Crucially, a word-schema stands for complete words, not for individual morphemes in the sense of the morpheme-based model. The word-schema in (3.24c) is a generalization based on the lexical entries in (3.24b), which are themselves word-forms, not morphemes. When the word-schema contains

both a segmentable piece of sound and a corresponding meaning, as is true in (3.24c), we can call this a 'morpheme'. However, it is important to remember that in a word-based model a morpheme is just a convenient term. It is simply one kind of schema among many, and has no special status.

Now what makes word-schemas really significant for morphology is the fact that closely related schemas are connected to each other. A schema that subsumes a very similar set of words is given in (3.25c).

(3.25) a. Words: *bag, key, god, rib, bone, gem, …*

b. Lexical entries

$$\begin{bmatrix} /\text{bæg}/_\text{N} \\ \text{'bag'} \end{bmatrix} \qquad \begin{bmatrix} /\text{k}^\text{h}\text{ij}/_\text{N} \\ \text{'key'} \end{bmatrix} \qquad \begin{bmatrix} /\text{gɑd}/_\text{N} \\ \text{'god'} \end{bmatrix} \qquad \begin{bmatrix} /\text{rɪb}/_\text{N} \\ \text{'rib'} \end{bmatrix}$$

c. Word-schema

$$\begin{bmatrix} /X/_\text{N} \\ \text{'}x\text{'} \end{bmatrix}$$

The morphological relationship between these sets of words can now be represented in the **morphological correspondence** in (3.26).

(3.26) $$\begin{bmatrix} /X/_\text{N} \\ \text{'}x\text{'} \end{bmatrix} \quad \leftrightarrow \quad \begin{bmatrix} /Xz/_\text{N} \\ \text{'plurality of } xs\text{'} \end{bmatrix}$$

The double arrow means that, for some word matching the schema on the left, there is a corresponding word matching the schema on the right. Example (3.26) thus shows what a morphological rule looks like in the word-based model. The rule in (3.26) is the word-based equivalent of (3.22b). It says that plural nouns can be formed from singular nouns by suffixing /z/.

Note that combinatory potential is represented here as well. In the correspondence, the left schema is marked as a noun. This indicates that the rule forming plurals with [z] requires a base that is a noun. In this way too, the word-based formalism of (3.26) is equivalent to the morpheme-based formalism in (3.22b), in which the lexical entry for the morpheme /-z/ contains the restriction that the suffix must attach to a noun.

Unlike the morpheme-based model, the word-based model has no way of dispensing with morphological rules, and while the correspondence in (3.26) represents a rule of suffixation, there is nothing in the model that necessarily restricts morphological rules to concatenation. As with the morpheme-based model, this raises the question: What are the advantages and disadvantages of an approach that allows a wide variety of rules, and gives no special status to rules of concatenation?

There are at least three significant advantages of the word-based model. First, the most striking is that non-concatenative patterns can be described with it quite naturally, whereas such phenomena are difficult to accommodate in morpheme-based models. As an example, (3.27b) shows

the correspondence for English noun–verb conversion of nouns denoting instruments.

(3.27) a. *hammer*$_N$/*hammer*$_V$, *saw*$_N$/*saw*$_V$, *spoon*$_N$/*spoon*$_V$, *funnel*$_N$/*funnel*$_V$, …

b. $\left[\begin{array}{l} /\text{X}/_N \\ \text{'}x\ (= \text{an instrument})\text{'} \end{array}\right]$ $\leftrightarrow$ $\left[\begin{array}{l} /\text{X}/_V \\ \text{'use}\ x\ (= \text{an instrument})\text{'} \end{array}\right]$

Here the word-schema on the right differs from the schema on the left in word-class and meaning, but not in phonological form. Processes of base modification can also be easily described by elaborating the phonological variable somewhat. For instance, shortening in Hindi/Urdu can be represented as in (3.28b), where /V:/ stands for any long vowel.

(3.28) a. *ma:r-* 'kill', *mar-* 'die'

b. $\left[\begin{array}{l} /\text{XV:Y}/_V \\ \text{'A causes B to happen'} \end{array}\right]$ $\leftrightarrow$ $\left[\begin{array}{l} /\text{XVY}/_V \\ \text{'B happens'} \end{array}\right.$

Reduplication is described by copying part of the phonological string in one of the word-schemas. (3.29b) shows the rule for the Somali duplifix *-aC* that we saw in (3.13) (here /C/ stands for any arbitrary consonant).

(3.29) a. *buug/buugag* 'book(s)', *fool/foolal* 'face(s)', *koob/koobab* 'cup(s)', …

b. $\left[\begin{array}{l} /\text{XC1}/_N \\ \text{'}x\text{'} \end{array}\right]$ $\leftrightarrow$ $\left[\begin{array}{l} /\text{XC1aC1}/_N \\ \text{'plurality of }x\text{s'} \end{array}\right]$

A second advantage is that the word-based model can explain how **back-formations** (like *to babysit,* which is historically derived from *babysitter*) are possible. In the morpheme-based model, it is quite puzzling that speakers should be able to create a verb *babysit*. English has many compounds denoting agents in which the first lexeme in the compound is interpreted as the object of an implicit action (*babysitter, truck driver, window washer*, etc.). English does not, however, have a productive rule combining a noun and a verb to create compounds like *to babysit* (**to bookread*, **to fishcatch*, **to truckdrive*, **to windowwash*). This causes a problem for the morpheme-based model because compounds can only be built up from component lexemes in this approach, and not derived directly from other compounds. But in the word-based model, the fact that *babysit* came from *babysitter* can be readily described. The noun *babysitter* matches two word-schemas simultaneously. First, it matches the nominal compound schema in (3.30), and everyone agrees that it was first created using this rule (i.e. as *baby* + *sitter*).

(3.30) $\left[\begin{array}{l} /\text{X}/_N \\ \text{'}x\text{'} \end{array}\right]$ & $\left[\begin{array}{l} /\text{Y}/_N \\ \text{'}y\text{'} \end{array}\right]$ $\leftrightarrow$ $\left[\begin{array}{l} /\text{XY}/_N \\ \text{'a }y\text{ that has to} \\ \text{do with }x\text{'} \end{array}\right]$

(Note that for compounds, the left-hand side of the correspondence must consist of two word-schemas.) And, second, it matches the word-schema

of non-compound agent nouns given on the right in (3.31). (Here 'do$x$' represents a variable action meaning.)

(3.31)
$$\begin{bmatrix} /\text{X}/\text{v} \\ \text{'do}x\text{'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /\text{X}\text{ər}/\text{N} \\ \text{'a person who} \\ \text{(habitually) does}x\text{'} \end{bmatrix}$$

Crucially, the bidirectional arrow indicates that the correspondence in (3.31) is not directed. In addition to the creation of *-er* nouns from verbs (like *bake* → *bak-er, write* → *writ-er, sin* → *sinn-er*, etc.), this rule allows the creation of verbs from nouns containing *-er* that denote an agent of some sort (*babysitter* → *babysit*). This is a fundamental difference between the word-based model and the morpheme-based model. Clearly, the rule in (3.31) is much more **productive** from left to right than from right to left (e.g. one cannot form a verb *to butch* from *butcher*), but under what sort of circumstances a rule is productive or unproductive is a separate question that we return to in Chapter 6.

Once a back-formed word has become a normal word of the language, it is synchronically indistinguishable from a non-derived word (thus, only historical linguists, but not other speakers of English, know that *edit* was back-formed from *editor*). From the perspective of the morpheme-based model, we might therefore argue that back-formations are solely a problem for language change, and that our theory can treat *babysitter* and *editor* as synchronically derived from *to babysit* and *to edit*, rather than the reverse. While this is true, it does not solve the problem because it still fails to explain how back-formation could ever arise in the first place. The word-based model has the advantage of being able to naturally explain this kind of historical development.

Third, even some concatenative patterns cause problems for morpheme-based models but are easily described within a word-based model. Cross-formations are good examples of this. Consider the three sets of English words in (3.32).

(3.32)
attract	*attraction*	*attractive*
suggest	*suggestion*	*suggestive*
prohibit	*prohibition*	*prohibitive*
elude	—	*elusive*
insert	*insertion*	—
discuss	*discussion*	—
—	*illusion*	*illusive*
—	*aggression*	*aggressive*

In order to describe the relations between these three sets, we minimally need the two correspondences in (3.33a–b). (For the sake of simplicity, we use the spelling rather than the pronunciation in representing the affixes *-ion* and *-ive* here.)

(3.33) a. $\begin{bmatrix} /X/\text{v} \\ \text{'do}x\text{'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /Xion/\text{N} \\ \text{'action of doing}x\text{'} \end{bmatrix}$ b. $\begin{bmatrix} /X/\text{v} \\ \text{'do}x\text{'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /Xive/\text{A} \\ \text{'prone to doing}x\text{'} \end{bmatrix}$

But these two rules do not suffice, because there are pairs like *illusion/illusive*, *aggression/aggressive* that lack a corresponding verb (**aggress, *illude*). This means that within the word-based model we also need the rule (3.33c).

(3.33) c. $\begin{bmatrix} /Xion/\text{N} \\ \text{'action of doing}x\text{'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /Xive/\text{A} \\ \text{'prone to doing}x\text{'} \end{bmatrix}$

Rules of the type in (3.33c) are **cross-formations**: a morphological rule in which both word-schemas in the correspondence exhibit a constant phonological element (Becker 1993a).

Cross-formations are in no way unusual or uncommon. Consider the pairs of words in (3.34), which demonstrate cross-formation in compounding.

(3.34) *seasick   airsick*
        sealane   airlane
        seafare   airfare
        seaborne   airborne
        seamanship airmanship
        seaworthy   airworthy
        seaman   airman

(Becker 1993a: 13–14)

For the first few words one can still imagine that the *sea* and *air* compounds were created independently of each other – i.e. *airsick* from *air* + *sick*, without direct relation to the older word *seasick*, or *airlane* from *air* + *lane*, without direct relation to *sealane*. But for some of the others this seems very unlikely because the meaning is **noncompositional**: the meaning of the word-form is more than the sum of the meanings of the parts. A *seaman* is a low-ranking navy member, not any man with some relation to the sea, and similarly an *airman* is a low-ranking air force member. Thus, we are probably dealing with a rule as in (3.35).

(3.35) $\begin{bmatrix} /seaX/ \\ \text{'an } x \text{ having to do} \\ \text{with sea travel'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /airX/ \\ \text{'an } x \text{ having to do} \\ \text{with air travel'} \end{bmatrix}$

We will see more examples of cross-formation when we discuss inflectional morphology in Chapter 8.

Despite being concatenative, cross-formation patterns cannot be described so easily in a purely morpheme-based model. Since the morpheme-based model usually assumes that complex words are not stored in the lexicon, it must posit that *illusion* and *illusive* are each derived from a root *illude*, with the suffixes having the lexical entries [/-ion/; N; V—] and [/-ive/; A; V—]. The problem lies in the fact that once *illude* is posited as the root, the morpheme-based model then faces difficulty explaining why the verb

illude does not exist. By allowing for a direct relationship between *illusion* and *illusive*, the word-based model avoids this problem. So in summary, the word-based model, by virtue of allowing a wide variety of rules, provides more satisfactory analyses of non-concatenative patterns, some results of language change such as back-formation, and even some concatenative patterns such as cross-formations.

Of course, the word-based model has its own potential disadvantages. One of the most common criticisms of the word-based model is that it is not restrictive. Restrictiveness is an important feature of a morphological model because it allows us to make generalizations about what is possible and impossible in language. The word-based model allows morphological rules of virtually any type – including many that are not known to exist in any language.

For example, in the well-known language game Pig Latin the basic principle is that if a word begins with one or more consonants, its Pig Latin equivalent moves those consonants to the end of the word and adds 'ay' ([ej]). So, English *book* → Pig Latin *ookbay*, *star* → *arstay*, etc. And in one version of the rules, if the word begins with a vowel, the Pig Latin word adds 'say': *orange* → *orangesay*, *apple* → *applesay*, etc.

We must remember that Pig Latin is a language game, and thus different in many respects from normal language. Morphological patterns in which sounds are moved from the beginning to the end of the word do not seem to exist in natural languages. The morphological pattern of metathesis does involve switching the order of sounds (see (3.9)), but it always involves 'local' rearranging – the sounds must be next to each other. No known natural languages have the Pig-Latin type of 'long distance' rearranging.

Many linguists argue that a good model of morphology will preclude this kind of long-distance rearranging of sounds. The morpheme-based model automatically excludes the Pig Latin pattern (local rearranging is also excluded), but nothing about the word-based model necessarily does. If re-arranging of sounds is generally allowed in the word-based model (e.g. in order to account for metathesis), some extra theoretical device would be needed to restrict long-distance rearranging (e.g. an ad hoc principle that the rearranging must be local). Inasmuch as this makes the word-based model more complicated than the morpheme-based model, many linguists would argue that non-restrictiveness is a significant disadvantage of the word-based model.

A related concern is how frequently morphological patterns involve concatenation. As discussed above, one of the advantages of the morpheme-based model is that it can easily account for the fact that concatenative patterns are very common in the world's languages, since the model reduces the formal architecture to morphemes and concatenation. By contrast, the word-based model posits morphological rules that effect a wide variety of changes on the base, including concatenation, metathesis,

vowel lengthening, etc., and treats them as equal in type. This means that the word-based model loses all morphology-internal explanation for the dominance of concatenative patterns.

Here, however, it may be possible to find an explanation outside of the morphological system. Concatenative patterns are more common than non-concatenative patterns in part because the language structures that are the historical sources of concatenative patterns are more common than the language structures that are the historical sources of many non-concatenative ones.

By far the most common way in which new morphological patterns, and particularly concatenative patterns, arise is by **coalescence** of several formerly free syntactic elements. When the two elements that coalesce are content words, the result is a compound. When one of the coalescing elements is a semantically abstract element that mostly serves grammatical functions in the sentence, the result of the coalescence is an affixed word. Let us consider an example from Spanish, which has a future tense that is formed by adding the suffix *-r* to the stem, followed by a series of special person–number suffixes:

(3.36) | | PRESENT TENSE | FUTURE TENSE |
|---|---|---|
| 1SG | *cant-o* 'I sing' | *canta-r-é* 'I will sing' |
| 2SG | *canta-s* | *canta-r-ás* |
| 3SG | *canta* | *canta-r-á* |
| 1PL | *canta-mos* | *canta-r-émos* |
| 2PL | *cantá-is* | *canta-r-éis* |
| 3PL | *canta-n* | *canta-r-án* |

Originally this was a syntactic pattern, involving the auxiliary verb *habere* 'have' (Modern Spanish *haber*), which was combined with the infinitive to express obligation: *habeo cantare* or *cantare habeo* 'I have to sing'. Then the meaning shifted from obligation to future, and the verb *haber* lost its freedom of position and came to occur only immediately after the main verb. As a result of phonological reduction, the infinitive lost its final *-e* (*cantare* became *cantar*) and the forms of the verb *haber* were shortened (*he, has, ha, habemos, habéis, han*). Finally, the infinitive and the forms of *haber* were fused together to form a set of single complex words:

(3.37) | *cantar* | *he* | > | *cantaré* |
|---|---|---|---|
| *cantar* | *has* | > | *cantarás* |
| *cantar* | *ha* | > | *cantará* |
| *cantar* | *(hab)emos* | > | *cantarémos* |
| *cantar* | *(hab)éis* | > | *cantaréis* |
| *cantar* | *han* | > | *cantarán* |

Such grammaticalization changes are extremely common in languages, and the vast majority of all (non-compound) concatenative patterns seem ultimately to go back to such syntactic phrases with auxiliary words.

By contrast, many non-concatenative patterns historically began as phonological patterns. (The reader may have noticed that most of the base modification patterns in Section 3.1.2 were described using terms from phonology.) For example, the English verb *house* used to have a voiceless [s], like the noun *house*, but until Middle English times, all forms of the verb had a suffix that began with a vowel (*hous[ɛ]n*, *hous[ɛ]th*, *hous[ɛ]d*, etc.). In the noun the [s] was in word-final position already in Old English. At some point, [s] between vowels came be pronounced as [z] (a phonological rule of voicing). This, of course, affected the stem-final consonant in the verb, but did not affect the noun. Later, the suffixes disappeared from most of the verbal forms, causing the noun and the verb to be identical – except for the voicing of the final consonant. In this way, voicing became the (only) morphological marker distinguishing the verb *house* from the noun *house* (verb *wreathe* from noun *wreath*, *thieve* from *thief*, etc.).

The point here is that voicing is a common phonological process, so there are many opportunities for voicing to develop into a morphological pattern, but still not nearly as many opportunities as there are for free words to become morphemes. There are even fewer phonological patterns that involve switching the order of two sounds. As a result, there are historically very few opportunities for patterns like morphological metathesis to develop (Janda 1984). Thus, one possibility is to explain the frequency of concatenative patterns by positing a theory of mostly or solely concatenative rules, as the morpheme-based model does. But another possibility is to explain the frequency of concatenation as the indirect result of some historical changes being more common than others (Bybee and Newman 1995). This is the preferred explanation within a word-based approach. Moreover, the same logic can be applied to the non-restrictiveness of the word-based model. While the word-based model can describe many morphological patterns that do not exist in natural languages, including Pig Latin-type long distance movement of sounds, perhaps this is not a problem if those patterns would never arise by historical processes. Since system-external explanation is a major goal of linguistic research, lack of restrictiveness is not necessarily a disadvantage of the word-based model.

In the end, in these two approaches to rules we find a classic conflict between different goals of morphological research. The morpheme-based model is restrictive and captures similarities between morphology and syntax, but at the cost of empirical adequacy. The word-based model is more empirically adequate, but at a cost of lost restrictiveness. It is therefore not the case that one approach is inherently superior to the other. Morphologists (and morphology students) must decide for themselves which goals of research are most important. But inasmuch as the problem of non-restrictiveness is minimized by system-external factors, whereas the problem of empirical inadequacy is not, the word-based approach should perhaps be evaluated more favourably.

Summary of Chapter 3

In addition to concatenative patterns (affixation and compounding), morphology includes a wide variety of non-concatenative patterns. These include conversion, reduplication, and base modification (palatalization, weakening, gemination, lengthening, shortening, tonal change, stress shift, voicing, subtraction, metathesis, etc.).

Given these patterns, it is difficult to create a formal analysis of morphological structure that posits only concatenative rules similar to those found in syntax (the morpheme-based model). Any such theory would have to posit extensive zero affixes and unmotivated rules of allomorphy. The opposite view, that rules represent morphological correspondences between word-schemas (the word-based model), allows for a more straightforward explanation of both non-concatenative patterns and issues of analysis, such as back-formation and cross-formation. The word-based model is thus more empirically satisfactory.

At the same time, one consequence is that the word-based model is capable of describing many kinds of morphological patterns that are not found in the world's languages. The morpheme-based model is more restrictive. Some linguists consider this a significant advantage of the morpheme-based model. However, a counterargument is that the word-based model does not need to be highly restrictive if unattested patterns are very unlikely to occur for reasons external to the morphological system (e.g. because of conditions in language change). The same argument helps explain why concatenative patterns are much more common than non-concatenative ones.

Further reading

An early version of the morpheme-based model was advocated by Bloomfield (1933). More recent morpheme-based models are Word Syntax (Selkirk 1982; Di Sciullo and Williams 1987; and Lieber 1992) and Distributed Morphology (Halle and Marantz 1993, 1994; and Harley and Noyer 1998). Versions of the word-based model, grouped together under the name of Word and Paradigm models, are advocated most strongly by Matthews (1972), Bybee (1985), Becker (1990), Anderson (1992), Bochner (1993), Aronoff (1994), and Stump (2001a), and in Dasgupta *et al.* (2000) and Singh and Starosta (2003). See also Aronoff (2007). The word-schema formalism used in this chapter is based especially on Becker (1990, 1993a,b) and Bochner (1993).

Psycholinguists have debated whether both morpheme-based rules and schema-like correspondences (often called *associative processes*) exist side-by-side. See Bybee and Slobin (1982), Skousen (1989), and Alegre and Gordon (1999). Derwing (1990) is a summary.

Janda (1982, 1984) and Bybee and Newman (1995) argue for a role for historical explanation in morphological theory. Joseph (1998) provides an overview of the historical sources of morphological patterns, and Haspelmath (1995) considers morphological reanalysis.

Comprehension exercises

1. Which formal operation (or combination of operations) is involved in the following morphological patterns?

   a. Mbay (ǹ = low tone, ń = high tone, n̄ = mid tone)

tétə̀	'break'	*tétā*	'break several times'
ɓìndā	'wrap'	*ɓíndā*	'wrap several times'
rīyā	'split'	*ríyā*	'split several times'
			(Keegan 1997: 40)

   b. Yimas

manpa	'crocodile'	*manpawi*	'crocodiles'
kika	'rat'	*kikawi*	'rats'
yaka	'black possum'	*yakawi*	'black possums'
			(Foley 1991: 129)

   c. Coptic

kōt	'build'	*kēt*	'be built'
hōp	'hide'	*hēp*	'be hidden'
tōm	'shut'	*tēm*	'be shut'
			(Layton 2000: 129)

   d. Hausa (ǹ = low tone, ń = high tone)

búgàa	'beat'	*búbbùgáa*	'beat many times'
táakàa	'step on'	*táttàakáa*	'trample'
dánnèe	'oppress'	*dáddànnée*	'oppress (many (times))'
			(Newman 2000: 424)

   e. Tagalog

ibigay	'give'	*ibinigay*	'gave'
ipaglaba	'wash (for)'	*ipinaglaba*	'washed (for)'
ipambili	'buy (with)'	*ipinambili*	'bought (with)'

   f. German

finden	'find'	*gefunden*	'found'
singen	'sing'	*gesungen*	'sung'
binden	'tie'	*gebunden*	'tied'

2. What would be the lexical entries of the following English morphemes (using the formalism of (3.22))?

   hear, -ing (as in *he is playing, she is dancing*, etc.), *re-* (as in *to replay, to rewrite*, etc.), *good, -s* (as in *sells, knows*, etc.)

3. Formulate the morphological rule in the word-based format of (3.26) (i.e. as a correspondence between word-schemas) for the following pairs of words (each standing for a large set of such pairs):
   warm – warmer
   happy – unhappy
   play – replay
   happy – happily

4. Formulate the morphological rule for the following Tagalog lexeme pairs:

búhay	'life'	*buháy*	'alive'
gútom	'hunger'	*gutóm*	'hungry'
tákot	'fear'	*takót*	'afraid'
hába?	'length'	*habá?*	'long'
gálit	'anger'	*galít*	'angry'

5. The following pairs of English lexemes are related by cross-formation. Formulate the rule for them, analogous to (3.33c).

astronomy	*astronomer*
philosophy	*philosopher*
ethnography	*ethnographer*

6. For French adjectives, linguists have often advocated an analysis in terms of subtraction: the masculine form is formed from the feminine form by subtracting the final consonant (Bloomfield 1933: 217):

plat/platte	'flat'	[pla/plat]
laid/laide	'ugly'	[lɛ/lɛd]
long/longue	'long'	[lõ/lõg]
soul/soule	'drunk'	[su/sul]
gris/grise	'grey'	[gri/griz]

   Why is this an attractive analysis?

Exploratory exercise

One issue that was not addressed in this chapter is whether morphological rules ever fail to apply. We implied that morphological rules apply to all and only the bases that meet the conditions for a given rule, and linguists generally strive to formulate rules for which this is true. But is it always possible to write rules that are this efficient? In other words, how common are

exceptions? The goals of this exercise are to practise writing morphological rules using the formalism of word-schemas and morphological correspondences, and to consider some of the issues that exceptions pose for an analysis of morphological structure. The methodology consists of classic morphological analysis. An optional last step adds a simple experimental component. Croatian is used for demonstration purposes, but the reader could choose to investigate virtually any language with significant inflectional morphology.

Instructions

Step 1: Select a language and morphological relationship to study. The best choices will be pairs of word-forms belonging to the same lexeme. One of the forms should also be more 'basic' than the other. For example, consider the following words from Croatian.

(3.38) a. SINGULAR PLURAL   b. SINGULAR PLURAL

blog	blogovi	'blog(s)'	album	albumi	'album(s)'
džep	džepovi	'pocket(s)'	biskup	biskupi	'bishop(s)'
film	filmovi	'film(s)'	dokument	dokumenti	'document(s)'
grad	gradovi	'city(ies)'	kamen	kameni	'stone(s)'
park	parkovi	'park(s)'	papir	papiri	'paper(s)'
vlak	vlakovi	'train(s)'	razgovor	razgovori	'conversation(s)'

Here we have chosen singular and plural nouns in the nominative form. (This data represents only masculine nouns with 'hard' stems. Croatian has other types of nouns as well, but they are not relevant here.) These meet both criteria: the word-forms are inflectionally related (e.g. *blog* and *blogovi* belong to the same lexeme), and the form of the singular in these examples is more basic than that of the plural. This indicates that it is reasonable to set up a morphological correspondence that derives plurals from singulars. It is also best to pick a morphological relationship that exhibits multiple morphological patterns. Here there are two patterns: the nouns in (3.38a) form the plural with –*ovi*, whereas the nouns in (3.38b) have –*i* in the plural. For reasons that will be apparent below, the more morphological patterns there are, the more interesting the data will be to analyze.

   Step 2: Gather examples. Build a long list of word-form pairs that express the chosen inflectional relationship (e.g. singular-plural). Be sure to include all of the relevant morphological patterns. (A good way to do this is to consult a dictionary that gives inflectional information, and record all of the relevant examples on every 10th (20th, 50th, etc.) page.)

   Step 3: Write morphological rules. Sort the data into groups according to morphological pattern. Write rules to describe each group. For example, the major generalization for Croatian is that words with only one syllable in the nominative singular (**monosyllabic** nouns) form the nominative plural with -*ovi*, whereas words with more than one syllable (**polysyllabic** nouns)

form nominative plural with -*i*. In (3.39), the symbol 'σ' is used to represent a syllable, so 'X$_\sigma$' means any string of sounds that is one syllable in length. 'X$_{\sigma\sigma+}$' means any string that is at least two syllables in length.

(3.39) Croatian rule for plural formation (masculine hard-stem nouns)

a. $\begin{bmatrix} /X_\sigma/N \\ \text{'}x \text{ (NOM SG)'} \end{bmatrix}$ → $\begin{bmatrix} /Xovi/N \\ \text{'}x \text{ (NOM PL)'} \end{bmatrix}$

b. $\begin{bmatrix} /X_{\sigma\sigma+}/N \\ \text{'}x \text{ (NOM SG)'} \end{bmatrix}$ → $\begin{bmatrix} /Xi/N \\ \text{'}x \text{ (NOM PL)'} \end{bmatrix}$

Be as specific as possible about the relevant factors. The goal is for the schemas to subsume as many word-forms as possible that follow the rule, while excluding as many as possible that do not. For example, the rule in (3.39a) excludes all polysyllabic nouns, because only monosyllabic nouns match the left schema (linguists say that monosyllabic nouns 'meet the conditions' for the rule of plural formation).

Formulating rules may not be easy. For example, a large data set of Croatian would also include the nouns in (3.40).

(3.40) a. SINGULAR PLURAL   b. SINGULAR PLURAL
    golub   *golubovi* 'pigeon(s)'   *cent*   *centi* 'cent(s)'
    jastreb   *jastrebovi* 'hawk(s)'   *dan*   *dani* 'day(s)'
    pramen   *pramenovi* 'tuft(s), hair   *gost*   *gosti* 'guest(s)'
                             lock(s)'

The problem is apparent: the singular word-forms in (3.40a) meet the conditions for the rule in (3.39b), but seem to undergo rule (3.39a). The examples in (3.40b) have the same problem with regard to the rule in (3.39a). Does this mean that the rules in (3.39) are incorrect?

This is where **type frequency** can help. More than 93 per cent of monosyllabic nouns followed the pattern in (3.38a); fewer than 7 per cent followed the pattern in (3.40b). Polysyllabic nouns are similarly likely to follow the pattern in (3.38b), rather than (3.40a). This suggests that the generalization formalized by the rules in (3.39) is fundamentally correct. The examples in (3.40) are exceptions. Look for similar issues in your data. You may need to rewrite some rules, or write new rules, to cover all of the examples in your data set. There is no rigid formula for morphological analysis – linguists develop a feel for good analysis through practice.

Step 4: Ponder the implications of any exceptions. Consider the following questions in the context of your analysis.

1) How many exceptions can accrue before they no longer seem 'exceptional', and instead seem to be a rule-governed pattern? There is no absolute right or wrong answer here. Consider your data, the Croatian data, or other examples. Identify factors that would lead you to conclude

that a given example is rule-governed, and factors that would lead you to conclude that it is truly idiosyncratic, and needs to be learned on an item-by-item basis. Explain your reasoning.

2) Think about whether additional data might help decide whether a particular group of exceptions is, or is not, represented by a morphological rule. For instance, if exceptions do not follow any rules (i.e. if the relevant word-forms are truly anomalous), how would you expect new words to behave? If a series of new monosyllabic words were to enter Croatian, would you expect 93 per cent of these new words to form plurals with -*ovi*, and 7 per cent with -*i*? This would be a result that matches the type frequency of similar existing nouns. Would you expect all of the new words to have plurals formed with -*ovi*? Or would you expect something else? Would your predictions change if the exceptions were described by a rule, albeit one that does not apply very widely? Do new words in a language (e.g. ones borrowed from another language) necessarily follow the same morphological patterns as existing native words? Apply the same questions to your data. Try to explain why you expect one or the other result.

Step 5 (optional): Test your predictions about new forms with native speakers. Make up a variety of hypothetical words of the language (**non-words**). Non-words follow the phonological rules of a language, and sound like they could be words, but are not. Your non-words should match the schema for the 'basic' form. Present native speakers with the non-words and ask them to produce the relevant derived form. For example, we might ask Croatian speakers to decide what the plural form would be, given the hypothetical singular nouns *brag, glik, adret, bakral, mokilar*, etc. Are your predictions correct? And in general, do speakers behave in the ways that your rules would suggest?

Lexicon

4

In this chapter we look more closely at morphemes, focusing on the following fundamental issue: Do speakers memorize entire complex word-forms (*readable*, *reads*, *washable*), their component morphemes (*read*, *wash*, *-able*, *-s*), or both? Another way to ask the same question is: What is the content of the **lexicon**? Remember that the lexicon is the linguist's term for the language user's mental dictionary. When a linguist says that something is listed in the lexicon, this means that it must be stored in speakers' memories (but linguists generally prefer the more abstract, less psychological-sounding terminology).[1]

The content of the lexicon is an important issue for any theory of morphology because **lexical items** are the fundamental building blocks of morphological structure. They are the bases to which morphological rules apply. As such, our view of the lexicon affects our analysis of morphological structure in broad ways. If evidence points to the lexicon consisting primarily of morphemes, the rules that we write will operate on morpheme-based structures. And correspondingly, if evidence suggests that the lexicon consists primarily of words, the rules that we posit will be fundamentally word-based. The material in this chapter is thus complementary to the discussion in Chapter 3.

All linguists agree that the lexicon must contain at least all the information that is not predictable from general rules. For instance, an English speaker's lexicon must contain the monomorphemic English verbs *arrive*, *refuse*, *deny*, and words showing extreme semantic peculiarities (e.g. *awful*, which is not

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[1] A distinction is sometimes made between a *lexicon* and a *mental lexicon*, where the *lexicon* is a purely abstract tool of linguists to describe roots and affixes that does not necessarily correspond in any way to speakers' mental knowledge. The term *mental lexicon* is then used for the more psychological concept of a speaker's mental dictionary. However, we follow the view that linguists should strive to analyze language in ways that are plausible representations of speakers' knowledge, so we will continue to talk about the lexicon in terms of a (hypothetical) speaker, and not distinguish between these terms.

at all the same as 'full of awe'). But does the lexicon additionally contain predictable information? For example, does an English speaker's lexicon contain the complex word-form *helpful*, despite the fact that this word is easily segmented into the morphemes *help* and *-ful*, and fully predictable from the meaning of these parts? Here, there is disagreement.

We can identify three major positions. One possibility is that no regular complex words (like *helpful*) are stored in the lexicon. On this view, the lexicon contains, to the extent possible, just simple, monomorphemic elements, i.e. roots and affixes. Idiosyncratic complex words are also lexical entries, but virtually all complex words are created by rule, rather than being listed. This is a **morpheme lexicon**. It corresponds to the morpheme-based model. Another position takes exactly the opposite view: not just some, but all complex word-forms are included in the lexicon, whether they are predictable or idiosyncratic. This is a **strict word-form lexicon**. The third position is intermediary – it posits that word-forms, morphemes and derived stems are all potentially listed in the lexicon. Whether any particular word-form is listed depends on a variety of factors. Since word-forms still play the primary role in this approach, we call it a **moderate word-form lexicon**. Both the strict word-form lexicon and the moderate word-form lexicon are consistent with the word-based model from Chapter 3. In the following sections we evaluate these hypotheses.

4.1 A morpheme lexicon?

Based on the apparent parallelism between sentences, morphemes and phonemes shown in Figure 4.1, we might assume that the basic units of the lexicon are morphemes. Just as language users do not memorize each sentence that they use, we can also hypothesize that language users do not generally memorize complex words.
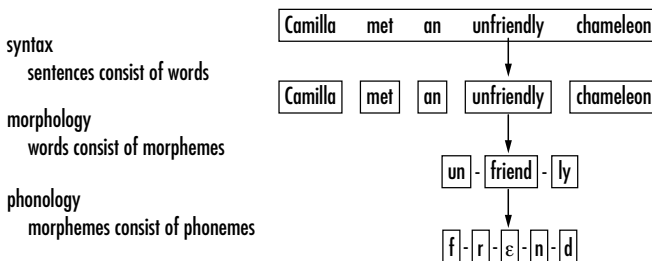

Figure 4.1: A simple picture

This is an appealing hypothesis not only because of the parallels to syntax and phonology, but also because linguists seek to provide an elegant description of language structure.

In the context of the lexicon, elegance is often measured in terms of economy, and a morpheme lexicon is maximally economical. To see how this works, consider again the word-forms belonging to the Modern Greek noun lexeme FILOS 'friend' (repeated from (2.2)):

(4.1)   The paradigm of FILOS

	SINGULAR	PLURAL
NOMINATIVE	*fílos*	*fíli*
ACCUSATIVE	*fílo*	*fílus*
GENITIVE	*fílu*	*fílon*

Combined, these six word-forms contain seven unique morphemes (*fil-*, *-os*, *-o*, *-u*, *-i*, *-us*, and *-on*). It might therefore seem more efficient to store the individual complex word-forms: six versus seven **lexical entries**. However, there are of course other lexemes whose word-forms follow the same morphological patterns as FILOS, including KOSMOS 'world' (*kósm-os*, *kósm-o*, *kósm-u*, *kósm-i*, *kósm-us*, *kósm-on*), FOVOS 'fear' (*fóv-os*, …), GAMOS 'marriage' (*gám-os*, …), and SKILOS 'dog' (*skíl-os*, …), just to list a few. If all word-forms are directly listed in the lexicon, there are thirty lexical entries corresponding to just these five lexemes. However, if only the morphemes are listed, there are eleven corresponding lexical entries, because the suffixes do not need to be repeated: *fíl-*, *kósm-*, *fóv-*, *gám-*, *skíl-*, *-os*, *-o*, *-u*, *-i*, *-us* and *-on*. Multiplied by thousands of Greek verb lexemes, the morpheme approach becomes much more economical than listing each individual word-form.

Note that economical representation is not restricted to inflectionally related forms. The English word-forms *read*, *reader* and *readable* belong to the same word family (i.e. they are derivationally related), and the word-forms *write*, *writer* and *writeable*, and many other sets of words, are related in a parallel fashion. In principle, it is thus possible to posit a lexicon that is quite economical – one lexical entry per morpheme.

Unfortunately, a morpheme lexicon is not usually as elegant in practice as it is in principle. There are several kinds of complications that force even a theory seeking a minimal lexicon to posit some word-forms as lexical entries. In fact, we have already anticipated two potential problems in preceding chapters – unpredictability of meaning and lack of morpheme segmentability.

First, if the lexicon consists primarily of separate morphemes that are combined together to form words, the meaning of a complex word should be equal to the sum of the meanings of its component morphemes. Stated differently, the word should exhibit **compositional meaning**. But as we have already seen, this kind of direct relationship between form and meaning does not always occur, and derivational morphology presents a particular problem in this regard. A *reader* is not just any person who reads, but also a kind of textbook and the title of an academic job (in the British system). These last two meanings are not predictable from the meanings of *read* and *-er* individually; the meaning is **non-compositional**. This indicates

that *reader* (textbook) and *Reader* (British academic title) are probably represented in the lexicon as complex words, rather than according to the component morphemes. The hypothesis that the lexicon consists (almost) exclusively of morphemes thus faces the same practical problem that has led dictionary-makers to give one entry to each lexeme – the meaning of a derived lexeme is often more than the sum of the meanings of the component parts. Since many languages have a large number of derived lexemes with unpredictable meaning, there is correspondingly a significant problem for the hypothesis of a morpheme lexicon.

Another potential problem for a morpheme lexicon is lack of morpheme segmentability. Here we briefly describe four types: base modification, cumulative expression, zero expression and empty morphs.

We have already encountered examples of base modification in Chapter 3. A familiar example, plurals in German, is repeated as (4.2). Some German plurals are formed by replacing a back vowel of the singular form by a front vowel ([ʊ], [aː], [ɔ] are replaced by [ʏ], [eː], [ø], spelled *ü, ä, ö*). Although this is clearly a morphological pattern, because an aspect of form corresponds to an aspect of meaning, it is not possible to segment a proper morpheme meaning 'plural'.

(4.2) SINGULAR PLURAL
    Mutter   *Mütter* 'mother(s)'
    Vater   *Väter*   'father(s)'
    Tochter *Töchter* 'daughter(s)'
    Nagel   *Nägel* 'nail(s)'

Second, when an affix expresses two different morphological meanings simultaneously, we have **cumulative expression** (also called **fusion**). For example, the Serbian noun OVCA 'sheep' has the number and case forms shown in (4.3).

(4.3)

	SINGULAR	PLURAL
NOMINATIVE	*ovc-a*	*ovc-e*
ACCUSATIVE	*ovc-u*	*ovc-e*
GENITIVE	*ovc-e*	*ovac-a*
DATIVE	*ovc-i*	*ovc-ama*
INSTRUMENTAL	*ovc-om*	*ovc-ama*
VOCATIVE	*ovc-o*	*ovc-e*

Clearly, it is not possible to isolate separate singular or plural or nominative or accusative (etc.) morphemes. The suffixes that follow the stem *ov(a)c-* express number and case simultaneously, or, in the technical term of morphology, cumulatively. Cumulative or fused expression is most often illustrated with different inflectional meanings, but it is also possible for an inflectional meaning and a derivational meaning to be expressed cumulatively. In Krongo, a language of Sudan, the derivational meaning 'agent'

and the inflectional meanings 'singular' and 'plural' are expressed in a single affix: *cà-/cò-* denotes 'agent/singular', and *kà-/kò-* denotes 'agent/plural'.

(4.4) *màlìŋ*   'theft'   *cà-màlìŋ*   'thief'   *kà-màlìŋ*   'thieves'
       mòtò   'work'   *cò-mòtò*   'worker' *kò-mòtò*   'workers'

(Reh 1985: 157)

A suppletive stem may also simultaneously express the base meaning and the grammatical meaning. Thus, English *worse* expresses the lexeme meaning 'bad' and the inflectional meaning 'comparative' in a cumulative way. Affixes and stems that cumulatively express two meanings that would be expected to be expressed separately are also called **portmanteau morphs**.

A particularly important phenomenon that causes problems for segmentation is the existence of words in which a morphological meaning corresponds to no overt form, i.e. a **zero affix** (or **zero expression**). Two examples are given in (4.5) and (4.6).

(4.5) Coptic
       čō-i   'my head'
       čō-k   'your (M) head'
       čō   'your (F) head'
       čō-f   'his head'
       čō-s   'her head'

(Layton 2000: 69, 103)

(4.6) Finnish
       oli-n   'I was'
       oli-t   'you were'
       oli   'he/she was'
       oli-mme   'we were'
       oli-tte   'you(PL) were'
       oli-vat   'they were'

Some morphologists have worked with the requirement that the segmentation of words into morphemes must be exhaustive and all meanings must be assigned to a morpheme. If we adopt this requirement, then we are forced to posit zero morphemes here that have a meaning, but no form (so Finnish *oli* would really have the structure *oli-Ø*, where the morpheme Ø stands for the third person singular, and Coptic *čō* would formally have the structure *čō-Ø*). But the requirement is not necessary, and alternatively one could say, for instance, that Finnish has no marker for the third person singular in verbs. To be sure, the practical difference between the affixation of an unpronounced element and no affixation at all is not great, but at a conceptual level the two approaches are substantially different. And it does seem to be the case that the latter is less far-fetched and cognitively more plausible.

Finally, the opposite of zero affixes can also be found: apparent cases of morphemes that have form but no meaning (called **empty morphs**). For example, in Lezgian all nominal case-forms except for the absolutive case (i.e.

the most basic case) arguably contain a suffix that follows the noun stem and precedes the case suffix. In (4.7), four of Lezgian's sixteen cases are shown.

(4.7) ABSOLUTIVE *sew*   *fil*   *Rahim*
       GENITIVE   *sew-re-n*   *fil-di-n*   *Rahim-a-n*
       DATIVE   *sew-re-z*   *fil-di-z*   *Rahim-a-z*
       SUBESSIVE   *sew-re-k*   *fil-di-k*   *Rahim-a-k*
                   'bear'   'elephant'   (male name)
                                        (Haspelmath 1993: 74–5)

Under this analysis, the suffixes *-re*, *-di* and *-a* have no meaning, but they must be posited if we want to have a maximally general description. With the notion of an empty morph we can say that different nouns select different suppletive stem suffixes, but that the actual case suffixes that are affixed to the stem are uniform for all nouns. The alternative would be to say that the genitive suffix has several different suppletive allomorphs (*-ren*, *-din*, *-an*), the dative case has several different allomorphs (*-rez*, *-diz*, *-az*), and so on. But such a description would be inelegant, missing the obvious and exceptionless generalization that the non-absolutive case suffixes share an element.

In all four of these examples we find a similar problem for morphological segmentation. We can identify a morphological pattern which applies to the word, but it is difficult or impossible to segment a proper morpheme. This has undesirable consequences for the hypothesis of a morpheme lexicon in at least two ways. First, in Section 1.1 we defined a morpheme as the smallest meaningful part of a linguistic expression that can be identified by segmentation. However, empty morphs have no meaning, and zero affixes have no form and therefore cannot be segmented. So positing zero affixes and empty morphs allows for a maximally economical lexicon, but if we incorporate these devices, we must expand the idea of what counts as a 'morpheme' lexical entry. And allowing lexical entries that can have form but no meaning, or the reverse, greatly reduces the restrictiveness of the morpheme-based model.

Second, non-segmentable morphological patterns may force the morphological system to become more complicated in other ways. For instance, in Tiv, some classes of words express the imperative with a high tone on the final syllable. This is thus a kind of base modification. (In this analysis, the low tones on non-final syllables are filled in by default.)

(4.8) ROOT   IMPERATIVE   GLOSS
       kimbi   *kìmbí*   'pay'
       kəŋgəsə   *kə̀ŋgə̀sə́*   'chew cud'
       de   *dé*   'leave'
       gba   *gbá*   'fall'
       vá   *vá*   'come'
                            (based on Abraham 1940: 29)

Since this pattern is completely regular, it is possible here to argue that the lexicon contains only the root, and that the imperative is derived by

a rule of tone assignment. However, note that under such an analysis, the imperative meaning is carried by the rule, not by an affixal lexical entry. So some inflectional meanings are associated with lexical entries, and some with rules. It seems undesirable to complicate our description of the morphological system in this way, but this problem cannot be easily resolved if the primary goal is to maintain a maximally economical lexicon.

In short, a morpheme lexicon seeks to minimize the information in the lexicon by subsuming as much information as possible under general principles of grammar, and including in the lexicon only that information that is unpredictable. This approach has the advantage of being highly elegant if (and only if) it is empirically adequate, and if a minimal lexicon does not lead to complications elsewhere in the morphological system. However, a morpheme lexicon often runs into one or both kinds of problems, depending upon the morphological patterns of a given language. There are thus quite a few problems that are faced by any attempt to make morphemes (in the sense of minimal morphological constituents) the cornerstone of morphological analysis and the basic unit of the lexicon. The major issues are summarized in Table 4.1.

Problems for a morpheme lexicon	Example
Unpredictable meaning of derived lexemes	*Reader* (British academic) does not mean *read + -er*
Lack of morpheme segmentability	
Base modification	German plurals, e.g. *Mütter*
Cumulative expression	Serbian noun paradigm, e.g. *ovc-a*
Zero expression	Finnish third person singular, e.g. *oli*
Empty morphs	Lezgian non-absolutive noun paradigm, e.g., *sew-re-n*

Table 4.1 Problems for a morpheme lexicon: summary

4.2 A strict word-form lexicon?

An alternative hypothesis is that the lexicon consists entirely of word-forms, both simple and complex. This approach is free of the problems with a morpheme lexicon that we have identified. For example, since meaning is associated in the lexicon with word-forms, not with morphemes, the meaning of a word-form need not be equal to the combined meanings of its morphemes. And morpheme segmentability becomes a significantly lesser problem if morphemes are not the basic units of the lexicon.

A word-form lexicon also has a number of other advantages. For example, it helps to explain traits unique to morphology, such as lack of productivity. Morphological patterns that can be used to create new words are called **productive**. Both derivational and inflectional patterns are often productive. Thus, the German plural suffix *-en* (e.g. *Fahrt* 'trip', plural *Fahrt-en* 'trips') can create new words when it is applied to new bases such as loanwords (e.g. *Box* 'loudspeaker unit', borrowed from English *box*, in German receives the plural *Box-en*). True novel words are far less common than novel sentences, and most of the time we use words that we have used many times before. But, in principle, morphology is like syntax in that it may be productive.

From this perspective, what is really remarkable about morphology is that morphological patterns may also be **unproductive**. For example, there are a number of English action nouns containing *-al* (some of which are listed in (4.9a)). As the hypothetical but unacceptable forms in (4.9b) show, there are many verbs to which this suffix cannot be applied.

(4.9)   a.   *refusal, revival, dismissal, upheaval, arrival, bestowal, denial, betrayal*
        b.   **repairal, *ignoral, *amusal, *belial, *debuggal*

But the crucial point is one that cannot be made by giving examples: the suffix *-al* cannot be used at all to form novel lexemes in English. The list of nouns formed with *-al* is fixed (it contains 35 nouns according to the *OED*), and no new nouns can be added to this list.

The reason why languages may have unproductive morphological patterns is that complex words, like simple words, are stored in the lexicon. Since it cannot be predicted that these verbs have an action noun in *-al*, the lexicon contains the nouns *arrival, refusal, denial,* in addition to *arrive, refuse,* and *deny*. When English speakers use a noun like *arrival*, in all likelihood they simply retrieve it from their lexicon rather than constructing it on the fly.

A variety of complex words must therefore be listed in the lexicon. At the very least, the list includes complex words for which a suffix is unproductive and thus unpredictable (like *arrival*), and those for which the meaning is unpredictable (like *Reader* in the British academic sense). Faced with these 'exceptions', we could conclude that there is overwhelming evidence in favour of word-based structure, that the word-based model is therefore superior to the morpheme-based model and that we do not need morphemes at all in morphology. This is the essence of a strict word-form lexicon, and a number of morphologists have drawn this conclusion. But at this stage a few words of caution seem in order. There are some apparent, and some real, problems with the hypothesis of a strict word-form lexicon.

First, should we worry about the inherent lack of elegance in a theory that lists all words? The answer depends upon which goal(s) of morphological research we consider most important. In addition to elegant description,

in our morphological description we aim for cognitive realism, system-external explanation and restrictive architecture. There are indications that a word-form lexicon is more cognitively realistic than a morpheme lexicon. Speakers remember a word not only if it is unpredictable, but also if it is very frequent. This is a general feature of animal (including human) cognition: the more often something is encountered, the more easily it is remembered (for instance, the more often a pianist plays a piece, the sooner she or he will be able to play it by heart). This applies to words, whether predictable or unpredictable, as to anything else. This is thus a classic case in which different goals of morphological research lead to a conflict. And to the degree that cognitive realism is given greater priority than elegance, we need not be very concerned about the lack of elegance of a word-form lexicon. Of course, if we prioritize elegance, we would not find a word-form lexicon to be very satisfactory.

Second, a common argument against a strict word-form lexicon relates to **agglutinative languages** such as Turkish. In Turkish, words can be quite long; see (4.10). According to one count, 20% of Turkish words have at least five morphemes (Hankamer 1989), and it is possible (though certainly not common) for Turkish verbs to contain ten or more inflectional morphemes.

(4.10) a. *oku-r-sa-m*
            read-AOR-COND-1SG
            'If I read…'

     b. *oku-malı-y-mış-ız*
            read-NEC-be-REP.PST-1PL
            'They say that we have to read.'

     c. *okú-ya-ma-yabil-ir-im*
            read-POT-NEG-POT-AOR-1SG
            'I might not be able to read.'

(Kornfilt 1997: 367–75)

Moreover, the inflectional system contains dozens of verbal affixes. Not all can co-occur (e.g. a word can have only one subject agreement marker). Still, the combinatory possibilities entail that every verb root can appear in a very large number of word-forms – at least 2,000. Multiplied by thousands of verbs, it seems completely impossible to memorize all forms of all verbs that a speaker might want to use (Hankamer 1989).

Certainly agglutinative languages present a challenge to claims of a strict word-form lexicon, but it is not clear whether languages like Turkish are really problematic. It may be possible to assume a weaker version of the word-form lexicon, according to which a speaker memorizes all word-forms that they have heard, or that they have heard a certain number of times. This issue remains to be investigated.

A more significant problem is that there is some evidence that speakers themselves see words as consisting of morphemes. Some linguists have

claimed that morphological rules never make reference to word-internal structure, so there is no need to assume that words 'have structure' once they have been formed according to the rules. But this does not seem quite right. For one thing, allomorphy is often conditioned by the morphological structure of the base. For example, Dutch past participles are marked by the prefix *ge-* (e.g. *spreken* 'speak', *ge-sproken* 'spoken') unless the verb bears a derivational prefix such as *be-* (e.g. *be-spreken* 'discuss', *be-sproken* 'discussed', not **ge-be-sproken*). The Sanskrit converb is formed by the suffix *-tvā* if the verb has no prefix (e.g. *ga-tvā* 'having gone', *nī-tvā* 'having led'), but by the suffix *-ya* if the verb has a prefix (e.g. *ā-gam-ya* 'having come', not **ā-ga-tvā*; **pari-ṇī-tvā*) (Carstairs-McCarthy 1993). This pattern would be very difficult to describe if we think that speakers have no knowledge of which stems have prefixes.

Finally, morphemes also seem to have relevance for phonology. For example, many languages have phonological **morpheme structure conditions** – i.e. restrictions on the co-occurrence of sounds within a morpheme. For example, English allows combinations such as [tθ] and [dθ] in complex words like *eighth* and *width*, but not within a single morpheme. German allows syllable-final consonant clusters such as [rpsts] as in *Herbst-s* (genitive of *Herbst* 'autumn'), but within a single morpheme four consonants (e.g. [rpst]) are the maximum. In addition, alternations may be sensitive to morpheme boundaries. Standard Northern Italian has an alternation in the pronunciation of *s* between [s] and [z], whereby [z] is chosen if the *s* occurs between vowels (e.g. *casa* [-z-] 'house') and [s] is chosen elsewhere (e.g. *santo* [s-] 'saint'). However, if the *s* is morpheme-initial, it is pronounced [s] even if it occurs between vowels (e.g. *asimmetrico* [-s-] 'asymmetric', *risocializzare* 'resocialize') (Baroni 2001). These phenomena, too, seem to require that we recognize morphemes as real entities.

A strict word-form lexicon is thus faced with a number of problems, which are summarized in Table 4.2. These facts make the strict word-form lexicon hypothesis less than fully satisfactory.

Problems for a strict word-form lexicon	Example
Some morphological patterns necessarily refer to morpheme-based structures	Conditions on Dutch past participle prefix *ge-*
Some phonological patterns necessarily refer to morpheme-based structures	Italian *asimmetrico* pronounced with [s], not [z], because of morpheme boundary
Speakers are unlikely to memorize all word-forms in rich inflectional languages	Turkish

Table 4.2 Problems for a strict word-form lexicon: summary

4.3 Reconciling word-forms and morphemes

Thankfully, the evidence for morphemes as real entities is compatible with a lexicon in which most lexical entries consist of (complex) words. This is because it is possible to treat a morpheme as a generalization based on word-forms in the lexicon.

For instance, according to the hypothesis of a moderate word-form lexicon, both the complex lexemes in (4.11) and the morphemes in (4.12) can be lexical entries. The latter are descriptions of patterns found among words in the lexicon.

(4.11) word lexical entries (Russian)

    a. $\left[\begin{array}{l}/\text{ruka}/_{\text{N}} \\ \text{'hand.\textsc{nom.sg}'}\end{array}\right]$ b. $\left[\begin{array}{l}/\text{ruku}/_{\text{N}} \\ \text{'hand.\textsc{acc.sg}'}\end{array}\right]$

    c. $\left[\begin{array}{l}/\text{rïba}/_{\text{N}} \\ \text{'fish.\textsc{nom.sg}'}\end{array}\right]$ d. $\left[\begin{array}{l}/\text{rïbu}/_{\text{N}} \\ \text{'fish.\textsc{acc.sg}'}\end{array}\right]$

    e. $\left[\begin{array}{l}/\text{sestra}/_{\text{N}} \\ \text{'sister.\textsc{nom.sg}'}\end{array}\right]$ f. $\left[\begin{array}{l}/\text{sestru}/_{\text{N}} \\ \text{'sister.\textsc{acc.sg}'}\end{array}\right]$

(4.12) word-schema lexical entries (Russian)

    a. suffixes

        $\left[\begin{array}{l}/\text{Xa}/_{\text{N}} \\ \text{'\textit{x}.\textsc{nom.sg}'}\end{array}\right]$ $\left[\begin{array}{l}/\text{Xu}/_{\text{N}} \\ \text{'\textit{x}.\textsc{acc.sg}'}\end{array}\right]$

    b. roots

        $\left[\begin{array}{l}/\text{rukX}/_{\text{N}} \\ \text{'hand'}\end{array}\right]$ $\left[\begin{array}{l}/\text{rïbX}/_{\text{N}} \\ \text{'fish'}\end{array}\right]$ $\left[\begin{array}{l}/\text{sestrX}/_{\text{N}} \\ \text{'sister'}\end{array}\right]$

Note that in (4.11), the lexical entries are presented using the word-schema formalism from Chapter 3. This formalism is useful because under the hypothesis of a moderate word-form lexicon, it is more accurate to say that a *morphological pattern*, rather than a morpheme, can be a lexical entry. In other words, 'morpheme' lexical entries need not be restricted to roots or affixes in a moderate word-form lexicon. We will often continue to talk about the contents of the lexicon in terms of morphemes for the sake of convenience, but it is important to remember that the same principles also apply to morphological patterns that are not as easily described in terms of morphemes.

The primary difference between this approach and the strict word-form lexicon lies in the status of morphological patterns. In a moderate word-form lexicon, word-forms are still primary, but morphological patterns, including ones that we can identify as 'morphemes', are allowed a secondary role and they can be lexical entries. Under this view, many complex words will be listed in the lexicon, but some will be composed on the fly from component parts when needed. From here on, the terms *word-form lexicon* and *word-*

based model will be used to refer to this approach, rather than the more rigid word-form-only approach to the lexicon discussed above.

In Section 3.2.2, where the word-based model was first discussed, it was taken for granted that both predictable complex word-forms and morphological patterns are lexical entries. In other words, that discussion already assumed the hypothesis of the moderate word-form lexicon, without calling it that or justifying it. We now look at evidence for this position.

A moderate word-form lexicon faces an immediate challenge. If the lexicon consists of both word-forms and morphemes, in our description we must determine which words are directly stored in the lexicon, and which are composed on the fly from morphemes. While most morphologists agree that all simple and at least some complex words are listed in speakers' lexicons, it is difficult to say which complex words are listed and which ones are not.

Part of the issue has to do with the fact that any language contains both words that are familiar to most speakers (such as *mis-represent* and *global-ize* in English) and words that are novel and were perhaps never used before (such as *mis-transliterate* and *bagel-ize*, two words that we have just made up). Morphologists refer to these two types of words as **actual words** and **possible words** (or **usual** and **potential words**). Thus, the set of words in a language is never quite fixed. Speakers have the capacity to create, and hearers can understand, an almost unlimited number of new words. Dictionaries can record only the actual words, but at any time a speaker may use a possible (but non-actual) word, and, if it is picked up by other speakers, it may join the set of actual words (thus, if the number of bagel shops in Europe continues to grow, people will perhaps start saying that Europe is being *bagelized*). Attested novel lexemes that were not observed before in the language are called **neologisms**, and neologisms that do not really catch on and are restricted to occasional occurrences are called **occasionalisms** (or **nonce formations**). Most occasionalisms are probably never recorded, and, even among those that are recorded, many disappear soon afterwards. For instance, in 1943 the new word *deglamorize* was observed and recorded by a linguist, perhaps because it was used repeatedly around that time (Algeo 1991). But it seems that the word has not caught on and has not really become part of the English lexicon (even though the *OED* records it). Around the same time, the word *decolonize* arose. This word was more successful, and most English speakers nowadays know it. It has thus become a truly actual word of English. On a practical level, then, it is simply not possible to document which rare words have been encountered (and sufficiently well remembered) by which speakers. With a word-form lexicon (strict or moderate), we would be forced to decide how established a word must be in the language to be memorized by speakers.

Additionally, and more importantly, many linguists argue that the hypothesis of a moderate word-form lexicon also faces a complex challenge

related to how speakers recall words stored in the lexicon. Imagine that the language user has just heard the word *insane*. If both morphemes and word-forms are stored in the lexicon, that person can retrieve the meaning of the word from his mental lexicon in two different ways – either by breaking the word into its component morphemes and looking each up (*in-*, *sane*), or by looking up the word-form directly (*insane*), assuming it is stored. The process of looking up a word in the lexicon is known as **lexical access**. When lexical access occurs by breaking up words into morphemes, this is the (morphological) **decomposition route**; retrieving complex word-forms without decomposition is the **direct route**.

Which method is a language user more likely to employ? Some linguists argue that the answer is, in some sense, *both*. There is evidence that when speakers need to retrieve a word from the lexicon, they try both routes simultaneously. The 'winner' is whichever method is faster in accessing the information. Lexical access is thus a kind of race which exists to make the mental work of processing language more efficient. This postulation is represented in Figure 4.2. The solid lines indicate lexical access via the decomposition route. The dashed line indicates lexical access via the direct route. (We will return to the thickness of the circles in the discussion below.)
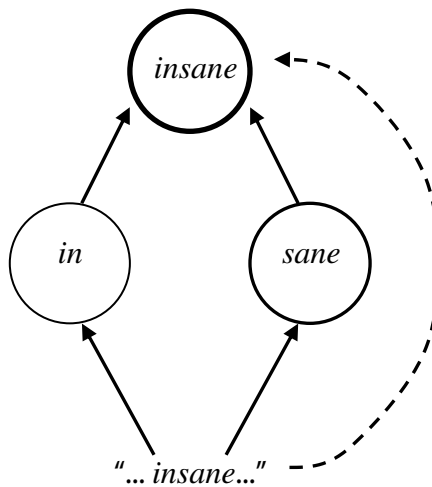

Figure 4.2: A schematized dual-route model of lexical access (Hay 2001: 1045)

Given that the decomposition route and the direct route compete to retrieve words, a natural question is: What determines which route wins? There seems to be a variety of relevant factors; here we discuss three:

frequency, morpheme segmentability and allomorphy. These factors may all support the same route, or they may conflict. Lexical access, and by extension also the contents of the lexicon, are thus quite complicated.[2]

First, there is a general consensus among linguists that speakers have detailed (subconscious) knowledge of how frequently a word is used. Metaphorically, this can be thought of as a representation of how well a person remembers a word. In a basic sense, lexical entries (both word-forms and morphemes) that are used more frequently – i.e. items that have a higher **token frequency** – are more firmly established in a person's memory, and have a stronger representation in the lexicon. We will say that these words have greater **memory strength**. Those that are used less have less memory strength. In Figure 4.2 above, the thickness of the circles represents token frequency (thicker = more frequently used = greater memory strength).

Frequently used words can be accessed more quickly. As a consequence, token frequency strongly influences the representation of complex words in the lexicon: if the word-form has a higher frequency than its base (all other factors being equal), it is more likely to be accessed via the direct route (Hay 2001). This is the scenario represented in Figure 4.2. In this case, the complex word *insane* is more common in English than the word *sane*. According to one count, the word-form *sane* is used about 8 times in every 1 million words of written text. *Insane* is used 14 times per million words (CELEX English database, Baayen *et al.* 1995). This difference leads *insane* to have greater memory strength, and the direct route – represented by the dashed line – wins. Conversely, whenever the root is more common (again, all else equal), decomposition is more likely.

The second factor affecting whether a complex word is stored in the lexicon is segmentability. Complex words with segmentable affixes are intuitively more likely to be stored according to these affixes. Words that display morphological patterns which are less segmentable, such as base modification, are more likely to be stored as word-forms.

Third, affixes that induce allomorphy in the base to which the affix attaches are less likely to be decomposed into morphemes than are affixes which do not cause allomorphy in the base. Examples of phonological allomorphy induced by the English suffix *-ity* are given in (4.13a). The final [k] in *electric* changes to an [s] in *electricity*, and the stress changes syllables. In *divinity*, the vowel changes quality. By contrast in the (b) examples, adding *-ship* to a base does not change its phonological shape.

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[2] It should be noted that lexical access is different from lexical content. This means that how a lexical entry is accessed is not exactly the same as what is listed in the lexicon. In this chapter we are interested in the latter issue. Nonetheless, the two are closely related, so we will assume that the same factors are important for both.

(4.13) a. base allomorphy induced by *–ity*: *electric – electricity, divine – divinity*
b. no base allomorphy induced by *–ship*: *ambassador – ambassadorship, representative – representativeship*

We can perhaps think of these last two issues in terms of the saliency of the internal morphemic structure of a complex word-form. When morphemes are segmentable and do not have multiple allomorphs, the internal structure may be more salient because the boundaries between morphemes are easier to identify. A summary of all three factors is given in Table 4.3.

Factors	Direction of influence
Relative token frequency of word-form	More frequent → word-form storage
Segmentability	Less segmentable → word-form storage
Allomorphy	More effect on base → word-form storage

Table 4.3 Three factors influencing lexical storage: summary

Finally, an important issue is whether decomposition entails full decomposition. The discussion above considered only words with two morphemes, but of course, words can have more than two morphemes, e.g. *insanely* (*in+sane+ly*). It is unlikely that *insanely* is directly listed in the lexicon because *insanely* is used much less frequently than is *insane* (less than one time in every one million words), and all three morphemes are easily segmented. But it is not entirely clear how *insanely* is decomposed. Is it stored in the lexicon with three separate lexical entries (*in-, sane, -ly*), or as two (*insane, -ly*)? There is some evidence that the latter is probably correct in this case, based primarily on the relative frequency of *sane* and *insane*. Decomposition thus does not necessarily entail full decomposition into component morphemes.

Ultimately, the structure of the lexicon is a very active area of research, but the evidence increasingly suggests that while both morphemes and words are listed, the balance is easily tipped in favour of word-based storage. This suggests that the lexicon, and thus morphology more generally, are fundamentally word-based. While a moderate word-form lexicon is not very economical, research to date suggests that it is the most cognitively realistic of the three proposals.

Summary of Chapter 4

A language user's mental dictionary is the lexicon. A major theoretical issue is whether the lexicon consists of morphemes or word-forms. This is important because lexical entries are the fundamental building blocks of morphological structure. There are several problems with the hypothesis of a morpheme lexicon, including the non-compositional meaning of many derived lexemes, and problems breaking words into morphemes, including base modification patterns, cumulative expression, zero affixes and empty morphs. Still, there are also problems with the strict word-form lexicon hypothesis, for example, some types of morphological rules seem to rely on the concept of the morpheme, and morphemes may have a real status for speakers. Combined with factors (e.g. frequency) that seem to promote decompositional route (morpheme-based) lexical access under some conditions and direct route (word-based) lexical access under others, the best conclusion is that morphological structure is fundamentally word-based, but morphemes (or more properly, morphological patterns) represent secondary generalizations. Word-forms, morphemes and derived stems are all stored in the lexicon.

Further reading

Classic works on the lexicon and lexical access include Butterworth (1983) and Taft and Forster (1975). The papers in Feldman (1995) and Baayen and Schreuder (2003) discuss a wide variety of issues related to morphological processing, and the papers in Jarema and Libben (2007) provide current perspectives on the structure of the lexicon from a psycholinguistic perspective.

For details of a parallel dual-route model, see Schreuder and Baayen (1999). Also, Hay (2003) demonstrates the role of relative frequency, Jarvikivi *et al*. (2006) look at allomorphy, and Bertram *et al*. (2000) discuss more generally the complex interaction of factors which promote or inhibit morphological decomposition.

Pinker (1991) and Clahsen *et al*. (1997) represent an opposing view that words with irregular inflection are accessed as whole word-forms, but regularly inflected words are always decomposed. Similarly, Caramazza *et al*. (1988) and Taft (1994) give greater weight to morphological decomposition.

Non-psycholinguistic models of morphology are also divided over whether morphemes, stems, or whole words are the fundamental units of morphological structure. See the Further reading section in Chapter 3 for references.

Comprehension exercises

1. Which of the following English words are actual, possible and impossible?

   replay, libertarian, itinerance, reknow, fraternitarian, penchance, rebagelize, abundance, happytarian

2. Which of the following words have compositional meaning, and which have non-compositional meaning?

   a. *ability, popularity, community, morality, authority*
   b. *materialize, modernize, legalize, vaporize, specialize*

3. Look again at the words in question 2. According to the hypothesis of a moderate word-form lexicon, the words in (a) are more likely to be stored as whole word-forms than the words in (b). Why? What is the most relevant factor that distinguishes the two groups? (Ignore frequency, since the necessary information is not provided.)

4. For each of the following languages, determine whether the examples exhibit cumulative expression, empty morphs or zero expression. (Some may exhibit more than one of these features.) Explain your answers.

   a. Finnish pronouns (partial paradigm)

	1ST P. PL	2ND P. PL	3RD P. PL
NOM	*me* 'we'	*te* 'you'	*he* 'they'
GEN	*meidän*	*teidän*	*heidän*
PAR	*meitä*	*teitä*	*heitä*
ESS	*meinä*	*teinä*	*heinä*
INESS	*meissä*	*teissä*	*heissä*
ELA	*meistä*	*teistä*	*heistä*

   b. Ndebele imperative verbs

ROOT	IMPERATIVE	GLOSS
lim-	*lima*	'cultivate!'
nambith-	*nambitha*	'taste!'
dl-	*yidla*	'eat!'
m-	*yima*	'stand!'
z-	*yiza*	'come!'
lw-	*yilwa*	'fight!'

   (Inkelas and Zoll 2000: 5)

   c. Serbian present tense verbs: GOVORITI 'to speak, say' and TRESTI 'to shake'

	SINGULAR	PLURAL
1ST PERSON	*govorim*	*govorimo*
2ND PERSON	*govoriš*	*govorite*
3RD PERSON	*govori*	*govore*

	SINGULAR	PLURAL
1ST PERSON	*tresem*	*tresemo*
2ND PERSON	*treseš*	*tresete*
3RD PERSON	*trese*	*tresu*

Exploratory exercise

In this chapter we argued that frequency has an effect on whether a complex word is directly given in the lexicon. But we did not ask two important methodological questions: if it is possible for a word-form like *insane* to be stored in the lexicon either via morphemes or directly, how can we, as researchers, know how the word is stored? And how can we know that frequency is an important factor? After all, we cannot directly observe the contents of the lexicon. There are a handful of methods for testing the content of the lexicon, and factors related to it. This research exercise has two purposes: first, to introduce one of these methods, and second, to test the hypothesized relationship between frequency and lexical storage that was presented in this chapter.

The basic methodology involves asking speakers to judge how related two words are to each other in meaning. For target items (i.e. the ones that are the focus of interest), one of the words is complex and the other is its base. The assumption underpinning this task is that speakers should judge complex words that are stored as morphemes as being closely related in meaning to their bases because the base and the complex word share a lexical entry. Thus, for example, if *insane* is stored in the lexicon according to the morphemes *in-* and *sane*, the meaning of the entire word should depend closely on the meaning of *sane*. By contrast, a complex word that is stored as its own lexical entry may be judged as less close in meaning to its root because the two are formally distinct in the lexicon. By manipulating the frequency of the complex word, we can test for a correlation between frequency and meaning closeness. And under the assumption that meaning closeness reflects lexical storage, a correlation (or lack thereof) should indicate whether frequency influences lexical storage.

The instructions below use English for demonstration purposes because it is a language that all readers are familiar with. However, this exercise could be conducted using virtually any language.

Instructions

Step 1: Choose an affix to study. The best choices will be ones that (a) frequently attach to monomorphemic bases, as opposed to only attaching to already-derived stems, and (b) create a new lexeme rather than a word-form of the same lexeme (see Section 2.1 for this distinction). For example, for English we might choose to study the suffix *-ity* (*obscurity, immensity*, etc.).

Step 2: Create words to be used in the experiment. Make a list of words containing the affix that you chose in Step 1. Also use a frequency dictionary (i.e. a dictionary that gives counts of how frequently a particular word-form is used) or a written or spoken corpus of the language to gather information about the token frequency of these words. Then, sort them into 'frequent' and 'infrequent' groups. (You may want to remove words of intermediate frequency, to create two maximally distinct frequency groups.) A few examples for *-ity* are given below. Of course, you will need a longer list of words.

Complex word	Freq/Infreq	Root
obscurity	infrequent	*obscure*
acidity	infrequent	*acid*
modernity	infrequent	*modern*
opportunity	frequent	*opportune*
priority	frequent	*prior*
security	frequent	*secure*

Table 4.4 Exploratory exercise: possible stimuli

Tips for finding words: For some languages, online dictionaries can be searched to find all words that contain some sequence of letters in a particular word position (e.g. the letters *ity* at the end of the word). Look for ones that allow wildcard searching. Some languages also have freely available online corpora that can be used in the same way. Also, if you have chosen a suffix rather than a prefix, find out whether the language has a reverse dictionary. In a reverse dictionary, entries are alphabetized from the end of the word to the beginning, rather than the usual beginning-to-end method. This groups all words with a given suffix together (assuming the word ends with the suffix), making examples easier to find.

Next, add a variety of 'filler' words. The fillers should be derived lexemes that range in semantic similarity to their roots, but do not contain the affix that you chose in Step 1. For example, at one end of the scale might be words like *helpful*, which is very similar in meaning to *help*, at the other end of the scale words like *awful*, which is not at all similar to *awe*, and in the middle words like *artful*. You might even want to include 'false' derived lexemes. For example, *defend* looks like it can be broken into two morphemes (*de-fend*) because *de-* is sometimes a prefix (e.g. *de-regulate*) and *fend* is a real word, but this would be a false segmentation. The fillers are included primarily to create a wide range of pairs of words. They also help to distract the speaker from the purpose of the study, namely studying the effects of frequency. (People do strange things when they think they know what you want them to say!)

Write each of the target words and its root on an index card, with the complex word first. For example, one card might be *obscurity-obscure*. Do the same for the filler words.

Alternative procedure: Hay (2001) argues that *relative frequency* is more important for lexical access than *absolute frequency*. In other words, as far as the lexicon is concerned, a frequent complex lexeme is one that is more frequent than its base, regardless of how often it is used in absolute terms. An infrequent complex lexeme is one that is less frequent than its base. As an alternative in Step 3, choose words that are frequent or infrequent in this relative sense. (Warning: This is much more difficult!)

Step 3: Review the discussion in Section 4.3 about frequency. This discussion represents the hypothesis about the relationship between frequency and word-form storage in the lexicon. Based on this discussion, develop specific predictions. Predictions are expectations about how the data will turn out if the hypothesis is correct. Based on what you have read, how do you expect frequency of the complex word to be related to speakers' judgements about semantic relatedness of a complex word and its root? For example, do you expect the words to be judged to be further apart in meaning when the complex word is frequent? Do you expect the opposite? Or no relationship between the frequency and meaning closeness? Explain the rationale behind your prediction. Remember to also consider what data you would expect to find if the hypothesis is *not* true.

Step 4: Run the study. Find native speakers of the language who are willing to participate in the project. Several participants is ideal, but even a few people can produce interesting results. Present them with each card. Ask them to 'Rate how much the meaning of the first word is related to the meaning of the second word on a scale from 1 to 7 in which 7 means "very related" and 1 means "not at all related".' Write down the rating for each card and each speaker. Hint: The target word cards should be presented in random order, with fillers mixed in. However, it helps if the first 5–10 cards are filler pairs representing different points on the scale. This allows the subject to practise and calibrate her/his judgements.

Step 5: Analyze the data. Determine whether ratings differ depending upon the frequency of the complex word. Was your prediction upheld? At the same time, also consider factors that are not directly related to the research questions but may have affected the results. For example, did all speakers give similar ratings? Did all frequent (or infrequent) target words produce similar ratings? If not, this may suggest other issues that the study did not take into consideration. Also think about the impact of the methodology. For example, is semantic transparency a good measure of word-based vs. morpheme-based listing? Why or why not? Will a complex word that has its own lexical entry always lead speakers to assign lower semantic relatedness ratings? Why or why not?

Step 6: Draw conclusions. If your prediction was upheld, does this

suggest that the hypothesis is correct? Why or why not? If your prediction was not upheld, what does this suggest? In short, what do the data indicate about the relationship between frequency, semantic transparency and the content of the lexicon?

Inflection and derivation

5

In this chapter, we discuss inflection and derivation in greater depth. As we saw in Section 2.1, this conceptual distinction is quite basic to most morphological theorizing and terminology, though it is not always easy to determine the relation between two word-forms: does *nicely* belong to a separate lexeme from *nice*, or are both word-forms in the paradigm of NICE? In other words, is the suffix *-ly* that is attached to *nice* to form *nicely* a **derivational** suffix or an **inflectional** suffix?

We survey inflectional functions in Section 5.1 and derivational meanings in Section 5.2. In Section 5.3 we examine a range of properties that have been proposed as distinguishing between inflection and derivation, and between two subtypes of inflection. Section 5.4 gives an overview of the ways in which the relation between inflection and derivation has been conceptualized by morphologists. The two most important views are the dichotomy approach, which argues that complex words can be neatly divided into two disjoint classes, and the continuum approach, which claims that morphological patterns are best understood as lying on a continuum ranging from the most clearly inflectional patterns to the most clearly derivational patterns. Finally, in Section 5.5 we briefly show some implications of these views for how linguists model the relationship between morphology and syntax.

5.1 Inflectional values

Morphologists usually talk in quite different terms about inflection and derivation. For instance, the different inflectional formations are referred to as expressing **inflectional values** (or **inflectional feature values**), so we say, for instance, that English verbs express the inflectional values 'present' (e.g. *(he/she) walks*) and 'past' (e.g. *(he/she) walked*). But for derived lexemes like *walker* we would not normally say that it represents a 'derivational value'

('agent noun') – instead we simply talk about derivational meanings. One reason for this distinction is that inflectional values often do not have a clearly identifiable meaning, only a syntactic function. For example, *walks* differs from *walk* in that *walks* is used when the subject is third person singular (*she, he, it*) and *walk* is used with other subjects (*I, you, we, they*), but many linguists feel uncomfortable calling this a difference of meaning because it is quite abstract.

Different languages vary quite dramatically in the amount of inflectional complexity that their words exhibit. Some languages, such as Vietnamese and Igbo, a language of Nigeria, have no (or virtually no) inflectional values, and others have inflection for more than a dozen values (though it is uncommon for a single word-form to be inflected for more than half a dozen values). However, despite all this diversity, the types of inflectional values that we find across languages are surprisingly uniform. Perhaps more than two-thirds of all inflectional values fall into one of the classes of Table 5.1.

On nouns, pronouns	On verbs	On adjectives, demonstratives, relative pronouns, adpositions
number (SINGULAR, PLURAL,…)	**number** (SINGULAR, PLURAL,…)	**number** (SINGULAR, PLURAL,…)
case (NOMINATIVE, ACCUSATIVE,…)	**person** (1ST, 2ND, 3RD)	**case** (NOMINATIVE, ACCUSATIVE,…)
gender (MASCULINE, FEMININE,…)	**tense** (PRESENT, FUTURE, PAST, …)	**gender** (MASCULINE, FEMININE,…)
person (1ST, 2ND, 3RD)	**aspect** (PERFECTIVE, IMPERFECTIVE, HABITUAL, …)	**person** (1ST, 2ND, 3RD)
	mood (INDICATIVE, SUBJUNCTIVE, IMPERATIVE,…)	

Table 5.1 Common inflectional features and values

As the organization of Table 5.1 suggests, inflectional values are often naturally grouped together into super-categories that we will call

inflectional features.[1] Two values belong to the same feature if they share a semantic (or more generally, functional) property and are mutually exclusive. For instance, the English present and past tenses both have to do with when an event happens, relative to the moment of speaking (so they share a semantic property), and they cannot occur together in the same verb (they are mutually exclusive). Thus, they are values of the feature 'tense'.

We have already seen **number** and **case** inflection of nouns, e.g. in Latin (repeated as Figure 5.1).[2] The number feature is self-evident; it indicates quantity. Case indicates the semantic and syntactic role of a noun in a sentence. A given case may express many roles, but one is usually considered basic. Among the Latin cases, **nominative** canonically marks subjects and is the citation form, **accusative** marks direct objects, and **dative** marks indirect objects. **Genitive** canonically indicates the possessor ('s in *student's book* is a genitive marker and one of the few case values in English), and **ablative** means 'movement away from'.

		number	
		SINGULAR	PLURAL
	NOMINATIVE	*insula*	*insulae*
case	ACCUSATIVE	*insulam*	*insulās*
	GENITIVE	*insulae*	*insulārum*
	DATIVE	*insulae*	*insulīs*
	ABLATIVE	*insulā*	*insulīs*

Figure 5.1 Case and number in Latin

Latin is a fairly typical language in terms of number: most languages mark **singular** and **plural** on nouns. Fewer distinguish a **dual** number, and even fewer a **paucal** number (paucal means 'a few'). Languages vary in the number of morphological cases they express; Latin has five cases, but many languages have no case distinctions at all, and a few have more than ten different cases. Typically, inflectional values of number and inflectional values of case combine freely, as shown.

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[1] Some linguists use the term *inflectional category* for our *inflectional feature*, and *inflectional property* for our *inflectional (feature) value*.

[2] See the Appendix of this chapter for notation conventions related to inflectional values.

Person distinctions are widely marked on verbs in the world's languages, but only in a limited way in English (and not even all dialects of English). The only verb to fully mark person values is *be*; there are distinct forms of *be* depending upon whether the subject refers to the speaker (**first person**), the addressee (**second person**) or a third party (**third person**), i.e. *(I) am, (you) are, (he/she/it) is*. In some languages, the verb marks person according to the value of the object, rather than the subject, or according to both (see (5.6) in Section 5.3.1 for an example from Yimas).

The features **tense, aspect** and **mood** exist to some extent in virtually all languages that have any inflection at all. Tense indicates the temporal location of a verb's action (**past**, **present**, **future**). Aspect has to do with the internal temporal constituency of an event, for example, whether the action is viewed as completed (**perfective**), non-completed (**imperfective**), **habitual**, etc. Finally, mood denotes the certainty, desirability or conditionality of an event. It subsumes a wider range of inflectional values, including the **imperative** (commands), **subjunctive** (non-realized events) and **indicative** (events viewed as objective facts).

The three feature names 'tense', 'aspect' and 'mood' suggest that values from these different features can be combined in the same way that case and number, or person and number, can be freely combined. Indeed, this is sometimes possible, for instance, in Latin, which has three tense values (present, past, future), two aspect values (infectum and perfectum; the latter is similar to the English perfect) and two mood values (indicative and subjunctive). See Figure 5.2.

	INDICATIVE			SUBJUNCTIVE	
	INFECTUM	PERFECTUM		INFECTUM	PERFECTUM
PRESENT	*canta-t*	*canta-v-it*	PRESENT	*cant-e-t*	*canta-v-eri-t*
PAST	*canta-ba-t*	*canta-v-era-t*	PAST	*canta-re-t*	*canta-v-isse-t*
FUTURE	*canta-bi-t*	*canta-v-eri-t*	FUTURE	—	—

Figure 5.2 Latin tense, aspect and mood forms (third person singular)

However, the Latin system does not have all possible combinations: there are no future subjunctive forms. Moreover, this system is quite atypical in being as symmetrical as it is. In most languages, different inflectional values for tense, aspect and mood are difficult to combine. A language that contrasts with Latin in this respect is Swahili, where tense, aspect and mood are expressed by inflectional prefixes. In Figure 5.3, forms with the prefix *n(i)-* (first person singular) are given. Here, there are no obvious formal reasons for setting up such a paradigm with two mood values, three tense

INDICATIVE			
	PRESENT	PAST	FUTURE
NORMAL	*n-a-fanya*	*ni-li-fanya*	*ni-ta-fanya*
PROGRESSIVE	*ni-na-fanya*	—	—
PERFECT	*ni-me-fanya*	—	—

HYPOTHETICAL			
	PRESENT	PAST	FUTURE
NORMAL	*ni-nge-fanya*	*ni-ngali-fanya*	—
PROGRESSIVE	—	—	—
PERFECT	—	—	—

Figure 5.3 Swahili tense, aspect and mood forms (first person singular, *-fanya* 'do')

values and three aspect values because there are no word-forms to express most of the combinations. From a formal point of view, positing just a single feature ('tense/aspect/mood') with seven values is simpler and does not seem to miss crucial generalizations. Thus, many linguists nowadays work with a single feature 'tense/aspect/mood'.

The explanation for the different behaviour of the combinations 'case + number' and 'tense + aspect + mood' lies in their semantics. All combinations of different cases and numbers are roughly equally plausible because the syntactic role of a noun in a sentence is logically independent of whether the noun refers to one or many entities. By contrast, certain combinations of aspect, tense and mood are unusual or downright exotic. For instance, perfective aspect (which implies that an event is viewed in its totality) does not go together well with present tense (which implies that the speaker is still in the middle of the event). Even more obviously, the imperative mood (which expresses a command) does not combine with the past tense. It is not surprising that most languages lack straightforward inflectional means for these combinations.

Besides the inflectional values that we have seen up to now, there are quite a few others that are less easy to generalize about, but that are also less widespread. In English, adjectives have inflectional markers of **comparative** and **superlative degree** (*big, bigger, biggest*), but this kind of inflection is not common in the world's languages – it seems to be largely confined to the languages of Europe and south-western Asia.

In verbs, some languages have **passive voice** inflection, which indicates an unusual association of semantic roles and syntactic functions: the semantic **patient** is the syntactic subject (e.g. Swedish *kasta* 'throw', *kasta-s* 'be thrown'). This is the opposite of **active voice**, in which the semantic **agent** is the syntactic subject. (For more on passives, see Section 11.1.2.) And

many languages have inflectional expression of **polarity** (i.e. affirmative versus negative, e.g. Japanese *kir-u* [cut-PRS] 'cuts', *kir-ana-i* [cut-NEG-PRS] 'doesn't cut').

Finally, the most important kind of inflection that we have not already discussed is the group of **dependent verb forms**. Many languages have special verb forms that are confined to dependent clauses. Although the terminology is not uniform, a rough generalization says that verb forms marking relative clauses are called **participles**, verb forms marking adverbial clauses are called **converbs** and verb forms marking complement clauses are called **infinitives** or **masdars**. Examples of a participle, a converb and an infinitive are given in (5.1)–(5.3).

(5.1) Korean participle
   Hankwuk-ul pangmwunha-nun salam-i   nul-ko   iss-ta.
   Korea-ACC   visit-PTCP   person-NOM increase-ing be-DECL
   'Those who visit Korea are increasing.'

   (S.-J. Chang 1996: 148)

(5.2) Hindi/Urdu converb
   Banie ke   beṭe ne   ciṭṭhii   likh-kor   ḍaak mẽ ḍaal-ii.
   grocer POSS son ERG letter(F).SG write-CVB box in put.PST-F.SG
   'The grocer's son wrote and posted a letter.'
   (lit. 'having written a letter, posted (it).')

(5.3) Mparntwe Arrernte infinitive
   Re   lhe-tyeke   ahentyene-ke.
   she go-INF   want-PST
   'She wanted to go.'

   (Wilkins 1989: 451)

5.2 Derivational meanings

Derivational meanings are much more diverse than inflectional values. Besides cross-linguistically widespread meanings such as **agent noun** (e.g. *drink*V → *drink-er*N), **quality noun** (e.g. *kind*A → *kind-ness*N) and **facilitative adjective** (e.g. *read*V → *read-able*A), we also find highly specific meanings that are confined to a few languages. For instance, Big Nambas, a language of the South Pacific island of Vanuatu, has a suffix *-et* that derives reverential terms from ordinary nouns (e.g. *dui* 'man' → *dui-et* 'sacred man', *navanel* 'road' → *navanel-et* 'sacred road' (Fox 1979)). And French has a suffix *-ier* that derives words for fruit trees from the corresponding fruit nouns (e.g. *pomme* 'apple' → *pomm-ier* 'apple tree', *poire* 'pear' → *poir-ier* 'pear tree', *prune* 'plum' → *prun-ier* 'plum tree').

There are too many types of derivational meaning to present here, but it is worth discussing one frequent characteristic of derivation. Derivational patterns commonly change the word-class of the base lexeme – i.e. nouns can be derived from verbs, adjectives from nouns, and so on. For such cases, the terms **denominal** ('derived from a noun'), **deverbal** ('derived from a verb') and **deadjectival** ('derived from an adjective') are in general use.

5.2.1 Derived nouns

Since creating new words for new concepts is one of the chief functions of derivational morphology, and since we have a greater need for naming diverse nominal concepts, languages generally have more means for deriving nouns than for deriving verbs and adjectives (Bauer 2002). Some common meanings with examples from various languages are listed in Table 5.2.

I.	**Deverbal nouns** (V → N)				
	agent noun[3]	English	*drink*$_V$	→	*drink-er*$_N$
		Arabic	*ħamala*$_V$	→	*ħammaal*$_N$
			'carry'		'carrier'
	patient noun	English	*invite*$_V$	→	*invit-ee*$_N$
	instrument noun	Spanish	*picar*$_V$	→	*pica-dora*$_N$
			'mince'		'meat grinder'
	action noun	Russian	*otkry-t'*$_V$	→	*otkry-tie*$_N$
			'discover'		'discovery'
II.	**Deadjectival nouns** (A → N)				
	quality noun	Japanese	*atarasi-i*$_A$	→	*atarasi-sa*$_N$
			'new'		'newness'
	person noun	Russian	*umn-yj*$_A$	→	*umn-ik*$_N$
			'smart, clever'		'clever guy'
III.	**Denominal nouns** (N → N)				
	diminutive noun	Spanish	*gat-o*	→	*gat-it-o*
			'cat'		'little cat'
	augmentative noun	Russian	*borod-a*	→	*borod-išča*
			'beard'		'huge beard'
	status noun	English	*child*	→	*child-hood*
	inhabitant noun	Arabic	*Miṣr*	→	*miṣr-iyyu*
			'Egypt'		'Egyptian'
	female noun	German	*König*	→	*König-in*
			'king'		'queen'

Table 5.2 Common derivational meanings of nouns

[3]   The glossary gives definitions of the derivational meanings in Tables 5.2–5.4.

Besides these widespread derivational meanings, many more specific derivational meanings are found in languages, but usually these are restricted to a few languages each. Thus, Russian has a suffix for nouns denoting kinds of meat (e.g. *kon'* 'horse', *kon-ina* 'horse meat'). Tagalog has a pattern for nouns meaning vendors (e.g. *kandila* 'candle', *magkakandila* 'candle vendor' (Schachter and Otanes 1972: 103)). Various sciences have developed terminological conventions for creating new technical terms by suffixation (e.g. *-itis* as a suffix for inflammatory diseases, *-ite* as a suffix for minerals, *-ide* and *-ate* as suffixes for certain kinds of chemicals, and so on).

5.2.2 Derived verbs

Verb-deriving patterns are generally less numerous and diverse. Most commonly, verbs are derived from other verbs. Denominal and deadjectival verbs are much less widespread than deverbal verbs (Bauer 2002). Again, some typical examples are given in Table 5.3.

I.	**Deverbal verbs** (V → V)				
	causative verb (see Section 11.1.4)	Korean	*cwuk-* 'die'	→	*cwuk-i-* 'kill'
	applicative verb (see Section 11.1.5)	German	*laden* 'load'	→	*be-laden* 'load onto'
	anticausative verb (see Section 11.1.2)	Swedish	*öppna* 'open (tr.)'	→	*öppna-s* 'open (intr.)'
	desiderative verb	Greenlandic	*sini-* 'sleep'	→	*sini-kkuma-* 'want to sleep'
	repetitive verb	English	*write*	→	*re-write*
	reversive verb	Swahili	*chom-a* 'stick in'	→	*chom-o-a* 'pull out'
II.	**Denominal verbs** (N → V)				
	'act like N'	Spanish	*pirat-a* 'pirate'	→	*pirat-ear* 'pirate'
	'put into N'	English	*bottle*$_N$	→	*bottle*$_V$
	'cover with N'	Russian	*sol'* 'salt'	→	*sol-it'* 'salt'
III.	**Deadjectival verbs** (A → V)				
	factitive	Russian	*čern-yj* 'black'	→	*čern-it'* 'make black'
	inchoative	Spanish	*verde* 'green'	→	*verde-ar* 'become green'

Table 5.3 Common derivational meanings of verbs

5.2.3 Derived adjectives

Derived adjectives are even less common than derived verbs, because adjectives are used more rarely than verbs, let alone nouns. Moreover, the semantic class of adjectives that is the most developed in a number of European languages, denominal **relational adjectives** (of the type *government* → *governmental*), seems to be quite rare in other areas of the world. Typical examples of derived adjectives are shown in Table 5.4.

I.	**Deverbal adjectives** (V → A)				
	facilitative	Basque	*jan* 'eat'	→	*jan-garri* 'edible'
	agentive	Spanish	*habla-r* 'talk'	→	*habla-dor* 'talkative'
II.	**Denominal adjectives** (N → A)				
	relational (= 'related to N')	Russian	*korol'* 'king'	→	*korol-evskij* 'royal'
	proprietive (= 'having N')	Ponapean	*pihl* 'water'	→	*pil-en* 'watery'
	privative (= 'lacking N')	Russian	*vod-a* 'water'	→	*bez-vod-nyj* 'waterless'
	material	German	*Kupfer* 'copper'	→	*kupfer-n* 'made of copper'
III.	**Deadjectival adjectives** (A → A)				
	attenuative	Tzutujil	*kaq* 'red'	→	*kaq-koj* 'reddish'
	intensive	Turkish	*yeni* 'new'	→	*yep-yeni* 'brand new'
	negative	German	*schön* 'beautiful'	→	*un-schön* 'ugly'

Table 5.4 Common derivational meanings of adjectives

5.3 Properties of inflection and derivation

Let us now look at the properties of inflectional and derivational morphology. The ultimate goal is to determine whether inflection and derivation have sufficiently different traits as to suggest that they represent two distinct subsystems in morphological architecture. We will call the hypothesis of a formal distinction the **dichotomy approach**. The other possibility is that we should model inflection and derivation as a continuum, with canonical inflection at one extreme, and canonical derivation at the other, but many

intermediary types. We call this the **continuum approach**. This choice has broad consequences for the relationship between morphology and syntax (discussed in Section 5.5 below), but we start by looking at some of the empirical facts underlying this debate.

Table 5.5 gives an overview of properties that differentiate inflection and derivation. Some of these are all-or-nothing properties, and others are relative, i.e. a complex word may have the property to a greater or lesser extent. We discuss these in turn below.

Inflection	Derivation
(i) relevant to the syntax	not relevant to the syntax
(ii) obligatory expression of feature	not obligatory expression
(iii) unlimited applicability	possibly limited applicability
(iv) same concept as base	new concept
(v) relatively abstract meaning	relatively concrete meaning
(vi) compositional meaning	possibly non-compositional meaning
(vii) expression at word periphery	expression close to the base
(viii) less base allomorphy	more base allomorphy
(ix) no change of word-class	sometimes changes word-class
(x) cumulative expression possible	no cumulative expression
(xi) not iterable	possibly iterable

Table 5.5 A list of properties of inflection and derivation

5.3.1 Relevance to the syntax

(i)　Inflection is relevant to the syntax; derivation is not relevant to the syntax.

For the most part, 'relevant to the syntax' means that the grammatical function or meaning expressed by a morphological pattern is involved in syntactic agreement or syntactic government.

In syntactic **government**, one word requires another word or phrase to have a particular inflectional value. For instance, Polish verbs that are negated often require a direct object in the genitive case (5.4). Verbs that are not negated require a direct object in the accusative case (5.5). Since the presence or absence of negation leads to a difference of case marking on the object, case must be relevant to the syntax. It is therefore possible to conclude that case is inflectional in Polish according to criterion (i).

(5.4) *Tomek*   *nie*   *czytał*   *gazet-y*
      tomek.M.NOM.SG   not   read.3SG.M.PST   newspaper-GEN.SG
      'Tomek was not reading a newspaper.'

(5.5) *Tomek*   *czytał*   *gazet-ę*
      tomek.M.NOM.SG   read.3SG.M.PST   newspaper-ACC.SG
      'Tomek was reading a newspaper.'

Agreement is a kind of syntactic relation in which the inflectional value of a word or phrase (the **target**) must be the same as the inflectional value of another word of phrase in the sentence (the **controller**) to which it is closely related. For instance, in *[the boy]*_{NP} *[walk-s]*_V and the *[girl-s]*_{NP} *[walk]*_V, the target verb *walk(s)* agrees with the subject NP in number.[4] And in *this girl* and *these boys*, the target demonstrative *this/these* agrees with its head noun (*girl/boys*) in number.

Looking back at Table 5.1, we can notice that the most common inflectional features for nouns and pronouns are the same as the most common inflectional features for adjectives, demonstratives, relative pronouns and adpositions. This is because in agreement relations, the controller is almost always a noun, pronoun or noun phrase. Adjectives, demonstratives, etc. are typical targets for noun agreement. Verbs are also frequent targets for number, person, and sometimes gender agreement.

A word-form may agree with a controller for multiple features, and/or agree with multiple controllers. Examples of agreement are shown in (5.6)–(5.8).

(5.6) Agreement of verb with subject and object in person, number and gender (Yimas)
      Krayŋ   *narmaŋ*   *k-n-tay.*
      frog.SG(G6)   woman.SG(G2)   3SG.G6.P-3SG.G2.AG-see
      'The woman saw the frog.'

                                  (Foley 1991: 194)

(5.7) Agreement of preposition with complement NP in person and number (Classical Nahuatl)
      i-pan   *noyac*
      3SG-on   my.nose
      'on my nose'

                                  (Sullivan 1988: 108)

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[4]   NP stands for *noun phrase*.

(5.8) Agreement of demonstrative and adjective in number and gender
(Swahili)

wa-le	*wa-tu*	*wa-refu*
PL.G2-that	PL-person(G2)	PL.G2-tall

'those tall people'

Note that agreement features are sometimes overtly marked *only* on the target. For instance, in Italian, determiners and adjectives agree with nouns for gender. But while Italian nouns are all lexically associated with one of the two genders, they do not have morphological marking for gender. Examples like *il poeta* 'the poet', *la casa* 'the house', *la mano* 'the hand', *il cuoco* 'the cook', *la chiave* 'the key', *il fiume* 'the river' (*il* = masculine article, *la* = feminine article) show that *-a* does not in general mean 'feminine', and *-o* does not mean 'masculine' (despite this commonly being taught in language classrooms). In Italian, only the determiners and adjectives have morphological gender marking.

The criterion of syntactic relevance covers most of the features listed in Section 5.1, but there is one problematic area: tense/aspect/mood patterns are not obviously relevant to the syntax. Tense, and even more so aspect, hardly ever occur in an agreement-like relationship, and are not otherwise assigned by the syntax. Do we have to consider tense/aspect/mood to be derivational by this criterion, rather than inflectional? A slightly modified interpretation of 'relevant to the syntax' resolves this problem. Specifically, it turns out that certain syntactic rules seem to require reference to tense and aspect; this allows us to include tense/aspect/mood under the rubric of inflection according to this criterion.

5.3.2 Obligatoriness

(ii) Inflectional features are obligatorily expressed on all applicable word-forms. Derivational meanings are not obligatorily expressed.

This can be illustrated by Latin: the lexeme INSULA 'island' has ten word-forms in its paradigm, and each word-form expresses (and must express) one value from each of the features 'number' and 'case'. The Latin speaker thus had no choice about whether to use a noun with or without case and number features – omitting these features was impossible. Number and case are thus inflectional features in Latin according to this criterion. (Note that inflection need not be expressed via an *overt* suffix. For instance, the paradigm of the Spanish verb CAMINA 'walk' contains the form *camina* 's/he walks', with no affix directly corresponding to the third person singular meaning. But here the absence of an affix is meaningful in itself; this is not an uninflected form, but an inflected form with zero expression.)

By contrast, expression of a given derivational meaning is not obligatory. The English suffix -er applies to verbs to derive nouns with the meaning of 'agent', e.g. DRINKER. But it is not the case that all nouns must express an agentive meaning.

5.3.3 Limitations on application

(iii) Inflectional values can be applied to their base without arbitrary limitations; derivational formations may be limited in an arbitrary way.

Generally speaking, a lexeme's paradigm contains a full set of inflected forms: verbal paradigms have word-forms expressing all the tense–aspect–mood values that are relevant to the language, noun paradigms have word-forms expressing all relevant case-number combinations, adjectival paradigms have all relevant comparative forms, etc. This is because a lexeme that does not have a full set of forms cannot function in every syntactic context. And notably, when exceptions do occur, this can usually be explained easily by the incompatibility of the inflectional meaning and the base meaning, i.e. the problematic syntactic context never arises in the first place. For instance, **stative** verbs may not have certain aspectual forms (e.g. English *She is knowing me*), **collective** nouns may have only singular or only plural forms (e.g. English *information*, *informations*), and **non-gradable adjectives** do not have comparative forms (e.g. *Mammoths are deader than Neanderthals*). Incomplete paradigms whose gaps are not semantically motivated are very rare (see Section 8.7 for discussion of these exceptions).

In comparison, arbitrary derivational gaps are quite common. Conceivable derived lexemes may be lacking without any obvious semantic explanation. For instance, English has female nouns in -ess such as *authoress, heiress, priestess*, but it is not possible to say *professoress* 'female professor', *presidentess* 'female president', and so on, although these make perfect sense semantically. The Spanish **inchoative** formation in -ear (see Table 5.3) occurs with colour adjectives (*verde → verdear* 'become green', *negro → negrear* 'become black', etc.), but it cannot be used freely with other adjectives where a 'become' sense would be just as appropriate and useful (e.g. *caro → *carear* 'become expensive' – this word does not exist).

5.3.4 Same concept as base

Some properties are best discussed in terms of *canonical* inflectional traits and *canonical* derivational traits.

(iv) Canonical inflected word-forms express the same concept as the base; canonical derived lexemes express a new concept.

While everyone would probably agree that the same concept is expressed in *go* and *goes*, or in Latin *insula* ('island.NOM.SG') and *insulae* ('island.GEN.SG'), this is less clear with singular–plural pairs in nouns. For instance, at one point in the history of English the plural of *brother* was *brethren*. But at a later stage, *brethren* took on the specialized meaning of members of a Christian fellowship, and came to be interpreted as a separate lexeme. A new plural (*brothers*) was created to pair with *brother* in the meaning of male sibling. This kind of split into separate lexemes shows that the singular *brother* and plural *brethren* expressed somewhat different concepts. Number in nouns is thus sometimes more similar to derivation according to criterion (iv) than to canonical inflection. And on the other side, derivation does not always lead to an obviously new concept. Although 'baker' is clearly a different concept from 'bake', in what sense is 'kindness' a different concept from 'kind'? This example also seems to fall into the middle ground between inflection and derivation.

5.3.5 Abstractness

(v)   Inflectional values express a relatively abstract meaning; Derivational meanings are relatively concrete.

The abstractness criterion works quite well for inflectional meanings, because all of them are highly abstract (in some intuitive sense). And many derivational meanings are quite concrete (e.g. French *-ier*, which denotes a kind of tree). But there are also derivational meanings that are just as abstract as inflectional meanings (e.g. the meaning 'status' of *-hood* in *childhood*). So *-hood* is neither canonically derivational, nor canonically inflectional.

5.3.6 Meaning compositionality

(vi)   Canonical inflected word-forms have compositional meaning; canonical derived lexemes have non-compositional meaning.

While inflectional values usually make a predictable semantic contribution to their base, derived lexemes are often semantically idiosyncratic. For instance, the Russian derivational suffix *-nik* means 'thing associated with (base concept)', and this meaning is clearly present in *dnev-nik* 'diary' (*dn-ev-* 'day'), *noč-nik* 'night lamp; night worker' (*noč* 'night'). However, the meaning of *dnevnik* is not exhausted by that of *dnev-* and *-nik*: a diary is indeed a kind of thing associated with days (or daily activities), but the additional meaning components 'notebook' and 'used for writing' cannot

be predicted on the basis of the meaning of the two constituent morphemes and must be associated with the lexeme as a whole. Even clearer examples are *ignorance* and *reparation;* their meanings are probably only historically related to *ignore* and *repair*.

But of course, some derivational formations exhibit compositional meaning. For instance, the meaning of German female nouns with *-in* (*König-in* 'queen', *Professor-in* 'female professor') is very regular. The suffix *-in* is by most criteria clearly derivational, but in this respect it shows a property that is more typical of inflection.

5.3.7 Position relative to base

(vii) Canonical inflection is expressed at the periphery of words; canonical derivation is expressed close to the root.

This property can be used as distinguishing criteria only in special circumstances because it is a relative property, and not an absolute one. The first is best illustrated by words that have one derivational affix and one inflectional affix on the same side of the root. In such cases, the derivational affix almost always occurs between the root and the inflectional affix:

(5.9) a. English *king-dom-s* root – status (D) – plural (I)
       b. English *real-ize-d* root – factitive (D) – past tense (I)
       c. English *luck-i-er* root – proprietive (D) – comparative (I)
       d. Turkish *iç-ir-iyor* root – causative (D) – imperfective aspect (I)
                   [drink-CAUS-IMPF.3SG]
                   'makes (somebody) drink'
       e. Arabic *na-ta-labbasa* 1st plural subject (I) – reflexive (D) – root
                   [1PL-REFL-clothe.PRF]
                   'we clothed ourselves'

When there are more than two affixes, normally all the derivational affixes occur closer to the root than the inflectional affixes (e.g. German *nation-al-isier-te-n* '(they) nationalized': root – relational adjective (D) – **factitive verb** (D) – past tense (I) – third person plural subject agreement (I)).

Yet here again, it is possible to find examples of inflection and derivation that do not exhibit the canonical traits. For example, German has deadjectival factitive verbs that are based on the inflectional comparative form (e.g. *schön* 'beautiful' → *schön-er* 'more beautiful' → *ver-schön-er-n* 'make more beautiful'); the inflectional comparative affix *-er* is closer to the root than the derivational affix *-n*. And English allows plurals inside many compounds (e.g. *publications list, New York Jets fan*).

5.3.8 Base allomorphy

> (viii) Inflection induces less base allomorphy; derivation induces more base allomorphy.

Base allomorphy is also a relative property. It can be demonstrated with roots that show allomorphy in derived lexemes, but not in inflected word-forms:

(5.10)		ROOT	INFLECTED FORM	DERIVED LEXEME
	a. English	*destroy*	*destroy-ed*	*destruc-tion*
	b. English	*broad*	*broad-er*	*bread-th*
	c. German	*Erde*	*Erde-n*	*ird-isch*
		'earth'	'earths (PL)'	'earthly'
	d. Latin	*honor*	*honor-is*	*hones-tus*
		'honour'	'honour-GEN'	'honest'
	e. Italian	*dialogo* [-g-]	*dialogh-i* [-g-]	*dialogico* [-dʒ-]
		'dialogue'	'dialogue-s'	'dialogical'
	f. Arabic	*kataba*	*katab-tu*	*kitaab*
		'he wrote'	'I wrote'	'book'

But the opposite pattern can also be found, as in the following examples from Serbian:

(5.11)	ROOT	INFLECTED FORM	DERIVED LEXEME
	junak	*junac-i*	*junak-inja*
	'hero (M)'	'heroes'	'heroine'
	pesnik	*pesnic-i*	*pesnik-inja*
	'poet (M)'	'poets'	'poet (F)'
	psiholog	*psiholoz-i*	*psiholog-inja*
	'psychologist (M)'	'psychologists'	'psychologist (F)'
	monah	*monas-i*	*monah-inja*
	'monk'	'monks'	'nun'

Base allomorphy is thus yet another tendency, according to which a morphological pattern may be more typically inflectional, or more typically derivational.

5.3.9 Word-class change

> (ix) Canonical inflection does not change the word-class of the base; derivational affixes may change the word-class of the base.

It is often claimed that derivational formations may change the word-class of the base, but inflectional ones never do. While the first part of this claim is true (e.g. many of the examples in Section 5.2 consisted of word-class-changing derivation), the second part is questionable. There seem to be two types of word-class-changing morphological patterns – one that is typical of derivational patterns, and one that is associated with patterns that are, to some degree, inflectional.

In most instances, when word-class-changing affixes are added to a base, the grammatical properties of the base are no longer relevant for purposes of agreement. In (5.12), the Russian adjective *otkrytoe* 'open' agrees for gender (and number and case) with the noun *okno* 'window', but when the denominal adjective *okonnaja* 'window (adj)' is derived from *okno*, the nominal stem can no longer serve as the controller for agreement. This is a typical consequence of (derivational) word-class-changing operations, and the reason (5.12b) is ungrammatical.

(5.12) Russian

   a. *otkryt-oe*   *okno*
      open-N.SG.NOM   window.N.SG.NOM
      'open window'

   b. **otkryt-oe*   *okon-naja*   *rama*
      open-N.SG.NOM   window-F.SG.NOM   frame.F.SG.NOM
      'open window frame' (i.e. 'frame of an open window')

However, some languages have affixes that can occur in structures parallel to (5.12b). Consider the example in (5.13), from another Slavic language: Upper Sorbian. Here, *mojeho* 'my' agrees for gender with the masculine noun *muž* 'husband', despite this being the root of the denominal adjective *mužowa*.

(5.13) *moj-eho*   *muž-ow-a*   *sotra*
        my-M.SG.GEN   husband-POSS-F.SG.NOM   sister.F.SG.NOM
        'my husband's sister'

                                                        (Corbett 1987: 303)

Thus, *-ow* seems to have the property that it is word-class changing, but in a way that allows the properties of its base to still control agreement by a modifying adjective.

Moreover, and crucially, *-ow* meets some of the criteria for inflection, e.g. it has fully compositional meaning. It is also highly productive (a trait not discussed in detail here, but one that is typical of inflection). Perhaps, then, no clear-cut binary distinction can be made between (derivational) affixes that change word-class, and (inflectional) affixes that do not (Corbett

1987; Haspelmath 1996). It is better to say that canonical inflection does not change word-class. Word-class-changing inflection is discussed further in Section 11.4.

5.3.10 Cumulative expression

(x)   Inflectional values may be expressed cumulatively; derivational meanings are not expressed cumulatively.

This criterion applies only to a small subset of cases, but is nevertheless interesting. We saw above that several inflectional values may be expressed by a single affix, as in Latin *insulārum* 'of the islands', where the suffix *-ārum* expresses both 'genitive' and 'plural'. Such cases of cumulation seem to be very rare in derivational formations, but a possible example is Dutch *-ster* 'agent' and 'female'.

5.3.11 Iteration

(xi)   Inflectional values cannot be iterated; derivational meanings can sometimes be iterated.

Inflection is more restricted in that inflectional affixes cannot be iterated. Thus, although it would make sense logically to have an iterated plural (e.g. **cat-s-es* 'sets of cats'), such double plurals are virtually unattested. Or one could imagine a past-tense affix to be repeated to give a sense of remote past (e.g. **didded* 'had done'). With derivational formations, iteration is not common either, but it is possible, for instance, with diminutives in Afrikaans (*kind-jie-tjie* 'a little little child'), and with various prefixes in English (*post-post-modern*) and German (*Ur-ur-ur-großvater* 'great-great-great-grandfather'). Another instance is the double causative, as we find it in Huallaga Quechua: *wañu-* 'die', *wañu-chi-* 'kill', *wañu-chi-chi-* 'cause to kill' (Weber 1989: 164). This property also applies to only a small number of morphological patterns, those for which iteration would be semantically plausible.

5.4 Dichotomy or continuum?

Do these facts indicate that the difference between inflection and derivation is a dichotomy, or a continuum? It turns out that there is less disagreement about the facts themselves, and more disagreement about the importance of some facts. Proponents of the dichotomy approach tend to consider the first

three properties in Section 5.3 (relevance to the syntax, obligatoriness and limitations on applicability) to be the most important, especially relevance to the syntax. And inasmuch as these three criteria are logically independent of each other, but nonetheless tend to categorize a given morphological meaning in the same way, either as derivation or as inflection, proponents of the dichotomy approach have argued that these traits are indicative of a distinction between inflection and derivation in the formal architecture of the morphological system.

By contrast, the reason some morphologists prefer the continuum approach is that they want to avoid making an arbitrary choice from the criteria in Table 5.5. Proponents of the continuum approach thus tend to consider the properties as a collective whole. If all these criteria are taken seriously, then the continuum approach is almost inevitable, because different criteria may point to different conclusions. But what is particularly interesting is that the mismatches between the criteria are not random, but present a surprisingly orderly picture. As an example, let us look at Table 5.6. It gives a sample list of six morphological formations, which are evaluated by five of the eleven criteria.

Language	Formation	Example	cum	obl	new	unl	cm
English	3rd singular	*walk/walks*	I	I	I	I	I
English	noun plural	*song/songs*	D	I	I	I	I
Spanish	diminutive	*gato/gatito*	D	D	I	I	I
English	repetitive	*write/rewrite*	D	D	D	I	I
English	female noun	*poet/poetess*	D	D	D	D	I
English	action noun	*resent/resentment*	D	D	D	D	D

Note: cum= cumulative expression; obl = obligatory; new = new concept; unl = unlimited applicability; cm = compositional meaning.

Table 5.6 A continuum from inflection to derivation

Table 5.6 is a simplification in various respects (e.g. in that it ignores the difficulties in applying some of the criteria), but it suffices to illustrate the continuum approach. The English third person singular suffix -*s* cumulatively expresses person/number and present tense; the other formations show no cumulation. Both verbal agreement and nominal number are arguably present in any verb and noun form, so these two are obligatory, whereas this is not the case for the other formations. Diminutives are like classical inflected forms in that they do not (necessarily) denote a new concept – Spanish *gatito* often refers to the same kind of cat as *gato*, but occurs only under special pragmatic circumstances. Only the English female suffix -*ess*

and the action-noun suffix *-ment* are limited in applicability, and only *-ment* is semantically irregular (as we can see in *govern/government*, which shows a different semantic relation from *resent/resentment*). On such a continuum view, agreement morphology such as *-s* (in *walks*) is canonical inflection and English action nouns in *-ment* are canonical derivation, but they are merely extremes of a continuum on which many intermediate items are found as well.

In the end, linguists must decide the relative merit of these eleven criteria as diagnostics of inflectional/derivational morphology. If we consider (i)–(iii) to be the most important diagnostics, this naturally leads to the conclusion that inflection and derivation are dichotomous categories, and as a result, that inflectional and derivational rules (potentially) operate in the architecture of the language system according to distinct principles. However, if all traits are considered equally important indicators, the best conclusion is that canonical derivation and inflection are end-points along a continuum of morphological properties, and no sharp division can be made between them.

5.4.1 Inherent and contextual inflection

Before considering the formal architecture of inflection and derivation, we should consider one other approach. Specifically, one popular modification of the dichotomy approach divides inflectional morphology into two subtypes: inherent inflection and contextual inflection. A tri-partition takes better account of the full range of characteristics described above, while maintaining sharp boundaries between types.

Inherent inflection comprises features that are relevant to the syntax but convey a certain amount of independent information. These include a verb's tense and aspect values, and the number values for nouns. For example, the number value of a noun is mostly dictated by the real-world entity that the noun refers to (the referent) – if the referent is one, the noun is singular. If it is more than one, the noun is usually plural (assuming the language has only two inflectional values for number). In this sense, nominal number contributes independent information to syntactic structure. Some grammatical cases can also be inherent, for instance, **locative** (e.g. Turkish *ev-de* [house-LOC] 'in the house'), ablative (e.g. Huallaga Quechua *mayu-pita* [river-ABL] 'from the river') and **instrumental** (e.g. Russian *nož-om* [knife-INS] 'with a knife'), which similarly make their own semantic contribution and are mostly not syntactically determined.

By contrast, **contextual inflection** comprises values which are assigned to a word because of the syntactic context in which it appears. Included here are **structural cases** – i.e. cases like nominative, accusative and genitive, which are typically required by syntactic agreement or government but

express largely redundant information. Note that inflectional features may be inherent for one word-class and contextual for another. Number is inherent for nouns because it expresses independent information, but contextual for adjectives, verbs, etc. where they agree with the noun for this feature.

A distinction between inherent and contextual inflection is appealing in part because inherent inflection often shares properties with derivation, whereas contextual inflection does not to the same degree. Here we highlight three examples.

First, although both contextual and inherent inflection often have compositional meaning, on the relatively rare occasion that inflection has an unpredictable, idiosyncratic meaning, the relevant examples come from inherent inflection. Some examples from Dutch are given in (5.14).

(5.14)	value	inflected word	compositional meaning	idiosyncratic meaning
	comparative	*ouder*	'older'	'parent'
	plural	*vaders*	'fathers'	'forefathers'
	past participle	*bezeten*	'possessed'	'mad'
	present participle	*ontzettend*	'appalling'	'very'
	infinitive	*eten*	'(to) eat'	'food'
				(Booij 1993)

Plural forms of verbs and other examples of contextual inflection do not seem to exhibit this kind of idiosyncrasy.

Second, just as derivational patterns tend to be closer to the root than inflectional patterns, inherent inflectional patterns tend to be closer to the root than contextual ones. Moreover, those exceptional cases in which an inflectional affix is closer to the root than a derivational affix, and those in which an inflectional affix occurs on a first compound member, generally involve inherent inflection (see the discussion following (5.9) for an example).

Finally, inherent inflection is more likely to induce base allomorphy than is contextual inflection. A few examples are given in (5.15).

(5.15)		contextual inflection	inherent inflection
	English	*sing/sings* (person/number agreement)	*sing/sang* (past tense)
	German	*warm-er/warm-e* (gender agreement)	*warm/wärmer* (comparative)
		'warm-MASC/warm-FEM'	'warm/warmer'
	Arabic	*kitaab-un/kitaab-in* (structural case)	*kitaab-/kutub* (plural)
		'book-NOM/book-GEN'	'book.SG/book.PL'

Thus, the conceptual distinction between contextual and inherent inflection is useful because there are a number of points on which the two kinds of inflection behave rather differently. Proponents of the continuum approach take this as continued evidence that canonical inflection and canonical derivation are end-points on a continuum of traits, but proponents of the dichotomy approach sometimes work with a tri-partition, rather than a strict dichotomy.

5.5 Inflection, derivation and the syntax-morphology interface

Perhaps the most interesting thing about the debate between the dichotomy and continuum approaches is that these perspectives have significant consequences for our formal description of morphological architecture. In particular, morphologists have debated whether inflectional and derivational rules are collected together into a single morphological component of the grammar, or split between two different components. The continuum approach allows for only the former argument. The dichotomy approach is consistent with either, but perhaps more naturally aligned with the proposal that inflection and derivation occupy separate areas of the grammar. The dichotomy and continuum perspectives thus suggest a very different formal relationship between inflection, derivation, and syntax.

5.5.1 The dichotomy approach and split morphology

As we have seen, morphologists who adopt the dichotomy approach think of inflection and derivation as having fundamentally different properties, and they usually take the first property of Table 5.5 – relevance to the syntax – as the crucial criterion for distinguishing inflection from derivation. Given this perspective, it is logical to conclude that inflectional and derivational patterns are governed, at least in part, by distinct grammatical principles. In essence, there is not one coherent morphological system, but rather two systems or subsystems – one for derivation and compounding, and one for inflection.

What is the relationship of these two systems to each other, and to syntax? One proposal argues that rules of derivation and compounding (i.e. all of word-formation) operate in a component of the grammar that feeds into the syntax, and that inflectional rules apply only after the syntactic rules have applied. In other words, word-formation is pre-syntactic, inflection is post-syntactic. This is referred to as the **split-morphology hypothesis**, and the architecture of the grammar is shown schematically in Figure 5.4.
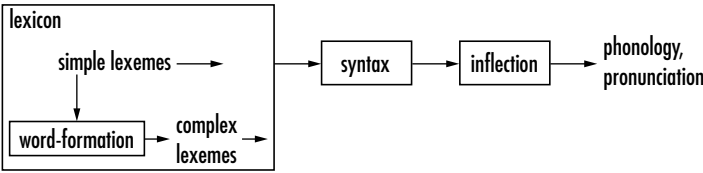
Figure 5.4 Word-formation and inflection in a split-morphology architecture

Let us look at a concrete example of how this works. Our example sentence is (5.16) from Latin.

(5.16) *Imperator*   *saluta-v-it*   *popul-um.*
     emperor(NOM.SG)   greet-PRF-3SG   people-ACC.PL
     'The emperor greeted the people.'

The Latin lexicon contains simple lexemes such as IMPERARE 'command', SALUS 'health' and POPULUS 'people'. The word-formation rules create complex derived lexemes such as IMPERATOR 'commander, emperor' and SALUTARE 'greet'. Word-formation is said to operate 'in the lexicon' (i.e. in this approach, the lexicon contains both a list and rules), so both simple lexemes and derived lexemes are the output of the lexicon. The syntax contains phrase structure rules (e.g. S → NP VP, VP → V NP) ('VP' is an abbreviation of *verb phrase*), case-assignment rules, which among other things ensure that the direct object gets accusative case ([VP V NPACC]), and agreement rules, which ensure that the inflectional values on the target match those on the controller. The syntactic rules might thus generate an abstract representation, as in (5.17) (here, the subject NP is the controller for person and number agreement, and the verb is the target). The feature-value notations at the end of the tree are often called **morphosyntactic representations**. All of this is of course greatly simplified, but is sufficient for our present purposes.

(5.17)
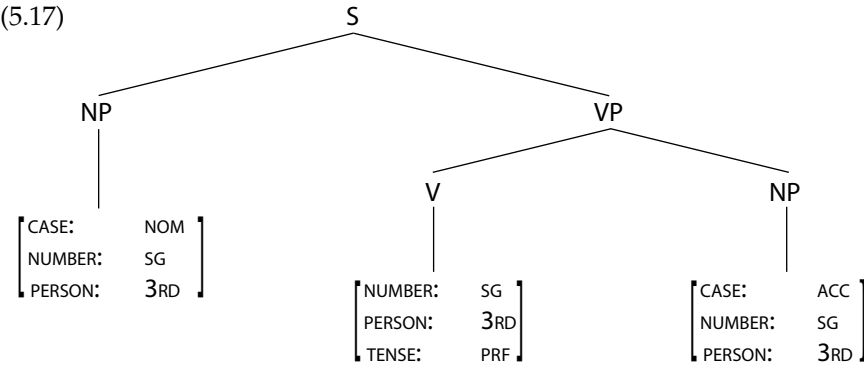
The lexemes from the lexicon are inserted into these abstract syntactic representations, yielding a lexically specified syntactic representation as shown in (5.18) (the representation with labelled brackets and subscripts is equivalent to the tree representation in (5.17) and saves space).

(5.18) [s [NP IMPERATORNOM/SG/3RD] [VP [V SALUTARESG/3RD/PRF]
      [NP POPULUS-ACC/SG/3RD]]]

Now the rules of inflection operate and create the correct word-forms from the lexemes with their feature specification: IMPERATORNOM/SG/3RD becomes *imperator*, SALUTARESG/3RD/PRF becomes *salutavit*, and POPULUSACC/SG/3RD becomes *populum*. This gives us the correct output (once phonological rules of pronunciation have applied): *Imperator salutavit populum*.

In addition to its intuitive plausibility, this architecture of the formal grammar is often claimed to have one significant advantage: it explains the fact that derivation is generally 'inside' inflection, i.e. it occurs closer to the root. If affixes are always attached peripherally by morphological rules, then the affix order of *king-dom-s* automatically follows from the order of application of the rules in Figure 5.4. The lexicon creates KINGDOM from the simple lexeme KING, and the inflection *-s* is added after the syntactic component. There is no way a form like **king-s-dom* could ever arise, because inflected forms like *king-s* cannot be the input to word-formation rules. Inflected forms should also not occur inside compounds, because compounding is a lexeme-forming rule in the lexicon. Thus, the impossibility of **trees plantation* in English follows from this as well (the correct form is *tree plantation*, where the first part is uninflected, despite the plural meaning). This seems to lend further support to the split-morphology claim.

At the same time, however, split morphology encounters some empirical problems. First and most obviously, exceptions in which inflection occurs inside derivation are occasionally observed; we have already encountered the German example *ver-schön-er-n* 'make more beautiful', in which the (inflectional) suffix *-er* is closer to the root than the (derivational) suffix *-n*. Such exceptions cannot obviously be accommodated under the split-morphology proposal. Even more importantly, as we saw in Section 5.4.1, inherent and contextual inflection sometimes behave quite differently, with inherent inflection having characteristics typical of derivation. This presents an intrinsic problem for split morphology, which groups inherent and contextual inflection together.

Attentive readers might suggest that perhaps the solution is to maintain the split-morphology hypothesis, but divide the two grammatical components such that derivation, compounding and inherent inflection apply pre-syntactically, and only contextual inflection applies post-syntactically.

Based on the evidence presented so far, this would seem to be reasonable. However, further evidence shows that this is not a satisfactory solution either. The most important data here is the fact that the same morphological pattern may express both inherent and contextual inflection. For instance, in Latin nouns, a single morpheme marks both number (inherent) and case (often contextual). This cumulative expression indicates an interaction of inherent and contextual inflection that is extremely difficult to account for if they are located in separate grammatical components.

Note that the dichotomy approach does not require us to accept the split-morphology hypothesis. Another possibility is that derivation and inflection operate according to partially different principles, but without them being split into pre- and post-syntactic components of the grammar. Still, split morphology is the most extreme logical interpretation of the dichotomy perspective.

5.5.2. The continuum approach and single-component architecture

According to the continuum approach, no firm distinction between inflection and derivation can be made, so inflectional and derivational rules must operate in the same grammatical component according to fundamentally similar grammatical principles. This, of course, has consequences for the relationship between morphology and syntax: the continuum approach is not consistent with the split-morphology hypothesis. Instead, it is consistent with the idea that syntax generates abstract structures containing morphosyntactic representations but no lexical information, as in (5.17), but instead of inserting a (derived) lexeme at each syntactic node and then generating an inflected form, a word-form is inserted that is consistent with the syntactic information. This does not require derivation and inflection to be split between pre- and post-syntactic operations. This grammar architecture is represented in Figure 5.5.

In this way, the job of the morphological component is to provide word-forms whose inflectional values match (or at least, do not contradict) those of the morphosyntactic representation.
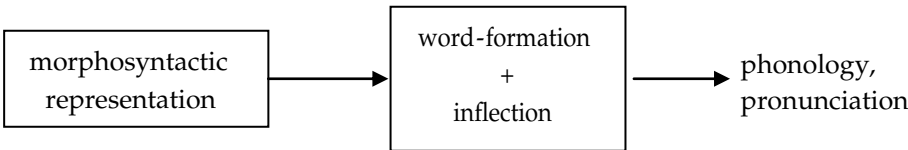
Figure 5.5 Word-formation and inflection in a single-component architecture

The dichotomy approach is also consistent with the idea that all of morphology is collected into one component of the grammatical architecture, but does not align with a **single-component hypothesis** as naturally as the continuum approach does.

The single-component hypothesis cannot be used to explain why derivational affixes occur closer to the root and inflectional affixes occur more peripherally, but perhaps this should not worry us. The ordering of inflectional affixes with respect to derivational affixes is not the only generalization that can be made. Even within inflectional affixes and within derivational affixes, some orders are strongly preferred, and others are strongly dispreferred. For instance, the diminutive suffix in Spanish is always outside other derivational suffixes (e.g. the female noun suffix *-es(a)*: *baron-es-ita* 'little baroness', not **baronitesa*). And case suffixes almost always follow number suffixes, rather than vice versa (e.g. Turkish *ev-ler-in* [house-PL-GEN] 'of the houses', not **ev-in-ler*).

There may be a system-external explanation for these affix ordering patterns. It has recently been proposed that the ability of two affixes to combine, and the order in which they do so, depend in part on constraints created by how words are mentally processed (Hay and Plag 2004). Affixes that are more likely to be accessed in the lexicon via the decomposition route (as opposed to the whole-word route) occur outside of affixes that are less likely to be decomposed (see Chapter 4 for discussion of lexical access). Thus, restrictions on the order of affixes may not be something that needs to be captured directly by our description of morphological architecture at all. The possibility of a system-external explanation suggests that the inability of a single-component architecture to explain affix order is not necessarily a disadvantage of the model.

Summary of Chapter 5

Morphologists use different terminology for talking about inflection and derivation. Inflection is described in terms of values grouped into features; derivation is described in terms of individual morphological patterns and their meanings. The range of inflectional meanings found in languages is severely restricted; most of them fall under the general headings of number, gender, case, person, tense, aspect and mood. Derivational meanings are more varied, but many recurrent types can be identified as well.

A persistent question in morphological theory is whether differences between inflection and derivation fall along a continuum, or sharply

divide inflection and derivation into distinct types. Linguists adopting the dichotomy approach have usually emphasized criteria such as relevance to the syntax and obligatoriness, whereas linguists favouring the continuum approach have considered a whole range of criteria, including compositional meaning, cumulative expression and closeness to the root. Within inflection, a distinction between (more derivation-like) inherent inflection and contextual inflection can be made.

Formally, the dichotomy approach is consistent with a theory that splits derivational and inflectional rules into separate components that apply pre- and post-syntactically, respectively (the split-morphology hypothesis). By contrast, some formalizations of the dichotomy approach and all instantiations of the continuum approach treat inflection and derivation as comprising a single-morphological area (the single-component hypothesis). While there is little consensus about how distinct inflection and derivation are, a number of empirical issues argue against split morphology.

Appendix. Notation conventions for inflectional values

There are three widespread conventions used to represent inflectional values. The format of Figure 5.6, sometimes called a **grid**, is the standard way to represent the set of word-forms (i.e. the paradigm) of a lexeme.
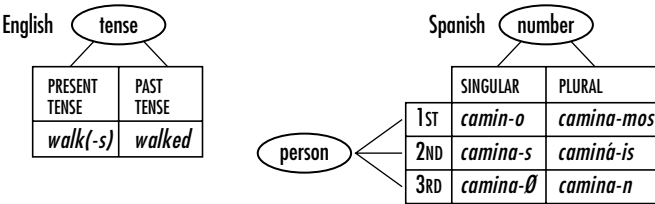
Figure 5.6 Inflectional features and values

In a grid, values of the same feature are shown in columns or rows that are usually labelled with the name of the feature. Each combination of inflectional values defines a **cell**. In Figure 5.6, values are printed in small capitals and features are enclosed in ovals. The first paradigm is from English, where verbs primarily inflect for tense. The second paradigm is

from Spanish, where verbs inflect for two values of the feature 'number' (singular and plural) and three values of the feature 'person' (first, second and third) (they also inflect for tense – see below).

When a lexeme inflects for three features simultaneously, a two-dimensional representation is no longer sufficient, and we would need a three-dimensional grid. Figure 5.7 is an attempt at drawing one. For practical purposes, three-dimensional (and especially *n*-dimensional, for *n* > 3) paradigms are mostly shown in two spatial dimensions as well. Thus, Figure 5.7 is generally replaced by Figure 5.8.
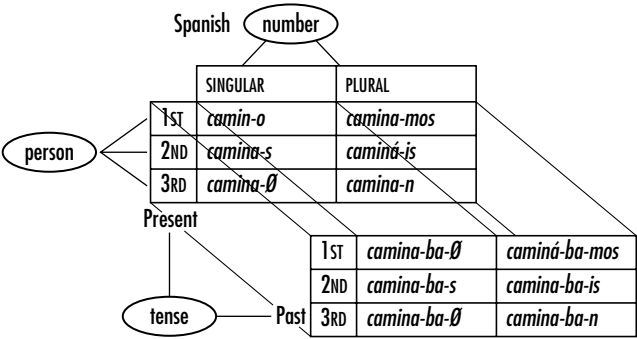
Figure 5.7 A three-dimensional representation of a three-dimensional paradigm

PRESENT TENSE

	SINGULAR	PLURAL
1ST	camin-o	camina-mos
2ND	camina-s	caminá-is
3RD	camina-Ø	camina-n

PAST TENSE

	SINGULAR	PLURAL
1ST	camina-ba-Ø	caminá-ba-mos
2ND	camina-ba-s	camina-ba-is
3RD	camina-ba-Ø	camina-ba-n

Figure 5.8 A two-dimensional representation of a three-dimensional paradigm

The inflectional information contained in a word-form can also be represented in a **feature-value notation**, as in the examples in (5.19). Feature-value notation indicates the inflectional feature on the left side of the colon, and the inflectional value on the right, with all 'feature: value' pairs enclosed in square brackets. This notation is most commonly used when writing lexical entries or word-schemas. Thus, (5.20) is a more informative and formal way to represent (5.21).

(5.19) a. Spanish
caminábamos
'we were walking'
$$\begin{bmatrix} \text{TENSE:} & \text{PAST} \\ \text{PERSON:} & \text{1ST} \\ \text{NUMBER:} & \text{PLURAL} \end{bmatrix}$$

b. Sanskrit
dātṛṇoḥ
'of two givers'
$$\begin{bmatrix} \text{NUMBER:} & \text{DUAL} \\ \text{GENDER:} & \text{NEUTER} \\ \text{CASE:} & \text{GENITIVE} \end{bmatrix}$$

(5.20) $$\begin{bmatrix} /\text{X}/\text{N} \\ \text{'x'} \\ [\text{ NUMBER: SINGULAR }] \end{bmatrix} \leftrightarrow \begin{bmatrix} /\text{Xz}/\text{N} \\ \text{'x'} \\ [\text{ NUMBER: PLURAL }] \end{bmatrix}$$

(5.21) $$\begin{bmatrix} /\text{X}/\text{N} \\ \text{'x'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /\text{Xz}/\text{N} \\ \text{'plurality of } x\text{s'} \end{bmatrix}$$

Finally, for practical purposes, the inflectional values may also be written as subscripts of word-forms, e.g. *caminábamos*$_{\text{1PL.PST}}$, *dātṛṇoḥ* $_{\text{DU.N.GEN}}$.

Further reading

A useful survey of the kinds of meanings that are expressed by derivational morphology is found in Bauer (2002).

The dichotomy and split-morphology approach to inflection and derivation is represented by works such as Scalise (1988a), Perlmutter (1988) and Anderson (1992), and it is implicit in much further work. The continuum approach is defended by Stephany (1982), Bybee (1985), Dressler (1989) and Plank (1994) (and see Wurzel (1996)). The tripartition between contextual inflection, inherent inflection and derivation was proposed by Booij (1993, 1996).

In this chapter we assumed that morphology operates largely separately from syntax, and focused on the question of whether there is one morphological component or two. But not all theories make this assumption, including Word Syntax and Distributed Morphology: see

Toman (1998) and Embick and Noyer (2007), respectively, for overviews of the syntax-morphology interface in these theories. Also, see the discussion in Chapter 9.

Comprehension exercises

1. Give the inflectional information of the following word-forms in feature-value notation (see (5.19)):

Spanish	*caminabas*	(3 features, see Figure 5.8)
Latin	*insulam*	(2 features, see Figure 5.1)
Latin	*cantabit*	(5 features, see Figure 5.2)
English	*books*	(1 feature)
Serbian	*ovci*	(2 features, see (4.3))
Classical Nahuatl	*incal*	(2 features, see (2.7))
English	*bigger*	(1 feature)

2. Lezgian verbs have suffixes for aspect (*-zawa* imperfective, *-nawa* perfect, *-da* habitual), followed by suffixes for polarity (*-Ø* affirmative, *-č* negative), followed by suffixes for tense (*-Ø* present, *-j/-ir* past; *-ir* is chosen after *-č*). For instance *katzawaj*$_{\text{IMPF.AFF.PST}}$ 'was running', *katdačir*$_{\text{HAB.NEG.PST}}$ 'would not run'. Give the whole three-dimensional paradigm in a two-dimensional representation (as in Figure 5.8), using the verb *kat-* 'run' (i.e. a grid with $3 \times 2 \times 2 = 12$ cells) (Haspelmath 1993).

3. Consider the meanings of the following denominal and deadjectival verbs of English and classify them using the categories of Table 5.3. For some of them, you need to set up new categories not represented in that table.

   butter, flatten, categorize, peel, legalize, phone, blacken, cannibalize, unionize, skate, modernize, terrorize, ski

4. At the beginning of this chapter, we asked whether the English deadjectival adverb-forming pattern (*nice → nicely*) is inflectional or derivational. Apply the criteria of Section 5.3 and try to form an opinion on this question.

Exploratory exercise

In language research, data sometimes point to opposite conclusions regarding the structure of the linguistic system. And when this happens,

linguists do not always agree on which data is most important and convincing. The following is primarily a thought exercise designed to help you develop your own arguments about what constitutes (un)convincing data. It also allows you to practise applying the criteria in Table 5.5. You will use the results to decide for yourself which approach – continuum or dichotomy – seems to be the best way to describe the differences between inflection and derivation.

Instructions

Step 1: Pick a variety of morphological patterns in a language of your choice. You might want to choose several morphological patterns that express a similar meaning/function, for instance, all of the patterns expressing plurality in nouns, and/or all of the patterns that turn verbs into abstract nouns. English examples for these functions are given in Table 5.7 and Table 5.8 below, but you need not be limited by these (see Sections 5.1 and 5.2 for ideas). In fact, you do not need to work on English at all, but it is helpful to work on a language that you know quite well.

Step 2: Using a good descriptive grammar of the language and/or your own knowledge, apply the eleven criteria for distinguishing inflection from derivation. For easy reference, we recommend organizing your analysis as shown in Tables 5.7 and 5.8 (for reasons of space we give only two of the criteria).

Pattern	Example	Obligatory	Base allomorphy
-s	*cat/cats*	I	I
-s	*house/houses*	I	D
-es ([-iz])	*index/indices*	I	D
vowel change	*goose/geese*	I	?
vowel change	*man/men*	I	?
vowel change	*crisis/crises*	I	?
-us → -i	*alumnus/alumni*	I	I (cross-formation, see (3.33))
-on → -a	*criterion/criteria*	I	I (cross-formation, see (3.33))
no change	*sheep/sheep*	I	I
-en	*ox/oxen*	I	I

Table 5.7 Morphological patterns for English plural nouns

Note that it might be difficult or impossible to apply some criteria. For example, it is not clear how the base allomorphy criterion should be applied to morphological patterns that consist of base modification, rather than affixation.

Pattern	Example	Obligatory	Base allomorphy
-ance/-ence	resist/resistance	D	I
	maintain/maintenance	D	D
-al	deny/denial	D	I
-age	cover/coverage	D	I
-ion	destroy/destruction	D	D
	hyphenate/hyphenation	D	D
-ation	consult/consultation	D	D
-ication	magnify/magnification	D	D
-ment	endorse/endorsement	D	I
-y	assemble/assembly	D	I
no change	walk/walk	D	D

Table 5.8 Morphological patterns for deverbal abstract nouns in English

Determine whether each morphological pattern is inflectional or derivational. For instance, the pattern represented by *cat-cats* has no base allomorphy, and number is obligatorily expressed. Both of these are indicative of inflectional patterns, so the criteria lead us to categorize plural *–s* as inflectional. Conversely, deverbal *–ion* does not express an obligatory meaning, and does induce base allomorphy, so both criteria indicate that this pattern is derivational. The criteria need not agree, of course (see, e.g. *endorse/endorsement* and *house/houses*); use a 'majority wins' principle to categorize each morphological pattern as inflectional or derivational.

Step 3: Consider the following questions.

1) Are some criteria more reliable than others? In other words, are there any criteria that always indicate that a given pattern is inflectional when the overall majority also categorize it as inflectional (and the same for derivation)? And if some criteria are more reliable than others in this sense, does this mean that these criteria are more valuable/important for distinguishing between inflection and derivation? Why or why not?

2) Can you think of another way to evaluate the merits of each criterion?

3) Are some morphological patterns 'more inflectional' or 'more derivational' than other patterns that express the same feature/meaning? If yes, which criteria are primarily responsible for this result? How important do you think these properties are as data, relative to the others? Why?

4) Return to the definitions of inherent and contextual inflection from Section 5.4.1: value making independent semantic contribution (inherent) vs. value assigned by agreement or government (contextual). Divide the inflectional patterns in your data according to this definition. Now look at the other criteria from Step 2. Are the inherent inflectional patterns more like derivation than the contextual inflectional patterns? In other words, is

the division into inherent/contextual inflection independently supported by the other criteria?

5) Based on the results of Step 2 and your answers to the previous questions, do you view inflection and derivation as dichotomous classes, or end-points along a continuum of traits? Support your conclusion by explaining your reasoning.

Productivity **6**

A morphological rule or pattern is said to be **productive** if (and to the extent that) it can be applied to new bases and new words can be formed with it. The notion of productivity is in principle applicable both to word-formation and to inflection, but in this chapter we focus more on productivity in word-formation.

A variety of questions arise when considering productivity: Is the productivity of a rule part of speakers' implicit knowledge of their language? What makes one rule more productive than another, i.e. what factors determine the likelihood of a given rule being used to create a new word? Also, are rules categorically productive or unproductive, or is productivity gradient? How can the productivity of a rule be measured, and how can the productivity of two rules be compared? In this chapter we explore possible answers to these questions.

6.1 Speakers' knowledge of productivity

One might begin by asking why productivity should be such a big issue in morphology. After all, syntactic rules are productive as well, but few syntacticians worry much about how to define and determine their productivity (and no syntax textbook devotes an entire chapter to productivity). In syntax, linguists study possible sentences, and they do not care much whether these are actual sentences in some sense or not. Indeed, we could carry over this procedure to morphology and say that linguists who are interested in the morphological systems of languages should study possible words, regardless of whether these words happen to be actual words in common use or not. In other words, according to one view, morphological **competence** (speakers' knowledge of the words and rules of the language) and morphological **performance** (the actual use of that knowledge for communication and other tasks) are conceptually quite

distinct and should therefore be studied separately. Linguists who adhere to this position have often attempted to define away the whole issue of productivity by treating it as purely related to performance.

One view that denies the relevance of productivity to the study of competence says that productivity is exclusively a **diachronic** phenomenon, i.e. one having only to do with the way in which morphological patterns change over the centuries. When a **neologism** is coined, and especially when it is accepted by the other speakers and becomes a usual word, this means that a new word enters the language and the language thereby changes. Thus, some linguists argue that when a strictly **synchronic** point of view is adopted, the issue of productivity does not arise. But this does not seem quite right. It fails to explain why some morphological patterns are more likely than others to be used to coin new words. Hypothetical words like *helpnessful (with the wrong order of the suffixes -ful and -ness) or *frownity (where the suffix -ity attaches to a verb) are clearly ungrammatical, as every speaker will agree (Aronoff 1980). Since such judgements are otherwise routinely used to study linguistic competence, this suggests that the productivity of a rule should also be considered part of speakers' (synchronic) knowledge of their language.

The relevance of productivity has also been denied by trying to equate the productivity of a rule with its restrictedness. The set of bases to which a rule could apply in principle is called its **domain**. Whenever the domain is less than the entire word-class, we say that there are systematic **selectional restrictions** on the rule. On this view, all morphological rules are equally productive, but they are not equally restricted. Some are quite unrestricted (like English -ness, which attaches to almost any kind of adjective), whereas others are heavily restricted (like English deadjectival -en in *blacken*, *redden*, etc., which attaches only to monosyllabic adjectives, among other restrictions). However, it is also quite unlikely that this view is correct. There are simply too many rules that are not obviously heavily restricted and yet their productivity is limited. For example, the English diminutive suffix -let (e.g. *streamlet*, *piglet*, *booklet*) could in principle combine with any monosyllabic concrete noun, but in fact it is very rarely used for new words. It is, of course, possible that such unproductive rules are subject to restrictions that have not been discovered yet, but we must regard it as more plausible that there is no such direct relation between the degree of productivity and unrestrictedness of a morphological rule.

Thus, we have to accept that speakers' knowledge of a language comprises not only words and rules, but also the probability of a given rule applying to create a new word, i.e. productivity. While we do not fully understand what causes a morphological rule to be productive or unproductive, research suggests a complex interaction of grammatical, social/pragmatic and processing restrictions (some of these are discussed in Sections 6.3–6.4 below), and speakers may even acquire some of their

knowledge of productivity by observing how morphological patterns are used (and not used) in the community. It is thus a phenomenon that cannot be explained away, or ignored, and most linguists consider productivity an important topic for morphological study.

6.2 Productivity, creativity and gradience

When a rule is very productive, neologisms formed by that rule are hardly noticed – by speakers, hearers and lexicographers. For instance, English adjectives with the suffix *-less* can be formed quite freely (*childless*, *joyless*, *shoeless*, and so on), and if a speaker or writer creates a new word with *-less* (e.g. *commaless*: *the poet writes in long, commaless sentences*), this does not strike hearers or readers as particularly innovative. The author may not have noticed herself that she was using a new word.

Some linguists have proposed that the unconscious nature of the formation of new words is not merely a typical property of highly productive rules, but should be a necessary criterion for regarding a rule as productive. According to this view, there is a sharp distinction between productivity and **creativity**. A productive rule allows speakers to form new words unconsciously and unintentionally, whereas creative neologisms are always intentional formations that follow an unproductive pattern. An example of a creative neologism would be the word *mentalese* ('the mental language of our thoughts'), because new words with the suffix *-ese* (such as *motherese, computerese, translationese*) are probably always coined intentionally, and they immediately strike hearers and readers as new and unusual. (The word *mentalese* must have been coined by a philosopher in the middle of the twentieth century.)

However, the proposed distinction between productivity and creativity has both a methodological and an empirical problem. The methodological problem is that it defines productive rule application as unconscious or unintentional, but we have no way of knowing what speakers' intentions and state of consciousness are when they form a new word. Moreover, we can distinguish consciousness and intentionality at several levels. When the philosopher coined the word *mentalese*, he or she probably intended to create a catchy single-word expression for a highly abstract concept that would make that concept more popular. At this level the coinage was no doubt conscious. But why did he or she not choose *thoughtese* or *mindese*, two words that would have made perfect sense to describe the language of our thoughts in the mind? It so happens that English words with the suffix *-ese* have a strong preference for a stress pattern strong–weak–strong (e.g. *compùterése, mòtherése, translàtionése*, and also *Jàpanése*, not **Japànése*, *Viètnamése*, not **Vietnàmése*), and the words *thòughtése* and *mìndése* would not conform to this pattern (Raffelsiefen 1996). It seems unlikely that the

philosopher was aware of this phonological regularity, and in this sense the choice of *mèntalése* instead of *thoughtese* or *mindese* was probably unintentional.

The empirical problem is that there are many rules that yield neologisms that are neither totally unremarkable nor immediately noticed. The English verb-deriving suffix *-ize*, for example, often forms new words, so it would be very odd to say that it is unproductive, but it may well be that quite a few of these new words are conscious creations (e.g. technical scientific terms such as *pronominalize, transistorize, multimerize*).

Perhaps the term *creativity* is most appropriate when it is applied to violations of ordinary language norms (this is called **poetic licence**). Poetic licence manifests itself as the creation of novel words by unproductive rules. In English, verb + noun compounds of the type *killjoy* are unproductive, yet J. Thurber used *kissgranny*, and G. M. Hopkins coined *daredeath*. In Russian, the denominal suffix *-ač* (e.g. *trubač* 'trumpeter', from *truba* 'trumpet') is unproductive, but V. Mayakovsky created *stixač* 'verse-maker' (from *stix* 'verse'), and V. Khlebnikov used *smexač* 'laugher' (from *smex* 'laughter') (Dressler 1981). These cases should not be completely dismissed as abnormal use of language by a few exceptional individuals, because their poetry is intended for a (reasonably) wide audience, and readers must be expected at least to understand the neologisms. Thus, they provide interesting evidence that speakers are able to recognize the structure of unproductively formed words, and that the rules, even if unproductive by ordinary standards, at least exist. But the vast majority of newly formed words are not due to poetic licence.

It seems more realistic to arrange rules on a continuous scale of productivity than to divide them into classes of 'productive' and 'creative' rules, or 'productive' and 'unproductive' rules. In this book we will therefore say that morphological rules can be gradiently productive, and the less productive a rule is, the greater the chance a neologism will be noticed. The suffix *-ese* is less productive than the suffix *-less*, so we expect *-ese* neologisms to be more striking than *-less* neologisms.

6.3 Restrictions on word-formation rules

So what makes a rule (relatively) productive or unproductive? In many cases, we can give specific reasons why a word-formation rule does not give rise to words that it might be expected to permit. For example, the German female-noun suffix *-in* (as in *König-in* 'queen', *Löw-in* 'lioness') does not generally combine with the names of lower animals (examples like *Käfer-in* 'female beetle', *Würm-in* 'female worm' can be found in small numbers on the internet, but speakers are less likely to accept them, as compared to *Königin* and *Löwin*); and the English suffix *-ity* systematically

fails to combine with adjectives ending in *-ish, -y* and *-ful (*hopefulity)*. In other words, the rules of *-in* and *-ity* have restricted domains.

There is disagreement about whether such restrictions on a rule should be considered issues of productivity. Some linguists posit that a rule may be considered very productive if it routinely creates new words from bases within the rule's domain (bases not within the domain are irrelevant). Others define productivity without regard to domain. Under this definition, a rule with an unrestricted domain may be productive or unproductive, but a rule with a very restricted domain cannot be highly productive because its restrictions keep it from contributing a large number of new words to the language. Which stance we take will affect how we measure productivity (see Section 6.5 for several productivity measures), but whichever definition we employ, it is clear that restrictions on the domain of a rule significantly limit the coining of new words. The kinds of restrictions that can be observed are discussed in this section.

6.3.1 Phonological restrictions

Phonological restrictions on the domain of a word-formation rule are particularly common with derivational suffixes, much less so with prefixes and compounding. In some cases, there is a straightforward reason for the restriction: certain complex words are impossible because they would create difficulties for phonetic processing (i.e. pronunciation or perception). A common restriction rules out the repetition of identical features, e.g. the repetition of the phoneme /λ/ (spelled *ll*) in Spanish (which reduces the domain of the diminutive suffix *-illo*, (see (6.1)), or the repetition of the vowel /i(ː)/ in English (which reduces the domain of the suffix *-ee* (see (6.2))).

(6.1)   Spanish diminutive suffix *-illo*

mesa	*mesilla*	'(little) table'
grupo	*grupillo*	'(little) group'
gallo	**gallillo*	'(little) rooster'
camello	**camellillo*	'(little) camel'

(Rainer 1993: 18)

(6.2)   English patient-noun suffix *-ee*

draw	*drawee*
pay	*payee*
free	**freeee*
accompany	**accompanyee*

(Raffelsiefen 1999a: 246)

Somewhat similar is the requirement that the derived word must have an alternating rhythm (strong–weak–strong). As a result, the English suffix *-ize*

freely attaches to bases with a strong–weak rhythm, but does not attach to bases that end in a strong (i.e. stressed) syllable. (The suffix *-ese* behaves similarly, as we saw in the previous section.)

(6.3)   English verbalizing suffix *-ize*
        prívate   *prívatìze*
        glóbal   *glóbalìze*
        corrúpt   **corrúptìze*
        secúre   **secúrìze*

                                              (Raffelsiefen 1996; Plag 1999: ch. 6)

Phonological restrictions can also be purely random. As noted above in Section 6.1, the English suffix *-en* (e.g. *blacken*, *redden*, *tighten*) attaches only to monosyllabic bases. This is an example of a phonological restriction, but not one with an (obvious) phonetic motivation.

6.3.2 Semantic restrictions

In many cases, the meaning of an affix automatically restricts the domain of a word-formation rule, because some base–affix combinations simply make no sense. For example, it would be nonsensical to add the German female-noun suffix *-in* to a noun like *Baum* 'tree' (**Bäum-in*), because we do not conceive of trees as having gender distinctions. Similarly, the English reversive prefix *de-* (as in *de-escalate*, *decolonize*) can be combined only with verbal bases that denote a potentially reversible process. Combinations such as *deassassinate* or *deincinerate* are hard to interpret, except perhaps in a science-fiction context.

   However, word-formation rules may also have semantic restrictions that seem quite arbitrary. For example, the Russian quality-noun suffix *-stvo* combines with adjectives that denote properties of human beings, not with adjectives denoting physical properties of objects.

(6.4)   Russian quality-noun suffix *-stvo*
        bogatyj   'rich'   *bogat-stvo*   'richness'
        znakomyj   'acquainted'   *znakom-stvo*   'acquaintance'
        udaloj   'bold'   *udal'-stvo*   'boldness'
        lukavyj   'wily'   *lukav-stvo*   'cunning'
        vjalyj   'withered'   **vjal'-stvo*
        priemlemyj   'acceptable'   **priemlem-stvo*

                                                    (Švedova 1980: 179)

Here there is no intrinsic reason why the suffix *-stvo* should not combine with other adjectives.

6.3.3 Pragmatic restrictions

In addition to being phonologically and semantically well-formed, a neologism must also be useful – this is what is meant by pragmatic restrictions. We noted at the beginning of this section that German do not generally accept female nouns in -*in* denoting lower animals (*Käferin* 'female beetle', *Würmin* 'female worm'). It seems clear that these gaps in the German lexicon are due to a pragmatic restriction: for animals like beetles and worms, it is simply not particularly useful to distinguish between males and females. Perhaps one should regard these derivations as potential German words, because it is not all that difficult to imagine a situation in which they might become useful (e.g. entomologists' specialized publications, or fairy tales). But ordinary speakers react to *Käferin* in much the same way as they would to *Bäumin*, and it is not easy to argue that the former is a possible word, while the latter is impossible.

6.3.4 Morphological restrictions

Some morphological patterns require special morphological properties in the base. For example, Modern Hebrew has a pattern for action nouns (*CiC(C)uC*) that is applied only to verbs of one particular inflection class (*CiC(C)eC*). Verbs of other inflection classes (*CaCaC, hiCCiC*, etc.) cannot form their action nouns in this way.

(6.5)   Modern Hebrew action-noun pattern *CiC(C)uC*

diber	'speak'	*dibur*	'talk'
kibec	'gather'	*kibuc*	'gathering; kibbutz'
liked	'unite'	*likud*	'union; Likud'
tixnet	'program'	*tixnut*	'programming'
katav	'write'	**kituv*	
ħamad	'desire'	**ħimud*	
hiškiv	'put to bed'	**hiškuv*	

In Russian, the female-noun suffix -*ja* combines only with bases that are themselves derived by the suffix -*un* (see (6.6)). All other nouns must use some other female-noun suffix (-*ka, -ša, -inja, -isa*).

(6.6)   Russian female-noun suffix -*ja*

govor-it'	'talk'	*govor-un*	'talker'	*govor-un'-ja*	
beg-at'	'run'	*beg-un*	'runner'	*beg-un'-ja*	
pljas-at'	'dance'	*pljas-un*	'dancer'	*pljas-un'-ja*	
lg-at'	'lie'	*lg-un*	'liar'	*lg-un'-ja*	

(Švedova 1980: 203)

It appears that, with such nouns, the suffix -*ja* is 100 per cent possible, but since the suffix -*un* is not particularly common and not particularly productive, nouns in -*ja* are very rare.

6.3.5 Borrowed vocabulary strata

In some languages, a large part of the lexicon consists of loanwords from another language that is (or traditionally has been) well known to many speakers, at least in some influential section of the population. These loanwords usually include many morphologically complex words. If an isolated complex word is borrowed into another language, its morphological structure inevitably gets lost (thus, the English word *orangutan* is monomorphemic, although this is a compound noun in the source language, Malay: *orang* 'man', *utan* 'forest'). But when a language borrows many morphologically complex words from the same language, their morphological structure may be preserved, and their patterns may become productive in the target language. For example, Japanese borrowed many verb–noun compounds from Chinese – e.g. those in (6.7).

(6.7) Japanese V + N compounds (borrowed from Chinese)
doku-syo   'reading a book'
kyuu-sui   'supplying water'
satu-zin   'killing a man'
noo-zei   'paying tax'
tuu-gaku   'going to school'
tai-kyoo   'staying in Tokyo'
hoo-bei   'visiting the United States'

(Kageyama 1982: 221–31)

In some cases, the Chinese simple words were borrowed as well, but, in many others, these noun and verb stems exist only in compounds (e.g. *bei-* 'US' occurs only in compounds such as *bei-koku* [US-country] 'United States'). The pattern of Chinese compounds is quite different from that of the corresponding native Japanese compounds, which take the form N + V (e.g. *hito-dasuke* [person-help] 'helping people', *yama-nobori* [mountain-climb] 'mountain climbing'). Thus, if Japanese had just borrowed a few compounds of the type in (6.7), they would have lost their morphological structure, but since they were borrowed in large quantities, these compounds are analyzable by Japanese speakers, and in effect Japanese borrowed the V + N pattern along with the compounds from Chinese. The pattern is productive in modern Japanese, and new compounds can be formed with it.

However, and this is crucial in the present context, only stems borrowed from Chinese can be used in this compounding pattern. For example, the noun *amerika* (used with the same meaning as *bei-koku*) cannot be a second compound member (**hoo-amerika* 'visiting America'). Thus, the Chinese–Japanese morphological pattern is still restricted to the vocabulary stratum of Chinese–Japanese words.

A similar situation can be found elsewhere. Many languages of India have borrowed heavily from the classical language Sanskrit and thus have many

derived lexemes of Sanskrit origin. In Kannada (a Dravidian language that is not genealogically related to Sanskrit), many Sanskrit affixes are used extensively, but mostly with bases that are themselves Sanskrit loanwords. For instance, the quality-noun suffix *-te* can be used freely as in (6.8), but it does not combine with non-Sanskrit bases such as *kuḷḷa* 'short'.

(6.8) *khacita*   'certain'   *khacitate*   'certainty'
       bhadra   'safe'   *bhadrate*   'safety'
       ghana   'weighty'   *ghanate*   'dignity'
       kuḷḷa   'short'   **kuḷḷate*

(Sridhar 1990: 270, 278)

In many European languages, we find an analogous situation with loanwords from Latin. English has borrowed particularly extensively from Latin, and suffixes like *-ive, -ity, -ous* and adjectival *-al* (as in *parental*, *dialectal*) are mostly restricted to bases of Latin origin (these are often called **Latinate** bases, as contrasted with **Germanic** bases).

(6.9) *act*   *active*   *fight*   **fightive*
       brutal   *brutality*   *brittle*   **brittality*
       monster   *monstrous*   *spinster*   **spinstrous*
       parent   *parental*   *mother*   **motheral* (cf. *maternal*)

Now the question arises how speakers could learn whether a stem belongs to the native or to the borrowed stratum – after all, speakers do not acquire the historical information of etymological dictionaries during their normal process of language acquisition. In many cases, the phonological peculiarities of the borrowed stratum are probably of some help. Thus, in Kannada only Sanskrit loans have aspirated consonants (*kh, bh, gh*), and, in Japanese, Chinese loan morphemes never have more than two syllables. But otherwise the only way to infer that a word belongs to the borrowed stratum is by observing that it combines (or fails to combine) with certain affixes.

Perhaps because of this, the restriction of a word-formation pattern to a borrowed stratum is often unstable. Thus, English *-ous* has also been applied to non-Latinate bases (e.g. *murderous, thunderous*), and the Kannada Sanskrit-derived suffix *-maya* (e.g. *haasya* 'humour', *haasya-maya* 'humorous') has also been applied to non-Sanskrit words (e.g. *lanca* 'bribe', *lanca-maya* 'corrupt'; *influuyens* 'influence', *influuyens-maya* 'influential' (Sridhar 1990: 282)). The English suffixes *-able, -ize, -ify, -ism* seem to have lost their restriction to Latinate bases almost entirely.

6.4 Productivity and the lexicon

While these kinds of restrictions explain why some words fail to exist that might otherwise be expected, we are still left with the problem that

morphological patterns that are largely unrestricted may nonetheless differ in degree of productivity. Why is this?

This is a complicated issue, and one that is not yet fully understood. However, one hypothesis is that the productivity of a rule depends in large part on how the words that exemplify it are structured in the lexicon. (This also helps explain why productivity is more important to morphology than to syntax – both morphological and syntactic rules have restrictions, but only morphological structure is closely tied to the lexicon.) The main ways in which the lexicon is argued to influence morphological productivity are reviewed in this section.

6.4.1 Processing restrictions

There is growing evidence that productivity is tied to how words are mentally processed, specifically, the extent to which complex words are stored in the lexicon. Remember from Section 4.3 that under the hypothesis of a **moderate word-form lexicon**, many complex words (and all simple words) are stored in the lexicon, but some complex words are decomposed and only their component morphemes are stored. This difference can affect the **memory strength** of an affix – when an affix occurs often in words of the second type, the lexical entry for the affix will be frequently accessed, and as a consequence will have greater memory strength. However, an affix that occurs mostly in words stored in the lexicon will have relatively weak memory strength because mentally accessing a stored complex word bypasses the lexical entry for the affix. The hypothesis is that high memory strength makes an affix more readily available to speakers for use in coining new words. All else being equal, morphological patterns thus tend to be more productive if they predominantly occur in words that are decomposed, rather than stored (Hay and Baayen 2002).

Of course, many factors influence whether a word is decomposed; see Section 4.3 for an overview. Here we review just one issue: relative frequency. When a complex word is less frequent than the base that it contains, it will tend not to be stored in the lexicon, all else being equal. For instance, *modernity* has a lower token frequency than *modern*, so *modernity* is likely to be decomposed – the high frequency of *modern* makes it efficient to mentally process *modernity* via the lexical entries *modern* and *-ity*. When the complex word is more common than its base (e.g. *security* has a higher token frequency than *secure*), the complex word will tend to be stored. With regard to productivity, the key question then, is: What percentage of words with *-ity* are like *modernity*, and what percentage like *security*? This is the **parsing ratio** – the proportion of words with a given affix (or other morphological pattern) that are estimated to be stored in the lexicon according to their component parts.

It turns out that complex words containing *-ity* are likely to be stored. This suffix has a parsing ratio of 0.17, meaning that about 17 per cent of unique

complex words containing -*ity* are decomposed (the *modernity* type), and correspondingly, about 83 per cent of words containing -*ity* are stored in the lexicon (the *security* type). Parsing ratios for a sample of English suffixes are given in (6.10).

(6.10) | affix | parsing ratio | productivity ($100 \times \mathcal{P}$) |
| --- | --- | --- |
| -*ence* | 0.1 | 0.0 |
| -*ity* | 0.17 | 0.1 |
| -*ate* | 0.31 | 0.3 |
| -*dom* | 0.5 | 0.2 |
| -*ness* | 0.51 | 0.8 |
| -*ish* | 0.58 | 0.5 |
| -*like* | 0.68 | 38.1 |
| -*proof* | 0.8 | 5.5 |
| -*less* | 0.86 | 1.7 |

(Hay and Baayen 2002: 233–5)

A higher parsing ratio means that the affix is being activated in the lexicon relatively more often. Thus, the higher the parsing ratio, the more productive we would expect that affix to be. How to calculate the productivity measure $\mathcal{P}$ is described in Section 6.5(v) below, but here it is sufficient to note that larger numbers indicate greater productivity. While there is not a perfect correlation, the overall pattern is as expected (e.g. -*ity* is not particularly productive).

We should be cautious in our conclusions about the influence of morphological processing on productivity because most of the relevant research has been conducted on English. The relationship between processing and productivity in other languages remains to be investigated. But this kind of processing constraint may help explain a long-noted but imperfect correlation between semantic and phonological regularity of words created by a rule, and that rule's productivity. It is intuitively not surprising that the rule of -*th* suffixation in English is unproductive, because many of the words containing -*th* are irregular phonologically (*depth, breadth, length, youth*) or semantically (*wealth* is not just 'being well'). But some completely regular rules are unproductive (e.g. the female-noun suffix -*ess* in English: *poetess, authoress, princess*), and some highly productive patterns have a fairly large number of irregular existing words (e.g. German -*chen* diminutives, as seen in idiomatized words like *Brötchen* 'bread roll', not 'little bread', *Teilchen* 'particle', not 'little part', *Weibchen* 'animal female', not 'little woman', *Zäpfchen* 'uvula', not 'little cone'). So it does not seem quite right to say that regularity directly determines productivity. However, semantic and phonological regularity are thought to influence whether complex words are stored in the lexicon, so there is likely to be an *indirect* relationship between regularity and productivity.

6.4.2 Synonymy blocking

Very often an otherwise productive derivational rule does not apply because it is pre-empted by an existing word that has the meaning of the potential neologism. For example, the verb *to broom* does not exist because the verb *to sweep* exists instead, which means the same as *to broom* would if it existed. Morphologists say that there is **synonymy blocking** (or just **blocking**, for short) under such circumstances. Apparently languages prefer not to have several words that mean exactly the same. Some other English examples are given in (6.11).

(6.11)	base	blocked word	blocking word	related pair
	broom	**to broom*	*to sweep*	*hammer/to hammer*
	to type	**typer*	*typist*	*to write/writer*
	gymnastics	**gymnastician*	*gymnast*	*statistics/statistician*
	good	**goodly*	*well*	*bad/badly*

As the examples show, it is immaterial whether the blocking word is morphologically related to the blocked word or not.

A puzzling fact about blocking is that it has many exceptions. For instance, English has synonymous pairs like *piety/piousness, curiosity/curiousness, accuracy/accurateness*, etc. (Plank 1981: 175–80), in which one would expect the second member to be blocked by the first one. Here, one relevant factor may be the token frequency of the blocking word: the more frequent the blocking word is, the greater is its blocking strength (Plank 1981: 182; Rainer 1988). Since the effect of frequency is relative, it is best to compare a range of cases that are structurally identical but differ in token frequency. We will look at quality nouns in Italian and German (Rainer 1988: 167–71).

The Italian quality noun suffix *-ità* is generally productive with adjectives ending in *-oso* such as *furioso* 'furious', *furiosità* 'furiousness'. However, when the adjective in *-oso* is itself derived from a non-derived quality noun, this noun has the same meaning as the (potential) derivative in *-ità*, and is thus potentially subject to synonymy blocking. For example, the adjective *bisognoso* 'needful' (derived from *bisogno* 'need') does not form a quality noun **bisognosità*, because this would have the same meaning as *bisogno* and is thus blocked by it. However, the blocking effect is not always observed. For instance, *malizioso* 'malicious' forms *maliziosità* 'maliciousness', although its base *malizia* 'malice' has the same meaning. When we look at the frequencies of a range of cases, we see that only the more frequent words have the blocking effect. In (6.12), the last column gives the frequency of the blocking word as determined by a frequency dictionary. (The frequency 0 means that the corpus is not large enough to contain a token of the word, not that the word does not exist.)

(6.12)

base	potentially blocked word	blocking word		its frequency
coraggioso	**coraggiosità*	*coraggio*	'courage'	52.70
pietoso	**pietosità*	*pietà*	'pity'	34.04
desideroso	**desiderosità*	*desiderio*	'desire'	31.92
fiducioso	**fiduciosità*	*fiducia*	'confidence'	30.79
orgoglioso	**orgogliosità*	*orgoglio*	'pride'	10.64
armonioso	*armoniosità*	*armonia*	'harmony'	4.13
rigoroso	*rigorosità*	*rigore*	'rigour'	3.42
malizioso	*maliziosità*	*malizia*	'malice'	0
acrimonioso	*acrimoniosità*	*acrimonia*	'acrimony'	0
parsimonioso	*parsimoniosità*	*parsimonia*	'parsimony'	0
ignominioso	*ignominiosità*	*ignominia*	'ignominy'	0

The frequency effect on blocking strength can also be observed when a productive quality noun rule competes with unproductive quality noun formations. In German, the suffix *-heit* '-ness' has all monosyllabic adjectives in its domain, but it is blocked when a different quality noun is available, e.g. **Reichheit* 'richness' from *reich* 'rich' is blocked by *Reichtum* 'wealth', which uses the unproductive suffix *-tum*. Again, the frequency of the blocking word is decisive, as shown in (6.13).

(6.13)

base		potentially blocked word	blocking word		its frequency
alt	'old'	**Altheit*	*Alter*	'(old) age'	1400
groß	'big'	**Großheit*	*Größe*	'size'	1301
tief	'deep'	**Tiefheit'*	*Tiefe*	'depth'	613
warm	'warm'	**Warmheit*	*Wärme*	'warmth'	520
frisch	'fresh'	**Frischheit*	*Frische*	'freshness'	107
eng	'narrow'	**Engheit*	*Enge*	'narrowness'	67
blass	'pale'	**Blassheit*	*Blässe*	'paleness'	23
schnell	'quick'	**Schnellheit*	*Schnelle*	'quickness'	23

The explanation for the frequency effect on blocking strength is that frequent words have greater memory strength and are therefore retrieved faster from memory than rare words. When a German speaker wants to say 'warmth', she has two options: applying the productive rule of *-heit* suffixation or retrieving an existing word with that meaning – i.e. *Wärme*. Since *Wärme* is very frequent and thus easy to retrieve from the lexicon, it will win out in this case. When the existing word is rare, it has a relatively weak memory strength, and the process of forming a new word may be faster, so no blocking is observed (see Anshen and Aronoff 1988). Blocking thus represents both a semantic restriction on productivity (the desire of the language not to have two words with identical meaning), and also a constraint imposed by the lexicon (words with stronger representations in

the lexicon create stronger blocking effects because they are more easily accessed).

6.4.3 Productivity and analogy

Finally, this book is primarily about synchronic morphology, the nature of morphological patterns as they function in a particular language at a given time. But, in order to understand synchronic patterns better, it is sometimes useful to consider the diachronic aspect of morphology, in particular here, analogical change.

An **analogical change** is said to occur when speakers form a new word on the model of (or *by analogy with*) another word. For instance, the English verb *fling* used to have a past tense formed with the suffix *-ed* (*flinged*), but at some point the past-tense form *flung* was created, clearly on the model of verbs like *sting/stung*. In order to show clearly what happens in analogical change, linguists often use **proportional equations** as in (6.14). The two terms on the left-hand side of the equation represent the model, and the X on the right-hand side represents the target word that was newly created by analogy.

(6.14) *sting* : *stung* = *fling* :   X
$\qquad\qquad\qquad\qquad$ X = *flung*

This is an example of **analogical extension**, which involves an existing morphological pattern being extended to a new lexeme. The *i/u* pattern was extended to the lexeme FLING, which was 'new' in the sense that it did not previously exhibit this pattern. Another example is the Polish plural suffix *-owie*. Originally this suffix occurred only with a few nouns (those belonging to the *u*-declension), e.g. *syn* 'son', plural *synowie* 'sons'. But later it was extended to quite a few other nouns denoting male humans, e.g. *pan* 'lord, sir', plural *panowie* (earlier plural form *pany*).

(6.15) *syn* : *synowie* = *pan* :   X
$\qquad\qquad\qquad\qquad$ X = *panowie*

Analogical extension also occurs in derivational morphology. For instance, on the model of pairs of French loanwords such as *change*$_V$, *changeable*$_A$, adjectives in *-able* were formed from native English words like *wash*:

(6.16) *change* : *changeable* = *wash* :   X
$\qquad\qquad\qquad\qquad$ X = *washable*

Analogical extension can thus create a new lexeme, thereby enriching the lexicon, or it can lead an existing lexeme to switch from one inflectional pattern to another. One way to look at analogical change is as the diachronic result of synchronic productivity.

The notation in terms of proportional equations suggests that a single word pair served as the model for the change, but in fact, there is no particular reason to assume that. The left-hand part of a proportional equation is best understood as a general pattern, a word-schema, rather than as a single word. If that is the case, then a formula such as *sting/stung* becomes virtually indistinguishable from word-based rules of the kind we have already encountered many times.

In fact, thinking of the pattern (and all of the words that exemplify it) as the analogical model helps explain why patterns with low type frequency can be productive. Reconsider *fling/flung*. At first glance, a switch from the *-ed* pattern to the *i/u* pattern may seem odd. Why should a lexeme be drawn away from a pattern that is quite productive and has high type frequency, and begin to exhibit a pattern that applies to fewer than two dozen words? The key observation is that the *i/u* pattern is dominant among words that are phonologically like the target; see (6.17).

(6.17)　/(s)C(C)ɪŋ/　　*cling/clung, fling/flung, sling/slung, string/strung,*
　　　　　　　　　　　wring/wrung, sting/stung, swing/swung
　　　　/(s)C(C)ɪŋk/　*slink/slunk, shrink/shrunk* (or *shrank*), *stink/stunk*
　　　　/(s)C(C)ɪn/　　*spin/spun, win/won*
　　　　/(s)C(C)ɪg/　　*dig/dug*
　　　　/(s)C(C)æŋ/　　*hang/hung*
　　　　/(s)C(C)ʌɪk/　*strike/struck*
　　　　/(s)C(C)ɪk/　　*stick/stuck*
　　　　/(s)C(C)ik/　　*sneak/snuck* (or *sneaked*)

These words are all highly similar in phonological form, and all share a morphological pattern. Linguists call such a group of words a **lexical gang**. Lexical gangs often have fuzzy boundaries; the correspondence in (6.18) describes the **prototypical members** of the *i/u* gang. Peripheral members of the gang differ from this prototype to varying degrees.

(6.18)　$\begin{bmatrix} \text{/(s)C(C)ɪŋ/v} \\ \text{'}x\text{'} \\ \text{TENSE: PRESENT} \end{bmatrix} \rightarrow \begin{bmatrix} \text{/(s)C(C)ʌŋ/v} \\ \text{'}x\text{'} \\ \text{TENSE: PAST} \end{bmatrix}$

According to a reverse dictionary of Modern English, seven of thirteen verbs matching the left schema in (6.18) have the *i/u* pattern (sometimes alongside another pattern). Thus, while *ding/dinged* (and *sing/sang*, and *bring/brought*) are all possible analogical models, they are relatively unlikely because the *i/u* pattern has a high type frequency among verbs with the shape /(s)C(C)ɪŋ/. And as a result, the *i/u* pattern is a strong analogical model in this particular phonological context, despite being of much lower type frequency overall than the *-ed* pattern (Bybee and Moder 1983).

We can conclude from this that the term *analogical change* emphasizes a diachronic outcome, whereas the term *productivity* emphasizes synchronic

structure, but the solution of an analogical equation is in practical terms the same as the application of a (productive!) word-based rule to a novel lexeme. Moreover, the analogical perspective highlights that productivity is directly tied to words in the lexicon, because these words help determine the strength of the pattern as a model for analogical extension.

6.5 Measuring productivity

We have seen that productivity is best regarded as a gradable property of morphological rules. Thus, for each rule we may want to ask how productive it is – i.e. we want to measure the degree of productivity of word-formation rules.

In syntax, **acceptability judgements** are widely taken to be direct reflections of speakers' competence, and are used to distinguish possible and impossible sentences. However, speakers tend to be more reluctant to accept new words than to accept new sentences, maybe because they do not encounter new words very often in ordinary life. Consider the set of adjectives *bearded* (having a beard), *winged* (having wings), *pimpled* (having pimples), *eyed* (having eyes). The last word in this set, *eyed*, seems odd, and speakers may judge it unacceptable. But does that mean that it is truly ungrammatical – i.e. not allowed by the morphological system? A straightforward explanation of the difference in the acceptability of *bearded*, *winged* and *pimpled*, on the one hand, and *eyed*, on the other, is that not all creatures have beards, wings and pimples, but virtually all have eyes, so one would rarely describe a person or an animal as *eyed*. But consider a context in which cave-dwelling bugs, worms and other lowly creatures are discussed, and the focus is on whether they have eyes or not. In such a context, the use of *eyed* suddenly becomes much more plausible, and, confronted with this context, speakers would perhaps reverse their acceptability judgements. So just what these judgements mean is not always obvious in morphology. For this reason, most morphologists are interested in actual words when measuring productivity, in addition to speakers' acceptability judgements of hypothetical words.

Various measures of productivity have been proposed, but it turns out that they measure rather different things.

(i) The **number of actual words** formed according to a certain pattern (also called **degree of generalization**, **profitability** of a pattern or **type frequency**). This is an interesting concept, and it is fairly easy to measure by examining a comprehensive dictionary (though, of course, this works only to the extent that the dictionary faithfully records all and only the actual words of the language). However, type frequency is not the same as productivity: according to this measure, the English suffix *-ment* has a high type frequency (English has hundreds of words like *investment*, *harassment*,

fulfilment), but it is not productive – only four neologisms with *-ment* are attested in the *OED* for the twentieth century. Conversely, there are not many usual words with the suffix *-ese* (as in *journalese*), but this can be used freely to coin new words denoting a special language or jargon.

(ii) The **number of possible words** that can be formed according to a certain pattern. This concept is much more difficult to measure, because it requires that we correctly identify all the restrictions on the pattern. But even then it is unlikely that the set of possible words equals the likelihood that a new word can be coined. There are simply too many cases of (more or less) unproductive rules that do not seem to be restricted in any general way. For instance, *en-/em-* prefixation in English should be possible with any noun that denotes a container-like object (e.g. *entomb, ensnare, embody*), but the rule is simply not productive (cf. **embox* 'put into a box', **encar* 'put in a car').

(iii) The **ratio of actual words to possible words** (also called the **degree of exhaustion**) (Aronoff 1976). Again, this requires that we be able to count the number of possible words, so it is not very practical. Moreover, when the possible bases include complex words that are themselves formed productively, the set of possible words becomes open-ended, and computing the ratio of actual to possible words is not really meaningful. For example, English or German N + N compounds can be formed freely without restrictions, and the compound members may be compounds themselves (see Section 7.1). Thus, the set of possible N + N compounds is staggeringly large (in principle, infinite), so the degree of exhaustion for N + N compounds is necessarily quite low (even though there are plenty of actual N + N compounds, and the pattern is highly productive).

(iv) The **number of neologisms** attested over a certain period of time (also called **diachronic productivity**). This measure can be determined if a good historical dictionary is available (such as the *OED*), but again only to the extent that the dictionary is reliable. And we saw earlier that if a pattern is very productive, lexicographers are likely to overlook new words with this pattern. Another technique uses large text corpora. By looking at a newspaper corpus of recent decades, it should be possible, for instance, to observe how the English semi-suffix *-gate* (as in *Watergate, Irangate*, etc.) gained (and perhaps lost) productivity over the years.

(v) The **ratio of hapax legomena with a given pattern to total token frequency of words with that pattern** (called the $\mathcal{P}$ measure, or the **category-conditioned degree of productivity**) (Baayen and Lieber 199; Baayen 1993). This measure stems from the observation that productive morphological rules are likely to produce occasionalisms, whereas unproductive rules are not likely to do so. Occasionalisms are thus particularly important for determining productivity. A **hapax legomenon** is a word that occurs only once in a corpus; in a very large corpus hapax legomena can be assumed to be occasionalisms. The category-conditioned degree of productivity is

calculated by dividing the total number of hapax legomena in the corpus exhibiting a given morphological pattern by the total number of **word tokens** in the corpus that exhibit that same pattern:

(6.19) Category-conditioned degree of productivity
$$\mathcal{P} = V_{1,m} / N_m$$

Here, $V_{1,m}$ is the number of hapax legomena in a corpus that exhibit morphological pattern m. N_m is the collected token frequency of all words exhibiting pattern m. The ratio captures the likelihood that a word randomly drawn from the corpus and exhibiting the relevant pattern will be an occasionalism.

   (vi) The **ratio of hapax legomena with a given pattern to all hapax legomena** (called the $\mathcal{P}^*$ measure, or the **hapax-conditioned degree of productivity**) (Baayen and Lieber 1991; Baayen 1993). This measure also relies on the tendency of productive rules to create occasionalisms, but $\mathcal{P}^*$ measures the extent to which a given morphological pattern contributes to the total growth rate of the vocabulary. In this measure, the number of hapax legomena exhibiting a given morphological pattern is divided by the total number of hapax legomena in the corpus (with all morphological patterns):

(6.20) Hapax-conditioned degree of productivity
$$\mathcal{P}^* = V_{1,m} / V_1$$

V_1 is the total number of hapax legomena in the corpus. This is thus similar to method (iv), but has the advantage that it measures productivity at a given moment in time, and a good historical dictionary is not needed.

   All of these measures are most useful for determining the relative productivity of patterns that serve similar functions, for example, -*ness* vs. -*ity* in English. It is often not clear how productivity measures should be interpreted when taken in isolation, or when comparing unlike morphological patterns (e.g. one that creates an adverb and one that creates a noun).

Summary of Chapter 6

The productivity of a morphological rule is a measure of the extent to which it can be used to create new words. Productivity is often regarded as a phenomenon that exclusively concerns language use (performance) or language change, but, in the view defended here, productivity is one part of speakers' knowledge of language (competence). Productivity itself must be an object of morphological study.

Morphological patterns can be arranged on a scale from totally unproductive to highly productive. A rigid dichotomy between creativity and productivity does not seem to be very useful, because there are always intermediate cases. The productivity of a pattern may be limited in various ways: phonologically, semantically, pragmatically and morphologically. Sometimes a pattern is productive only within a borrowed vocabulary stratum.

The structure of the lexicon is also a likely factor. Patterns with high memory strength (by virtue of being frequently accessed in the lexicon) tend also to be more productive. High frequency words can block newly coined words with the same meaning. Finally, lexical gangs and other patterns with low token frequency can be (quasi-) productive because they are phonologically densely clustered in the lexicon.

Various quantitative measures of productivity have been proposed; the corpus measures based on hapax legomena ($\mathcal{P}$ and $\mathcal{P}^*$) are increasingly used.

Further reading

Excellent recent discussions of issues surrounding productivity are found in Plag (1999) and Bauer (2001b) (see also Kastovsky (1986) and Dressler and Ladányi (2000)). Bauer (2005) looks particularly at the history of theories of productivity.

The view that competence and performance should be strictly separated is expressed in Di Sciullo and Williams (1987). Aronoff (1980) argues that productivity is relevant to competence and to the synchronic study of morphology more generally. The distinction between productivity and creativity is proposed in the classical paper Schultink (1961) (see also van Marle 1985). On productivity as a scalar notion, see Bauer (1992).

The non-distinctness of analogy and morphological rules is pointed out in Becker (1990) and Blevins and Blevins (2009); see also Bybee (1985, 1988). Perhaps the most detailed analogical approach to morphological rules and productivity is Skousen (1989, 1992). The logical extreme of the analogical approach is connectionism. Classic articles in this framework are Rumelhart and McClelland (1986), MacWhinney and Leinbach (1991) and Daugherty and Seidenberg (1994).

Blocking and its relation to frequency are discussed by Rainer (1988) and Anshen and Aronoff (1988). Aronoff (2007) shows that semantic regularity is not necessary for the creation of neologisms (which further implies that regularity and productivity are not quite the same thing).

For better or worse, a disproportionate amount of work on productivity has focused on English past tense inflection. In addition to the connectionist papers listed above, see in particular Bybee and Slobin (1982), Bybee and Moder (1983), Pinker and Prince (1988), Derwing and Skousen (1994) and Albright and Hayes (2002).

Comprehension exercises

1. The productivity of the suffix -*ity* in English is heavily restricted (see the examples below). What might be the nature of the restriction, and into which of the categories of Section 6.3 does it fall?

electric	*electricity*	*bountiful*	**bountifulity*
probable	*probability*	*sonorant*	**sonorantity*
captive	*captivity*	*aimless*	**aimlessity*
curious	*curiosity*	*darkish*	**darkishity*
abnormal	*abnormality*	*fearsome*	**fearsomity*

2. Recall Exercise 1 of Chapter 4. Of the words listed there, you have probably characterized *reknow* and *happytarian* as impossible words in English, although the affixes *re-* and *-(t)arian* are widely attested and productive in English. What is it about the nature of these affixes that makes them unsuitable for these bases? (In other words, in what way is their productivity restricted?)

3. Modern Greek has two action-noun suffixes, -*simo* and -*ma*, which are both productive, but in different, complementary domains. Try to extract a generalization from the following examples that predicts when -*simo* occurs and when -*ma* is used. (Note that the phonological stem alternations are irrelevant.)

VERB	MEANING	ACTION NOUN	MEANING
đjavázo	'I read'	*đjávasma*	'reading'
kóvo	'I cut'	*kópsimo*	'cutting'
lúzo	'I bathe'	*lúsimo*	'bathing'
mangóno	'I squeeze'	*mángoma*	'squeezing'
pjáno	'I seize'	*pjásimo*	'seizing'
skondáfto	'I stumble'	*skóndama*	'stumbling'
tinázo	'I shake'	*tínaɣma*	'shaking'
tréxo	'I run'	*tréksimo*	'running'

4. Which of the following words are impossible in the given meaning because of synonymy blocking? For words that cannot be explained as blocking, what is the reason for their impossibility?
   *musting   (e.g. *I hate musting get up every morning.*)

*foots   (e.g. *Bobby played outside and has dirty foots now.*)
*cooker   (e.g. *This meal is superb. The cooker is a real artist.*)
*bishopdom (e.g. *The bishop often travels through his bishopdom.*)
*teacheress   (e.g. *Our teacheress is a very competent woman.*)
*slickize   (e.g. *The Zambonis slickize the ice before the skaters compete.*)
*certainness (e.g. *Nowadays there is less certainness about church teachings.*)
*sisterlily   (e.g. *She embraced her sisterlily.*)

5. How did the suffixes (or perhaps bound roots) *-(er)ati* and *-scape* come into being? Consider the following examples:
literati, glitterati, liberati, chatterati, soccerati, digiterati (Kemmer 2003)
landscape, seascape, cloudscape, skyscape, waterscape, winterscape (Aldrich 1966).

Exploratory exercise

Acceptability judgements are used less often in morphology than in syntax. Morphologists tend to study actual words, rather than potential ones, and the measures of productivity introduced in Section 6.5 reflect that. But acceptability judgements are still important to morphology and are, for example, cited in many places in this book, so we might wonder about the relationship between acceptability judgements and productivity measures. Do acceptability judgements and productivity scores measure the same thing? In this exercise, you will explore and compare the two types of measures.

The instructions below use Russian for demonstration purposes, but this exercise could be conducted using any language for which a good electronic corpus or frequency list is available. Readers with basic programming skills will find it easier and more accurate to calculate productivity based directly on a corpus that is available electronically.[1] However, in the following instructions we assume that existing frequency lists or frequency dictionaries (i.e. a list/dictionary of words found in a corpus, with counts of how often each word occurs) will be used.

Instructions

Step 1: For the language you will investigate, find a frequency list or frequency dictionary, preferably one generated from a large corpus that includes a wide variety of textual and/or spoken data. The Russian examples in (6.21) and (6.22) were taken from a frequency list containing approximately 32,000 unique lexemes, which in turn was generated from a moderately sized corpus of modern Russian (about 16 million word tokens), from a variety of sources (Sharoff 2002).

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[1]   The Linguistic Data Consortium is a major distributor of corpora: www.ldc.upenn.edu.

Step 2: Pick 2–5 morphological patterns to study. The best choices will be derivational patterns that express the same meaning, or a very similar meaning, and intuitively seem to differ in productivity. (Derivational patterns are desirable, as opposed to inflectional ones, because inflectional patterns are more uniformly productive.) Two Russian patterns that meet these criteria are shown in (6.21).[2]

(6.21)

pattern	abstract noun		base adjective	
-stvo	bogat-stvo	'wealth'	bogat-yj	'wealthy'
	p'jan-stvo	'drunkenness'	p'jan-yj	'drunk'
-ost'	naivn-ost'	'naiveté'	naivn-yj	'naive'
	hrabr-ost'	'bravery'	hrabr-yj	'brave'

Step 3: Calculate the hapax-conditioned degree of productivity ($\mathcal{P}*$). This will require you to search your list or dictionary for all hapax legomena, regardless of morphological pattern, and record the total number that occur. (Most frequency lists are sorted from most frequent to least frequent, making this a relatively simple task.) Then, within the list of hapaxes, search for all words containing the chosen morphological pattern. For instance, of the 5,133 least frequent words in the Frequency Dictionary of Russian, 44 words contained -stvo and 118 contained -ost'. Some examples of these hapaxes are listed in (6.22).

(6.22) a. *besčinstvo*   'excess, enormity'
          svjatotatstvo   'sacrilege'
          provorstvo   'adroitness, dexterity'
          dissidentstvo   'nonconformism (rel.)'

       b. *prazdnost'*   'idleness'
          brennost'   'mortality'
          neperenosimost'   'unbearability'
          krasivost'   'beauty'

$\mathcal{P}*(stvo)$ = 44/5133 = 0.0086, and $\mathcal{P}*(ost)$ = 118/5133 = 0.023. Thus, -ost is approximately two and a half times more productive than -stvo according to the hapax-conditioned degree of productivity.

Note: The accuracy of hapax-based productivity scores depends in part on the size of the corpus. Logically, a word that occurs only once in a 2 million-word corpus might occur about 10 times in a 20 million-word corpus (and thus it would not be counted as a hapax in the larger corpus), and a word that is too rare to be attested in a 2 million-word corpus might

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[2] It is helpful if the sequence of letters in the chosen affixes is not likely to produce many false hits. For instance, the English suffix -*y* creates abstract nouns from verbs (e.g. *assemble – assembly*), but it would be a poor choice because many adjectives and other words also end in the letter *y* (e.g. *happy*). By contrast, in English words ending in the letters *ation*, this is almost always a suffix (e.g. *consult – consultation*).

be a hapax in a larger corpus. And so presumably, the larger the corpus, the more likely it is that hapaxes will be true occasionalisms that are produced by the productive rule. For practical reasons, many frequency lists give only the words that occur at least a certain number of times in the source corpus. But assuming that such a list is large enough to include many words that are rarely used, it should be possible to treat the most infrequent words on the list as if they were 'true' hapaxes, even if they occur more than once. This sacrifices some degree of accuracy, but in many respects it is equivalent to using a smaller corpus.

Step 4: Based on the results of Step 3, develop predictions about speakers' acceptability judgements. Do you expect speakers to be more likely to accept possible words when the affix is more productive? Less likely? No relation? Do you expect speakers to give potential words exhibiting the more productive patterns higher ratings on an acceptability scale? Why or why not? Explain your reasoning.

Step 5: Test your predictions with native speaker informants. Make a list of at least 10 possible words for each of the affixes. These test words should be built on real bases, and should obey the restrictions on the domain of the rule, but not be actual words. (See Section 6.3 for discussion of domain restrictions.) For instance, Russian has the adjectives *matovyj* 'matted, suffuse (of light)' and *laskovyj* 'tender, gentle', but the derived abstract nouns *matovost'* and *laskovost'* are not actual words. They can be considered possible words. Devise a ratings scale and ask at least three native speakers to judge the acceptability of these test words.

Step 6: Analyze the data. Determine whether there is a correlation between the productivity scores and speakers' acceptability judgements. Do speakers' judgements match your predictions? If not, develop hypotheses about factors that might influence one measure, but not the other. Also consider the possible impact of your data collection methodology on your results, for both types of measures. Finally, think about the relationship between speakers' acceptability judgements and hapax-conditioned productivity. Do they measure the same thing, or different things? Explain your reasoning.

Morphological trees

<div style="text-align: right; font-size: large;">**7**</div>

In this chapter we will see that various kinds of morphologically complex words can be thought of as having **hierarchical structure**. In this respect, morphological structure resembles syntactic structure, and the ways in which morphological and syntactic structure are similar and different are important. At issue is the degree to which syntactic principles govern word-level structure. Until now, we have largely assumed that morphological rules exist in a separate area of the grammar from syntactic rules, with each area subject to its own principles. However, strong commonalities between morphological and syntactic structure might suggest that the grammatical system is not divided in this way. In this chapter we assess the evidence related to hierarchical morphological structure. Hierarchical structure is quite evident in compound words, and less so in derivationally derived words. Thus, we will start by examining compounds in some detail.

7.1 Compounding types

A **compound** is a complex lexeme that can be thought of as consisting of two or more base lexemes. In the simplest case, a compound consists of two lexemes that are joined together (called *compound members*). Some examples from English are given in (7.1). English allows several types of combinations of different word-classes (N: noun, A: adjective, V: verb), but not all such combinations are possible.

(7.1)   English compounds: some examples[1]

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[1]   Note that the spelling of English compounds is inconsistent: often they are written as a single word, but in many other cases (especially with N + N compounds), the constituents of the compound are separated by a space, like syntactic phrases (e.g. *sugar plantation, morpheme lexicon*). These spelling differences are irrelevant in the present context and should be ignored.

N + N	*lipstick*	(*lip*N + *stick*N)
A + N	*hardware*	(*hard*A + *ware*N)
V + N	*drawbridge*	(*draw*V + *bridge*N)
N + V	*babysit*	(*baby*N + *sit*V)
N + A	*leadfree*	(*lead*N + *free*A)
A + A	*bitter-sweet*	(*bitter*A + *sweet*A)

Compounding rules may differ in productivity. In English, the N + N pattern is extremely productive, so novel compounds are created all the time and are hardly noticed. By contrast, the V + N pattern is unproductive and limited to a few lexically listed items, and the N + V pattern is not really productive either. For instance, one cannot say *to hair-wash* 'wash one's hair', and the small handful of examples like *babysit* from Section 3.2.2 are mostly backformations from nouns, and are not produced directly by N + V compounding rules.

However, there are many languages (especially morphologically rich, polysynthetic languages) that do allow compounds in which the notional object and the verb form a compound. Such compounding processes are called **noun incorporation** (metaphorically we say that the object is incorporated into the verb). An example from Alutor is given in (7.2). (For more on noun incorporation, see Section 11.2.1.)

(7.2) *gəmmə*   *tə-məng-ilgətav-ək*
         I   1SG-hand-wash-1SG
         'I washed (my) hands.' (Lit.: 'I hand-washed.')
                        (Koptjevskaja-Tamm and Muravyova 1993: 298)

In a compound that consists of two lexemes, it is really the lexeme stems that are combined, not inflected forms. In this respect compounding is no different from derivational affixes, which attach to stems. Thus, we get English compounds such as *lipstick* (not **lipsstick*), although it is used for both lips, and *child support* (not **children support*), even if several children are supported. While we have already seen some examples in which the first lexeme of a compound is inflected (e.g. *publications list* from Section 5.3.7), this is not common.

That the first compound member is almost always a stem, not an inflected word-form, can be seen most clearly in languages with richer inflection, such as Sanskrit. In Sanskrit, the first compound member in N + N/A compounds shows a vowel-final (or -ṛ-final) form that does not occur as a member of the inflectional paradigm – this can thus be regarded as the **pure stem**.

(7.3) *deva-senā-*   'army of gods'   (*devaḥ* 'god')
         pitṛ-bandhu-   'paternal relation'   (*pitā* 'father')
         pati-juṣṭa-   'dear to the spouse' (*patiḥ* 'spouse')

In German, many compounds even have a special semantically empty suffix (sometimes called an **interfix**) on the first compound member, which forms the stem that is appropriate for compounding. Some examples are shown in (7.4).

(7.4)   German compounds with interfixes
   Volk-s-wagen   lit. 'people's car' (*Volk* 'people' + *Wagen* 'car')
   Liebe-s-brief   'love letter'   (*Liebe* 'love' + *Brief* 'letter')
   Schwan-en-gesang 'swansong'   (*Schwan* 'swan' + *Gesang* 'song')

That the first member of a compound is a stem rather than a particular word-form is also clearly seen in German V + N compounds, as in (7.5).

(7.5)   German V + N compounds
   Wasch-maschine   'washing machine'
                       (*wasch-en* 'wash' +   *Maschine* 'machine')
   Schreib-tisch   '(writing) desk'
                       (*schreib-en* 'write' +   *Tisch* 'desk, table')
   Saug-pumpe   'suction pump'
                       (*saug-en* 'suck' +   *Pumpe* 'pump')

The elements *wasch-*, *schreib-* and *saug-* must be pure stems, because almost all word-forms of verbs have special suffixes (the suffix *-en* in (7.5) is the infinitive (and citation-form) suffix). The only suffixless word-form is the imperative, but it would not make sense semantically to claim that *wasch* in *Waschmaschine* is the imperative form of the lexeme WASCHEN.

   From the point of view of semantics, not much needs to be said about the compounds that we have seen so far. The first compound member generally serves to modify and narrow the meaning of the second compound member. Thus, a *lipstick* is a special kind of stick (not a special kind of lip), a *drawbridge* is a special kind of bridge and a *love letter* is a special kind of letter. Since semantically the second member is in this sense more important, it is referred to as the **semantic head** of the compound, and the modifying element is called the **dependent**. Examples like *lipstick* belong to the **endocentric** type of compound (the term *endocentric* means that the semantic head (or *centre*) of the compound is 'inside' (*endo-*) the compound). In endocentric compounds, the meaning of the entire word is a subset of the meaning of the lexeme that serves as the head. In English, the semantic head of an endocentric compound is always the second member, but in other languages such as Spanish, the head is the first member.

(7.6)   *hombre-rana*   'frogman'   (*hombre* 'man' + *rana* 'frog')
        año luz   'light year' (*año* 'year' + *luz* 'light')
        pez espada   'swordfish' (*pez* 'fish' + *espada* 'sword')

   The semantic relations that obtain between the head and the dependent in compounds are quite diverse: purpose (*writing desk, lipstick*), appearance

(*hardware, swordfish*), location (*garden chair, sea bird*), event participant (e.g. agent: *swansong*, patient: *flower-seller*), and so on. There thus seem to be almost no restrictions on the kinds of semantic relations that may hold between the dependent and the head in compounds (at least in the languages in which compound meanings have been studied extensively). It is our knowledge of the world that tells us that a *flower-seller* is someone who sells flowers, and that a *street-seller* is someone who sells something on the street. But it is easy to imagine a world (say, a fable about commercially active bees) in which selling goes on on flowers, and even easier to imagine a world in which people specialize in selling entire streets. English morphology does not seem to say more than that the dependent must be in some kind of pragmatically sensible relation to the head.

Not all compounds are of the endocentric type. Compounds may also be **exocentric** (i.e. their semantic head is 'outside' (*exo-*) the compound). Exocentric compounds can be illustrated with examples from Ancient Greek.

(7.7)   *kakó-bios*   'having a bad life'
                          (*kakós* 'bad' + *bíos* 'life')
         polu-phármakos   'having many medicinal herbs'
                          (*polús* 'much' + *phármakon* 'herb')
         hēdúoinos   'having sweet wine'
                          (*hēdús* 'sweet' + *oînos* 'wine')
         megaló-psukhos   'having a large mind, i.e. magnanimous'
                          (*mégas* 'large' + *psukhē* 'mind')

A compound such as *hēdúoinos* refers to someone who has sweet (*hēdú-*) wine (*oino-*), so it denotes a kind of person, not a kind of 'sweet' nor a kind of 'wine'. The semantic head is 'outside' the compound: the reference to 'someone' must be inferred from the structure as a whole – there is no morpheme that refers to a person or to ownership. English has a few exocentric A + N compounds of this semantic type (*redhead* 'someone who has red hair', *highbrow, lazybones*), but this pattern is hardly productive in English.

Another type of exocentric compound is illustrated by the Italian examples in (7.8).

(7.8)   *portabagagli*   'trunk'   (*portare* 'carry' + *bagagli* 'luggage')
         lavapiatti   'dishwasher'   (*lavare* 'wash' + *piatti* 'dishes')
         asciugacapelli 'hair dryer'   (*asciugare* 'dry' + *capelli* 'hairs')

Here the 'external' semantic head is an instrument for carrying out an action on an object. Again, English has a few exocentric V + N compounds as well (referring to people rather than instruments: *pickpocket, cutthroat, killjoy*), but this pattern is totally unproductive in English.

Using our word-based notation of Section 3.2.2, the rules that yield these exocentric compounds can easily be represented formally.

(7.9)   Rule for Italian exocentric compounds of (7.8)

$$\begin{bmatrix} /\text{X}re/_{\text{V.INF}} \\ \text{'do}x\text{'} \end{bmatrix} \quad \& \quad \begin{bmatrix} /\text{Y}/_{\text{N.PL}} \\ \text{'}ys\text{'} \end{bmatrix} \quad \leftrightarrow \quad \begin{bmatrix} /\text{XY}/_{\text{N.SG}} \\ \text{'instrument for doing}_x\ ys\text{'} \end{bmatrix}$$

Here the compound word-schema on the right contains the additional meaning element 'instrument for', which is not associated with a particular element of phonological form, but with the pattern as a whole (cf. the rule in (3.30), which is similar in this respect).

Besides endocentric and exocentric compounds, there are also compounds that have more than one semantic head. In these compounds, each member has a separate referent. Both members are on an equal footing, and they can be paraphrased with 'and', so they are called **coordinative compounds**. Some examples from Korean are in (7.10).

(7.10) *elun-ai*   'adult and child'   (*elun* 'adult' + *ai* 'child')
        ma-so   'horses and cattle' (*ma* 'horse' + *so* 'cow')
        non-path   'farm'   (*non* 'rice field' + *path* 'dry field')
        o-nwui   'brother and sister' (*o* 'brother' + *nwui* 'sister')
        son-pal   'hand and foot'   (*son* 'hand' + *pal* 'foot')
                                                (Sohn 1994: 416–7)

Coordinative compounds are widespread in the world's languages, but they happen to be rare in European languages, including English.

Another, more familiar type of compound is represented by examples such as (7.11) from Spanish, where both compound members have the same referent. Such compounds are called **appositional compounds**.

(7.11) *poeta-pintor*   'poet who is also a painter'
        actor-bailarín   'actor who is also a dancer'
        compositor-director 'composer who is also a director'

English also has some compounds of this kind (*student worker, Marxism-Leninism*), and adjective compounds such as *bitter-sweet* and *deaf-mute* can be subsumed under this type as well.

The last type of compound to be mentioned here is again exocentric, but it shares with coordinative compounds the feature of semantic equality of both compound members. A few examples from Classical Tibetan are given in (7.12).

(7.12) *rgan-gžon*   'age'   (*rgan* 'old' + *gžon* 'young')
        yag-ñes   'quality' (*yag* 'good' + *ñes* 'bad')
        mtho-dman   'height'   (*mtho* 'high' + *dman* 'low')
        srab-mthug   'density' (*srab* 'thin' + *mthug* 'thick')
                                        (Beyer 1992: 105)

The semantic head of these compounds is something like 'property', so *rgan-gžon* is literally 'property (in the feature) of old and young', i.e. 'age'.

7.2 Hierarchical structure in compounds

As we saw in the preceding section, the concept 'semantic head' is useful for talking about the kinds of semantic relations that may obtain between the members of a compound. In this section, we will see that not only a semantic notion of 'head', but also a formal notion of 'head' can play a role in morphology. Let us look at a number of examples of compounds and their tree diagrams.
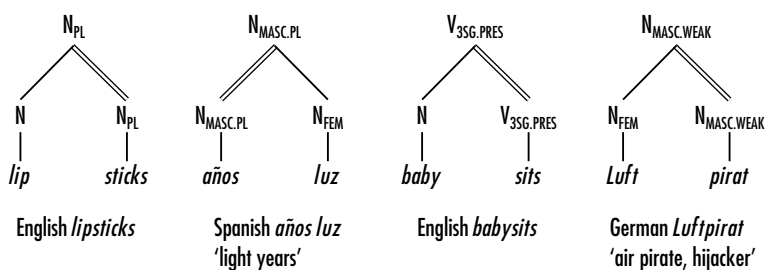
Figure 7.1 Compound trees: two compound members

Tree diagrams indicate hierarchical structure. In Figure 7.1 this is rather unexciting, because the compounds consist of only two lexemes. However, tree representations of compounds are particularly useful when a compound consists of members that are compounds themselves, because in that case several different hierarchical structures are possible. Two possibilities for three-term compounds are shown in Figure 7.2, and Figure 7.3 shows two possibilities for compounds with four terms. In the compound *Berkeley Linguistics Society*, for instance, the tree diagram shows that the second and third lexemes form a compound inside the larger structure. This hierarchical structure corresponds to the semantics: the Berkeley Linguistics Society denotes a kind of linguistics society, namely one established at the University of California, Berkeley. By contrast, in *particle physics conference*, the first two lexemes are grouped into a compound because it is a conference about particle physics.
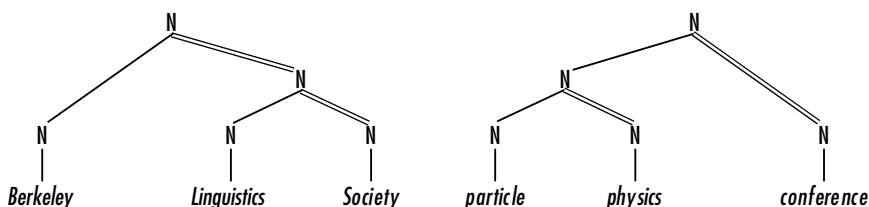
Figure 7.2 Compound trees: three compound members
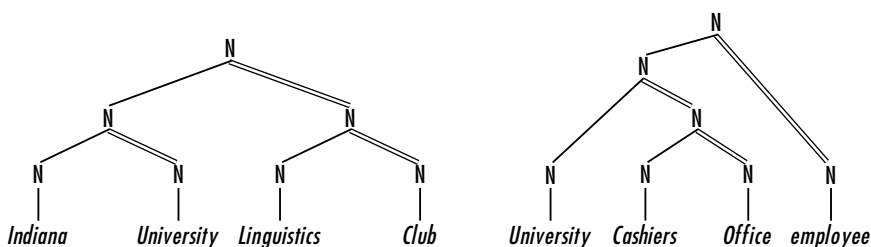
Figure 7.3 Compound trees: four compound members

Sometimes a compound with more than two nouns may allow two hierarchical structures simultaneously. For example, a compound like *nuclear power station* can be grouped as [[*nuclear power*][*station*]] or as [[*nuclear*][*power station*]] with equal justification, because both make sense semantically, and both the compounds *nuclear power* and *power station* exist in English.

Tree diagrams can also be used to indicate the **formal head** of a compound. The notion of a formal head is mostly relevant to the endocentric type, for which the formal head and the semantic head coincide. In the trees in Figures 7.1 to 7.3, the formal head of each compound is symbolized by a double line connecting the head and the next higher node in the tree. This is straightforward for compounds with two members, as in Figure 7.1, but note that in larger compounds, there is a formal head for each component compound, e.g., *conference* is the formal head of *particle physics conference*, but *physics* is the head of the compound *particle physics*.

We can identify at least two characteristics of formal heads in endocentric compounds. First, we see that in the noun *lipsticks* in Figure 7.1, *sticks* contains the number marking that characterizes the whole compound. The formal head of a compound is thus the **morphosyntactic locus** of the compound, in that it is the place where the morphosyntactic features of the compound are expressed.

An astute reader might object to analyzing *lipsticks* as [[*lip*][*stick-s*]], in which plurality is a property of the head. An alternative proposal is [[*lip*][*stick*]]*s*, where the plural suffix attaches to the complete compound word rather than to the head. This alternative works for this particular example, but attachment to the complete compound does not work for a case like Spanish *años luz* 'light years' (singular: *año luz* 'light year'). As we saw in (7.6), Spanish has left-headed N + N compounds, and if plurality is a property of the entire compound, not the head, we expect *año luz-es*, rather than the correct Spanish form *años luz*. At least in Spanish, then, the locus of plurality is the morphological head, and it is simpler to make the same analysis in ambiguous cases like *lipsticks* as well.

Second, the formal head determines for the entire compound characteristics such as word-class, gender and inflection class. For instance, the English word *babysits* is a verb, just like its head *sits*, but unlike the nonhead *baby*. In Spanish *años luz* and German *Luftpirat* 'air pirate, hijacker', the nonheads *luz* 'light' and *Luft* 'air' are feminine, but the compound nouns are masculine, just like their heads. And in German *Luftpirat* we also see that the inflection class of the head is shared by the compound: both *Pirat* and *Luftpirat* are 'weak' nouns – i.e. their genitive singular suffix is -*en* rather than the more common -*s*. This can also be illustrated from English: the plural of *church mouse* is *church mice*, not *church mouses* – i.e. the head determines the way the plural of the compound is formed.

As we would expect, compounds that are not semantically endocentric do not necessarily behave like formally headed compounds. Thus, in coordinative compounds we often find double plural marking (e.g. Spanish *actores-bailarines*, *compositores-directores*, etc.). Also, the English exocentric compound *sabretooth* ('a tiger whose teeth are like sabres', not 'a tooth that is like a sabre') forms the plural *sabretooths* (not *sabreteeth*), and *switchfoot* ('a surfer who can ride with either the right or left foot forward') forms the plural *switchfoots*. (But by contrast, *Blackfoot* ('a person belonging to the Blackfoot Native American tribe') most commonly has the plural *Blackfeet*, showing that there is some variation in this regard.)

7.3 Hierarchical structure in derived lexemes

Complex lexemes formed by derivational affixes are not unlike compounds in several respects, and many morphologists use tree representations to show the relations between the base and affixes. As with compounds, hierarchical tree structures are capable of showing semantic relations in derived lexemes in a salient way. For example, the two trees in Figure 7.4 distinguish the two different meanings of *undoable* very clearly. *Undoable1*

('cannot be done') is derived from *doable* with the negative prefix *un-*, and *undoable2* ('can be undone') is derived from *undo* with the suffix *-able*. The tree structures in Figure 7.4 show these derivational origins quite directly.
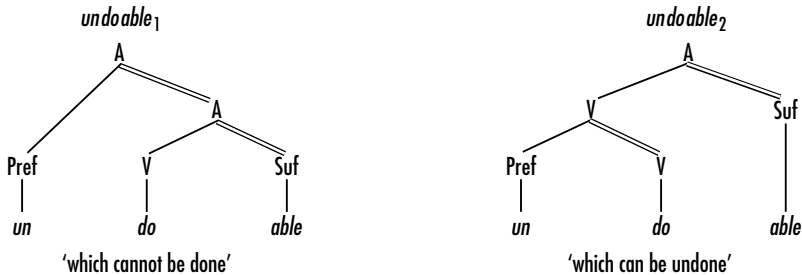
Figure 7.4 Two meanings and two structures of undoable

Sometimes different orderings of affixes yield significantly different meanings, and then hierarchical structure can be posited as well. Consider (7.13) from Capanahua.

(7.13) a. *pi-catsih-ma-hue*
        eat-DESID-CAUS-IMPV
        'Make him hungry.' (Lit.: 'Make him want to eat.')

    b. *pi-ma-catsihqu-i*
        eat-CAUS-DESID-PRS
        'He wants to feed it.' (Lit.: 'He wants to make it eat.')
                        (Payne 1990: 228; data from Eugene Loos)

Both of these example words contain desiderative ('want to do something') and causative ('make someone do something') suffixes, yet they have different meanings (even setting aside differences represented by the imperative and present tense suffixes). We can posit that the difference of meaning reflects a difference of internal structure. In particular, in the first example *-ma* [CAUS] attaches to the base *pi-catsih-* [eat-DESID], resulting in the hierarchical structure [[*pi-catsih*]-*ma*]. Semantically, this means that *-ma* does not modify the root *pi-* 'eat', but rather the entire base, meaning 'want to eat'. The result is the meaning 'make want to eat.' (Linguists say that *-ma* has **semantic scope** over *picatsih-*.) Likewise, in the (b) example, *-catsihqu* [DESID] attaches to and has semantic scope over the base *pi-ma-* [eat-CAUS] 'make eat', resulting in the meaning 'want to make eat'. The different orderings are therefore associated with different semantic scope, so two very different readings arise. This is just like syntax, and a tree-like representation as in syntax captures the properties of these affixes quite well.

In addition to showing semantic relations, tree representations have also been used in morphology for expressing certain formal properties of derived lexemes. Some examples of such representations are given in Figure 7.5.
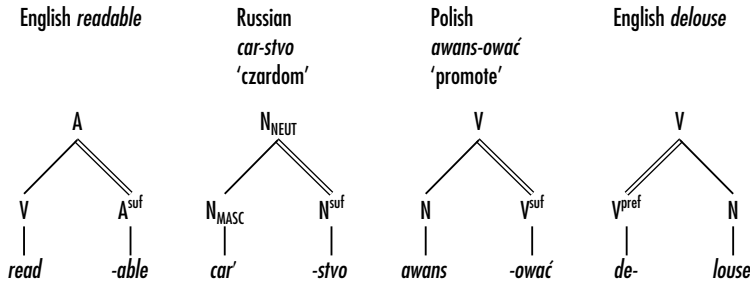
Figure 7.5 Tree representations of derived lexemes

The English suffix *-able* is mostly attached to verbs (and occasionally to nouns, as in *fashionable*), turning them into adjectives. As we saw in Chapter 5, it is quite typical of derivational affixes that they change the word-class of their base lexeme. This can be expressed by saying that the derivational affixes belong to a word-class (noun, verb, adjective) just like full lexemes and stems, and that they may be the heads of the corresponding derived lexemes. Since the formal head determines word-class (as we saw for compounds in the preceding section), the word-class of the resulting lexeme is that of the derivational affix. Thus, *read-able* is an adjective because *-able* belongs to the word-class of adjectives, Russian *carstvo* 'czardom' is a noun because of *–stvo*N, and Polish *awans-ować* 'promote' is a verb because of *-ować*v. And as in compounds, derivational affixes also typically determine the gender of nouns (as is illustrated by Russian *-stvo*, which derives neuter nouns) and the inflection class of the derived lexeme (*-stvo* derives nouns of the *o*-declension, and Polish *-ować* derives verbs of the *-owa/-uj* conjugation).

Not all derivational affixes are heads. Many derivational affixes do not determine the word-class and other properties of their derived lexemes. In the European languages, this is true in particular of prefixes and diminutive suffixes. Three such non-head affixes from three languages are listed in (7.14).

(7.14)   English *co-*   Spanish *pre-*   Italian *-ino*
   N   *co-author*   *pre-historia* 'prehistory' *tavol-ino* 'little table'
   A   *co-extensive* *pre-bélico* 'pre-war'   *giall-ino* 'yellowish'
   V   *co-exist*   *pre-ver* 'foresee'   (Adv) *ben-ino* 'rather well'

However, derivational affixes often behave like heads of compounds, and this may be regarded as a sufficient reason for treating them as heads as in Figure 7.5.

7.4 Parallels between syntax and morphology?

In this book we have already looked at the architecture of the language system in terms of whether inflection and derivation are split between two different components of the grammar (the so-called split-morphology hypothesis; see Section 5.5). However, there is another, equally important question about the architecture of the system: Is morphology formally distinct from syntax? In other words, do the same principles apply to both word formation and sentence formation? There is a variety of evidence that bears on this question, but in this chapter we restrict ourselves to the evidence that is related to formal heads. (Other considerations will be added in Chapter 9 in the context of something called the Lexical Integrity Principle. See also the Further reading section of this chapter.)

Some morphologists argue that compounds and derived lexemes have internal hierarchical structure and formal heads because syntactic structure is hierarchical and consists of heads and dependents. In other words, syntax and morphology are similar because syntactic principles govern word-internal structure. Others posit that compounding and derivation operate largely independently of syntax. In this perspective, it is possible for morphological structure to be similar to syntactic structure, but this need not be true. Empirically, then, strong parallels between (hierarchical) morphological structure and syntactic structure would suggest a language architecture in which there is no distinct morphological component, since this provides a more natural explanation for similarities. Strong differences would be inconsistent with a syntactic approach to morphology, and support an architecture in which there are distinct morphological and syntactic components. The question to be answered, then, is: To what extent are morphological heads and syntactic heads similar?

Endocentric compounds and syntactic phrases share a semantic trait – in both cases, the dependent member narrows the meaning of the head. For instance, in the compound *doghouse* the dependent member *dog* specifies a particular kind of house. And in the syntactic phrase *house for a dog*, the dependent *for a dog* has the same kind of semantic relationship to the head noun *house*. In this limited sense, then, heads in endocentric compounds and in syntactic phrases are similar.

However, in syntax, there are also three other purely formal properties that heads share:

(7.16) Syntactic head properties
   a. The head is the morphosyntactic locus, i.e. it bears inflectional
       markers that belong to the whole phrase.
   b. The head may govern the form of its dependents.
   c. A dependent may agree in person/number with its head.

As introduced in Section 5.3.1, government is a kind of syntactic relation
in which one word requires another word or phrase to have a particular
inflectional value. The latter is thus dependent upon the former for its
properties. Similarly, in agreement, the inflectional value of a dependent
word or phrase must be the same as the inflectional value of another word
or phrase in the sentence.

   These properties can be illustrated with the sentence in (7.17) (a Russian
example is chosen because the inflectional properties are less salient in
English). In Figure 7.6, a tree diagram for this sentence is given.

(7.17) *Student-y   pomaga-l-i   zavedujušč-ej   kafedr-oj.*
        student-PL   help-PST-PL   chairwoman-DAT   department-INS
        'The students helped the chairwoman of the department.'
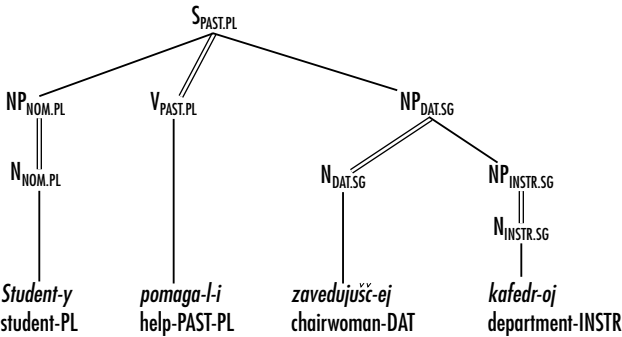
Figure 7.6 A tree diagram for (7.17)

In the tree in Figure 7.6, the head of each phrase is symbolized by a double
line between the head and the next higher node in the tree, called the
phrasal node. We see that the verb *pomagali* is the morphosyntactic locus of
the sentence; it bears the tense marking that characterizes the whole clause.
Likewise, nouns are the morphosyntactic locus of their noun phrases (NPs);
they bear the case and number markers that ultimately belong to the NP.
We also see two examples of government: The verb *pomagali* requires its
dependent object NP to have dative case, and the noun *zavedujuščej* requires
its dependent complement NP to have instrumental case. Finally, *pomagali*
agrees with the subject NP in number.

Of these three syntactic head properties, only morphosyntactic locus applies to compounds as it does to syntactic phrases. The remaining two syntactic head properties cannot be observed because the dependent in compounds does not in general bear inflectional features. As we saw in Section 7.1, the dependent member in compounds is an uninflected stem whose inflectional form cannot be governed and which cannot be the target of agreement.

Moreover, similarities between syntactic heads and derivational heads are even weaker. The semantic criterion does not apply here, for obvious reasons: *reality* is not a kind of *-ity*, something that is *yellowish* is not kind of *-ish*, and so on. So the similarity to the syntactic notion of head is tenuous, and many morphologists have expressed scepticism about the usefulness of carrying over this notion to affixes. It must also be kept in mind that not all derivational patterns involve affixes. It may be possible to describe English *carri-er* as a headed structure, but Arabic *ḥammaal* 'carrier' (from *ḥamala* 'carry') cannot be so described. So for derivational patterns that involve base modification or other non-concatenative operations, it is not clear that even morphosyntactic locus is relevant.

Head characteristic	Syntactic	Compound	Derivational
Dependent narrows meaning	+	+	–
Morphosyntactic locus	+	+	(+)
Government	+	–	–
Agreement	+	–	–

Table 7.1 Properties of formal heads in syntax, compounding and derivation

In short, hierarchical structure at the word level is superficially similar to hierarchical structure at the level of the sentence, but parallels between syntactic and formal morphological heads are only partial for compounds, and even less strong for derivation. Clearly, there might be some underlying principle of language that causes both syntax and compounding (and maybe derivation) to exhibit hierarchical structure and head properties, but the principles governing syntactic structure and the principles governing morphological structure are not identical. The degree of formal separation between morphology and syntax is a topic of ongoing debate.

Summary of Chapter 7

There are many types of nominal compounds: endocentric compounds, exocentric compounds, and various kinds of compounds with more than one semantic head (e.g. coordinative compounds and appositional compounds). Like syntactic phrases, (endocentric) compounds are often conveniently described as having hierarchical structure and formal heads. These are represented using tree diagrams. Such hierarchical structures are often also applied to derived lexemes, and derivational suffixes are often described as the heads of their words. However, derivational suffixes share only a few properties with the heads of syntactic phrases, and even compounds do not exhibit the syntactic head properties of government and agreement. Parallels between syntactic and morphological structure are thus not particularly strong, indicating that principles of word formation are, at least to some degree, distinct from principles of sentence formation.

Further reading

For a cross-linguistic survey of compounding, see Bauer (2001a) and Guevara and Scalise (2009). For noun incorporation, see Mithun (1984). For coordinative compounds, see Olsen (2001). Investigation of compounds from psycholinguistic and neurolinguistic perspectives has only recently begun in earnest, but see Libben and Jarema (2006).

The approach that uses hierarchical structures is most prominently represented by works such as Selkirk (1982), Di Sciullo and Williams (1987), Lieber (1992) and Embick and Noyer (2007). On heads in morphology, see in particular Williams (1981a), Scalise (1988b) and Haspelmath (1992), and, for some sceptical voices, see Reis (1983) and Bauer (1990). A recent defence is found in Štekauer (2000).

Regarding the broader argument of whether the morphological component can be collapsed into the syntactic one, classic arguments in favour are Baker (1985) and Pesetsky (1985). Specific attacks on the syntactic approach to morphological structure include Spencer (1997) and Smirniotopoulos and Joseph (1998). The typological evidence for compounding as a syntactic process is assessed in Sadock (1998) and Baker (1998), to opposite conclusions.

Comprehension exercises

1. Draw tree diagrams (analogous to those in Figures 7.1–7.3) for the following English compounds:
   family planning adviser, undersea cable repair team, fixed-line phone system, mad cow disease hysteria, World Trade Center rescue worker, credit card agreement form, major league baseball game

   (For some of these, two different solutions may be correct.)

2. Consider the following Sanskrit compound stems and, judging by their meaning, determine the type of compound in each case. (Note that in Sanskrit, morphophonological alternations often slightly alter the shape of roots at morpheme boundaries.)

aśvakovida-	'knowledgeable about horses'
bahuvrīhi-	'having a lot of rice'
divyarūpa-	'having divine shape'
gṛhapati-	'houseowner'
mahārāja-	'great king'
mahātman-	'having a big soul, i.e. magnanimous'
priyasakhī-	'dear friend'
rājarṣi-	'poet who is also royalty'
śuklakṛṣṇa-	'bright and dark'
sukhaduḥkha-	'joy and pain'

   A list of relevant Sanskrit nominal and adjectival roots:

ātman-	'soul'	*gṛha-*	'house'
aśva-	'horse'	*kovida-*	'knowledgeable'
bahu-	'much'	*kṛṣṇa-*	'dark'
divya-	'divine'	*mahat-*	'big'
duḥkha-	'pain'	*pati-*	'lord'
priya-	'dear'	*śukla-*	'bright'
ṛṣi-	'seer, poet'	*sakhī-*	'female friend'
rājan-	'king'	*sukha-*	'joy'
rūpa-	'shape'	*vrīhi-*	'rice'

3. In Spanish, there are two homophonous adjectives *inmóvilizable*: *inmóvilizable1* 'unmobilizable' and *inmovilizable2* 'immobilizable'. The morphological structure of these words corresponds closely to the structure of the corresponding English words (prefix *in-* 'un-', suffix *-able* '-able', suffix *-iz* '-ize', *móvil* 'mobile'). Draw the constituent structure trees of these two words.

4. Russian has a productive class of exocentric A + N compounds comparable to the Ancient Greek compounds in (7.7):

dlinnorukij	'long-armed'	*dlinnyj*	'long'	*ruka*	'arm'
krasnoborodyj	'red-bearded'	*krasnyj*	'red'	*boroda*	'beard'
černokožij	'black-skinned'	*černyj*	'black'	*koža*	'skin'
tolstonogij	'thick-legged'	*tolstyj*	'thick'	*noga*	'leg'

Formulate the word-based rule for these compounds.

(Note: *-yj* and *-ij* are phonological allomorphs. Russian consonants can be phonologically 'hard' or 'soft'. The adjectival allomorph *-yj* is used when the preceding consonant is hard, and *-ij* when it is soft. Since the difference results from phonology, the conditions for *-yj* vs. *-ij* do not need to be captured by your rule.)

Exploratory exercise

In this chapter, we saw that compounds and maybe derived lexemes can be described as having hierarchical structure. In some respects, word structure thus has much in common with sentence structure. We have also asked whether these similarities are sufficient to posit that the same or closely related principles govern both syntax and morphology. In this task, you will delve deeper into the parallels (or lack thereof) between sentence structure and word structure by conducting a typological survey of word order and the order of affixes and stems.

   Typologists have demonstrated that among the world's languages, some grammatical structures systematically co-occur with others. For example, dominant word order is closely connected to the order of prepositions/postpositions relative to nouns. (A **postposition** is like a preposition, except that it comes after the noun (*post-*), rather than before it (*pre-*). They are collectively referred to as **adpositions**.) In some languages, the dominant order for a sentence with both a subject and an object is subject-verb-object (abbreviated SVO). English is such a language: *John* (=subject) *read* (=verb) *the letter* (=object). In other languages, both the subject and the object normally come before the verb (SOV order). Japanese is this kind of language, as shown in (7.18). Other languages may have yet other dominant word orders.

(7.18) *John   ga   tegami   o   yon-da*
        John   SBJ   letter   OBJ   read-PST
        'John read the letter.'

Interestingly, languages with SVO order are very likely to have prepositions, whereas languages with SOV order are very likely to have postpositions. Table 7.2 shows the number of languages with each combination of word order and adposition type, based on a sample of 750 languages.

Basic Order	Prep	Post
SOV	8	328
SVO	278	29
VSO	69	6
VOS	20	0
OVS	2	7
OSV	0	3

Table 7.2 Correlation between dominant word order and prepositions vs. postpositions (Dryer 2008a, b)

Linguists thus say that the order of subjects and objects relative to verbs and the order of adpositions relative to nouns exhibit an **implicational relationship**. Knowing the dominant word order of a language greatly increases the chance of correctly predicting whether adpositions come before or after nouns. (Of course, implicational relationships can have exceptions. Finnish and Estonian, for example, are predominantly SVO languages, but they have postpositions. Implicational relationships thus represent likely co-occurrence rather than an absolute correlation.)

Linguists are interested in this implicational relationship because it suggests that the generalization governing the order of subjects/objects and verbs may be closely related to the generalization governing the order of adpositions and nouns. In particular, the generalization seems to be that most languages are either predominantly **head-initial** or predominantly **head-final**, meaning that syntactic heads occur at the beginning or end of phrases, respectively. Adpositions are the heads of their phrases, and verbs are the heads of VPs. Thus, if a language has both SOV word order and postpositions, it is predominantly head-final.

The purpose of this research exercise is to determine whether there is an implicational relationship between word order and the order of affixes relative to stems, and to explore the importance of this typological data for the following research question: Are the principles governing word order and morpheme order closely related? If sentence structure and word structure follow the same basic principles, we might expect an implicational relationship to hold between them.

Instructions

Step 1: Develop hypotheses and predictions. Remember that a hypothesis is a formal guess about the relationship between syntactic and morphological rules (i.e. are they different?). A prediction is the result that you expect in your data, based on your hypothesis. So, for instance, if a language is

syntactically head-initial, do you expect to find that *morphological* heads (i.e. affixes) will also precede their dependents (stems)? What would be predicted by a theory in which morphological and syntactic rules are not distinct? By a theory in which they are distinct?

Step 2: Collect data using *World Atlas of Language Structures (WALS)*. The atlas is available both as a book accompanied by CD-ROM, and also via the web (http://wals.info). Identify languages for which inflection is primarily expressed with prefixes or primarily with suffixes (Dryer 2008c). Then look at word order for these same languages (Dryer 2008a, d). Organize your data – including language family and where in the world the language is spoken – as shown in Table 7.3. Obviously, you will need a much bigger sample of languages than is shown in the table.

Language	Language family	Where spoken	Affixes	Basic Order
Paiute (Northern)	Uto-Aztecan, Numic	N. America	Mostly suffixes	SOV
Evenki	Altaic, Tungusic	C. Asia	Mostly suffixes	SOV
Arrernte (Mparntwe)	Australian, Pama-Nyungan	Australia	Mostly suffixes	SOV
Albanian	Indo-European, Albanian	E. Europe	Mostly suffixes	SVO
Kikuyu	Niger-Congo, Benue-Congo	E. Africa	Mostly prefixes	SVO
Mixtec (Chalcatongo)	Oto-Manguean, Mixtecan	C. America	Mostly prefixes	VSO

Table 7.3 A sample of languages according to inflectional prefixation vs. suffixation and word order

Give some thought to how you select the languages in your sample. Do you want to pick randomly from among those for which information is available? Or do you want your sample to be representative according to some criterion (e.g. geographically representative, or evenly distributed among language families)? Try to anticipate how your choice of methodology might affect your results.

Hint: The interactive tool available as part of the CD-ROM and web versions of *WALS* is the most efficient way to look for correlations, because it allows the combination of two features to be mapped (called the 'Composer' feature on the CD-ROM and 'Feature Combination' in the web version). The book and web versions contain articles with more detailed information

about individual features; these articles are useful for understanding how the data set was constructed, and for overviews of typological patterns.

Step 3: Analyze the data. Was your prediction upheld? Remember to consider any issues, including the following:

1) Is there is an implicational relationship between the order of words and the order of stems and affixes? If so, how strong is it?

2) Is any implicational relationship of the type that you predicted? For example, if you predicted that heads and dependents are in the same order at both the sentence level and the word level, is this the pattern found in your data?

3) Do some patterns occur predominantly in one language family, or in one area of the world? If so, is this what you would expect, given your hypothesis? What explanations could there be for grouping?

4) This chapter was primarily about hierarchical structure in compounds and derivational affixes, but in this study affix-stem order refers to inflectional affixes. How important is this discrepancy? Or stated differently, do morphologists ever claim that inflectional affixes are heads, and does this change your analysis/conclusions at all? (A good answer to this question will require you to read more about heads in morphology. See the Further reading section.)

5) Finally, also consider the possible impact of your data collection methodology on your results.

Step 4: Draw conclusions. Consider whether your data supports only one answer to the research question, or whether multiple answers are consistent with your data.

Extension: Explore other kinds of word orders (e.g. the order of adpositions and noun phrases, the order of adjectives and nouns, and so on), and possible correlations between these and the order of affixes and stems.

Inflectional paradigms

<div style="text-align: right">**8**</div>

8.1 Syntagmatic and paradigmatic relations in morphology

The relations between linguistic units are of two broad kinds: **syntagmatic** relations between units that (potentially) follow each other in speech, and **paradigmatic** relations between units that (potentially) occur in the same slot. In other words, syntagmatic relations have to do with items ordered one after the other, while paradigmatic relations have to do with items that stand in contrast to one another. We can think about syntagmatic and paradigmatic relations at the sentence level, for instance, in (8.1), where the horizontal dimension shows syntagmatically related units, and the vertical dimension shows paradigmatically related units. Parentheses show optionally occurring linguistic units, curly brackets show choices among units, and asterisks show impossible units.

(8.1) *In* $\begin{vmatrix} the \\ {}^*\varnothing \end{vmatrix}$ *beginning* $\left\{ \begin{array}{l} God \\ Allah \\ he \\ {}^*why \end{array} \right\}$ $\left\{ \begin{array}{l} created \\ made \\ {}^*create \\ {}^*rested \end{array} \right\}$ *the* $\begin{vmatrix} heaven \\ heavens \end{vmatrix}$ *(and the earth) (*not).*

Morphology can likewise be looked at from both a syntagmatic and a paradigmatic point of view. Bases are syntagmatically related to affixes that attach to them, whereas word-forms belonging to the same lexeme are paradigmatically related because they form a set of contrasting instantiations of the lexeme (to take a simple example, the English word *bag* is identifiable as having singular number exactly because it contrasts with the plural form *bags*, and because singular and plural forms generally form such a contrast in English).

(8.2) *bag* $\begin{Bmatrix} \text{-}\varnothing \\ \text{-}s \\ \text{*-}en \end{Bmatrix}$ (as in *children*)

Now, in developing a description of language architecture, we might ask whether we need formal mechanisms that encode both syntagmatic and paradigmatic dimensions of structure. To be sure, some linguists have posited models that describe morphological patterns in purely syntagmatic terms. The formalism in (8.3) (which we have used in this book to represent the morpheme-based model; see (3.22)), represents *bags* as the linear combination of the morphemes *bag* and -*s*.

(8.3) *bag* $\qquad$ -*s*

$\begin{Bmatrix} /\text{bæg}/ \\ \text{N} \\ \text{'bag'} \end{Bmatrix} + \begin{Bmatrix} /\text{z}/ \\ \text{N} \text{---} \\ \text{'plural'} \end{Bmatrix} \rightarrow bags$

Crucially, (8.3) does not include the paradigmatic perspective at all, which is to say that there are no direct relations between word-forms belonging to the same lexeme. (*Bag* is the root, not a word-form with singular number. Formally, it is purely coincidental that the root has the same form as the singular.)

The same pattern may also be described with emphasis on the paradigmatic dimension. Example (8.4), our standard formalism for the word-based model, also represents the syntagmatic aspect of the structure (the order in which the stem and plural marker appear in the word), but additionally it draws a direct relationship between singular and plural forms.

(8.4)[1] $\begin{Bmatrix} /\text{X}/_{\text{N}} \\ \text{'}x\text{'} \\ \text{NUMBER: SING} \end{Bmatrix}$

$\qquad$ $\updownarrow$

$\begin{Bmatrix} /\text{Xz}/_{\text{N}} \\ \text{'}x\text{'} \\ \text{NUMBER: PLUR} \end{Bmatrix}$

So it is clear that morphological rules need to capture the syntagmatic dimension since affixes occur in particular positions relative to their bases, but the real question is whether we need to also incorporate paradigmatic rules into our formal description of language structure. Logically, if our formal description could make do with only syntagmatic description and

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[1] This correspondence is set up vertically to emphasize that this is a paradigmatic relation and to be consistent in this respect with (8.1)–(8.2). But of course, the spatial layout is just a convenience. We will return to the normal, space-saving horizontal representation below.

still be empirically adequate, then this should be simpler, and therefore preferable.

The answer depends on whether there are phenomena in language that can be adequately described *only* as a direct relationship between inflected forms. If so, then morphological structure would seem to include both syntagmatic and paradigmatic dimensions. If not, then a purely syntagmatic model would be sufficient. In this chapter, we show that some inflectional patterns do indeed seem to require a paradigmatic approach, indicating that paradigmatic relations are part of the architecture of the (inflectional) morphological system. But to make this discussion possible, we must first introduce the idea of the *inflection class*.

8.2 Inflection classes

Perhaps the most important challenge for an insightful description of inflection is the widespread existence of allomorphy in many languages. Phonological and morphophonological allomorphy will be the topic of Chapter 10; in this section we focus on **suppletive allomorphy**. We saw some examples of suppletive inflectional affixes in Section 2.3, and two more are given in (8.5)–(8.6).

(8.5)   Irish

NOM.SG.	GEN.PL	
focal	*focail*	'word'
muc	*muic-e*	'pig'
corón	*corón-ach*	'crown'

(8.6)   Old English

INFINITIVE		3RD SG PRESENT		3RD SG PAST	
dēm-an	'to deem'	*dēm-ð* 'deemeth'		*dēm-de* 'deemed'	
luf-ian	'to love'	*luf-að* 'loveth'		*luf-ode* 'loved'	

In (8.5), for instance, all three Irish words show zero expression in the nominative singular, but in the genitive plural each word has a different inflectional marker: zero, *-e* or *-ach*. The genitive plural thus exhibits suppletion.[2]

When different lexemes show different suppletive inflectional allomorphs, morphologists say that they belong to different inflection

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[2]   Remember from Section 2.3 that some linguists use the term *suppletion* only to refer to non-phonological allomorphy in stems. Under such a definition, we would say that the words in (8.5) and (8.6) exhibit different affixal morphemes (rather than different allomorphs). This is primarily a terminological issue, however, and it has no real impact on how inflection classes are defined.

classes.[3] An **inflection class** is thus the set of paradigms that exhibit the same inflectional pattern. Inflection classes may be very large and contain hundreds or thousands of lexemes, or they may be small and contain only a handful of lexemes. The limiting case would be an inflection class with just a single lexeme (for most purposes, this would amount to saying that the inflection of that lexeme is irregular).

Languages differ in the number of inflection classes that they exhibit. In (8.5), three different nominal inflection classes (or **declensions**) are illustrated, and, in (8.6), two verbal inflection classes (or **conjugations**) are shown. The existence of different inflection classes is a hallmark of Indo-European languages, so many examples in this chapter will come from the Indo-European language family. Of course, the phenomenon is not restricted to Indo-European, but there are many languages with fairly complex morphological systems in which suppletion of this kind is not found or is at least much less prominent (for instance, Turkish, Korean, Quechua and Tamil). Thus, not all languages have multiple inflection classes.

In inflection classes, the various suppletive allomorphs are grouped into sets. This can be seen by looking at the complete paradigms of the two Latin words:

(8.7)

		o-declension	*u*-declension
SG	NOM	*hort-us*	*grad-us*
	ACC	*hort-um*	*grad-um*
	GEN	*hort-ī*	*grad-ūs*
	DAT	*hort-ō*	*grad-uī*
	ABL	*hort-ō*	*grad-ū*
PL	NOM	*hort-ī*	*grad-ūs*
	ACC	*hort-ōs*	*grad-ūs*
	GEN	*hort-ōrum*	*grad-uum*
	DAT	*hort-īs*	*grad-ibus*
	ABL	*hort-īs*	*grad-ibus*

We can say that a Latin noun in *-us* (like *hortus* 'garden', *gradus* 'step') has a genitive plural in *-orum* if its genitive singular is *-ī*, and a genitive plural in *-uum* if its genitive singular is *-ūs*. If the distribution were arbitrary, we might expect that some nouns in Latin would have the genitive singular *-ī*, the ablative singular *-ū*, the accusative plural *-ōs*, and the dative plural *-ibus*, for instance. But, in fact, a noun can only choose a complete package of suffixes, either the package of *hortus* (generally called the *o*-declension) or the package of *gradus* (generally called the *u*-declension). Thus, one form can be used to predict another. Of course, in practice some of these dependencies may be more useful than others. For example, the nominative and accusative singular are identical in both classes and therefore have little

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[3]   The term *inflection class* is not generally used for phonological allomorphy.

or no predictive value. Less obviously, learners of Latin probably hear the genitive singular of a new word more often than its genitive plural, so the ability to predict the genitive plural from the genitive singular is probably more relevant than the ability to make the reverse prediction.

8.2.1 Inflection class assignment

Words are assigned to inflection classes based on phonological, semantic or morphological criteria. Some examples of phonological class assignment are given in (8.8).

(8.8)   a.   Lezgian aorist participle: *-j(i)* after low vowel *(a, e)*, *-r* after high vowel *(u, ü, i)*

AORIST FINITE	*awu-na*	*t'ü-na*	*fe-na*	*ata-na*
AORIST PARTICIPLE	*awu-r*	*t'ü-r*	*fe-ji*	*ata-j*
	'did/	'ate/	'went/	'came/
	done'	eaten'	gone'	come'

(Haspelmath 1993: 131)

   b.   Eastern Armenian plural: *-er* with monosyllabic bases, *-ner* with polysyllabic bases

SG	*jeřk'*	*yug*	*erexa*	*tari*
PL	*jeřk'-er*	*yug-er*	*erexa-ner*	*tari-ner*
	'hand(s)'	'oil(s)'	'child(ren)'	'oil(s)'

   c.   Standard Arabic plural: If the singular has the phonological shape *CVCCVC*, then the plural has the form *CaCaaCiC.* If the singular is *CVCCVVC*, the plural is *CaCaaCiiC.*

SG	*qayṣar*	*daftar*	*dirham*	*dustuur*	*quftaan*
PL	*qayaaṣir*	*dafaatir*	*daraahim*	*dasaatiir*	*qafaaṭiin*
	'emperor'	'notebook'	'drachma'	'statute'	'caftan'

Among semantic criteria, **animacy** distinctions are particularly widespread. In German, only animate nouns belong to the masculine *n*-declension ending in *-e* in the nominative singular (*Hase* 'hare', *Affe* 'ape', *Junge* 'boy'). In Tamil, the locative suffix is *-il* with non-human nouns (e.g. *nāṭṭ-il* 'in the country'), but *-iṭam* with human nouns (e.g. *manitan-iṭam* 'in the man') (Annamalai and Steever 1998: 105). Welsh has a special plural suffix for nouns denoting animals, *-od* (e.g. *cath/cathod* 'cat(s)', *draenog/draenogod* 'hedgehog(s)', *eliffant/eliffantod* 'elephant(s)') (King 1993: 59). Lezgian has a special oblique-stem marker that is used with all consonant-final proper names, *-a* (e.g. *Farid-a* 'Farid', *Talibov-a* 'Talibov'). Lezgian also illustrates the potential relevance of the **mass-count** distinction: mass nouns tend to have the oblique-stem suffix *-adi/-edi* (e.g. *naq'w-adi* 'soil', *kf-adi* 'foam', *hüm-edi* 'haze') (Haspelmath 1993: 75–6). In verbs, **transitivity** often plays a role. For

example, in Ossetic intransitive and transitive verbs show different agreement inflection in the past tense. The singular forms of the intransitive verb *xuyssy-* 'sleep' and of the transitive verb *dzur-/dzyr-* 'say' are given in (8.9).

(8.9)

	intransitive pattern	transitive pattern
1SG	*xuyssy-d-æn* 'I slept'	*dzyr-d-on* 'I said'
2SG	*xuyssy-d-œ*	*dzyr-d-aj*
3SG	*xuyssy-d*	*dzyr-d-a*

(Isaev 1966: 247)

When there is morphological assignment, most typical is that the derivational pattern of a derived lexeme determines its inflectional behaviour. For example, Welsh has about a dozen different plural patterns, which are often unpredictably associated with individual nouns. However, when a noun has a derivational suffix, it is mostly predictable which plural affix the noun takes:[4]

(8.10)

Derivational suffix	Plural suffix	Base		Derived form	
-og (person)	*-ion*	*swydd*	'job'	*swydd-og*(*-ion*)	'official(s)'
		march	'horse'	*march-og*(*-ion*)	'horseman/men'
-es (female)	*-au*	*tywysog*	'prince'	*tywysog-es*(*-au*)	'princess(es)'
		Sais	'Englishman'	*Saesn-es*(*-au*)	'Englishwoman/ -women'
-ur (agent)	*-iaid*	*pechu*	'sin'	*pechad-ur*(*-iaid*)	'sinner(s)'
		cachu	'shit'	*cachad-ur*(*-iaid*)	'coward(s)'

(King 1993: 53–61)

Another example of derivational patterns determining inflectional behaviour comes from Tagalog. In this language most verbs have a derivational affix that indicates in some way the transitivity or voice of the verb (e.g. actor voice *-um-*, *ma-*, patient voice *-in*, *-an*). The perfective form of the verb can be formed in four different ways: (i) zero (when the voice affix is *-um-*); (ii) *m-* becomes *n-* (e.g. when the voice affix is *ma-*); (iii) infix *-in-* (e.g. when the voice affix is *-an*); and (iv) infix *-in-* and subtraction of *-in* (when the voice affix is *-in*):

(8.11)

root	basic form with voice affix	perfective form	gloss
takbo	*tumakbo*	*tumakbo*	'run'
tulog	*matulog*	*natulog*	'sleep'
hugas	*hugasan*	*hinugasan*	'wash'
basah	*basahin*	*binasah*	'read'

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[4]   As we saw in Section 7.3, this is one of the reasons why some morphologists regard derivational affixes as heads of their lexemes – the derivational affix determines the inflectional pattern of the entire word-form.

Again, this illustrates the dependence of inflection-class membership on a morphological property of the lexeme (its derivational pattern). Of course, the derivational pattern need not be characterized by an affix. In Arabic, nouns derived by the pattern $C_1aaC_2iC_3$ tend to have the plural $C_1uC_2C_2aaC_3$ (e.g. *kaafir* 'infidel', plural *kuffaar*; *kaatib* 'writer', plural *kuttaab*; *zaahid* 'ascetic', plural *zuhhaad*).

8.2.2 Relationship to gender

Inflection classes are often linked to gender, but this relationship can be complicated. For instance, in the Bantu languages (e.g. Zulu), a link between inflection class and gender is evident: the markers that reflect the gender on agreement targets are formally similar to the inflectional affixes on controller nouns. Zulu has the four inflection classes illustrated in (8.12), among others.

(8.12)

SG PREFIX	PL PREFIX	EXAMPLE	MEANING	AGR PREFIXES
um-	*aba-*	*umfazi/abafazi*	'woman/-men'	*u-/ba-*
um-	*imi-*	*umfula/imifula*	'river(s)'	*u-/i-*
i-	*ama-*	*itafula/amatafula*	'table(s)'	*li-/a-*
isi-	*izi-*	*isicathulo/ izicathulo*	'shoe(s)'	*si/zi-*

The agreement prefixes for the genders corresponding to the four inflection classes are given in the last column in (8.12). Two examples of their use as subject prefixes on verbs are given in (8.13).

(8.13) a. *Aba-fazi*   *ba-biza*   *aba-fana*
           PL.G2-woman   3PL.G2.SBJ-call   PL.G2-boy
           'The women call the boys.'

    b. *Isi-hambi*   *si-buza*   *um-gwaqo.*
           PL.G8-traveller   3PL.G8-ask   SG.G3-road
           'The traveller asks the road.'

<div align="right">(Ziervogel et al. 1981: 34, 46)</div>

The similarities between *aba-* and *isi-* as inflectional markers on the nouns, and *ba-* and *si-* as gender agreement markers on the verbs, are striking. Clearly, there is a close correspondence between the gender classes and inflection classes in Zulu.

Nonetheless, we need to make a principled distinction between inflection class and gender. Consider the Italian examples (8.14)–(8.15).

(8.14) Two Italian inflection classes

SG SUFFIX	PL SUFFIX	EXAMPLE	MEANING	AGR SUFFIXES
-o	*-i*	*giardino/giardini*	'garden(s)'	*-o/-i* (masc.*)*
-a	*-e*	*casa/case*	'house'	*-a/-e* (fem.)
-o	*-i*	*mano/mani*	'hand'	*-a/-e* (fem.)
-a	*-i*	*poeta/poeti*	'poet'	*-o/-i* (masc.)

(8.15) Italian gender agreement (adjectives agree with nouns)
    a. *il giardin-o nuov-o*   'the new garden'
    b. *la cas-a nuov-a*   'the new house'
    c. *la man-o rugos-a*   'the wrinkled hand'
    d. *il poet-a mort-o*   'the dead poet'

In Italian we clearly need to distinguish between inflection classes and genders because there are nouns that have the singular suffix *-o* but are feminine (e.g. *mano* 'hand') and nouns that have the singular suffix *-a* but are masculine (e.g. *poeta* 'poet'). Such nouns are much rarer than the opposite pattern, but they exist. Thus, we must make a principled distinction between a noun's inflection class (which determines the set of inflected forms of the noun lexeme), and its gender (an agreement feature).

Formally, semantic factors and the inflection class of a noun together determine the noun's gender (Corbett 1982, 1991). For instance, most Russian nouns belonging to inflection class II (indicated by a nominative singular form ending in *-a*, e.g. *kniga* 'book') are feminine, but a small subset are masculine (*sluga* 'male servant'). These latter nouns take the same endings as class II feminine nouns, but we know that they are masculine because they trigger masculine syntactic agreement (*xorošaja kniga* 'good(fem.) book'; *xorošij sluga* 'good(masc.) servant'). If gender determined inflection class, we would expect these words to fall into class I, which contains the vast majority of masculine nouns. However, if inflection class and semantic factors together determine gender, the observed pattern is easier to explain. Importantly, all of the nouns like *sluga* refer to sex-differentiable male beings. We must therefore simply assume that gender assignment in Russian is determined by natural sex when the word refers to a sex-differentiable animal or human, and by inflection class otherwise. (There are also languages in which gender is purely semantically based, or in which it depends on a combination of semantic and phonological criteria (Corbett 1991), but these are not directly relevant here.)

8.2.3 Inflection classes and productivity

Like word-formation patterns, inflection classes can differ in productivity. Specifically, they can differ in their ability to apply to novel lexemes that come into the language, either as **loanwords** or as neologisms formed by productive word-formation rules, and they can also differ in their ability to attract new members by **inflection class shift**. A class shift is a diachronic change by which a lexeme changes its inflection class. (We have already seen an example of inflection class shift in Section 6.4.3: *fling/flinged* → *fling/flung*.) It is convenient to identify three degrees of inflection-class productivity on the basis of these criteria (Dressler 1997), as summarized in Table 8.1.

Criteria and examples	Highly productive classes	Classes with intermediate productivity	Unproductive classes
Criteria			
Apply to loanwords	YES	NO	NO
Attract class-shifting lexemes	YES	NO	NO
Can form neologisms	YES	YES	NO
Examples			
Welsh plurals	*-au, -iaid*	*-oedd*	*-edd*
Italian nouns	*-o/i*	*-a/i, -e/i*	—
Russian nouns	*-C* (I), *-a*(II)	*-o* (IV)	*-ja*

Table 8.1 Three degrees of inflection-class productivity

Only highly productive classes are able to accommodate loanwords and attract lexemes from other, unstable classes. Productively formed neologisms, by contrast, often go into classes with intermediate productivity. Completely unproductive classes do not get new members at all, and, since they inevitably lose some members (e.g. when a word becomes obsolete), they are ultimately doomed to disintegration unless the productivity of the class changes.

For exemplification, let us go back to Welsh plurals (King 1993: 52–64). As shown in (8.10), Welsh has several highly productive plural classes that can accommodate loanwords from English – for instance, the suffix *-au*, which is the most common Welsh plural suffix (e.g. *siop/siopau* 'shop(s)', *trên/trenau* 'train(s)'), or *-iaid*, which is often used with nouns denoting persons (e.g. *doctor/doctoriaid* 'doctor(s)', *biwrocrat/biwrocratiaid* 'bureaucrat(s)'). Both these classes also apply to regularly formed neologisms. Thus, *-au* is always used with quality nouns in *-deb* (e.g. *ffurfioldeb* 'formality', *ffurfioldebau* 'formalities'), and *-iaid* is always used with agent nouns in *-dur* (e.g. *pechadur* 'sinner', *pechaduriaid* 'sinners'). The class in *-au* also shows its productivity in attracting members of other classes – e.g. from the class of plurals in *-oedd*. For example, *amser* 'time' has an older plural *amseroedd* and a newer plural *amserau*, and *cylch* 'circle' has an older plural *cylchoedd* and a newer plural *cylchau*. The plural class in *-oedd* is thus losing members, but it has at least intermediate productivity in that productively formed place-nouns in *-fa* have *-oedd* plurals (e.g. *meithrinfa* 'nursery', *meithrinfaoedd* 'nurseries'). Completely unproductive is, for

instance, the plural suffix *-edd* of *bys/bysedd* 'finger(s)', as well as the various classes of vowel-changing plurals (e.g. *fford/ffyrd* 'road(s)', *asgell/esgyll* 'wing(s)').

In Italian nouns, the *-o/-i* and *-a/-e* inflection classes (see (8.14)) are highly productive: they are used with loanwords (e.g. *il chimono,* plural *i chimoni* 'kimono(s)', *la giungla*, plural *le giungle* 'jungle(s)'), and occasionally they attract members from other inflection classes in non-standard varieties of Italian (e.g. standard language *il pane* 'bread' becomes *il pano* 'bread', *la moglie* becomes *la moglia* 'wife'). The class in *-a/-i* (*poeta/poeti* 'poet(s)') cannot be used with loanwords: the noun *lama* 'Tibetan monk' does not get the plural *-i* (**i lami* 'lamas') but remains unchanged in the plural (i.e. it joins the class of **indeclinables**, like all consonant-final loanwords). However, the *-a/-i* class is not totally unproductive, as it is used with the productive suffix *-ista* (e.g. *leghista* 'follower of the Lega', plural *leghisti*). There is no real unproductive class in Italian, unless one regards the few irregular nouns (*uomo/uomini* 'man / men', *bue/buoi* 'ox(en)', etc.) as classes of their own.

In Russian, two highly productive classes have been absorbing many lexemes from other inflection classes over the past millennium. Loanwords become class I if they end in a 'hard' consonant (*komp´juter*), or class II if they end in *-a* (*disketta*). But by contrast, class IV (consisting almost entirely of neuter nouns ending in *-o* or *-e*) is not highly productive – even loanwords ending in *-o* (such as *pal´to* 'coat' from French *paletot*) do not follow this class but are indeclinable. However, the class still gets new members through productive suffixes like *-stvo*, which creates abstract nouns (e.g. *professorstvo* 'professorship'). There is a small class of neuters in *-ja* (e.g. *vremja* 'time') that is totally unproductive.

8.3 Paradigmatic relations and inflection class shift

In the rest of this chapter we explore why it can be useful, and in some cases necessary, to look at inflection classes from a paradigmatic perspective. We begin by using the word-based model from Section 3.2.2 to develop a formal description.

In a word-based description, the relation between the inflected forms of a lexeme can be seen as parallel to the relation between two derivationally related lexemes. Thus, the relation between *hortī* 'garden, NOM.PL' and *hortōrum* 'garden, GEN.PL' can be characterized by the rule in (8.16). The full form of the rule is given in (8.16a), and (8.16b) shows an equivalent abbreviated notation.

(8.16) a.
$$\begin{bmatrix} /X\bar{\imath}/_N \\ 'x' \\ \text{CASE:} \quad \text{NOMINATIVE} \\ \text{NUMBER: PLURAL} \end{bmatrix} \leftrightarrow \begin{bmatrix} /X\bar{o}rum/_N \\ 'x' \\ \text{CASE:} \quad \text{GENITIVE} \\ \text{NUMBER: PLURAL} \end{bmatrix}$$

b. $[/X\bar{\imath}/_{\text{NOM.PL}}] \leftrightarrow [/X\bar{o}rum/_{\text{GEN.PL}}]$

The fact that there is no Latin noun with a nominative plural in -ī and a genitive plural in -*uum* is thus expressed by the non-existence of a rule that would link these two suffixes. Thus, a correct genitive plural form can be created on the basis of other word-forms in the paradigm, and in fact every form can be created on the basis of every other form. Since there are ten forms in the paradigm, we can posit 45 pairwise rules like (8.16).

Now recall that, even in derivational morphology, there is sometimes reason for positing rules that involve more than two word-schemas. In Section 3.2.2 we saw that, in addition to the English rules in (8.17a,b), we also need the rule in (8.18) because there are word families that contain two derived forms, but not the root (e.g. *illusion, illusive, *illude*).

(8.17) a. $\begin{bmatrix} /X/v \\ \text{'do}x' \end{bmatrix} \leftrightarrow \begin{bmatrix} /Xion/\text{N} \\ \text{'action of doing}x' \end{bmatrix}$ b. $\begin{bmatrix} /X/v \\ \text{'do}x' \end{bmatrix} \leftrightarrow \begin{bmatrix} /Xive/\text{A} \\ \text{'prone to doing}x' \end{bmatrix}$

(8.18) $\begin{bmatrix} /Xion/\text{N} \\ \text{'action of doing}x' \end{bmatrix} \leftrightarrow \begin{bmatrix} /Xive/\text{A} \\ \text{'prone to doing}x' \end{bmatrix}$

These three rules are more properly described as a single rule relating three word-schemas. This can be represented using a further notational convention: sets of corresponding word-schemas are enclosed in curly brackets and separated by commas. Thus, (8.19) is a convenient notation for the combination of (8.17) and (8.18).

(8.19) $\left\{ \begin{bmatrix} /X/v \\ \text{'do}x' \end{bmatrix}, \begin{bmatrix} /Xion/\text{N} \\ \text{'action of doing}x' \end{bmatrix}, \begin{bmatrix} /Xive/\text{A} \\ \text{'prone to doing}x' \end{bmatrix} \right\}$

If we adopt this formalism, we can formulate the rule in (8.20), which contains 10 corresponding word-schemas, to describe the Latin paradigm.[5]

(8.20) {[/Xus/NOM.SG], [/Xī/GEN.SG], [/Xō/DAT.SG], [/Xum/ACC.SG], [/Xō/ABL.SG], [/Xī/NOM.PL], [/Xōrum/GEN.PL], [/Xīs/DAT.PL], [/Xōs/ACC.PL], [/Xīs/ABL.PL]}

In what follows, we will call rules like (8.20) **paradigm rules**. Such word-based rules capture the generalization that inflectional markers come in packages.

This approach is useful as a way to explain class shifts. For example, in later Latin quite a few nouns of the *u*-declension shifted to the *o*-declension – e.g. *senātus* 'senate' (older genitive form *senātūs*, newer genitive *senātī*), *exercitus* 'army', *frūctus* 'fruit'. How can class shift be explained? First,

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[5]   This word-based rule is just a notational variant of the paradigms found in Latin school grammars. Latin school grammars usually give a concrete lexeme like *hortus*, but everyone understands that *hortus* is just an example and really stands for /Xus/. Thus, the word-based description is just a somewhat more explicit variant of what school grammars have long been doing.

we noted earlier that not all word-forms are equally good indicators of inflection class membership. The nominative singular and genitive singular together can uniquely identify the class that a Latin noun belongs to, but the nominative singular by itself cannot. So to explain this shift, we need assume only that the innovating speakers did not remember the genitive form of these nouns for some reason (perhaps because it is infrequent). Now if they remember only the nominative form, the word matches two paradigm rules – i.e. it could belong either to the *o*-declension or to the *u*-declension. In such situations of choice, speakers tend to opt for those rules that generalize over more items. Latin always had many more *o*-declension nouns than *u*-declension nouns, so that the *o*-declension rule was stronger. This explains why shifts from the *u*-declension to the *o*-declension were common in Latin, but shifts in the opposite direction did not occur (see Wurzel 1987: 79).

A key observation for explaining inflection class shift is thus that the form of a word is indicative of its inflection class membership, which is the same as saying that speakers use one word-form in a paradigm to predict another. This is a paradigmatic relation. A purely syntagmatic approach (such as the morpheme-based model) would have trouble describing this generalization, but word-based rules are naturally well suited to accounting for this data because they incorporate and emphasize the paradigmatic dimension of (inflectional) morphological structure.

8.4 Inheritance hierarchies

The value of the paradigmatic perspective also emerges when we examine similarities across inflection classes. From what we have said so far, one might get the impression that inflection classes may differ arbitrarily in the kinds of markers that they exhibit. But in fact different inflection classes often show great similarities, to the point where it is unclear whether a separate inflection class needs to be set up. Let us consider seven important inflection classes of Modern Greek nouns, shown in the traditional way in (8.21). (To simplify the presentation, stress is ignored here, even though it is relevant to establishing inflection classes in Greek.)

(8.21)		*os*-declension	*as*-declension	*us*-declension
SG	NOM	*nomos*	*pateras*	*papus*
	ACC	*nomo*	*patera*	*papu*
	GEN	*nomu*	*patera*	*papu*
PL	NOM	*nomi*	*pateres*	*papuðes*
	ACC	*nomus*	*pateres*	*papuðes*
	GEN	*nomon*	*pateron*	*papuðon*
		'law (masc.)'	'father (masc.)'	'grandfather (masc.)'

		a-declension	*i1*-declension	*i2*-declension	*u*-declension
SG	NOM	*imera*	*texni*	*poli*	*maimu*
	ACC	*imera*	*texni*	*poli*	*maimu*
	GEN	*imeras*	*texnis*	*poleos*	*maimus*
PL	NOM	*imeres*	*texnes*	*polis*	*maimuðes*
	ACC	*imeres*	*texnes*	*polis*	*maimuðes*
	GEN	*imeron*	*texnon*	*poleon*	*maimuðon*
		'day (fem.)'	'art, skill (fem.)'	'town (fem.)'	'monkey (fem.)'

In the more abstract notation of our paradigm rules, these could be written as (8.22).

(8.22) a. Paradigm rule for the *os*-declension
{ [/Xos/NOM.SG], [/Xo/ACC.SG], [/Xu/GEN.SG],
[/Xi/NOM.PL], [/Xus/ACC.PL], [/Xon/GEN.PL] }

b. Paradigm rule for the *as*-declension
{ [/Xas/NOM.SG], [/Xa/ACC.SG], [/Xa/GEN.SG],
[/Xes/NOM.PL], [/Xes/ACC.PL], [/Xon/GEN.PL] }

and so on.[6]

None of the seven classes in (8.21) is completely identical to any other class, but the similarities among them are evident. Theoretically, given seven different declensions and six cells in the paradigm, we could have (6 × 7 =) 42 totally different suffixes. In reality we have almost the opposite: the declensions seem to differ only slightly from each other. One might even propose that some of them could be lumped together, especially the *a*-declension and the *i1*-declension.

In order to express this generalization, we will introduce one additional descriptive device: the **rule-schema**, which generalizes over rules in much the same way as word-schemas generalize over words. Thus, given the paradigm rules for the *a*-declension and the *i1*-declension in (8.23), we can formulate the rule-schema in (8.24), which subsumes both rules. In addition to the stem variable X, this also contains the variable V for the vowel, which may be instantiated by *a* or *i*.

(8.23) a. Paradigm rule for the *a*-declension
{ [/Xa/NOM.SG], [/Xa/ACC.SG], [/Xas/GEN.SG],
[/Xes/NOM.PL], [/Xes/ACC.PL], [/Xon/GEN.PL] }

b. Paradigm rule for the *i1*-declension
{ [/Xi/NOM.SG], [/Xi/ACC.SG], [/Xis/GEN.SG],
[/Xes/NOM.PL], [/Xes/ACC.PL], [/Xon/GEN.PL] }

---

6   There is no point in rewriting all the paradigms of (8.19) in this format, because the tabular format is more perspicuous than the format with brackets and subscripts.

(8.24) Rule schema for (8.23a–b)
    { [/XV/ɴᴏᴍ.sɢ], [/XV/ᴀᴄᴄ.sɢ], [/XVs/ɢᴇɴ.sɢ],
    [/Xes/ɴᴏᴍ.ᴘʟ], [/Xes/ᴀᴄᴄ.ᴘʟ], [/Xon/ɢᴇɴ.ᴘʟ] }

To make the notation more reader-friendly, let us introduce the formalism in Figure 8.1, where the slashes for the phonological representation and the inflectional values are omitted for the sake of simplicity. In this figure, the two declensions and the rule schema are shown in a tree format, the standard format for representing taxonomic hierarchies. In effect, the *a*-declension and the *i1*-declension are subtypes of the declension described by the rule-schema of (8.24), in much the same way as, say, a violin and a cello are subtypes of stringed instruments, and these are again a subtype of musical instrument. The taxonomic hierarchy of declension classes is completely parallel to hierarchies of this familiar kind, and is called an **inheritance hierarchy**.
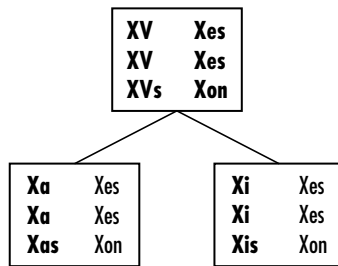
Figure 8.1 A hierarchy of declension classes

    In this formalism, those pieces of information that are identical in the rule schema and in the individual rule need not be specified twice. They can be specified once in the rule-schema, and the individual paradigm rule can inherit the information from the superordinate node in the hierarchy (hence the name *inheritance hierarchy*). This is symbolized by the use of boldface and normal print in Figure 8.1: boldface information is necessary, and normal-print information is redundant and could in principle be inherited from the superordinate node. (If we wanted a completely redundancy-free representation of grammatical information, normal-print material could simply be omitted. However, as we saw earlier in the discussion of word storage (Section 4.3), lack of redundancy does not seem to be a priority for human memory.)

    We can also extend this hierarchy to subsume the other Modern Greek inflection classes that we saw earlier. Figure 8.2 shows an attempt to draw a single inheritance hierarchy for the seven classes of (8.21) that has four different levels of abstractness.
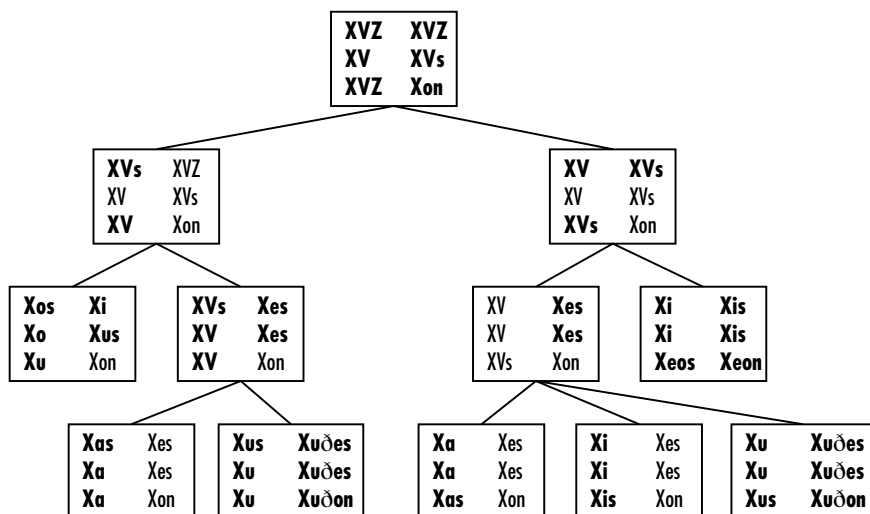
Figure 8.2 An inheritance hierarchy for seven Modern Greek declension classes

The top-level rule-schema is so abstract that it consists almost exclusively of variables (X for the stem, V for a vowel following the stem and Z for anything else, including zero, that follows that vowel). The only concrete elements that all classes share are the genitive plural suffix *-on* and the last consonant of the accusative plural suffix (*-s*). The major split is between the masculine classes (*-os, -as, -us*), on the one hand, and the feminine classes (*-a, -i1, -i2, -u*), on the other: all masculines are characterized by an *-s* in the nominative singular, and all feminines are characterized by an *-s* in the genitive singular.

The inheritance network allows us a flexible and sophisticated answer to the question of how many different inflection classes should be set up for the Modern Greek data in (8.21). At the lowest level, there are seven classes, and we may call these *microclasses*. At an intermediate level, we might say that there are four classes (some of them with subclasses), and at a higher level, we could say that it has just two *macroclasses*, the masculine and feminine declension types.

Now, the hierarchy in Figure 8.1 is just a single tree with no cross-classification, but in reality such cross-classifications are necessary, and examples are easy to find. This is again parallel to other domains of knowledge. One could cross-classify musical instruments into classical instruments (violin, cello, flute) and modern instruments (saxophone, electric guitar). One obvious generalization that is missed by Figure 8.2 but that is certainly not lost on speakers of Greek is the similarity between the *us*-class and the *u*-class, so for this, cross-classification is required.

In the hierarchy of Figure 8.2 there is also never a conflict between a lower and a higher node; higher nodes are merely less specific. Now it has been suggested that such conflicts should be allowed, and that specifications in a lower node should be able to override specifications in a higher node. For example, the Greek *os*-declension and the *a*-declension could be subsumed under the same rule schema as shown in Figure 8.3.

XVs	**Xes**
XV	**Xes**
XV	**Xon**

Xos	**(!)Xi**
Xo	**(!)Xus**
Xu	**Xon**

Xas	**Xes**
Xa	**Xes**
Xa	**Xon**
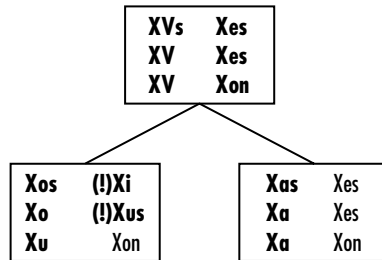
Figure 8.3 An inheritance hierarchy with a mismatch

Here there is a mismatch between the nominative and accusative plural forms /Xi/ and /Xus/ and the corresponding forms specified in the higher node (/Xes/). The exclamation mark in the notation shows that a higher specification is overridden. The forms /Xes/ in the higher rule schema are no longer fully schematic, but they are a default that applies unless it is overridden. By using the device of **default rules** and overrides, the inheritance hierarchy can be simplified. Thus, in Figure 8.2 one of the rule schemas could be dispensed with if the description of Figure 8.3 were adopted.

So in the end, the tree structure and inheritance are not by themselves always sufficient to capture similarities among inflection classes, but they do help us to see that inflection classes can be related to each other to greater or lesser degrees.

By setting up hierarchies as in Figures 8.2 and 8.3, our formal description establishes relationships between entire inflection classes along a paradigmatic dimension. Moreover, we know that this dimension is salient for Greek speakers (and not just the creation of linguists) because of inflection class changes over time. For instance, the Modern Greek *i2*-declension used to have the ending *-is* in the nominative singular ({ [/Xis/NOM.SG], [/Xi/ ACC.SG], [/Xeos/GEN.SG], …}), e.g. *polis/poli/poleos* 'town'. The change from /Xis/ to /Xi/ in the nominative singular was clearly a morphological, not a phonological change. The paradigm rule of the *i2*-declension clashed with the general schema for the other feminine microclasses in an important respect (the nominative singular in *-is*), and, by changing this, that schema was able to subsume the rule for the *i2*-declension as well. If the speakers had had only the rules for the individual declensions, this change would

be mysterious. Thus, diachronic change indicates that speakers establish paradigmatic relations across inflection classes, and that paradigmatic relations are therefore part of the architecture of the morphological system.

8.5 Stems and Priscianic formation

In this section we show that not only inflectional endings, but also stems may be related along the paradigmatic dimension.

In many languages, lexemes are associated with multiple inflectional stems, i.e. there is weak or strong stem suppletion. Consider the Persian verb forms in (8.25).

(8.25) INFINITIVE   PAST TENSE   PRESENT TENSE
  mund-œn   1SG *mund-œm*   *mi-mun-œm*
  'to stay'   2SG *mund-i*   *mi-mun-i*
                3SG *mund*   *mi-mun-e*
                1PL *mund-im*   *mi-mun-im*
                2PL *mund-id*   *mi-mun-id*
                3PL *mund-œnd*   *mi-mun-œnd*
                              (Mahootian 1997: 28, 236)

All past-tense forms and the infinitive share a stem (*mund-*), and all present-tense forms share another (*mun-*). All Persian verbs behave like MUNDÆN in this respect, as the verbs in (8.26) show.

(8.26) INFINITIVE   1ST SG PAST   1ST SG PRESENT
  mund-œn   *mund-œm*   *mi-mun-œm*   'stay'
  xœrid-œn   *xœrid-œm*   *mi-xœr-œm*   'buy'
  mord-œn   *mord-œm*   *mi-mir-œm*   'die'
  šekaft-œn   *šekaft-œm*   *mi-šekaf-œm*   'split'
  šetaft-œn   *šetaft-œm*   *mi-šetab-œm*   'hurry'
  did-œn   *did-œm*   *mi-bin-œm*   'see'
                              (Mahootian 1997: 231–7)

The relation between the past-tense stem and the present-tense stem is unpredictable for many verbs, but the past stem and the infinitival stem are always identical. Moreover, because the relationship between the present and the past/infinitive sometimes involves suppletion, it is natural to say that lexemes are associated in the lexicon with two stems that are restricted to occurring with particular inflectional values.

Now, in the context of this chapter's discussion, one of the more interesting facts about inflectional stems is that they can sometimes be built on other stems in the same paradigm. A well-known case in Latin is the past passive participle and the future active participle. Some representative forms are given in (8.27).

(8.27) INFINITIVE   PAST PASS. PART.   FUTURE ACT. PART.

laudāre	*laudātus*	*laudātūrus*	'praise'
monēre	*monitus*	*monitūrus*	'warn'
dūcere	*ductus*	*ductūrus*	'lead'
vehere	*vectus*	*vectūrus*	'carry'
mittere	*missus*	*missūrus*	'send'
haerēre	*haesus*	*haesūrus*	'stick'
premere	*pressus*	*pressūrus*	'press'
ferre	*lātus*	*lātūrus*	'bear'

(Aronoff 1994: ch. 2)

We could say here that each lexeme is associated with a set of three stems (e.g. *laudā-*, *laudāt-*, *laudātūr-*). But two facts are noteworthy. First, the future-active participle stem is the same as the past-passive participle stem with *-ūr* added. Second, the relationship between the infinitive and the past-passive participle is sometimes suppletive, but the relationship between the past-passive participle and the future-active participle is always regular. An alternative would thus be to describe the future-active participle in terms of **Priscianic formation** (so called because it was used by the Latin grammarian Priscian, in the sixth century CE), whereby a member of an inflectional paradigm is formed from another member of the paradigm to which it need not be closely related semantically. A Priscianic analysis of Latin would say that the form of the future-active participle is dependent upon the form of the past-passive participle. This can be represented with a word-based rule as in (8.28).

(8.28) [/XY/PST.PASS.PART] ↔ [/XūrY/FUT.ACT.PART]

This rule nicely captures the regular relationship between the past-passive participle and the future-active participle. (Note that the meaning is quite independent of the form; obviously the future-active participle cannot be based *semantically* on the past-passive participle.)

A description in terms of Priscianic formation is equivalent to a description in terms of stem sets for most purposes, and most linguists have continued to describe examples like (8.27) in terms of stem sets. (It is, after all, the approach that is consistent with the more dominant syntagmatic perspective.) But even for these linguists, such an analysis is perhaps less attractive in cases like the following from Tümpisa Shoshoni. This language has two non-nominative case forms, an objective case and a possessive case. The formation of these cases is illustrated in (8.29).

(8.29) NOMINATIVE   OBJECTIVE   POSSESSIVE

mupin	*mupitta*	*mupittan*	'nose'
tümpi	*tümpitta*	*tümpittan*	'rock'
nümü	*nümi*	*nümin*	'person'

piammütsi	*piammütsia*	*piammütsian*	'baby'
kahni	*kahni*	*kahnin*	'house'
			(Dayley 1989: 185–6)

The objective case is related to the nominative in various ways (one of them being identity to the nominative), but the possessive is systematically formed from the objective by adding a further suffix *-n*. If we wanted to describe this pattern without Priscianic formation, we would have to set up a non-nominative stem that yields the possessive form by addition of *-n* and the objective form by addition of nothing. Of course, this kind of purely syntagmatic description is perfectly possible, but nothing seems to be gained when compared to the Priscianic solution.

8.6 Syncretism

Not uncommonly, two word-forms in an inflectional paradigm are phonologically identical, or in other words, **homonymous**. For example, in the present-tense paradigm of German verbs, the third person singular and the second person plural, and the first and third person plural have the same form:

(8.30)	1SG	*(ich)*	*spiele*	'I play'
	2SG	*(du)*	*spielst*	'you(SG) play'
	3SG	*(er/sie)*	*spielt*	'he/she plays'
	1PL	*(wir)*	*spielen*	'we play'
	2PL	*(ihr)*	*spielt*	'you(PL) play'
	3PL	*(sie)*	*spielen*	'they play'

When the inflectional homonymy is systematic, we speak of **syncretism**, and homonymous forms of a paradigm are called syncretic. Syncretism is thus a kind of 'mismatch' between form and inflectional function – one form for two or more (sets of) inflectional values. We will see that syncretism is perhaps the strongest piece of evidence for paradigmatic relations as part of morphological architecture. However, since the issues are somewhat complicated, we discuss them at some length in this section.

8.6.1 Systematic versus accidental inflectional homonymy

We must first be able to distinguish between systematic and accidental homonymy. We will discuss four tests: systematicity across inflection classes, syntactic functionality, patterns of language change and whether the affected paradigm cells form a natural class (see Zwicky 1991).

The first test considers the extent to which a pattern of homonymy is found in different inflection classes. The two pairs of homonymous forms

in (8.30) behave differently by this criterion. German has a small class of vowel-changing verbs that have a different stem vowel in the second and third person singular, e.g. *gebe/gibst/gibt* 'give', *falle/fällst/fällt* 'fall'. In these verbs, the third person singular and the second person plural are not identical, because the vowel alternation is restricted to the third person singular (3SG *gibt* versus 2PL *gebt*, 3SG *fällt* versus 2PL *fallt*), but the first person and third person plural are still identical. In fact, the first person and the third person plural are identical in all German verb paradigms, including the suppletive paradigm of *sein* 'be' (singular: *bin/bist/ist*, plural: *sind/seid/sind*). So in this respect, the 1PL/3PL homonymy (*spielen*) is more systematic than the 3SG/2PL homonymy (*spielt*).

The syntactic test concerns an interesting syntactic property of syncretic forms: they can be used in situations where two conflicting syntactic requirements must be fulfilled simultaneously. One such construction is shown in (8.31a), where the verb *spielt* has to agree simultaneously with both coordinands of the disjunction. Now there are situations where the two requirements are in conflict, as in (8.31b), where the verb is supposed to agree both with *ich* (first person singular) and with *du* (second person singular). Since there is no verb form that can do this, the sentence is ungrammatical.

(8.31) a. *Entweder Ballack oder Klose spielt gegen Bulgarien.*
            'Either Ballack or Klose will play in the Bulgaria match.'

        b. **Entweder ich oder du spiele/spielst gegen Bulgarien.*
            'Either I or you(SG) will play in the Bulgaria match.'

        c. *Entweder wir oder sie spielen gegen Bulgarien.*
            'Either we or they will play in the Bulgaria match.'

        d. **Entweder Bierhoff oder ihr spielt gegen Bulgarien.*
            'Either Bierhoff or you(PL) will play in the Bulgaria match.'

However, when the two requirements are first or third person plural, as in (8.31c), there is a way to resolve the feature-value conflict: the syncretic form *spielen* can serve simultaneously as a first person plural and as a third person plural form. In this, it contrasts with the two homonymous forms *spielt* '3rd sg' and *spielt* '2nd pl': as we see in (8.31d), the form *spielt* cannot resolve the feature-value conflict, and hence we say that, in the case of *spielen*, we have systematic homonymy (i.e. syncretism), whereas, in the case of *spielt*, we are dealing with accidental homonymy. The syntactic criterion shows that speakers treat the two syncretic forms as related. In the case of German verbs, this test gives the same results as does the first test: The identity of *spielt* (3SG) and *spielt* (2PL) is accidental, but the identity of *spielen* (1PL) and *spielen* (3PL) is systematic – i.e. in the latter case we are dealing with syncretism.

The ability to resolve a feature-value conflict can be taken as a sufficient criterion for systematic homonymy, but it cannot be a necessary one

because sometimes there are no relevant syntactic constructions that would impose conflicting requirements. For instance, if we want to know whether the frequent homonymy of the English past tense and the past participle (as in forms like *played, fed, thought*) is systematic, we cannot apply the syntactic test, because there are no constructions in which a verb should simultaneously be a past tense and a past participle. It is true that, for the vast majority of verbs, these forms are homonymous, but in Old English they were distinct for all verbs, and the present-day homonymy could be explained in almost all cases by regular phonological changes. Thus, the homonymy might still be accidental for English speakers. However, here the diachronic criterion can be invoked: there are a few verbs whose past-participle form became identical with the past-tense form through morphological (analogical), not phonological change: *stand/stood/stood* (cf. Old English *standan/stōd/gestanden*), *sit/sat/sat* (cf. Old English *sittan/sæt/ geseten*). The morphological change is a strong indication that, at least at the time of the change, the homonymy of the two forms was perceived as systematic by the speakers.

Finally, when all else fails, we can reasonably guess that forms are systematically homonymous when they form a **natural class**, i.e. when they can be described by a single (set of) inflectional value(s), and they are the only word-forms that express that set. Consider the Lithuanian verb paradigm in (8.32) (present tense, indicative mood of *sup-* 'shake, swing').

(8.32)

	SINGULAR	PLURAL
1ST	*supu*	*supame*
2ND	*supi*	*supate*
3RD	*supa*	*supa*

Here the two syncretic cells are the third person singular and the third person plural and they form a natural class, which is to say they are the only word-forms expressing third person. Such syncretisms may be called **natural syncretisms**, and patterns of this sort are likely to not be accidental.

8.6.2 Underspecification

Once we have established that a case of identity is systematic and not accidental, we can return to the question of whether syncretism requires a paradigmatic perspective in order to be adequately described. This question can be rephrased in the following way: Are we really dealing with two different cells in the paradigm, and a rule stating that they must have identical form (a paradigmatic approach), or is there perhaps just a single form that simply does not distinguish the relevant values (a non-paradigmatic approach)?

Certainly, examples of natural syncretisms do not require the paradigmatic approach, and they are quite easy to describe. We can simply say that the Lithuanian third person form of the verb is *supa* – i.e. we do not have to mention the number feature at all. We can visualize this description by a representation in which the syncretic form occupies an enlarged cell, as in (8.33).

(8.33)

	SINGULAR	PLURAL
1ST	*supu*	*supame*
2ND	*supi*	*supate*
3RD	*supa*	

In the more formal representation format of (8.20), we would say that the paradigm of *sup-* is described by the paradigm rule in (8.34), in which nothing is said about the number feature for the form *supa*.

(8.34) $\{[/Xu/1.\text{SG}], [/Xi/2.\text{SG}], [/Xa/3], [/Xame/1.\text{PL}], [/Xate/2\text{PL}]\}$

Such a mode of description is called **underspecification**: we simply do not specify the value of certain features in the paradigm rule. For the syntactic rule of agreement that interacts with these inflectional values, this means that it should not require **feature-value identity**, but only **feature-value compatibility**. Both a singular and a plural subject NP are compatible with a form like *supa*, so the agreement relation works, even though *supa* is not specified for number.

Sometimes an underspecification analysis is possible even when the syncretic cells do not constitute a natural class. Consider another example, Standard Arabic case inflection:

(8.35)

	SINGULAR	PLURAL
NOM	*ħaywaan-un*	*ħaywaan-aat-un*
GEN	*ħaywaan-in*	*ħaywaan-aat-in*
ACC	*ħaywaan-an*	*ħaywaan-aat-in*
	'animal'	'animals'

In the plural, the genitive and the accusative have the same form, and the usual analysis is that we are dealing with syncretism here (this genitive–accusative homonymy is found in all non-singular forms, so it is unlikely to be accidental). However, this is not an example of natural syncretism: only two of the three plural cells are syncretic.

One possibility is to say that Arabic has a different case system in the plural that distinguishes only a nominative and an oblique case. In other words, one might propose (8.36):

(8.36)

	SINGULAR
NOM	*ħaywaan-un*
GEN	*ħaywaan-in*
ACC	*ħaywaan-an*

	PLURAL
NOM	*ħaywaan-aat-un*
OBL	*ħaywaan-aat-in*

But most linguists would not adopt this description, because it would make the rules of syntax more complicated. Instead of saying that a direct object is in the accusative case, we would have to say that it is in the accusative case in the singular and in the oblique case in the plural. Or possibly, our model could specify that oblique is somehow compatible with accusative and genitive.

But a simple alternative is to posit that the nominative plural formally bears the feature values NOM.PL, and the syncretic forms are underspecified for case, bearing only the value PL. This causes an apparent problem: both word-forms are then compatible with a syntactic rule that requires nominative plural, but only one of the words can appear in this context. However, we can easily solve this problem by assuming that the morphology provides to the syntax that word whose feature values are compatible *in the most specific way*. If the syntactic context requires a nominative plural, *ħaywaanaatun* meets these conditions in a more specific way than *ħaywaanaatin* because the former specifies both case and number values. This principle is a version of the **elsewhere condition** – more specific conditions apply before more general ones. The elsewhere condition is relevant to many areas of grammatical structure.

Underspecification is thus a powerful tool for describing syncretism, but it is not restricted to the word-based model. The examples in this section can just as easily be described in the morpheme-based model; the Lithuanian example is given in (8.37).

(8.37) a.
$$\begin{bmatrix} /u/ \\ \text{V}\_\_\_ \\ \begin{bmatrix} \text{PERSON:1ST} \\ \text{NUMBER:SG} \end{bmatrix} \end{bmatrix}$$
b.
$$\begin{bmatrix} /a/ \\ \text{V}\_\_\_ \\ \{\text{PERSON:3RD}\} \end{bmatrix}$$

As in the word-based rule in (8.34), the morpheme lexical entry in (8.37b) is underspecified for number. This highlights that underspecification does not require a paradigmatic perspective. And inasmuch as all examples of syncretism can be described as feature underspecification, both the word-based model and the morpheme-based model offer equally viable descriptions. But of course, the key word in the preceding sentence is 'inasmuch'. In the following section we show that many instances of syncretism cannot be described by underspecification. Such examples require a paradigmatic approach.

8.6.3 Rules of referral

Consider the three Old Church Slavonic nominal inflection classes in (8.38). Only the case endings are given here in order to save space.

(8.38)

	ŭ-class			*a*-class				*ĭ*-class		
	SG	DU	PL	SG	DU	PL		SG	DU	PL
NOM	*-ŭ*	*-a*	*-i*	*-a*	*-ě*	*-y*		*-ĭ*	*-i*	*-i*
ACC	*-ŭ*	*-a*	*-y*	*-o*	*-ě*	*-y*		*-ĭ*	*-i*	*-i*
GEN	*-a*	*-u*	*-ŭ*	*-y*	*-u*	*-ŭ*		*-i*	*-ĭju*	*-ĭjĭ*
LOC	*-ě*	*-u*	*-ěxŭ*	*-ě*	*-u*	*-axŭ*		*-i*	*-ĭju*	*-ĭxŭ*
DAT	*-u*	*-oma*	*-omŭ*	*-ě*	*-ama*	*-amŭ*		*-i*	*-ĭma*	*-ĭmŭ*
INST	*-omĭ*	*-oma*	*-y*	*-ojǫ*	*-ama*	*-ami*		*-ĭ*	*-ĭma*	*-ĭmĭ*

Especially in the dual, we have a lot of syncretism: The nominative and accusative, the genitive and locative, and the dative and instrumental are systematically homonymous (this is true also of the other inflection classes not shown here). These syncretisms are clearly not natural syncretisms, because these three pairs of cases do not have any exclusive properties. Moreover, these examples cannot (in any obvious way) be described using the device of feature underspecification. If all three pairs of syncretic dual forms were underspecified for case, all six dual forms would have the same feature specification (i.e. they would be marked *only* for being dual). The elsewhere condition would not function because no one form would be associated with more specific feature values.

For such cases, we need a special type of rule that says that several forms in the paradigm are identical. Such rules are called **rules of referral**. We can formulate the rule for the nominative–accusative dual as in (8.39).

(8.39) $\begin{bmatrix} /X/_N \\ \text{'NOM.DU'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /X/_N \\ \text{'ACC.DU'} \end{bmatrix}$

This rule generalizes over all the paradigms of Old Church Slavonic. A rule of referral can thus be thought of as a kind of paradigm rule schema that relates two cells in the paradigm to each other. And as should be obvious by this point, this kind of rule encodes paradigmatic relations.

That such rules of referral are real for speakers and not just thought up by linguists becomes clear when they trigger morphological changes. An example comes from Old High German (Wurzel 1987: 70–1). The paradigm of neuter nouns of the *a*-declension that must have existed in pre-Old High German is shown in (8.40).

(8.40)

	SINGULAR	PLURAL		SINGULAR	PLURAL
NOM	*wort*	*wort*		*faz*	*fazzu*
ACC	*wort*	*wort*		*faz*	*fazzu*
GEN	*wortes*	*worto*		*fazzes*	*fazzo*
DAT	*worte*	*wortum*		*fazze*	*fazzum*
	'word'			'barrel'	

The original suffix of the nominative/accusative was *-u*, as is clear from comparative evidence. This suffix was lost by regular sound change in heavy-syllable words like *wort*, but it was preserved in light-syllable words like *faz*. Now apparently speakers formulated a rule of referral stating that the singular and the plural forms of the nominative and accusative are identical. This rule was originally based only on nouns of the *wort* class, but since the *faz* class had a much lower type frequency, it also came to be affected by this rule, and by the time of Old High German the paradigm of (8.40) had changed: the forms *fazzu* have been replaced by *faz*, in accordance with the rule of referral.

8.7 More form-meaning mismatches

Nobody is perfect, not even inflectional paradigms. In the previous section we encountered one way in which cells in an inflectional paradigm may have a mismatch between form and meaning; they may be identical to other cells in the paradigm. In this section, we look at two more ways in which inflection fails to correspond to the principle of one-form-one-meaning, and how description of these examples benefits from a paradigmatic approach.

8.7.1 Defectiveness

First of all, lexemes may simply lack word-forms. Lexemes with missing word-forms are called **defective lexemes**.[7] An example of a defective lexeme is the Italian verb *incombere* 'be incumbent', which lacks a past participle and therefore cannot be used in the compound past tense. In French, the verbs *frire* 'fry', *déchoir* 'fall' and *clore* 'close' lack an imperfective past tense. In English, many speakers feel that the verb *forego* sounds strange in the past tense (*??He foregoed/forewent treatment for cancer*). In Russian, a number of verbs do not have a first person singular in the present/future tense (e.g. *pobedit'* 'win, defeat', **pobežu*), and a few nouns like *mečta* 'dream' lack a genitive plural form (**mečt*).

Defectiveness is surprising and interesting for a few reasons. First, it disturbs the functionality of the language. Sometimes one wants to say 'I will win' in Russian, but the system does not allow it. Of course, speakers are not condemned to silence in such cases – there is always a way around the defective form. A Russian speaker can resort to the expression *oderžu pobedu* [gain victory$_N$] 'I will gain a victory', and an English speaker can

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[7]   Note that the term *defectiveness* is usually applied only to individual lexemes, not to entire inflectional values. For instance, English systematically lacks one-word forms to express the past-passive participle, but this is not normally called defectiveness.

avoid *foregoed* by choosing a semantically similar verb or phrase such as *did without* or *sacrificed*.

Second, it is surprising that speakers can learn the negative fact that a lexeme lacks certain forms. Normally there is at least one productive pattern for each inflectional value, a default pattern that is used when no other pattern is remembered. But in defective lexemes, this default pattern is not used to 'fill in' missing forms. This suggests that defectiveness is not simply a situation in which speakers fail to learn the missing word-form. Rather, speakers learn that no word-form is used, not even the default. Moreover, in contrast to other irregular lexemes, which usually show a high frequency of use (see Section 12.3), many defective lexemes are rather rare. Some more examples of Russian verbs that are defective in the first person singular present/future are shown in (8.41). (In Russian, the perfective future and the imperfective present are formed in the same manner. The verbs are therefore defective in either the present tense or the future, depending on aspectual value.) The summed token frequency of all present/future tense forms is also listed, based on the modern (post-1950) subpart of the Russian National Corpus, a large corpus consisting mostly of written texts of various types (newspapers, magazines, fiction, religion and philosophy, law, technical and scientific works, letters, diaries, etc.).[8]

(8.41)	LEXEME	EXPECTED 1SG	PRESENT/FUTURE FREQUENCY (IPM)[9]	GLOSS
	pobedit´	*pobežu*	30	'be victorious'
	ubedit´	*ubežu*	23.2	'persuade'
	oščutit´	*oščušču*	7.3	'feel'
	čudit´	*čužu*	0.8	'behave oddly'
	derzit´	*deržu*	0.6	'be imprudent'
	umiloserdit´	*umiloseržu*	0	'to take pity on'

We might posit that speakers learn that *pobedit´* is defective simply by having many opportunities to observe that all of its word-forms are used – except the first person singular. But this does not seem to help explain how lexemes like *derzit´* and *umiloserdit´* are learned to be defective, and how defectiveness in these words can be stable for multiple generations. (A probable answer is that a kind of analogy is at work here; speakers learn that *derzit´* is defective because other, similar verbs are also defective (Daland *et al*. 2007; Baerman 2008).)

Finally, and relevant to the central discussion of this chapter, the most surprising thing about defectiveness is probably that it, too, sometimes exhibits paradigmatic dependencies. In Sections 8.2 and 8.3 we argued that the ability to predict one word-form from another is an important property

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[8]   Russian National Corpus: http://ruscorpora.ru/en/. Frequency list based on modern subcorpus: http://corpus.leeds.ac.uk/serge/frqlist/ (access: July 2010).

[9]   IPM = instances per million words of corpus

of inflection classes. Paradigm rules help explain, for example, why lexemes sometimes shift from one inflection class to another. Here we note that paradigm rules sometimes play a role in defectiveness as well – forms that cannot be accurately predicted may become defective. For instance, a handful of Spanish verbs are defective in the first person singular, e.g. *abolir* 'abolish' (1SG: **abolo*, **abuelo*), and sometimes other cells in the paradigm. Crucially, the defective cells are exactly those which cannot be confidently predicted based on other word-forms of the same lexeme, and are not frequent enough to have been memorized by speakers (Albright 2003).

8.7.2 Deponency

Another phenomenon of paradigm mismatch is **deponency**, whereby a formal marker of an inflectional value is used in the 'wrong' function, i.e. to express a different value. Consider the Modern Greek active and passive forms of *pléno* 'wash' in (8.42a). This represents the inflectional pattern that most verbs follow. However, a handful of verbs like *ðéxome* 'receive, accept', *eryázome* 'work', and *érxome* 'come' (8.42b), are semantically active, but nonetheless exhibit the inflection pattern that normally expresses the passive.

(8.42) a.

	ACTIVE	PASSIVE	b.	ACTIVE
1SG	pléno	plénome		érxome
2SG	plénis	plénese		érxese
3SG	pléni	plénete		érxete
1PL	plénume	plenómaste		erxómaste
2PL	plénete	plenósaste		erxósaste
3PL	plénun	plénonde		érxonde

Verbs like *érxome*, which have a paradigm from a different value but not the meaning of that value, exhibit deponency.

In a purely syntagmatic approach, deponency is difficult to describe adequately. The morpheme-based model must treat *-ome* as meaning 'passive first person singular', *-ese* as meaning 'passive second person singular', and so on, because morphemes bear meaning in this approach. However, this principle runs into obvious problems with the deponent verbs.

From a paradigmatic perspective this pattern is understood easily enough if we make one small assumption: paradigmatic relations akin to rules of referral can operate not only within paradigms, but also across inflection classes. The active in the deponent class can be specified as systematically taking the same inflectional endings as the passive in other inflection classes. (Proper rules of referral involve complete phonological identity, not only inflectional identity, but the same principle is at work here.) A paradigmatic approach thus offers a more intuitive description of deponency than is possible in a purely syntagmatic approach.

8.8 Periphrasis

Not uncommonly, missing cells are not completely empty, but may be filled by multi-word phrases that express the needed concepts in a conventional way. For example, many English adjectives lack ordinary comparative forms in *-er*. We have *warm-er, nic-er, pretti-er*, but we do not have **beautifuller, *interestinger, *activer*. However, morphologists do not say that the lexemes *beautiful, interesting* and *active* are defective in lacking a comparative form, because there is a well-established convention for expressing the value: *more beautiful, more interesting, more active.* Such comparatives are called periphrastic, and the phenomenon is **periphrasis**. Another example comes from Romanian, where nouns inflect for an oblique case (e.g. *prietenul* 'the friend (NOM)', *prietenului* 'the friend (OBL)', *Ana* 'Ana (NOM)', *Anei* 'Ana (OBL)'). However, masculine personal names such as *Petre* lack an ordinary oblique case. In order to use them in a syntactic slot that requires the oblique case, a periphrasis involving the pronoun *lui* 'him' is used (*lui Petre* 'Petre (OBL)').

These examples represent cases of **lexical periphrasis**, where certain (groups of) lexemes lack word-forms for certain values. But we also find **paradigmatic periphrasis** – i.e. cases in which entire word-classes lack word-forms for certain combinations of inflectional values. A well-known example of this comes from Latin verbs. The passive is sometimes expressed morphologically for verbs (e.g. when combined with present or imperfect meanings). Likewise, the perfect and the pluperfect are expressed morphologically when combined with the active. However, the combination of perfect/pluperfect and passive is periphrastic for all verbs. In (8.43) we see the third person singular forms of some tense–aspect–voice combinations of the verb *scribere* 'write'. The perfect and pluperfect passive forms are expressed by the past passive participle plus the verb *esse* 'be'.

(8.43)

	PRESENT	IMPERFECT	PERFECT	PLUPERFECT
ACTIVE	*scribit*	*scribebat*	*scripsit*	*scripserat*
PASSIVE	*scribitur*	*scribebatur*	*scriptum est*	*scriptum erat*

We should be careful to distinguish paradigmatic periphrasis from another kind of periphrasis that we may call **categorial periphrasis**. In categorial periphrasis, a given grammatical function is *always* expressed with a multi-word expression. For example, French is sometimes said to have a periphrastic future involving the auxiliary verb *aller* 'go', e.g. *je vais faire* 'I'm going to do', *tu vas faire* 'you're going to do', *il va faire* 'he's going to do', and so on. The crucial difference, as compared with (8.43), is that the French future is never expressed with a single word, whereas the Latin

passive sometimes is. In contrast to paradigmatic periphrasis, then, such cases of categorial periphrasis have nothing to do with morphology, and the morphologist can ignore them.

Periphrasis does not appear to exhibit paradigmatic dependencies in the same way that deponency and syncretism do. But it is significant that paradigmatic (i.e. morphologically-relevant) periphrasis can only be identified in the context of other paradigmatic forms – the relevant inflectional values must somewhere in the paradigm be expressed with a single word. Moreover, some linguists have argued that paradigmatic periphrasis tends to exhibit morphological properties (e.g. non-compositional meaning), and periphrastic examples as in (8.43) therefore should be formally considered as part of a lexeme's paradigm, but there is no consensus on this point.

Summary of Chapter 8

Inflection classes have a number of properties. They are delineated by sets of suppletive inflectional allomorphs, which are typically linked to properties such as the phonological shape of the base, the lexeme's meaning (e.g. animacy, transitivity) and/or morphological properties such as the derivational pattern. Although inflection class and gender are clearly related, their relationship is complex. Inflection classes may differ in productivity, seen in their ability to apply to novel lexemes (loanwords or productively formed neologisms) and in their ability to attract class-shifting lexemes.

The balance between syntagmatic and paradigmatic description of (inflectional) structure is a major issue for the description of morphological architecture. This chapter focused on evidence that a syntagmatic perspective is insufficient by itself; formal devices for a paradigmatic description of inflection are also needed. The primary evidence comes from inflection class-shift, similarities across inflection classes (described in terms of inheritance hierarchies), Priscianic formation (one stem being built on another stem in the paradigm) and form-meaning mismatches: syncretism (one form for two sets of inflectional functions), defectiveness (lack of a form for a given function), deponency (a form with an unexpected function), and to a lesser extent, periphrasis (a function is expressed by a multi-word phrase).

Further reading

Book-length studies on inflection include Matthews (1972), Carstairs (1987), Wurzel (1989) and Stump (2001a). A typologically oriented overview article

is Bickel and Nichols (2007). For inflection classes and stems, see Aronoff (1994) and Blevins (2003), and for inheritance hierarchies, see Corbett and Fraser (1993) and Stump (2001b). For productivity, see Dressler (1997) and Bauer (2001b).

Various mismatches between form and inflectional function have been studied individually. For syncretism (including discussion of rules of referral, underspecification and related approaches), see Zwicky (1985a), several of the papers in Plank (1991), Noyer (1998) and Baerman *et al*. (2005). The distinction between systematic and accidental homonymy is set out in Zwicky (1991). For periphrasis, particularly the debate about whether periphrastic constructions are morphological or syntactic, see Börjars *et al*. (1997), Embick (2000), Ackerman and Stump (2004) and Kiparsky (2005). An overview of periphrasis is Haspelmath (2000). For deponency, see the papers in Baerman *et al*. (2007). For defectiveness and its relationship to paradigmatic dependencies, see Hansson (1999), Albright (2003), Sims (2006), Daland *et al*. (2007) and the papers in Baerman *et al*. (2010).

For the relationship between gender and inflection class, see Corbett (1982, 1991), Aronoff (1994) and Spencer (2002).

Comprehension exercises

1. Using the rules given in connection with (8.11), form the perfective form of the following Tagalog verbs:

root	basic form with voice affix	
langoy	*lumangoy*	'swim'
wagayway	*wumagayway*	'wave'
takot	*matakot*	'be afraid'
uhaw	*mauhaw*	'be thirsty'
buhat	*buhatin*	'raise'
punit	*punitin*	'rip'
punas	*punasan*	'wipe'

2. Near the end of Section 8.4, we said that 'in Figure 8.2, one of the rule schemas could be dispensed with if the description of Figure 8.3 were adopted'. Which rule schema could be dispensed with? What would the modified version of Figure 8.2 look like?

3. Take a complete list of English 'irregular verbs' based on past tense formation and try to group them into small inflection classes. Which classes can be established? Which verbs must be said to be truly irregular – i.e. cannot be put into a class with some other verb(s)?

4. Consider the following three inflection classes of Ancient Greek (only singular forms are given). Class (i) consists of feminines (like the Latin

class of *insula* 'island'), class (ii) consists of masculines denoting men (like the Latin class of *poeta* 'poet') and class (iii) mostly consists of masculines. The nouns of class (ii) originally inflected just like class (i). What may have motivated the change?

	(i)	(ii)	(iii)
NOM	*hēmérā*	*neaníās*	*phílos*
ACC	*hēmérān*	*neaníān*	*phílon*
GEN	*hēmérās*	*neaníou*	*phílou*
DAT	*hēmérāi*	*neaníāi*	*phílōi*
	'day'	'young man'	'friend'

5. Consider the following four inflection classes of Russian nouns, and try to set up an inheritance hierarchy corresponding to Figure 8.2. (see Corbett and Fraser 1993). (Note that <y> and <i> stand for the same phoneme. Also, note that the spelling obscures the stem shape in (iii), and the following all stand for the phoneme /tʲ/: <t´>, <tj>, and plain <t> when followed by <e> or <i>.)

	(i)	(ii)	(iii)	(iv)
	'law'	'room'	'bone'	'swamp'
NOM.SG	*zakon*	*komnata*	*kost´*	*boloto*
ACC.SG	*zakon*	*komnatu*	*kost´*	*boloto*
GEN.SG	*zakona*	*komnaty*	*kosti*	*bolota*
DAT.SG	*zakonu*	*komnate*	*kosti*	*bolotu*
INST.SG	*zakonom*	*komnatoj*	*kost´ju*	*bolotom*
LOC.SG	*zakone*	*komnate*	*kosti*	*bolote*
NOM.PL	*zakony*	*komnaty*	*kosti*	*bolota*
ACC.PL	*zakony*	*komnaty*	*kosti*	*bolota*
GEN.PL	*zakonov*	*komnat*	*kostej*	*bolot*
DAT.PL	*zakonam*	*komnatam*	*kostjam*	*bolotam*
INST.PL	*zakonami*	*komnatami*	*kostjami*	*bolotami*
LOC.PL	*zakonax*	*komnatax*	*kostjax*	*bolotax*

6. English has few cases in which syncretism could be observed. However, consider the present-tense and past-tense paradigms of *be*:

I	*am*	*was*
you(SG)	*are*	*were*
he/she	*is*	*was*
we	*are*	*were*
you(PL)	*are*	*were*
they	*are*	*were*

Apply the criteria of Section 8.6.1 to determine whether second person singular *are* and *were* are systematically syncretic with plural *are* and *were*.

Exploratory exercise

In Section 8.6 we saw a few examples of syncretism, a kind of mismatch between form and inflectional function. A question that we did not ask, however, is whether syncretism tends to affect one part of a lexeme's paradigm more than another. In this exercise, you will explore cross-linguistic patterns of syncretism using the Surrey Person Syncretism Database (Baerman 2002). This database contains examples of person (-number-gender) syncretism in verbal inflection classes. The data come from a geographically and genetically diverse sample of 111 languages. You will use this data to develop an answer to the question above, and consider possible explanations for any observed patterns.

Instructions

Step 1: Develop a hypothesis and predictions. For instance, in a language in which verbs agree with controller nouns for three person values (first, second, third), and two number values (singular, plural), would you expect to find that the third person singular and third person plural are more commonly syncretic than are the third person singular and first person singular? Or the opposite pattern? Or no difference? What about the third person singular and the first person plural? Do you expect to find more examples of 'natural' syncretism, and if so, in which values of person/number/gender/etc. features? In developing your predictions, you might find it helpful to inspect the examples of syncretism presented in this chapter.

(Having three person values and two number values is common among verbs that agree with pronouns and nouns for person and number. But of course, verbs may express more or fewer than two number values, may agree also for gender, the first person plural and dual may be subdivided into **inclusive** ('we, including the addressee') and **exclusive** ('we, not including the addressee') forms, etc. Be sure to include other inflectional values in your predictions.)

Based on what you have read in this chapter and elsewhere in the book, explain the rationale underlying your predictions. If you expect to find asymmetries in attested patterns of syncretism (more in one value than another), why do you think that such an asymmetry might exist? If you do not expect to find any asymmetrical patterns, why not?

Step 2: Familiarize yourself with the data set. The Surrey Person Syncretism Database is available here (as of July 2010): www.smg.surrey. ac.uk/personsyncretism/index.aspx. Explore its content, structure, and the theoretical assumptions it makes about syncretism. Begin by reading the document 'How to Use the Database'. Also, notice in particular that in results returned by a query, clicking the 'Example' button will show the entire relevant paradigm.

Step 3: Develop an appropriate classification/counting method. For instance, if you expect to find more syncretism among singular forms than among plural ones, or vice versa, it might seem obvious that you want to count the number of examples in the database with syncretism in the plural, and the number with syncretism in the singular. However, a single language may have more than one example of syncretism. Should each example be counted, or each language? (A question to consider here is whether multiple examples of syncretism in the same language are likely to be independent of each other.) Also, what if a language has syncretism between all plural cells, but also one singular cell; how should this kind of example be counted? There are no absolute 'right' answers to these questions. The important thing is that you develop precise criteria, justify them to the extent possible, and most of all, be consistent in applying them.

Step 4: Collect data. Using the search interface for the Surrey Person Syncretism Database, collect data that can be used to support or reject your hypothesis.

Step 5: Draw conclusions. Was your hypothesis supported? And more generally, what do the data suggest about syncretism? Are all cells in a paradigm equally likely to be syncretic, or are there asymmetries? Speculate about the reasons for any observed patterns. And as always, be sure to consider the (potential) influence of your research methodology on your results, especially the impact of the criteria that you created in Step 3.

Step 6 (optional): This exercise previews discussion in Section 12.1.3. Do your results support the claims made there, or contradict them? Explain your reasoning.

Words and phrases

<div style="text-align: right; font-size: 3em;">**9**</div>

So far in this book we have pretended that it is easy to distinguish words from phrases. This has been possible because in the modern European writing system, the boundary between words is often indicated by a blank space. The segmentation of a sentence into **word tokens** thus seemed to be a straightforward matter – a word is surrounded by spaces.

However, when we look closely, we find this procedure does not work very well. Not all writing systems indicate word boundaries. In Chinese, for instance, there are never blank spaces between characters. And even in languages that use the modern European writing system, the conventional spelling is occasionally ambiguous. Sometimes the spelling vacillates, as in English compounds (e.g. *flower pot*, *flower-pot*, *flowerpot*). Sometimes boundary symbols other than a blank space are used – for example, the apostrophe (as with the English genitive *'s*, e.g. *Joan's book*) or the hyphen (as with object pronouns in the French imperative, e.g. *donne-le-moi* 'give it to me'). Sometimes the same element is spelled differently under different circumstances. In Spanish, weak object pronouns are spelled separately when they precede the verb (e.g. *lo hacemos* 'we do it'), but together with the verb when they follow it (*hacerlo* 'to do it'). Also, in German the infinitive marker is spelled separately in most cases (e.g. *zu bringen* 'to bring'), but together with the verb when it is preceded by a prefix such as *ein-* 'in' (e.g. *einzubringen* 'to bring in').

So in short, the hints from the spelling can be contradictory and misleading, and we cannot rely on the writing system of a language when trying to determine whether an expression is a word, a phrase, or an affix. The rules for orthographic word division are to some extent simply traditional in languages with a long written history. And when a language is first written down, language users often disagree on where to put blank spaces between words, and when a conventional spelling is agreed on, the decisions are sometimes clearly arbitrary. To distinguish between words, phrases and affixes, we must develop other criteria.

In this chapter we begin by showing that words and phrases exhibit different properties, and that these can be used to identify word boundaries. In Section 9.1 we address a common area of difficulty – distinguishing compounds from phrases. We then go on to discuss a more complicated issue in Sections 9.2 and 9.3, namely, expressions that fall along the continuum between canonical affixes and canonical words. These are clitics. Lastly, we consider whether a distinction between words and phrases is important for a formal description of language structure. Fundamentally, this is a question of whether syntactic principles apply to word structure. The relationship between morphology and syntax arose already in Chapters 5 and 7. In Section 9.4 we look again at this issue in the context of something called the Lexical Integrity Hypothesis.

9.1 Compounds versus phrases

A common situation in which we might ask the question whether an expression is a single word or a syntactic phrase involves (potential) compounds. For instance, are the expressions *backboard, backdoor, back seat* compounds or phrases? In this section we discuss some properties of compounds that allow us to distinguish them from phrases.

In many cases, compounds are easy to tell apart from phrases with two content words. For instance, compounds may consist of two (or more) lexeme stems that are juxtaposed in a single word-form, and, when a language does not allow phrases consisting of two juxtaposed lexemes of those same word-classes, the combination must be a compound. For example, German *Holzhaus* [wood-house] must be a compound noun because two juxtaposed nouns cannot by themselves form a noun phrase in German. Also, Italian *segnalibri* [indicate-books] 'bookmark' must be a compound, because it is structurally not similar to a phrase with a similar meaning. (Italian has a phrase *segna libri* whose pronunciation is the same, but this is an imperative verb phrase and means 'indicate books!', so both syntactically and semantically it is clearly distinct from the compound *segnalibri*.) Occasionally compounds even have a special segmental marker. Thus, in Coast Tsimshian an *-m-* interfix between the two members indicates a compound, e.g. *gyemg-m-dziws* [light-INTF-day] 'sun', *güünks-m-hoon* [dry-INTF-fish] 'dried fish' (Dunn 1979: 55). And we saw in (7.4) that the interfixes *-s-* and *-en-* are used in German to form compounds (*Liebe-s-brief* 'love letter', *Schwan-en-gesang* 'swansong').

However, there are also a great many cases in which compounds are quite similar to phrases with a similar meaning, and then we have to take a closer look in order to distinguish the two patterns. For example, Lango has an **inalienable possessive** construction with the order head–possessor that is expressed by simple juxtaposition (e.g. the syntactic phrases *wì rwòt* [head

king] 'the king's head', *bàd dàktàl* [arm doctor] 'the doctor's arm'). Now Lango has expressions that look like compounds at first blush, e.g. *wàŋ ɔ̀t* [eye house] 'window', *dɔ́g bɔ́ŋɔ́* [mouth dress] 'hem' (Noonan 1992: 115, 157–8). Their most striking property is that they are idiomatic – i.e. their meaning cannot be determined from the meaning of their constituents. **Idiomaticity** is a typical property of compounds. However, it is neither a necessary nor a sufficient criterion for identifying a compound. On the one hand, all languages with productive compounding have some compounds with compositional meaning (English examples are *piano-tuner, brake cable, spring festival*). On the other hand, not all idioms are compounds. Idioms like English *spill the beans*, French *roulette russe* 'Russian roulette' or German *goldenes Zeitalter* 'golden age' are formally just like ordinary syntactic phrases in the language, and the general assumption is therefore that they are idiomatic phrases. Thus, one might suspect that Lango expressions like *wàŋ ɔ̀t* 'window', *dɔ́g bɔ́ŋɔ́* 'hem' are simply phrases that happen to be semantically idiomatic.

Now, in actual fact, this seems unlikely, because Lango also has clear compounds of the type N–N, e.g. *ɔ̀t cèm* [house-eating] 'restaurant', *mɔ̀ɔ̀ ɲìm* [oil sesame] 'sesame oil'. These cannot be phrases, because *ɔ̀t* and *mɔ̀ɔ̀* are not inalienable nouns, and this kind of possessive construction is possible only with inalienable nouns such as kinship terms and body part terms. Thus, *wàŋ ɔ̀t* and *dɔ́g bɔ́ŋɔ́* are probably compounds. But the point is exactly that there can be ambiguity.

So how can we distinguish a compound from a syntactic phrase when ambiguity arises? First, a semantic property of almost all compounds is that a dependent noun does not denote a particular referent but the entire class; in other words, a dependent noun in a compound is not **referential** but **generic**. For example, in the compound *piano-tuner*, the element *piano* cannot refer to a particular piano, but must refer to pianos in general. Generic meaning is also a general feature of dependent nouns in verb-headed N–V compounds (i.e. in noun incorporation), as the examples in (9.1)–(9.2) show. The (a) examples show a non-incorporated, phrasal version, and the (b) examples show an incorporated version of the sentence, with a generic interpretation of the incorporated noun. (Note in (9.1b) the absence of the second determiner *ki*, i.e. the one that serves to pick out particular wood in (9.1a). Likewise, the demonstrative marker *-o* is missing in (9.2b).)

(9.1) Lakhota

  a. *Wičháša*   *ki*   *čhą́*   *ki*   *kaksá-he.*
      man   the   wood   the   chop-CONT
      'The man is chopping the wood.'

  b. *Wičháša*   *ki*   *čhą-káksa-he.*
      man   the   wood-chop-CONT
      'The man is chopping wood.' (Lit.: 'The man is wood-chopping.')
      (Van Valin and LaPolla 1997: 123)

(9.2)   Ponapean
    a. *I*   *pahn*   *kang*   *wini-o.*
        1SG   FUT   eat   medicine-DEM
        'I will take that medicine.'

    b. *I*   *pahn*   *keng-wini.*
        1SG   FUT   eat-medicine
        'I will take medicine.' (Lit.: 'I will do medicine-taking.')
                                     (Rehg 1981: 209–14)

In syntactic phrases, by contrast, a noun is more typically referential, as in (9.1a) and (9.2a).

However, generic interpretation is not a sufficient criterion by itself. A dependent noun in a noun phrase need not necessarily be referential. In the German phrase *Haus aus Holz* 'house from wood', *Holz* 'wood' can be just as generic as in *Holzhaus* 'wood house', the compound that we saw above. This means that we cannot conclude that the expression is a compound just because a dependent noun is generic. But, conversely, if a dependent noun is referential (as in Lango *wì rwòt* 'the king's head', which refers to the head of a particular king), we can be fairly certain that the expression is a phrase and not a compound.

Since the typical semantic properties of compounds are not unique to compounds, we often need additional phonological, morphological and syntactic properties to identify compounds when compound and phrase patterns are otherwise formally similar. In general terms, compounds exhibit greater phonological, morphological and syntactic cohesion than phrases.

A well-known phonological criterion is stress. In English, each word has one main stress, so main stress on only one member of a compound-like expression suggests that it is a word. Thus, the expressions in (9.3a) are compounds, whereas those in (9.3b) are generally taken to be phrases. (As these examples show, word division in the spelling correlates only imperfectly with the criterion of stress.)

(9.3)   a. *góldfish*
       báckdròp
       Whíte Hòuse

    b. *góld médal*
       báckstáirs
       whíte kníght

Stress is also one of the criteria that show that Lakhota incorporation ((9.1b) above) is a compounding pattern: the expression *čhákáksahe* 'wood-chopping' is phonologically cohesive in the sense that it acts as a single unit for the purpose of stress assignment.

An example of a different kind of phonological cohesion comes from

Chukchi. In this language, compounding creates a single domain for **vowel harmony**. Within a compound, the vowels must either all belong to the set [i], [e], [u], or all belong to the set [ə], [a], [o]. Thus, when *kupre-n* 'net' occurs in a compound, it may have to be changed to *kopra-n* (e.g. *pəlvəntə-kopra-n* 'metal net'). In many better-known languages with vowel harmony (e.g. Turkish), compound nouns do not count as a single domain for vowel harmony, so an expression that does not show harmony could be either a phrase or a compound. But vowel harmony never applies across word boundaries, so when harmony does affect both lexemes, as in Chukchi, we can conclude that the expression is a compound.

In some cases, morphological cohesion can give us decisive criteria for word status. In the relevant examples, a morphological pattern clearly takes the whole compound in its domain rather than just the head. Consider the English word *sister-in-law*, which for many speakers has the plural form *sister-in-laws*. The older form *sisters-in-law*, which has the plural suffix on the head noun, could be either a phrase or a compound noun (with the head serving as the morphosyntactic locus; see Section 7.2 for similar examples), but *sister-in-laws* can only be a compound. The plural suffix *-s* is semantically associated with the entire unit, and not only with *law* (it indicates multiple sisters, not multiple laws). And since the plural marker normally attaches only to words, not to phrases, *sister-in-law* must be a compound. Similarly, in Ponapean the aspectual suffix *-(a)la* attaches to verbs, as shown in (9.4a).

(9.4) a. *I*   *kang-ala*   *wini-o.*
           1SG   eat-COMPL   medicine-DEM
           'I completed taking that medicine, i.e. I took all of that medicine.'

       b. *I*   *keng-winih-la.*
           1SG   eat-medicine-COMPL
           'I completed my medicine-taking.'

                                                                (Rehg 1981: 214)

The position of the completive affix in (9.4b) is evidence that *keng-wini(h)* is a compound verb.

Where phonological and morphological criteria are not decisive, criteria of syntactic cohesion can differentiate between compounds and phrases. Most obviously, syntactic phrases and compounds differ with regard to **separability**: phrases are often separable, whereas compounds are inseparable. This means that other words cannot intervene between compound members. For example, Hausa has N–N compounds that resemble phrasal possessive constructions in that they show head-dependent order and a relation marker (*-n* (masculine)/*-r̃*) (feminine)) on the head, e.g. *gida-n-sauroo* [house-REL.M-mosquito] 'mosquito net'. There are no phonological or morphological properties that would distinguish such compounds from possessive phrases like *gida-n Muusaa* 'Musa's

house'. However, when an adjective modifies these expressions, it becomes clear that the compound is inseparable, whereas the phrase is separable.

(9.5)　a.　*gida-n-sauroo*　　　　*bàbba*　(*gidaa bàbba na sauroo*)
　　　　　house-REL.M-mosquito　big
　　　　　'big mosquito net'

　　　b.　*gidaa*　　　　　　*bàbba*　*na*　　　*Muusaa*
　　　　　house　　　　　　big　　REL.M　Musa
　　　　　'Musa's big house'

<div align="right">(Newman 2000: 109)</div>

Another clear indication of phrasal status is the **expandability** of the dependent element, because dependents in compounds cannot generally be expanded by modifiers such as adjectives or adverbs (e.g. English *kingmaker* versus **illegitimate kingmaker* 'someone who makes an illegitimate king'; *crispbread* versus **very crispbread* 'bread that is very crisp').

In compounds, the head noun cannot be replaced by an anaphoric pronoun.[1] For instance, English allows (9.6a), but not (9.6b). *Silversmith* must be a compound.

(9.6)　a.　*My aunt has one gold watch and three silver ones*
　　　　　　(i.e. three silver watches).

　　　b.　**My aunt knows one goldsmith and three silver ones*
　　　　　　(i.e. three silversmiths).

By contrast, in Japanese, complex verbal expressions like *benkyoo suru* [study do] 'study' and *rakka suru* [fall do] 'fall' are sometimes regarded as N–V compound verbs. However, the noun in these combinations can be omitted with an anaphoric interpretation. See (9.7), where the noun *rakka* does not occur in the response. This suggests that these expressions are phrases after all.

(9.7)　*Sore　wa　　rakka　si-masi-ta　　　ka?　　–　　Hai, si-masi-ta.*
　　　　it　　TOP　fall　do-POLITE-PST　INT　yes　do-POLITE-PST
　　　　'Did it fall? – Yes, it did.'

<div align="right">(Matsumoto 1996: 41)</div>

(The dependent noun in a compound cannot be replaced by an anaphoric pronoun either (**the king and the him-makers*), but this is not very useful as a test. As we have seen already, the dependent noun is almost always generic. Anaphoric pronouns cannot be interpreted generically, so there is an independent reason for this failure.)

Finally, phrases can exhibit **coordination ellipsis**, meaning that one of two identical elements in coordinated phrases can be optionally left out.

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[1]　An anaphoric pronoun refers back to some noun that has already been introduced in the sentence or discourse.

By contrast, a compound member generally cannot be deleted in this way; compare (9.8b) to (9.9b).

(9.8) a. *Large fish and small fish were mistakenly placed in the same tank.*
     b. *Large Ø and small fish were mistakenly placed in the same tank.*

(9.9) a. *Flying fish and small fish were mistakenly placed in the same tank.*
     b. **Flying Ø and small fish were mistakenly placed in the same tank.*

Flying fish must be a compound.

    Thus, compounds can be distinguished from phrases by semantic, phonological, morphological and syntactic criteria. These are summarized in Table 9.1.

	Phrases	**Compounds**
semantic	dependent noun may be referential	dependent noun virtually always generic
	head may be replaced by an anaphoric pronoun	head may not be replaced by an anaphoric pronoun
phonological	less cohesion	greater cohesion e.g. compound as domain of stress assignment, vowel harmony
morphological	no cohesion	greater cohesion e.g. compound as domain of affixation
syntactic	separable	inseparable
	dependent noun expandable	dependent noun not expandable
	coordination ellipsis possible	coordination ellipsis impossible

Table 9.1 Phrases versus compounds

While the discussion here has focused on compounds, some of these criteria (e.g. phonological and morphological cohesion, nonseparability and coordination ellipsis) apply to other types of words as well. These can thus be used as general tests for distinguishing words from phrases. Some examples that do not involve compounds will be presented below.

9.2 Free forms versus bound forms

The boundary between words and phrases is not always clear – tests for wordhood may produce contradictory results. One of the more interesting complications is that an expression may be a word for the purposes of syntax, but not by itself an entire **prosodic word** (i.e. a word for purposes of stress assignment). These are **clitics**. In this section we compare clitics and affixes on the one hand to independent word-forms on the other.

Clitics and affixes (collectively referred to as **bound forms**)[2] are similar in that they exhibit **prosodic dependence**. This means that they cannot by themselves constitute a domain for word stress – they must 'lean' on a prosodic **host**. By contrast, canonical word-forms (often called **free forms**) exhibit prosodic independence. This can be seen in several ways.

First, an utterance may be interrupted at a boundary between two free forms, but not at a boundary between a bound form and its host. This is true for affixes (e.g. *Paul … started to play*, or *Paul started … to play*, but not **Paul start … ed to play*), and also for clitics, as shown by the Croatian sentences in (9.10).[3]

(9.10) a.   *Oni*   *= su*   …   *počeli*   *igrati.*
           they   = AUX.3PL   began.M.PL   play.INF
           'They began to play.'

    b.   **Oni … = su počeli igrati.*

Croatian clitics are prosodically dependent on the preceding word. The prosodic dependence of the clitic makes it impossible to pause between the clitic and the preceding word.

Also, clitics never bear their own stress. In the example above, *su* does not (and cannot) bear stress at all. In the French imperative *joue=le!* 'play it!', the weak object pronoun clitic *le* bears stress (*joue='le*), but this is the stress of the whole prosodic word (which happens to be on the final syllable), not *le*'s own stress.

Finally, in languages that use stress to express contrast, free forms can exhibit contrastive stress, whereas bound forms cannot. Thus, in English we can have *PAUL started to play*, or *Paul started to PLAY*, or *Paul STARTED to play*, but not **Paul startED to play*, or **Paul started TO play*, because past-tense *-ed* and infinitival *to* are prosodically dependent.

Prosodic dependence can have syntactic consequences; free and bound

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[2]   Note that a *bound form* in this sense is not the same as a *bound stem* (Section 2.2), although the two terms are related. A bound stem is a base that cannot stand by itself in any way – it is not a complete word for the purposes of the syntax nor is it a complete prosodic word. The term bound form, as used here, refers only to lack of prosodic independence. It is thus a broader term that encompasses bound stems, affixes and clitics.

[3]   In this and other examples, we follow the convention of linking clitics to their hosts by an equal sign.

forms differ in the kinds of syntactic constructions in which they can appear. In languages like French, where contrast is expressed by clefting, free forms can be clefted, but bound forms cannot.[4] The sentence in (9.11a) can have the clefted variant (9.11b), but (9.12a) cannot have the clefted variant in (9.12b).

(9.11) a. *Paul   commenç-ait   à   jou-er.*
            Paul   begin-3SG.IMPF   to   play-INF
            'Paul started to play.'

      b. *C'   est   Paul   qui   commenç-ait   à   jou-er.*
            it   is   Paul   who   begin-3SG.IMPF   to   play-INF
            'It's Paul who started to play.'

(9.12) a. *Il=commençait à jouer.*
            'He started to play.'

      b. **C'est il qui commençait à jouer.*
            'It's HE who started to play.'

Example (9.12b) is impossible in part because cleft constructions involve prominent stress on the clefted word or phrase, and the weak subject pronoun *il* is a clitic (i.e. not prosodically independent). Therefore, in the clefted variant of (9.12a), French uses its independent pronoun *lui* 'he' (*C'est lui qui commençait à jouer*).

    This difference between *lui* (free form) and *il* (bound form) extends to other syntactic constructions as well. For example, the bound forms are used in normal subject + verb constructions (as in *je=joue* 'I play', *tu=joues* 'you play', *il=joue* 'he plays'), but when the pronoun is topicalized, the free form is used (*moi, je=joue* 'as for me, I play', not **je, je=joue*).[5] And likewise in coordination, the free form is used: *moi et toi jouons* 'you and I play', not **je et tu jouons*. So, the bound form cannot be used when the pronoun is separated from a viable host and/or in a position that requires sentential stress. Cross-linguistically, free forms thus exhibit more syntactic **freedom of movement**, and movement tests like clefting and topicalization can be useful for distinguishing free forms from bound forms.

9.3 Clitics versus affixes

The contrast between free forms and bound forms is only half of the distinction that interests us. We also need tests that will distinguish clitics from affixes.

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[4]   In cleft constructions, a word or phrase is positioned outside of its clause for the purpose of creating focus. In English, *it is X that Y* (e.g. *It is MARY that ran a marathon*, (*not Bill*).) is a typical cleft type.

[5]   Topicalization is when a constituent is moved out of its phrase, usually to the beginning of the sentence, to indicate the topic about which new information will be added.

The first thing to note is that clitics exhibit notoriously heterogeneous behaviour. (In fact, clitics are diverse enough that some linguists use the term as a kind of 'junk' label for anything that is not quite a word and not quite an affix.) This means that it is impossible to identify traits that all clitics will exhibit, to the exclusion of affixes. Still, even allowing that there are many different sorts of clitics, there are a number of properties that are useful for collectively distinguishing them from affixes.

Perhaps the most salient property of clitics is that they have **freedom of host selection** – i.e. a clitic can often occur with hosts of various syntactic categories, and its host need not be syntactically related to it. Example (9.13) shows that the English clitic =*'s* has freedom of host selection.

(9.13) a. *The person you were talking about='s walking over here.* [preposition]
      b. *Replacing the window you broke='s going to cost a lot of money.* [verb]
      c. *That house down the street='s going to sell quickly.* [noun]

Affixes do not have such freedom of host selection – they combine with stems to which they are syntactically related.

Additionally, clitics may be less prosodically integrated with their hosts than are affixes. In other words, affixes are always within the domain of word stress, but clitics may or may not be. French *joue='le!* 'play it!' is an example of word stress applying to the entire **clitic group** (the expression formed by one or more clitics and the host). Spanish exemplifies the opposite pattern, in which clitics are not prosodically integrated. In Spanish, stress is usually on the last or penultimate syllable of the word, and rarely on the antepenultimate (e.g. *caminár* 'walk.INF', *camína* 'walk.PRS.3SG', *caminábamos* 'walk.PST.1PL'), but never on the fourth syllable from the end. But this is possible with clitic groups, e.g. *díga=me=lo* 'say it to me!', suggesting that in this language, the clitics are prosodically dependent on the host, but outside of the domain for stress placement. In this respect, then, Spanish clitics behave unlike affixes.

Third, morphophonological rules are less likely to operate across the boundary between a host and a clitic than across the boundary between a stem and an affix. Certainly, some languages have rules that apply equally to affixes and clitics, including the rule of vowel harmony in Finnish. Bound elements like the suffix *-nsa/-nsä* 'his' and the clitic =*ko/=kö* (question marker) agree in backness with the last vowel of the stem or host (*koira-nsa* 'his dog', *ystävä-nsä* 'his friend'; *koira=ko* 'dog?', *ystävä=kö* 'friend?').[6] However, many languages have morphophonological rules that operate within the domain of the word-form, but not within the clitic group. For example, in Dutch obstruents are devoiced word-finally, and no such devoicing occurs when a vowel-initial suffix follows the same morpheme

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[6]   Orthographic <ä>, <ö>, <y>, <o> and <a> correspond to International Phonetic Alphabet [æ], [ø], [y], [o] and [a], respectively. The first three are front vowels; the last two are back vowels.

(see (9.14a)). However, when a vowel-initial clitic follows it, devoicing still occurs, as can be seen in (9.14b). Thus, the clitic is 'invisible' to the rule of final devoicing.

(9.14) a. *verband*   [vər'bɑnt]   *verband-ig*   [vər'bɑndɪx]
              'bandage'   'bandage-like'

         b. *ik brand*   [ɪg'brɑnt]   *brand=ik*   ['brɑntɪk]
              'I burned'   'I burned'

Similarly, in Ponapean there is a rule of vowel lengthening at the end of the word that does not apply when a suffix follows. However, when a clitic such as demonstrative *et* follows the noun, vowel lengthening still occurs (Ponapean spelling marks vowel length by the letter *h*):

(9.15) *sahpw*   'land'   *sapw-ei*   'my land'   *sahpw=et*   'this land'
         ngihl   'voice'   *ngil-ei*   'my voice'   *ngihl=et*   'this voice'
         pwuhs   'novel'   *pwus-ei*   'my novel'   *pwuhs=et*   'this novel'
                                                    (Rehg 1981: 169–70, 186)

Fourth, affixes may trigger idiosyncratic suppletive alternations in the base, whereas clitics do not. For example, consider the Finnish words in (9.16).

(9.16) *nainen*   'woman'   *naise-llinen*   'woman-like, feminine'
                               naise-n   'woman's (GEN.SG)'
                               naise-lla   'to the woman (ALL.SG)'
                               naise-nsa   'his woman'
                                                    (Kanerva 1987: 506)

In Finnish, many nouns alternate between a stem-final sequence *-nen* (e.g. *nainen*) and a sequence *-se* (e.g. *naise-*). The former occurs when the word is unsuffixed (i.e. in the nominative singular form), and the latter occurs when any kind of suffix follows, inflectional or derivational. But when a clitic follows the noun 'woman', the stem *nainen* is used (e.g. *nainen=ko?* 'the woman?'), showing that the clitics behave differently from affixes in this respect, and more like word-forms.

Likewise, affixes may undergo idiosyncratic suppletive alternations, whereas clitics do not. For instance, Polish has several different inflection classes of verbs, and the first person singular suffix is either *-m* or *-ę*, depending on the class (*kocha-m* 'I love', *umie-m* 'I'm able', *ucz-ę* 'I teach', *pij-ę* 'I drink'). Object pronouns, however, are clitics that attach after their hosts, and they have an invariable shape: *go* (*kocham=go* 'I love him', *piję=go* 'I drink it', *uczę=go* 'I teach him', etc.).

Fifth, affix–base combinations may have an idiosyncratic meaning, whereas clitic–host combinations never do. Idiosyncratic meanings of affixes are widespread in derivational morphology, but occasionally they are found in inflection as well, e.g. the Dutch inflected form *ouder*. In its

literal meaning this word is a comparative ('older'), but has also been extended to use as a noun, with the idiosyncratic meaning 'parent' (see (5.14) for more examples).

Sixth, expected affix–base combinations may arbitrarily fail to exist, whereas clitic–host combinations are always possible.

And finally, it is often noted that clitics may have some syntactic freedom of movement, whereas an affix must always attach to its base and cannot move independently of it. The degree to which clitics do have freedom of movement is a somewhat complicated issue, and it is useful here to divide clitics into two categories: simple and special (Zwicky 1977).

A **simple clitic** is one that can appear in the same syntactic positions as a corresponding free form. For instance, the clitic form *'s* appears largely in the same positions as the free form *is*, as shown in (9.17).

(9.17) a. *Replacing the window you broke='s going to cost a lot of money.*
    a'. *Replacing the window you broke is going to cost a lot of money.*

    b. *It='s going to cost a lot of money to replace the window you broke.*
    b'. *It is going to cost a lot of money to replace the window you broke.*

Of course, as we saw in the preceding section, clitics cannot be used when an accented form is required, or when there is no host to lean on (* *='s he going to replace the window?*). Otherwise, however, simple clitics have the same freedom of movement as free forms.

A **special clitic** is 'special' in the sense that its syntactic distribution differs from that of free forms and must be described in its own right. Special clitics typically have less freedom of movement than simple clitics, or even none. For instance, **second-position clitics** (also called **Wackernagel clitics** after the linguist who made them famous) appear after the first element of the (simple) sentence, which serves as the host. Depending on the language, the first element may be either the first stressed word, or the first syntactic constituent. The following examples come from Pitjantjatjara.

(9.18) a. *Tjitji-ngku*   *=ni*   *nya-ngu.*
        child-ERG   =ACC.1SG   see-PST
        'The child saw me.'

    b. *Tjitji*   *nyanga*   *puḷka-ngku*   *=ni*   *nya-ngu.*
        child   this   big-ERG   =ACC.1SG   see-PST
        'This big child saw me.'

                                                (Bowe 1990: 12)

In this language, the accusative pronominal clitic *n̠i* must occur after the first syntactic constituent, as shown in (9.18).[7] It cannot occur in other positions,

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7   In the Pitjantjatjara writing system, the letters *l̠* and *n̠* correspond to IPA [ɭ] (retroflex lateral) and [ɳ] (retroflex nasal), respectively. These contrast with [l] and [n], which are written without the underline.

even where a free form pronoun is possible. Compare the sentence with free form of the pronoun in (9.19a) to the one with the equivalent clitic in (9.19b).

(9.19) a. *Trevor-lu   mukuri-nganyi Mary-lu   ngayunya helpamila-ntjaku.*
            Trevor-ERG want-PRS.CONT Mary-ERG me   help-PURP
            'Trevor wants Mary to help me.'

      b. **Trevor-lu mukuri-nganyi Mary-lu   =<u>ni</u>   helpamila-ntjaku.*
            Trevor-ERG want-PRS.CONT Mary-ERG =ACC.1SG help-PURP
            (Bowe 1990: 72)

The pronominal clitic thus has no freedom of movement.

   Serbian similarly has second-position clitics. An accusative clitic pronoun is shown in (9.20), and the free form pronoun in (9.21). The (c) examples are the crucial comparison: the full form can occur in third position but the clitic cannot, despite having a suitable prosodic host.

(9.20) a. *Marija   =ga   voli.*
            Marija   =him   loves
            'Marija loves him.'

      b. *Voli =ga Marija.*
      c. **Marija voli =ga.*

(9.21) a. *Marija   njega   voli.*
            Marija   him   loves
            'Marija loves HIM.'

      b. *Voli njega Marija.*
      c. *Marija voli njega.*

Notably, however, Serbian clitics have limited freedom of movement under particular circumstances.

(9.22) a. *Marija   želi   da   = joj   = ga   predstavi.*
            Marija   wants   that   F.DAT.SG M.ACC.SG   introduces
            'Marija wants to introduce him to her.'

      b. *(?)Marija = joj   = ga   želi   da   predstavi.*
            Marija   F.DAT.SG M.ACC.SG   wants   that   introduces
            'Marija wants to introduce him to her.'
            (Franks and King 2000: 243)

Here, the clitics *joj* 'to her' and *ga* 'him' are associated with the verb *predstavi* 'introduce', and in (9.22a), they appear in second position in that verb's clause (*...da joj ga predstavi*). In (9.22b), however, the clitics have 'climbed' into the higher clause, and appear in second position within it. Some speakers consider (9.22b) to be the less preferable version of the sentence, but many speakers accept both. Thus, when Serbian second-position clitics

appear in a lower clause they may have some freedom of movement, and in this respect they are unlike affixes.

The criteria for distinguishing between affixes and clitics are summarized in Table 9.3.

Clitics	Affixes
freedom of host selection	no freedom of stem selection
possible freedom of movement	no freedom of movement
less prosodically integrated	more prosodically integrated
may be outside the domain of a phonological rule	within the domain of a phonological rule
do not trigger/undergo morphophonological or suppletive alternations	may trigger/undergo morphophonological or suppletive alternations
clitic–host combinations...	affix–base combinations...
do not have idiosyncratic meanings	may have idiosyncratic meanings
do not have arbitrary gaps	may have arbitrary gaps

Table 9.3 Clitics versus affixes

Overall, the data present us with the picture that clitics are like affixes in some respects, and like independent word-forms in others. Just as importantly, however, clitics do not themselves constitute a uniform group. All clitics are prosodically dependent on a host and have some freedom of host selection, but some clitics are prosodically or phonologically integrated with their hosts while others are not; some have special syntax, but others do not; and so on. This heterogeneous behaviour makes sense from a diachronic perspective. Inflectional morphology commonly arises from free words, and we can hypothesize that clitics represent the intermediate stages in this transition. Most likely, fast speech processes lead to reduced variants of already prosodically weak grammatical elements. These reduced variants are then susceptible to being reanalyzed by a new generation of speakers as distinct lexical expressions, rather than as straightforward instances of phonetic reduction. And over time, these clitics may acquire further affixal properties: reduced stem selection (e.g. if a clitic attaches predominantly to a single word-class, it may be reanalyzed as attaching only to that word-class), reduced freedom of movement, morphological and phonological cohesion, etc.

Cross-linguistically, then, clitics can be expected to exhibit a wide range of syntactic, morphological and phonological properties. Of course, some clitics may never become canonical affixes. The development from a free word form to an affix is not a single change with a predetermined

outcome; it is better thought of as a series of small changes that collectively (and to some extent coincidentally) reduce the prosodic, syntactic and morphological independence of an expression. Not surprisingly, many of the facts surrounding clitics, and how they should be accounted for in formal description, are topics of ongoing debate in morphological theory.

9.4 Lexical integrity

We saw in the preceding sections that words differ from syntactic phrases in a number of crucial respects. We failed, however, to ask *why* these differences exist. We now turn to this issue.

Many linguists have posited that the various differences in the behaviour of words and phrases reflect a single general principle, which can be formulated as follows:

(9.23) **Lexical Integrity Hypothesis**: Rules of syntax can refer/apply to entire words or the properties of entire words, but not to the internal parts of words or their properties.

The Lexical Integrity Hypothesis (also called the **Lexical Integrity Principle**) comes in many subtly different forms, but the core idea is that as far as syntactic rules are concerned, words have no internal structure. They are atomic. Moreover, (9.23) is a claim about the nature of language in general, so the generalization should apply to all languages in the world.

The validity of the generalization is subject to empirical testing. So far, discussion in this chapter has focused on examples that are consistent with (9.23). It is not, however, sufficient to show that rules of syntax (e.g. movement, anaphoric replacement, coordination ellipsis) often fail to apply to the internal parts of words. The Lexical Integrity Hypothesis states that syntactic rules can *never* refer to the internal parts of words. We must therefore first ask whether languages ever violate the principle of lexical integrity.

The Lexical Integrity Hypothesis can be evaluated in a meaningful way only if the notions 'word' and 'syntactic rule' are specified precisely. For instance, a clitic forms a prosodic word with its host, but (9.23) clearly does not hold over the prosodic word. If it did, clitics could have no independent freedom of movement – movement is a kind of syntactic rule, and a clitic is an internal part of a prosodic word. However, there is a simple resolution to this issue. We need only assume that lexical integrity holds over the morphosyntactic word, rather than the prosodic word, meaning that a clitic and its prosodic host are separate words in the relevant sense and thus not subject to (9.23) (Bresnan and Mchombo 1995).

Hungarian exemplifies a more complex problem. As shown in (9.24), *meg-old* [PFV-solve] can serve as the input to deverbal noun derivation and deverbal adjectival formation. It is thus quite clear that constructions formed

with *meg* are single words in some sense. (The alternative analysis, that *-ás* and *-hatatlan* attach to *old* by itself seems unlikely because *meg* appears with nouns and adjectives only if they are deverbal.)

(9.24) *meg-old*   'solve'
        meg-old-ás   'solution'
        meg-old-hatatlan   'unsolvable'

Given this, it is somewhat surprising that *meg* can be separated from the rest of the verb, as shown in (9.25b).

(9.25) a. *Pál*   *meg-old-ott-a*   *a*   *problémá-t.*
           Paul   PFV-solve-PST-DEF.3SG   the   problem-ACC
           'Paul solved the problem.'

      b. *Pál*   *nem*   *old-ott-a*   *meg*   *a*   *problémá-t.*
           Paul   not   solve-PST-DEF.3SG   PFV   the   problem-ACC
           'Paul didn't solve the problem.'

Is this a violation of lexical integrity? Not necessarily. Like the forms in (9.24), by all indications *megoldotta* is generated by morphological rules, but some formal approaches posit that these kinds of **periphrastic constructions** are then inserted into syntax at more than one node (i.e. *meg* and *oldotta* occupy separate syntactic nodes). Moreover, it has been suggested that the relevant notion of a word is 'terminal syntactic node', rather than 'morphologically generated object' (Ackerman and LeSourd 1997). Thus, under these assumptions, lexical integrity is not violated. The point here is that it can be quite difficult to determine what constitutes a true violation of the Lexical Integrity Hypothesis.

Nonetheless, some kinds of data are widely viewed as problematic. For instance, all syntactic models treat agreement and movement (or some equivalent of movement) as types of syntactic rules, so we should not expect to find agreement within a word, or between an internal part of a word and another element in the sentence. Likewise, we should not encounter instances of movement within a word, or syntactic placement of an element within a word. No conclusive examples of word-internal syntactic movement have been documented. (Some approaches to morphological description posit word-internal movement, but for theory-internal reasons, not empirical ones.) However, rare instances of the other three possibilities can be found.

For example, in some languages verbs show agreement with incorporated nouns (i.e. with compound members), as is the case in Southern Tiwa:

(9.26) a. *ti-khwian-mu-ban*
          1SG.SBJ/SG.OBJ-dog-see-PST
          'I saw the dog.'[8]

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[8]   Note that this example seems to be an exception to the generalization that incorporated nouns have generic interpretation (see (9.1) and (9.2)). The reason for this is unclear.

b. *bi-khwian-mu-ban*
1SG.SBJ/PL.OBJ-dog-see-PST
'I saw dogs.'

(Allen *et al*. 1990: 322)

Here the agreement prefixes register the number of the incorporated noun *-khwian-* 'dog(s)', so it is hard to escape the conclusion that there is agreement between the internal parts of the complex verb. Also, in Chapter 5 we encountered the following Upper Sorbian example of agreement between an internal part of a word and another word in the phrase (repeated from (5.13)). Here, the adjective *mojeho* agrees for gender with the root of the denominal adjective *mužowa*. (*Muž* 'husband' is a masculine noun.)

(9.27) *moj-eho*   *muž-ow-a*   *sotra*
        my-M.SG.GEN   husband-POSS-F.SG.NOM   sister.F.SG.NOM
        'my husband's sister'

(Corbett 1987: 303)

Equally interesting are examples of clitics within words. In Udi, the clitic *ne* sometimes occurs between the two parts of a bimorphemic verb stem (see (9.28a)).

(9.28) a. *nana-n*   *buɣa=ne-b-e*   *p'ạ*   *ačik'alšey*
           mother-ERG   find=3SG-do-AORII   two   toy.ABS
           'Mother found two toys.'

      b. *nana-n*   *te=ne*   *buɣa-b-e*   *p'ạ*   *ačik'alšey*
         mother-ERG   NEG=3SG   find-do-AORII   two   toy.ABS
         'Mother did not find two toys.'

(Harris 2002: 117, 123)

Buɣa-b-e seems to be a single word: coordination ellipsis, movement and anaphoric replacement of the internal constituents are all impossible. Yet according to properties such as host selection, *ne* is a clitic whose position is governed by principles of syntax, not an affix (compare (9.28a) with (9.28b)). So it seems that the syntax places the clitic internally to the verb. Moreover, to do so, the rules of syntax must know where the morpheme boundaries are, and therefore must refer to the verb's internal morphemic structure (Harris 2000). This is problematic for the idea of lexical integrity.

In the end, the Lexical Integrity Hypothesis remains controversial. The most extreme syntactic approaches to morphological structure reject it entirely, partly on empirical grounds, but also for theory-internal reasons. (A theory without a principled distinction between words and phrases entirely cannot in any meaningful way even define a condition like (9.23).) Still, some linguists consider counterexamples to be minor, and many approaches to formal description accept some version of the Lexical Integrity Hypothesis.

Finally, if we believe that the Lexical Integrity Hypothesis can be upheld on

empirical grounds, we may ask about its underlying causes. One possibility is that (9.23) is an axiomatic principle of Universal Grammar – a fundamental and irreducible constraint on the nature of language. Or alternatively, lexical integrity effects might indirectly result from independent syntactic constraints on movement, binding of anaphoric pronouns, and so on. But most commonly, lexical integrity is seen as following from the architecture of grammar. If morphology and syntax are two completely separate components of grammar, it can be expected that syntactic rules do not 'look inside' the complete words received from the morphology. In particular, lexical integrity effects have been used to motivate a language architecture in which syntactic rules apply to bundles of morphosyntactic features, and the morphological component delivers complete words only after all syntactic rules have applied. (See Section 5.5.2 for more discussion of this proposed architecture.) This would explain why compound members cannot be replaced by anaphoric pronouns, why they cannot be extracted or undergo coordination ellipsis, etc. The syntax simply has no access to word-internal structure because words are inserted post-syntactically.

There are a large number of ways in which syntactic rules can be formulated, and a large number of ways in which the relevant notion of 'word' can be defined. It will therefore inevitably be difficult to reach a consensus about the exact relation between syntax and morphology. Clearly, morphology and syntax are different to some degree, but the nature of the relationship will probably be debated for a long time to come.

Summary of Chapter 9

There are two main difficulties that we encounter in dividing texts into word-forms: distinguishing affixed word-forms from phrases that contain a function word, and distinguishing compounds from phrases with two content words. Word-forms that are intermediate between fully independent word-forms and fully dependent affixes are called clitics, and clitics and affixes are grouped together as bound forms. Free forms differ from bound forms in that they are prosodically independent, cleftable, topicalizable and coordinatable. Clitics differ from affixes in that they have greater freedom of host selection, are phonologically less integrated, do not trigger or undergo morphophonological alternations, show no idiosyncrasies of meaning or distribution, and may have more freedom of movement. Phrases differ from compounds in that they allow referential dependent members and exhibit less phonological, morphological and syntactic cohesion.

Often a 'Lexical Integrity Hypothesis' is postulated that forbids syntactic rules to apply to parts of words. While (apparent)

counterexamples to lexical integrity can be found, linguists have interpreted these exceptions differently. Among those formal approaches that accept the Lexical Integrity Hypothesis, the effects are usually seen as falling out from the architecture of the grammatical system – separate morphological and syntactic components.

Further reading

The literature on clitics is strikingly large. First and foremost, much influential work regarding the affix/clitic distinction is due to Arnold Zwicky (e.g. Zwicky 1977, 1985b and Zwicky and Pullum 1983). See also Klavans (1985), Kanerva (1987), Halpern (1995), Bošković (2001), Aikhenvald (2002) and Anderson (2005). Some famous examples of special clitics come from the Slavic languages; see Franks and King (2000) for descriptions. Nevis *et al*. (1994) is a bibliography of clitic research prior to 1991. More recent collections of papers include Beukema and den Dikken (2000) and Gerlach and Grijzenhout (2000).

For compounds versus phrases, see Bauer (1998), Smirniotopoulos and Joseph (1998) and Bisetto and Scalise (1999).

Lexical integrity is discussed and defended in Wasow (1977), Lapointe (1980), Di Sciullo and Williams (1987), Bresnan and Mchombo (1995), and in a modified form, in Ackerman and LeSourd (1997). Also see Rosen (1989) and Mohanan (1995) for arguments specifically related to incorporation. For counterarguments to the Lexical Integrity Principle, see Lieber (1992), Harris (2000), and Booij (2009). Syntactic approaches that do not assume lexical integrity include Baker (1988), Sadock (1991) and Halle and Marantz (1993).

Comprehension exercises

1. At the beginning of Section 9.1, we asked whether *backboard*, *backdoor* and *back seat* are compounds or phrases. Develop an answer to this question, and justify it using tests introduced in this chapter.

2. Provide arguments to show that English *-s*, the suffix of the third person singular of present-tense verbs, is an affix, not a clitic.

3. What is wrong with the following sentences?

    a. Polish
        *Go   spotka-ł-em   w   Krakowie.
        him   meet-PST-1SG   in   Cracow
        'I met him in Cracow.'

b. French

*A:	Qui	joue?	Robert?	–	B:	Non,	TU=joues.
	who	plays	Robert			no	you=play

'A: Who is playing? Robert? – B: No, YOU are playing.'

c. Serbian

*Klaru	čovek	voleo=je.
Klara.ACC	man.NOM	loved=AUX

'The man has loved Klara.'

d. Ponapean

*I	keng-wini-o-la.
1SG	eat-medicine-DEM-COMPL

'I completed my taking of that medicine.'

4. Sometimes the various criteria for distinguishing clitics from affixes contradict each other. For instance, in Spanish the bound pronominals undergo a morphophonological alternation when a third-person dative pronominal co-occurs with an accusative pronominal: *-le* is replaced by *-se* because another *l* follows:

díga-me	'tell me'
díga-le	'tell him'
díga-me-lo	'tell me it'
díga-se-lo	'tell him it'	(**díga-le-lo*)

Given what we said in this chapter about Spanish bound pronominals, where is the contradiction?

5. Another case of a contradiction comes from Lithuanian, which forms reflexive verbs by means of an element *s(i)*. (The letter *ė* stands for a long [e:].)

	'rock'	'rock oneself'	'not rock oneself'
1SG	*supu*	*supuosi*	*nesisupu*
2SG	*supi*	*supiesi*	*nesisupi*
3	*supa*	*supasi*	*nesisupa*
1PL	*supame*	*supamės*	*nesisupame*
2PL	*supate*	*supatės*	*nesisupate*

In what ways is this element like an affix, and in what way is it like a clitic?

6. Look at the example of noun incorporation in Guaraní (ex. (11.26)). Which criteria can be applied to show that (11.26b) contains a compound, not a phrase like (11.26a)?

Exploratory exercise

As we saw in this chapter, some linguists have posited that a word boundary operates as a kind of border below which syntactic rules cannot apply. However, it is not always clear what constitutes evidence for or against this hypothesis. For instance, in Germanic languages such as English, German and Dutch, entire phrases can act as compound members, e.g. a *down in the trenches attitude*, a *floor of the birdcage taste*, or *just rolled out of bed hair*. We will call these **phrasal compounds**. The question we want to ask is: Do phrasal compounds violate lexical integrity?

Some researchers have suggested that the dependent member of the compound (i.e. the phrase) must be a set phrase or idiom – something that is stored in the lexicon as a single unit. If so, phrasal compounds are probably not true violations of lexical integrity. If the embedded phrase is stored in the lexicon similarly to a word, this may make it available to the word-formation component without the operation of syntactic rules. In this exercise you will test the claim that the dependent member of such compounds must be a set phrase or idiom, and explore implications that the results have for the Lexical Integrity Hypothesis.

Many languages do not allow phrasal compounds, so the language of study should be one for which you already know that these compounds are possible to some extent. English is used here for demonstration purposes. The methodology involves observation of naturally-occurring examples.

Instructions

Step 1: Develop criteria for determining that a construction is (or is not) a phrasal compound. For instance, *down in the trenches attitude* is clearly a phrasal compound because 'normal' compounds cannot include prepositions or determiners. Moreover, the structure must be [[*down in the trenches*] *attitude*]. But what about *gold and jewellery merchants* or *severe weather warning*? Should the first be considered a phrasal compound (presumably with the structure [[*gold and jewellery*] *merchants*]), or conjoined phrases with ellipsis (derived from [[*gold merchants*] *and* [*jewellery merchants*]])? Is *severe weather* a phrase, or itself a compound inside the larger compound?

Consider many kinds of borderline cases and develop specific criteria for including or excluding them from the category of phrasal compounds. Explain your reasoning. You might find it helpful to review the rules of compounding for your chosen language of study. Useful descriptions of English compounding patterns include Marchand (1969), Bauer (1983), Bauer and Renouf (2001) and Plag (2003).

Step 2: Choose a newspaper or magazine to gather data from. Scan the text for phrasal compounds, and record any that are found. Continue until you have recorded at least 10 examples, preferably more. If working with others (e.g. in a class setting), a divide-and-conquer approach might be

useful.[9] Have each person gather 10 examples from different sources and then combine the results.

Step 3: Analyze the data. Remember that the starting point for this project is the claim that in phrasal compounds, the phrase must be likely to be directly stored in the lexicon rather than productively generated. Decide whether the dependent members of your phrasal compounds fit this description. Are they freely formed syntactic constructions, collocations, set phrases, idioms …?

(A collocation consists of two or more words that tend to occur together. For instance, *weather* tends to occur together with *severe*, but less often with *harsh*. Thus, *severe weather* is a collocation, but *harsh weather* is not. Linguists often measure the collocation strength of two words as the likelihood of two words occurring together, compared with the likelihood of each word occurring independently. Collocation strength can thus formally be expressed as a probability. However, for the purposes of this exercise, it is sufficient to use your own intuitions about the degree to which some construction constitutes a collocation or set phrase in the language.)

Step 4: Consider the implications of your data for the Lexical Integrity Hypothesis. Are your data consistent with this hypothesis, or do they seem to contradict it? Explain your reasoning.

Step 5 (optional): Read some of the literature about phrasal compounds and lexical integrity. Work in this area includes Botha (1981), Lieber (1992), Wiese (1996), Ackema and Neeleman (2004), Carstairs-McCarthy (2005) and Lieber and Scalise (2007). Do your observations match the description of phrasal compounds in the literature? Based on what you have read, why is it difficult to determine whether phrasal compounds represent true violations of lexical integrity? Does discussion in the literature make you look at your data in a new light? If so, explain.

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[9]   The attentive reader has noticed that [[*divide-and-conquer*] *approach*] is a phrasal compound!

Morphophonology **10**

In Chapter 2, we saw that morphemes often have different phonological shapes depending on the environment, i.e. the other morphemes and sounds with which they co-occur in a word. For example, the stem of the English lexeme *leaf* is pronounced [lif] in the singular, but [li:v] in the plural (*leaves*); the stem of *pat* is always pronounced [pæt] if it occurs without any suffix, but in many varieties the pronunciation is [pæɾ] if a vowel-initial suffix follows (*patting* [pæɾɪŋ]). The forms [pæt] and [pæɾ] (and [lif] and [li:v]) are **phonological allomorphs** – they bear the same meaning and have quite similar phonological shape (in contrast to **suppletive allomorphs**, which are not phonologically similar). Phonological allomorphs are interesting because they represent the point of intersection between morphological and phonological structure. In this chapter we explore issues related to the morphology–phonology interface in some detail.

10.1 Two types of alternations

The formal relation between phonological allomorphs is called an **alternation**. Alternations come in two kinds: **automatic alternations** and **morphophonological alternations**. Like morphological patterns, alternations are often described in process terms. For example, German has a phonemic distinction between /k/ and /g/, and in positions before a vowel, both consonants are possible (e.g. *Kinder* [k] 'children', *Geld* [g] 'money', *Völker* [k] 'peoples', *Tage* [g] 'days'). But in syllable-final position, both /k/ and /g/ are pronounced as [k] (e.g. *Volk* [volk] 'people', *Tag* [ta:k] 'day'). This alternation of voiced and voiceless obstruents is thus called Final Devoicing (a process term) because /g/ seems to 'lose' its voicing feature in syllable-final position. As always when process terms are used, this terminology is probably best understood as metaphorical – speakers' own knowledge may not include a literal process of devoicing.

But the process terminology is very convenient because it gives more information than purely static terminology. If we simply referred to the German alternation in [ta:k]/[ta:gə] as *voiceless/voiced alternation*, we would not know that voiceless obstruents in syllable-final position do not always participate in this alternation – e.g. [k] in both *Volk* and, crucially, *Völker*. If, on the other hand, we call the alternation *devoicing*, it is immediately clear that the existence of [k] in both syllable-initial and syllable-final positions is completely expected, but [g] in syllable-final position is not.

Let us look at a few representative cases of both automatic and morphophonological alternations, focusing on examples of stem allomorphy.

(10.1) Some automatic alternations[1]

   a. German Final Devoicing: Voiced obstruents are pronounced voiceless when they occur in syllable-final position.

Tage [ta:gə]	'days'	*Tag* [ta:k]	'day'
Liese [li:zə]	'Liese (name)'	*Lieschen* [li:sçən]	'little Liese'
Monde [mo:ndə]	'moons'	*Mond* [mo:nt]	'moon'

   b. English Flapping: In many varieties of English, alveolar plosives ([d] and [t]) are pronounced as voiced flaps [ɾ] when they occur after a vowel and in front of an unstressed vowel.

pat [pæt]	*patting* [pæɾɪŋ]
fat [fæt]	*fatter* [fæɾər]
pad [pæd]	*padding* [pæɾɪŋ]

   c. Russian Akanie (neutralization of unstressed *o* and *a*): The vowel *o* is pronounced [ɑ] when it occurs in the syllable immediately before the stressed syllable, and both *o* and *a* are pronounced [ə] when they occur in an earlier syllable, or in a syllable after the stressed syllable.

vol [vol]	'ox (NOM.SG)'	*vol-y* [vɑ'lɨ]	'oxen (NOM.PL)'
nós-it ['nos´it]	'carries'	*nos-í* [nɑ's´i]	'carry!' (IMPV)
bórod-y ['borədɨ]	'beards'	*borod-á* [bərɑ'dɑ]	'beard'
bandít [bɑn'd´it]	'gangster'	*bandit-ízm* [bənd´i't´izm]	'gangsterism'

   d. Japanese Palatalization: Alveolar obstruents ([t] and [s]) are pronounced as palatals ([tɕ] and [ɕ], commonly written as *ch* and *sh*) when they occur before the high palatal vowel [i].

kas-e 'lend' (imperative)	*kash-i* 'lend' (continuative)
kat-e 'win' (imperative)	*kach-i* 'win' (continuative)

(Vance 1987: 177)

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[1]   The names of alternations are capitalized here because they are often traditional names that are in general use among linguists (e.g. German *Umlaut*, Russian *Akanie*, Japanese *Rendaku*).

(10.2) Some morphophonological alternations

- a. English Trisyllabic Shortening: The vowels or diphthongs [ei], [iː], [ai] and [ou] alternate with the short vowels [æ], [ɛ], [ɪ] and [ɒ] when followed by two syllables, the first of which is unstressed.
  [ei] *nation* [æ] *national*
  [iː] *extreme* [ɛ] *extremity*
  [ai] *divine* [ɪ] *divinity*
  [ou] *globe* [ɒ] *globular*

- b. German Umlaut (vowel fronting): The back vowels and diphthongs *a, o, u* and *au* alternate with front vowels *ä* [ɛ,æ], *ö* [ø, œ], *ü* [y, ʏ] and *äu* [ɔʏ] in certain morphological environments (plural of nouns, past subjunctive of verbs, female-noun suffix *-in*).
  Buch 'book' *Bücher* 'books'
  Vater 'father' *Väter* 'fathers' (cf. (3.1))
  bot 'offered' *böte* 'would offer'
  Jude 'Jewish person/man' *Jüdin* 'Jewish woman'

- c. Russian Zero Alternation: The vowels *o/e* in the last syllable of the stem sometimes alternate with zero when a vowel-initial suffix follows.
  zámok 'castle (NOM)' *zámk-i* 'castles (NOM)' (cf. 2.12b)
  ókon 'windows (GEN)' *okn-ó* 'window (NOM)'
  zemél'-nyj 'relating to land' *zemlj-á* 'land'
  ogrómen 'huge (predicative)' *ogrómn-yj* 'huge (attributive)'

- d. Hebrew Spirantization (fricativization): The stops *p, b, k* alternate with the fricatives *f, v, x* when a vowel precedes.
  yi-spor 'he will count' *sofer* 'he counts'
  kotev 'he writes' *yi-xtov* 'he will write'
  pilpel 'he peppered' *me-falpel* 'he peppers'
  bakaša 'request' *be-vakaša* 'please'

- e. Turkish *k/ğ* alternation: The consonant *k* alternates with *ğ* when a vowel follows. (In standard Turkish, the letter *ğ* is no longer pronounced, so *yatağ-ı* is [jataɨ], but some non-standard varieties preserve a velar fricative.)
  inek 'cow' *ineğ-i* 'his cow'
  kuyruk 'tail' *kuyruğ-u* 'its tail'
  köpük 'foam' *köpüğ-ü* 'its foam'
  yatak 'bed' *yatağ-ı* 'its bed'

- f. Japanese Rendaku (sequential voicing): Morpheme-initial voiceless obstruents alternate with voiced obstruents when a vowel precedes, mostly when they occur initially in a second

compound member. (Note that [b] functions as the voiced equivalent of [h].)

kami	'paper'	(*iro*	'color')	*iro-gami*	'colored paper'
tooroo	'lantern'	(*ishi*	'stone')	*ishi-dooroo*	'stone lantern'
shirushi	'mark'	(*hoshi*	'star')	*hoshi-jirushi*	'asterisk'
hone	'bone'	(*se*	'back')	*se-bone*	'backbone'
chi	'blood'	(*hana*	'nose')	*hana-ji*	'nosebleed'

(Vance 1987: ch. 10)

So what makes automatic alternations different from morphophonological alternations? In other words, why do linguists recognize two distinct types? The following empirical characteristics can be used to distinguish between the two.

(i) **Phonological versus morphological/lexical conditioning.** In automatic alternations, the conditions under which the alternations occur can always be described in purely phonological terms. In morphophonological alternations, by contrast, the conditions always have a morphological (and sometimes also lexical) component. For example, English Trisyllabic Shortening is restricted to certain suffixes (e.g. *globular* versus *globalize*) and to certain words (e.g. *national* exhibits Trisyllabic Shortening, but *notional* does not; the latter is pronounced [noʊʃn̩l], not [nɒʃn̩l]). Also, Hebrew has many words where *k* does not undergo Spirantization although the phonological condition, a preceding vowel, is met (e.g. *kocer* 'reaps', *yikcor* 'will reap').

In the extreme case, a morphophonological alternation occurs under purely morphological and lexical conditions. This can be illustrated by German Umlaut. This alternation was originally motivated by assimilation to a high front vowel in the following syllable (e.g. *Jude/Jüdin*), but in most contemporary words, this original front vowel has been lost completely or reduced to schwa, as shown in the examples in (10.3).

(10.3) Old High German | Modern German
apful/epfili	*Apfel/Äpfel* [ɛpfl]	'apple(s)'
		(complete loss of final [i])
kalb/kelbir	*Kalb/Kälber* [kɛlbər]	'calf / calves'
		(reduction to schwa)

Thus, nowadays this original phonological condition is irrelevant. Umlaut occurs together with certain suffixes such as plural *-er* (e.g. *Buch/Bücher* 'book(s)'). With other suffixes, it occurs only subject to further lexical conditions. With the plural suffix *-e*, the application of Umlaut has to be learned individually for each lexeme (e.g. *Hund/Hunde* 'dog(s)' versus *Bund/Bünde* 'league(s)').

Automatic alternations are the synchronic consequence of phonetically-motivated diachronic sound changes. Sound change is motivated by phonetics in the sense that it occurs because phonetic production is made

easier by the change. For example, pronouncing an alveolar or velar consonant before [i] is relatively more difficult than pronouncing a palatal (or palatalized) consonant, and this explains why the diachronic change of palatalization before front vowels is so common in the world's languages (e.g. (10.1d)). Final devoicing helps pronunciation because maintaining the vibration of the vocal chords (which is made difficult by the oral obstruction of obstruents anyway) is particularly difficult in the final position (e.g. (10.1a)). Neutralization of unstressed vowels occurs for perceptual reasons: when a vowel is not stressed, it is less loud and thus differences between vowels are harder to perceive (e.g. (10.1c)). As in German Umlaut, morphophonological alternations often result when the phonetic motivation for some automatic alternation is subsequently obscured.

(ii) **Phonetic coherence.** Often a whole range of different sounds is affected in a similar way by a sound change, so automatic alternations are more likely to be phonetically coherent in the sense that both the affected sounds and their replacements are **natural classes**. For example, in Old High German (c. 800–1100 CE), voiced obstruents did occur in syllable-final position, but around 1100 a sound change occurred by which all syllable-final obstruents became voiceless. As a result, in German, the synchronic rule of Final Devoicing affects all voiced obstruents and turns them into the corresponding voiceless obstruents. Similarly, English Flapping affects all alveolar plosives.

In morphophonological alternations, by contrast, the coherence of the set of affected sounds may have been lost by subsequent changes. Thus, the class of English vowels affected by Trisyllabic Shortening is not a natural class; the class of Hebrew consonants affected by Spirantization is not a natural class; and the vowels resulting from German Umlaut are not a natural class (in particular, *äu* [ɔʏ], the umlauted counterpart of *au* [aʊ], can be described as 'fronted' only with great difficulty).

(iii) **Phonetic distance.** Moreover, in automatic alternations, the alternating sounds tend to differ in one feature only, but in morphophonological alternations they may differ quite drastically. For instance, English [iː]/[ɛ], [ɔʏ]/[ɒ], Turkish [k]/Ø and Japanese *h/b* show a wide phonetic distance because the sound changes that originally created the alternations occurred a long time ago and subsequent changes have made the connections opaque. (For instance, Japanese Rendaku originally led to *p/b* alternations, comparable to *k/g* and *t/d* alternations, but later *p* became *h*.)

(iv) **Application in derived environments only**. Automatic alternations result from constraints on pronunciation that are valid for all environments, and an alternation is just a special case that arises when different morphological contexts provide different phonological conditions. For instance, syllable-final obstruents are always voiceless in German, Russian [o] can never occur in an unstressed syllable and Japanese never allows [t] and [s] in front of [i] (Vance 1987: 21). Morphophonological alternations, by

contrast, may be restricted to derived environments. For instance, Turkish [k] is deleted between vowels in a derived environment (see (10.2d)), but inside a morpheme there is nothing wrong with intervocalic [k] (e.g. *sokak* 'street', *sitreptokok* 'streptococcus'). In Hebrew, [b] is spirantized to [v] after a vowel, but inside a morpheme there is no problem with [b] (e.g. *kibuc* 'gathering; kibbutz'). English long vowels and diphthongs may get shortened when a two-syllable suffix follows (e.g. *divine – divinity*), but inside a morpheme there is nothing wrong with a diphthong in the antepenultimate syllable (e.g. *vitamin* ['vaɪtəmɪn]).

(v) **Application to loanwords.** Automatic processes generally apply to loanwords and foreign names as they do to native words. Thus, the city *Madrid* is pronounced with a final [t] in German because of final devoicing; in Russian, not only *Moskvá* is pronounced with [a] where the spelling has *o*, but also *Mombása* and *Montána* (and in *Mogadíšo*, the pronunciation is [ə], because *o* is not immediately before the stressed syllable). In Japanese, loans from English have *chi* and *shi* for English [ti] and [si] (e.g. *shiisoo* from *seesaw*, *shiizun* from *season*). By contrast, the effects of morphophonological alternations need not be found in loanwords. Thus, Turkish loanwords sometimes preserve their final [k] (e.g. *sitreptokok* 'streptococcus', *sitreptokoku*), and Russian zero alternation is never applied in loanwords (e.g. *baron/barony* 'baron', not **barny*).

(vi) **Speech style and obligatoriness.** Automatic alternations may still be optional and sensitive to the speech style. Often, for instance, in formal, slow speech the process is less likely to occur than in informal, fast speech. For instance, English Flapping may be suppressed in formal speech. Morphophonological alternations are never sensitive to the speech style. It should be noted, however, that most automatic alternations that are described in grammars are obligatory as well. Thus, obligatoriness is not a good diagnostic of a morphophonological alternation, but sensitivity to speech style or optionality indicates an automatic process.

(vii) **New segments.** Automatic alternations sometimes create segments that are not found under other conditions. For instance, English [ɾ] only occurs under the conditions of Flapping, and Russian [ə] occurs only under the conditions of Akanie. By contrast, morphophonological alternations tend to lead to segments that occur independently in the language. Thus, German has front vowels like *ö* and *ü* in basic words that have nothing to do with Umlaut (e.g. *öde* 'bleak', *Mühle* 'mill'), and Hebrew has the fricatives *f, v* and *x* in basic words that have nothing to do with Spirantization (e.g. *finjan* 'coffee cup', *ʕaxšav* 'now'). (This property of morphophonological alternations is also called **structure preservation**.)

(viii) **Application across word boundaries.** Automatic alternations may apply across word boundaries. Thus, Flapping occurs in English also within phrases, as in *a lot of stuff* [ə lɒɾ əv stʌf]. This is not generally possible with morphophonological alternations.

These differences are summarized in Table 10.1.

Automatic alternations	Morphophonological alternations
only phonologically conditioned	at least partly morphologically or lexically conditioned
phonetically coherent	not necessarily phonetically coherent
alternants are phonetically close	alternants may be phonetically distant
not contradicted by simple morphemes	may be restricted to derived environments
extend to loanwords	need not extend to loanwords
may be optional and sensitive to speech style	not sensitive to speech style
can create new segments	do not generally lead to new segments
not necessarily restricted to the word level	generally restricted to the word level

Table 10.1 Two types of alternations

These empirical criteria divide alternations into two types. The significance of this distinction for the formal architecture of the language system is addressed in Sections 10.4 and 10.5. But first we consider more properties of morphophonological alternations.

10.2 The productivity of morphophonological alternations

When we look at morphophonological alternations in greater detail, we see that these show quite a bit of internal diversity. For the sake of convenience, we can distinguish three different classes, although they are probably just three points on a continuum: relic alternations, common alternations and productive alternations.

Relic alternations are found only in a few words, and it is therefore doubtful whether a rule should be formulated for them. An example is the *s/r* alternation in German. This was quite regular in Old High German: in

vowel-changing verbs, the past-tense plural forms and the past participle showed *r*, whereas the other forms showed *s*:

(10.4)

PRESENT TENSE	PAST TENSE SINGULAR	PAST TENSE PLURAL	PAST PARTICIPLE	
lesan	las	lārum	gileran	'read'
ginesan	ginas	ginārum	gineran	'be saved'
kiusan	kōs	kurum	gikoran	'choose'
friusan	frōs	frurum	gifroran	'freeze'

In Modern German, most of these alternations have been **levelled**: the modern forms are *lesen/las/lasen/gelesen*, *genesen/genas/genasen/genesen* and *frieren/fror/froren/gefroren*. However, in the high-frequency lexeme BE, the alternation was partially preserved (*war/gewesen*). And, when we take derived lexemes into account, we also see it in *Frost/frieren* 'frost / freeze'. In these cases it really takes a historical linguist to discover anything systematic about these alternations. For contemporary speakers, the relation between *war* 'was' and *gewesen* 'been' is probably as suppletive and non-systematic as the relation between *bin* 'am' and *war* 'was'.

Common alternations are found in many words in a language, and often in different morphological contexts. An example is the Diphthongization alternation in Spanish, whereby *ue* and *ie* occur in stressed syllables, and *o* and *e* occur in unstressed syllables:

(10.5)

ciérro	'I close'	*cerrár*	'to close'
cuénto	'I tell'	*contár*	'to tell'
buéno	'good'	*bondád*	'goodness'
cuérpo	'body'	*corpóreo*	'bodily'

Spanish has dozens of verbs such as *cerrar* and *contar* that show this alternation, and there are many derivational relationships such as *bueno/bondad* where it shows up as well. So at least as linguists we want to formulate a rule rather than just say that all these cases show (weak) suppletion. And it would seem reasonable to assume that speakers, too, have some kind of rule. However, this is difficult to show, because the Diphthongization alternation is not productive. When a stem with a diphthong becomes the stem of a novel verb (e.g. a verb formed by the denominal pattern *des-N-ar* 'remove N'), the diphthong appears throughout the paradigm (as in *deshuesár* 'remove bones' from *huéso* 'bone', not *deshosár). When a stem with a monophthong appears in a novel verb, it shows no alternation (e.g. *filosofár* 'philosophize', which has stem-stressed forms such as *filosófo* 'I philosophize', not *filosuéfo). Similarly, when a diminutive in *-ito* is formed from a noun with a diphthong, the diphthong is preserved (e.g. *cuerpíto* 'little body', not *corpíto, from *cuérpo* 'body').

Productive alternations are not merely found in many words, but are also extended to new words such as neologisms and borrowings. German

Umlaut is a famous example of such an alternation. In older German, it was productively extended to new plurals such as *Mutter/Mütter* 'mother(s)', *Garten/Gärten* 'garden(s)', which did not have Umlaut in the plural originally because their old plural suffix (now lost) did not contain an [i]. However, in modern German the Umlaut is no longer productive in plurals, and neither is it in female-noun formations of the type *Jude/Jüdin* (a newly formed female noun from *Luchs* 'lynx' would have to be *Luchsin*, not **Lüchsin*). But there is one pattern in which the Umlaut is required: diminutives in *-chen* and *-lein*. For instance, one could form a diminutive *Fäxchen* from the new word *Fax* 'fax', and parents might refer to a medicine called *Vitamnol* as *Vitamnölchen* when talking to a small child. German Umlaut thus demonstrates clearly that a morphophonological alternation may be productive.

Some other productive morphophonological alternations are:

(i) Turkish *k / ğ*. This is extended to some loanwords, e.g. *kartotek/kartoteği* 'card catalog', *frikik/frikiği* 'free kick', *barok/baroğu* 'baroque'. However, other loanwords preserve *k* (see the example *sitreptokok/sitreptokoku* in Section 10.1).

(ii) Polish Second Palatalization. This process changes the velars *k, g* and *ch* [x] to *c* [ts], *dz* [dz] and *sz* [ʃ] in certain environments – e.g. in the locative singular of nouns of the *a*-declension (e.g. *mucha* 'fly', locative *musze*; *sługa* 'servant', locative *słudze*; *matka* 'mother', locative *matce*). This alternation is completely productive, and it always applies to loanwords – e.g. *Braga* (city in Portugal), locative *Bradze*; *alpaka* 'alpaca', locative *alpace*, and so on.

(iii) Indonesian Nasal Substitution. In this alternation, the initial voiceless stop of a verb root is replaced by a nasal stop at the same place of articulation when the active-voice prefix *meng-* is attached to the root. In addition to *t, k* and *p*, this alternation also affects *s*, where the replacing nasal is *ny* [ɲ]. (The letters *ng* stand for [ŋ].)

(10.6) *meng* + *urus*   *mengurus*   'take care'
      meng + *tulis*   *menulis*   'write'
      meng + *kirim*   *mengirim*   'send'
      meng + *pakai*   *memakai*   'use'
      meng + *sewa*   *menyewa*   'rent'

That this alternation is productive can again be seen in the behaviour of loanwords, which are also subject to Nasal Substitution:

(10.7) *meng* + *kritik*   *mengritik*   'criticize'
      meng + *sukses + kan*   *menyukseskan*   'make successful'
      meng + *protes*   *memrotes*   'protest'
                                       (Sneddon 1996: 9–13)

However, in recent borrowings the initial consonant tends to be retained, and, besides the forms in (10.7), the forms *mengkritik, mensukseskan* and *memprotes* are possible as well. This perhaps indicates that the alternation is losing its productivity.

These properties of relic alternations, common alternations and productive alternations are summarized in Table 10.2.

Relic alternations	Common alternations	Productive alternations
apply to very few items	apply to many items	apply to many items
do not apply to novel words	do not apply to novel words	apply to novel words
probably not recognized by speakers	probably recognized by speakers	clearly recognized by speakers

Table 10.2 Three types of morphophonological alternations

The different degrees of productivity exhibited by morphophonological alternations make them quite different from automatic alternations, which always apply to new words.

10.3 The diachrony of morphophonological alternations

We have seen that synchronic alternations have their origin in historical sound changes, but we have not yet explained why these sometimes result in automatic alternations and sometimes in morphophonological alternations. On one level, the answer is straightforward: sound changes always yield automatic alternations initially, and automatic alternations then become morphophonological alternations in a further step of development:

(10.8) sound change → automatic alternation → morphophonological alternation

Automatic alternations arise because phonetics and phonology are to a large extent autonomous from morphology, or, to put it in even more metaphorical terms, they act blindly, without seeing the consequences of their actions for morphology. If sound changes could, so to speak, predict the outcome of their actions and cared about morphology, they might exercise some restraint. For example, Hebrew Spirantization (see (10.2d)), which turned intervocalic [p] into [f], could have changed non-alternating words like *safa* 'lip' (from earlier *sapa*), and it could have spared verbs like *soper/yispor*, which became alternating (*sofer/yispor*) as a result of the sound change. The fact that this does not happen shows that phonetics and phonology mostly mind their own business and operate without consideration of morphological structure.

But this does not explain yet why automatic alternations change into morphophonological alternations. For instance, in early Old High German, the Umlaut must have been an automatic alternation, so that, for instance, *Jüdin* 'Jewish woman' (derived from *Jude* 'Jew') could not have been pronounced otherwise because a back vowel had to be assimilated to a front vowel in the next syllable. But subsequently the phonological restriction that made *u-i* sequences unpronounceable was lost, and already in Middle High German words like *Luchsin* 'female lynx' were no problem. But why was the alternation retained? Why did *Jüdin* not revert to its earlier pronunciation *Judin*? The reason is apparently that speakers had already begun treating the front vowel *ü* as a property of the word. If Old High German speakers actively derived the word *Jüdin* each time it was produced by applying the Umlauting rule to an **underlying representation** [ju:din] (producing the **surface representation** [jü:din]), then we might expect that loss of the rule would cause the pronunciation of *Jüdin* to revert to *Judin*. But this did not happen, and such things do not happen in general. However, perhaps speakers stored the word in the lexicon as the surface form which they heard, or maybe they stored the set of stem allomorphs ([jud-] and [jüd-]), along with a generalization about their distribution. If so, there is no reason that we should expect the effects of automatic alternations to disappear along with the phonological rule.

The loss of the phonological restriction thus revealed that speakers had reanalyzed the alternation. Speakers reinterpreted the automatic alternation as signalling (or co-signalling) a particular morphological pattern. An alternation that originally was purely phonologically conditioned came to be morphologically conditioned. This reinterpretation was hidden as long as the phonological rule was in effect, and became observable only upon further change in the language.

Another example of an automatic alternation being reanalyzed as a morphophonological alternation comes from Zulu Labial Palatalization in passive verb forms. In Zulu, the passive voice is marked by a suffix *-w(a)*, as illustrated in (10.9a). In (10.9b), we see the effects of Labial Palatalization. (Note that orthographic *j* = [dʒ], *sh* = [ʃ], *ny* = [ɲ]; otherwise the spelling reflects the pronunciation directly.)

(10.9) a. *bon-a*   'see'   *bon-w-a*   'be seen'
            shay-a   'beat'   *shay-w-a*   'be beaten'

        b. *gubh-a*   'hollow'   *guj-w-a*   'be hollowed'
            khiph-a 'take out'   *khish-w-a* 'be taken out'
            lum-a   'bite'   *luny-w-a*   'be bitten'
            bamb-a   'catch'   *banj-w-a*   'be caught'
                          (Ziervogel *et al*. 1981: 106–7, 160, 163)

The original alternation can be summarized as in (10.10). The rule applies wherever these conditions are met.

(10.10) Labial Palatalization

$$\begin{Bmatrix} bh \\ ph \\ m \\ mb \\ mp \end{Bmatrix} + w \rightarrow \begin{Bmatrix} j \\ sh \\ ny \\ nj \\ ntsh \end{Bmatrix}$$

Interestingly, Zulu speakers evidently reinterpreted the alternation as co-signalling the passive meaning and introduced it into words that could never have developed palatals by phonological processes. Such words are shown in (10.11).

(10.11)
khumul-a	'loosen'	*khunyul-w-a*	'be loosened'
khumbul-a	'remember'	*khunjul-w-a*	'be remembered'
bophel-a	'harness'	*boshel-w-a*	'be harnessed'
gijimis-a	'make run'	*gijinyis-w-a*	'be made to run'
bophis-a	'make fasten'	*boshis-w-a*	'be caused to fasten'

(Ziervogel *et al*. 1981: 106–7, 160, 163)

In all these verbs, the root-final labial consonant is followed by some segments that would have protected it from undergoing Labial Palatalization as a sound change. The fact that it was extended to these cases shows that the alternation was reanalyzed as being morphologically conditioned.

10.4 Morphophonology as phonology

With this foundation, we are now ready to address the following questions related to formal description of language architecture: Do automatic and morphophonological alternations reflect morphological structure or phonological structure? How should we describe the interface between morphology and phonology?

One position, connected with the morpheme-based model, holds that both automatic and morphophonological alternations are generated by phonological structure.[2] In this view, alternations are the result of phonological rules induced by affixation and in formal terms are not therefore considered markers of morphological function or meaning. To see why this approach is appealing, it is useful to look in some detail at one particular proposal of this type, known as **level ordering**.

Level ordering is rooted in the observation that in some languages, it is

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[2] Linguists who adhere to this position sometimes use *phonological alternation* as a general term for both automatic and morphophonological alternations, implying that both belong in the same component of grammar. Since this is a controversial issue, we avoid the term in this book in favour of the more neutral (and shorter!) term *alternation*.

useful to distinguish between two types of affixes, depending in large part on their behaviour with respect to morphophonological alternations. We call these **integrated** and **neutral affixes** here. Their typical properties are summarized in Table 10.3. We begin by briefly examining integrated and neutral affixes in two languages, Lezgian and English.

Integrated affixes	Neutral affixes
are in the domain of stress assignment	are not in the domain of stress assignment
trigger and undergo morphophonological alternations	do not trigger or undergo morphophonological alternations
words with integrated affixes show the phonotactics of monomorphemic words	words with neutral affixes may show phonotactic peculiarities
tend to occur closer to the root	tend to occur further from the root

Table 10.3 Integrated and neutral affixes

In Lezgian, most inflectional suffixes are neutral, but some are integrated (all prefixes are integrated, but there are so few of them that they can be neglected here). To see the difference between the two types of suffixes, we need to consider the rule of stress assignment and two relevant morphophonological alternations (see (10.12)).

(10.12) a. Lezgian Stress Rule: Stress is on the second syllable in the stress domain, if there are at least two syllables in it.

b. Aspirate Ejectivization: A word-final voiceless aspirate consonant (spelled *Ch*, where *C* stands for any consonant letter) alternates with an ejective (spelled *C'*) if the plural suffix follows:
   meth   *met'-ér*   'knee(s)'
   neth   *net'-ér*   'louse/lice'
   wakh   *wak'-ár*   'pig(s)'
   haqh   *haq'-ár*   'truth(s)'

c. Vowel Harmony: The stressed syllable and the pre-stress syllable agree in backness and, in the case of high front vowels, labialization – i.e. the only allowed sequences of unlike vowels are *a–u, u–a, i–e, e–i, ü–e, e–ü*. (Disallowed are *a–e, e–u, i–ü*, etc.; note that Lezgian has the five vowel phonemes *a, e, i, u, ü*.) The suffix vowels *a/e* and *i/u/ü* alternate:

q'al	q'al-ár	'stick(s)'	ğal	ğal-úni	'thread'
q'ul	q'ul-ár	'board(s)'	č'ul	č'ul-úni	'belt'
q'il	q'il-ér	'head(s)'	ric'	ric'-íni	'bowstring'
q'ül	q'ül-ér	'dance(s)'	q'ül	q'ül-üni	'dance'

<div align="right">(Haspelmath 1993: 56–8)</div>

The suffixes -er/-ar (plural) and -uni/-ini/-üni (oblique stem) that are illustrated in (10.12) are examples of integrated suffixes. As the examples show, they are in the stress domain (in accordance with the Stress Rule, they receive stress when they attach to a monosyllabic base) and they trigger and undergo morphophonological alternations ((10.12b) and (10.12c), respectively).

Besides these, Lezgian also has neutral plural suffixes and neutral oblique-stem suffixes, as illustrated in (10.13).

(10.13) a. Lezgian oblique-stem suffix -di (neutral)

fil	fíl-di	'elephant'
tip	típ-di	'type'
nur	núr-di	'beam'
din	dín-di	'religion'

  b. Lezgian plural suffix -ar (neutral)[3]

tip	típ-ar	'type(s)'
kiir	kiir-ar	'shed(s)'
kar	kár-ar	'enclosure(s)'
li	lí-jar	'hide(s)'

<div align="right">(Haspelmath 1993: 68–9)</div>

These are not in the stress domain – the stress is on the first syllable in these words, contrary to the Stress Rule – and they neither undergo any alternations (in particular, they are not subject to vowel harmony) nor do they trigger them. Integrated suffixes always follow the root immediately, whereas neutral suffixes may also come after a derivational suffix. For instance, the noun Čečen-wi 'Chechen person' (derived from čečen 'Chechnya') has the plural čečen-wi-jar and the oblique-stem suffix -di (čečen-wi-di).

Lezgian words with neutral suffixes are immediately recognizable as morphologically complex: consonant sequences like pd (in tipdi) are impossible morpheme-internally. By contrast, if we disregard meaning, all words in (10.12b–c) could be monomorphemic in principle.

Let us now look at English, where the distinction between integrated and neutral affixes has occupied many morphologists and phonologists. Some examples of both types of affixes are given in (10.14).

(10.14)   integrated affixes: -ity, in-, -ical, -ion, -ian, -al, -y1, -ous, -ive
        neutral affixes: -ness, un-, -ly, re-, -ize, -able, -ful, -y2, -ism

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[3]   The neutral plural suffix -ar has the same shape as one of the alternants of the integrated plural suffix -er/-ar, but it is a distinct suffix.

Integrated suffixes often lead to a stress shift, whereas neutral suffixes never do:

(10.15)

BASE	WITH INTEGRATED SUFFIX	BASE	WITH NEUTRAL SUFFIX
réal	*reálity*	*nátural*	*náturalness*
cómedy	*comédian*	*accómpany*	*accómpaniable*
phótograph	*photógraphy (-y1)*	*ríckets*	*ríckety (-y2)*
advántage	*advantágeous*	*bóunty*	*bóuntiful*

Integrated suffixes may also trigger Trisyllabic Shortening (cf. (10.2a)), whereas neutral suffixes never do. The integrated prefix *in-* shows Nasal Assimilation of the *n* to the first consonant of the base (*elegant/inelegant*, but *literate/illiterate*, *regular/irregular*), whereas the *n* of the neutral prefix *un-* is always preserved (*unlimited, unrealistic*, etc.). The attachment of neutral affixes may lead to the violation of morpheme-internal phonotactic constraints – e.g. *cleanness* and *unnecessary* show two consecutive instances of [n], something that never occurs within a morpheme. Likewise, the suffix *-ful* brings about consonant sequences such as [pf] (e.g. *hopeful*) and [kf] (e.g. *thankful*) that do not occur morpheme-internally. The integrated affixes, by contrast, only create combinations that are independently possible morpheme-internally. And finally, English shows a strong tendency for integrated suffixes to occur close to the root, whereas neutral suffixes occur further away from the root. Integrated affixes do not, as a rule, attach to words derived by a neutral affix (*[hope-ful]-ity*, **in-[friend-ly]*, **[kind-ness]-ical*), whereas the opposite order is unproblematic ([*natur-al]-ness*, *un-[product-ive]*, *[Rastafari-an]-ism*).

The contrast between integrated and neutral affixes in English gave rise to the idea that the innate architecture of the grammar provides the possibility of several levels of affixes that are linked to particular (morpho)phonological rules. English derivation would have two levels, commonly called level I and level II (see Table 10.4). The basic idea is that the levels are ordered relative to each other, and within each level rules introducing affixes are ordered relative to phonological rules: sets of derivational affixes are paired with sets of phonological rules that apply after the affix has been introduced.

Level	Affixes	(Morpho)phonological rules
level I: (≈ integrated affixes)	*-ity, in-, -ical, -ion, -ian, -al, -y1, -ous, -ive*	Trisyllabic Shortening Stress Assignment Nasal Assimilation
level II: (≈ neutral affixes)	*-ness, un-, -ly, re-, -ize, -able, -ful, -y2, -ism*	Flapping

Table 10.4 The two levels of English morpho(phono)logy

This architecture requires level I affixes to be attached before level II affixes. In this way, level ordering explains the restriction that prohibits integrated affixes from attaching to words with neutral affixes. Sample derivations are given in (10.16).[4]

(10.16)	*nation*	*acid*	*debate*	*create*
Root	ˈnejʃn̩	ˈæsɪd	dəˈbejt	kriˈeit
Level I Morphology	ˈnejʃn̩-l̩	ˈæsɪd-ɪti		kriˈeit-ɪv
Level I Phonology				
Trisyllabic Shortening	ˈnæʃn̩-l̩			
Stress Assignment		æˈsɪdɪti		
Level II Morphology			dəˈbejt-əbl̩	kriˈeitɪv-nɛs
Level II Phonology				
Flapping		æˈsɪɾɪɾi	dəˈbejɾəbl̩	kriˈeiɾɪvnɛs
Surface	[ˈnæʃn̩l̩]	[æˈsɪɾɪɾi]	[dəˈbejɾəbl̩]	[kriˈeiɾɪvnɛs]
Representation	*national*	*acidity*	*debatable*	*creativeness*

In addition, it explains why neutral affixes are not affected by morphophonological rules. Note that the word-forms *national* and *chastity* exhibit Trisyllabic Shortening. But in *debatable* and *creativeness* the rule does not apply, even though both have surface forms that meet the conditions for the rule. In a level ordering account, this is because Trisyllabic Shortening applies at level I, whereas for *debatable* and *creativeness*, the conditions for the morphophonological rule are met only at level II.

The level ordering approach thus has appealing powers of explanation. Moreover, it has been argued that level ordering has an added advantage in being a restrictive hypothesis about morphological architecture: like other models that posit only concatenative rules, it disallows many types of morphological patterns that are not observed in the world's languages.[5] Not surprisingly, level ordering has been influential among generative morphologists and phonologists.

At the same time, when the details are pinned down, application of level ordering to English encounters some serious problems. Some counterexamples to the ordering restriction are obvious and widely recognized: the level I suffix *-ity* can attach to the level II suffix *-able* as in *readability*, and *-ation* (a variant of *-ion*) can attach to *-ize* (e.g. *realization*). There are also problems with the pairing of affixes and rules. For example, the rule of Velar Softening (which changes underlying [k] into [s], and [g]

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[4]   Note that there are multiple senses of the term *derive*. In Chapter 3 and elsewhere, we have used this term mostly to describe a static relationship between complex word-forms and their bases. Here, however, the term is intended in the sense of 'derivational phonology' – constructing surface representations from underlying representations by applying a series of rules.

[5]   At least, it is restrictive in this way if zero affixes are excluded. See Chapter 3 for a discussion of restrictiveness as a goal in morphological analysis, and problems with zero affixes.

into [dʒ] before certain suffixes – e.g. *electric/electricity*) is a clear example of a morphophonological rule that should go with level I affixes. And, indeed, many level I affixes do trigger this rule (e.g. *analogous/analogy, music/ musician, opaque/opacity*), but there are also two level II suffixes that trigger it, *-ize* and *-ism* (e.g. *public/publicize, fanatic/fanaticism*). Also with respect to stress, integrated and neutral affixes may behave alike: words prefixed with *in-* and *un-* both share the same stress pattern, with secondary stress on the prefix (*ùnnátural, ùnafráid, ìmprecíse*). This stress pattern contrasts with that of monomorphemic words like *ínnocent, ímpudent, ínfidel*. Thus, in this respect *in-* behaves as we would expect from a level II prefix (Raffelsiefen 1999b). Now, a few counterexamples do not in general invalidate a generalization, but if the generalization is supposed to be a direct consequence of the architecture of the grammar, counterexamples do become a big problem, because there is no way in which they could arise if the system of Table 10.4 is assumed.

Even more damaging to the level ordering hypothesis is the fact that there appears to be an alternative explanation for the observed ordering restrictions. Most integrated affixes in English are quite unproductive anyway, so it seems unnecessary to invoke a level ordering architecture in order to explain why they do not attach to words derived with neutral affixes. The integrated affixes were borrowed along with complex words from French or Latin, and most of them never became truly productive in English. Even the most common suffix, *-ity*, cannot in general be used with new bases (cf. **chivalrosity, *naturality, ?*effectivity*), only in the special case of adjectives derived by *-able* (*readability, bagelizability*, etc.). True, within strict limits it is sometimes possible to form new words with the integrated affixes; for instance, use of *telescopy*, *grammophonic* and *credentious* can be found with a Google search (*telescopy* is by far the most frequent of these three). Still, limited productivity probably goes a long way towards explaining affix ordering restrictions.

Factors that affect the saliency of the morpheme boundary may also play a role. Remember that a word with an integrated affix has the same phonotactic structure as a monomorphemic word. The internal morpheme boundary is thus less salient in some sense. According to one proposal, this (among other factors) tends to make it more efficient for an English speaker to store a stem and integrated affix together as a single unit in the lexicon. (See Chapter 4 and Section 6.4.1 for details about lexical storage and its interaction with morphological structure.) And lexical storage, in turn, has consequences for affix ordering: since a stem and integrated affix constitute a unit, integrated affixes must occur closer to the root than neutral affixes (Hay and Plag 2004). Furthermore, in this **complexity-based ordering** hypothesis, integration is a matter of degree, which helps explain ordering restrictions within the two categories of affixes. More integrated affixes must occur closer to the root than less integrated affixes, and so on. Level

ordering incorrectly predicts that there should be no ordering restrictions within a given level.

In the following section it is shown that the problems not only concern the hypothesis of level ordering, but in fact extend to the more general claim that morphophonological alternations fall into the domain of phonology.

10.5 Morphophonology as morphology

The alternative hypothesis – that morphological alternations properly belong to the domain of morphology – begins from the observation that these alternations behave in ways that are typical of morphological structure more generally. For instance, we have already seen that morphophonological alternations can vary in productivity. This is a typical property of affixes, but not of phonological rules. Alternations can also serve as the basis for back-formation. An example of this comes from Polish.

A widespread (and productive) alternation in Polish is the First Palatalization, whose effects are shown in (10.17). (Note that this is somewhat different from the Second Palatalization, which we saw in Section 10.2, and which occurs in different environments.)

(10.17) $\begin{Bmatrix} [k] \\ [g] \\ [x] \end{Bmatrix} \rightarrow \begin{Bmatrix} [t\int] \\ [ʒ] \\ [\int] \end{Bmatrix}$ (spelling: $\begin{Bmatrix} k \\ g \\ ch \end{Bmatrix} \rightarrow \begin{Bmatrix} cz \\ ż \\ sz \end{Bmatrix}$

The First Palatalization occurs, for instance, with the verb-deriving suffix *-yć*, with the adjective-deriving suffix *-ny* and with the diminutive suffixes *-ek* and *-ka*:

(10.18) *kaleka*   'cripple'   *kaleczyć*   'mutilate'
        dynamika 'dynamics' *dynamiczny* 'dynamic'
        pończocha 'stocking' *pończoszka* 'little stocking'
        krąg   'circle'   *krążek*   'little circle'

Polish has a productive pattern of back-forming words from non-diminutive words ending in *-ek* or *-ka*. These derivatives get an augmentative interpretation, as in (10.19).

(10.19) *ogórek*   'cucumber' *ogór*   'big cucumber'
        szpilka   'pin'   *szpila*   'big pin'

Now when this rule of subtractive augmentative formation is applied to words ending in *-szka* or *-czka*, the result is a new word ending in *-cha* or *-ka*:

(10.20) *broszka*   'brooch'   *brocha*   'big brooch'
       flaszka   'bottle'   *flacha*   'big bottle'
       gruszka   'pear'   *grucha*   'big pear'
       Agnieszka   (name)   *Agniecha*   'big Agnieszka'
       beczka   'barrel'   *beka*   'big barrel'
       taczka   'wheelbarrow'   *taka*   'big wheelbarrow'

The words in the left-hand column in (10.20) all have [ʃ] (*sz*) and [tʃ] (*cz*) originally. For example, *broszka* was borrowed from French *broche* [bʀɔʃ], *flaszka* was borrowed from German *Flasche* and *gruszka* was derived from *grusza* 'pear tree'. The *ch/k* in the back-formed augmentatives is clearly new, and it shows that morphophonological alternations can operate in the reverse direction under certain circumstances. In this respect, these alternations are just like morphological rules.

Based on this kind of data, many linguists would say that only automatic alternations are truly phonological, whereas morphophonological alternations are really morphological in nature. This means that morphophonological alternations can signal (or co-signal) morphological meaning. From the perspective of language change, an automatic alternation that becomes closely associated with a morphological pattern is susceptible to being reanalyzed as part of the morphology, and it can then be expected to behave like other ingredients of morphological patterns.

For instance, it is possible for a morphophonological alternation to become the sole formal marker of a pattern – e.g. when the original marker disappears for phonological reasons. This has happened in Modern Irish, where the past tense of verbs is marked by Lenition of the initial consonant. Lenition involves fricativization and some other changes and originally it occurred only in intervocalic position (like Hebrew Spirantization (10.2d)).

(10.21) Modern Irish Lenition
      { k, g, t, d, p, b, s, f} → { x, γ, h, γ, f, w, h, Ø}
      (spelling: *c, g, t, d, p, b, s, f* → *ch, gh, th, dh, ph, bh, sh, fh*)

(10.22) PRESENT TENSE   PAST TENSE
      molaim   *mhol mé*   'I praise(d)'
      brisim   *bhris mé*   'I break/broke'
      sábhálaim   *shábháil mé*   'I save(d)'
      díbrím   *dhíbir mé*   'I banish(ed)'

The past tense was originally formed with a prefix *do-*, but this was lost, and nowadays only the Lenition is a signal of the past tense (but there are also different person-number markers, *-(a)im* and *mé* for first person singular). The result in Modern Irish was thus a **base modification** pattern, and we saw similar cases earlier in the book: German plurals signalled solely by the Umlaut (e.g. *Mutter*, *Mütter* 'mother(s); see (3.1)), and Albanian plurals signalled solely by Palatalization (e.g. [fik], [fic] 'fig(s); see (3.3)). The loss of

the original affixes makes sense here if the morphophonological alternations co-signalled the relevant morphological meaning, i.e. if they were part of the morphological system of expression. These data seem to further support a morphological approach to morphophonological alternations.

Furthermore, as pointed out already in Chapter 3, the existence of base modification without (overt) affixation has led many linguists to conclude that we cannot reasonably reduce the operation of morphology to concatenation – even if morphophonological alternations are factored out of the equation. An adequate description of base modification patterns still requires either non-concatenative operations or zero affixes. And if non-concatenative operations must be posited anyway, nothing is really sacrificed by positing that the same kinds of principles govern morphophonological alternations as well. And since zero affixes are virtually unrestricted theoretical devices, shuttling morphophonological alternations off to the phonology does not clearly lead to a simpler, more restrictive morphology (despite frequent assumptions to the contrary). Theoretical concerns thus also seem to come down on the side of morphology.

Now, a word of caution is in order here, lest we think that the data unques-tionably favour the morphological approach. The need for non-concatenative operations in the morphological system does not entail that *all* morphophonological alternations are morphology. A description of morphology that includes only concatenative rules forces morphophonology to be treated as phonology, but a model that allows non-concatenative morphological operations is, in principle, compatible with both a morphological and a phonological approach to these alternations (although perhaps more naturally aligned with the former). The key question thus becomes: Is phonology ever sensitive to morphological structure? If not, we can safely conclude that morphophonological alternations necessarily belong to the domain of morphology. But if not, we must be more careful in our conclusions.

It turns out that there is at least one good candidate for morphology-sensitive phonology: phonotactic constraints at morpheme boundaries. Affixation sometimes creates combinations of sounds that are not allowed morpheme-internally (e.g. *pd* in Lezgian *tip-di* 'type', the consonant cluster [ksts] in English *text-s*). More violations of **morpheme structure conditions** were presented in Section 4.2, including a pattern in Standard Northern Italian whereby an alternation between [z] and [s] ([z] between vowels and [s] elsewhere) is violated morpheme initially, e.g. *a*[s]*immetrico* 'asymmetric'. So it seems that phonotactic constraints are sometimes sensitive to morphological structure. And given that phonotactics are considered a core aspect of phonological structure, it may turn out that little is sacrificed by allowing morphologically-conditioned phonological rules, i.e. (some) morphophonological alternations as affix-induced phonology.

The proper place of morphophonology has not been conclusively settled. As should be obvious from the discussion in this chapter, analyses of the

morphology–phonology boundary depend crucially on a host of other assumptions about how morphology and phonology function. As long as debates in those areas continue, morphophonological alternations will probably continue to be a contentious issue.

Summary of Chapter 10

Two types of alternations can be distinguished: automatic alternations and morphophonological alternations. They differ in a variety of ways: automatic alternations show clear signs of phonetic motivation, may be optional and may apply across word boundaries, whereas morphophonological alternations have lost their connection to phonetics, have morphological conditioning, are obligatory and apply within words. Morphophonological alternations vary in productivity. Diachronically, automatic alternations turn into morphophonological alternations. Some languages have two types of affixes (here called neutral and integrated), depending on the type of alternation that they trigger.

   It is widely agreed that automatic alternations are phonological in nature, but the status of morphophonological alternations is controversial. A strict morpheme-based model requires morphophonological rules to belong to the phonological component of the grammar. For instance, in a level ordering account, morphophonological and automatic alternations (and neutral and integrated affixes) correspond to different rule blocks that are ordered relative to each other. However, this approach encounters a number of serious theoretical and empirical problems. The alternative hypothesis – that morphophonological alternations belong to the morphological component – is appealing because it can account for commonalities that morphophonology has with morphology.

Further reading

Alternations and derivational phonology are discussed in every phonology textbook (e.g. Gussenhoven and Jacobs 2005: ch. 6). The most influential work in derivational phonology is Chomsky and Halle (1968).

   The view that only automatic alternations are phonological and morphophonological alternations really belong to the morphology is highlighted in Hooper (1976) and Bochner (1993), among many others. The opposing view is defended in Mohanan (1995) and Kiparsky (1996). A

variety of approaches to morphophonology are discussed in the papers in Singh (1996).

For diachronic change from phonological to morphophonological rules, see Wurzel (1980) and Joseph and Janda (1988).

For the theory of level ordering (also called 'Lexical Phonology'), see Kiparsky (1982, 1985) and Kaisse and Shaw (1985). Optimality Theory is a constraint-based framework that has been developed to explore some of the same interactions between morphology and phonology that motivated level ordering. Major references include Prince and Smolensky (1993), McCarthy and Prince (1993a, b), and Kager (1999). (Classical OT rejects the principle of level ordering, but it is worth mentioning Stratal Optimality Theory (Kiparsky 2000), which has adopted some of its fundamental insights.)

Kiparsky (1982), Fabb (1988), Aronoff and Fuhrhop (2002), Hay and Plag (2004) and Plag and Baayen (2009) investigate affix order restrictions (in English) and their relation to productivity and other factors.

The most comprehensive book on morphophonology is Dressler (1985). Important insights on morphophonology are found in Bybee (1985, 2001).

Comprehension exercises

1. Is the voicing alternation of English fricatives in
   leaf/leaves
   knife/knives
   house/houses, etc.

   an automatic or a morphophonological alternation?

2. English has a morphophonological alternation of [ŋ] and [ŋg] – e.g. *young* [jʌŋ], *younger* [jʌŋgr̩]. Is this a relic alternation, a common alternation or a productive alternation?

3. Decide whether the following alternations are automatic or morphophonological, on the basis of the (necessarily incomplete) information given here.

   a. In Hausa, the alveolars *t, d, s, z* palatalize to *c* [tʃ], *j* [dʒ], *sh* [ʃ], *j* [dʒ] when they occur before an original front vowel (Newman 2000: 414–15):

kàazaa	'hen'	*kàajii*	'hens'
cìizaa	'bite'	*cìiji*	'bite' (imperative)
Hausa	'Hausa'	*Bàhaushèe*	'Hausa person'
gwadàa	'measure'	*gwajìi*	'experiment' (deverbal noun)

Recent sound changes have created new cases of *ee* and *i*:

	original form			current form
ai > ee	tàibà	>	tèebà	'cooked cassava flour'
	ƙoosai	>	*ƙoosee*	'fried beancake'
u > i	*tukaatukii* >		*tikàatikii*	'calf, shin'

Some English loanwords:
laasiisìi   'licence'
teebur   'table'
gàzêt   'gazette'

b. In Spanish, the voiced stops *b, d, g* alternate with the fricatives [β, ð, γ] if a vowel or fricative precedes them:

el dedo [el deðo]	'the finger'
los dedos [loz ðeðos]	'the fingers'
Damiano viene [damjano βjene]	'Damiano is coming'
viene Damiano [bjene ðamjano]	'Damiano is coming'

c. In Modern Greek, the velar phonemes [k], [g], [x], [γ] alternate with the palatal phonemes [c], [ɟ], [ç], [j] whenever they precede a front vowel ([e] or [i]), e.g.

1SG	steko	exo
2SG	stecis	eçis
3SG	steci	eçi
1PL	stekume	exume
2PL	stecete	eçete
3PL	stekun	exun
	'stand'	'have'

Some loanwords: [cinino] 'chinine', [ɟemi] 'reins' (from Turkish *gem*).

d. In Polish, the vowel [o] alternates with [u] (spelled *ó*) in certain morphological forms when the morpheme-final consonant does not start a new syllable, e.g.

głowa	'head.NOM.SG'	*głów*	'head.GEN.PL'
głodu	'hunger.GEN.SG'	*głód*	'hunger.NOM.SG'
woda	'water'	*wódka*	'vodka'

However, there are numerous exceptions to this rule, not just loanwords:

spora	'spore.NOM.SG'	*spor*	'spore.GEN.PL'
kodu	'code.GEN.SG'	*kod*	'code.NOM.SG'
wódeczka	'little vodka'	*wódka*	'vodka'

4. We saw that Zulu Labial Palatalization is a morphophonological alternation (and not an automatic alternation), because it is tied to particular morphological contexts. What other criteria can be invoked to support that conclusion?

Morphology and valence

<div style="text-align: right; font-size: larger;">**11**</div>

So far we have focused our attention primarily on form-related aspects of morphology. But this chapter will be entirely devoted to one type of function of morphological patterns. We will examine various ways in which morphology can affect valence – i.e. the expression of arguments in verbs and deverbal formations. We will first look at valence-changing operations such as passives and causatives (Section 11.1), then move on to the way in which valence is affected by compounding (Section 11.2), and finally discuss what happens to verbal arguments in transpositional derivation (i.e. derivational patterns that change the base's word-class) (Section 11.3) and transpositional inflection (Section 11.4).

11.1 Valence-changing operations

11.1.1 Semantic valence and syntactic valence (argument structure and function structure)

Most verbs are associated with one, two or three **arguments** as part of their lexical entries (verbs with zero or more than three arguments are very rare, and many languages lack them completely). When we know a verb's meaning, we also know the **semantic roles** (alternatively, **thematic relations**) of the participants of the verbal event. For example, a verb that means 'eat' will have an **agent** participant (the entity doing the eating) and a **patient** participant (the thing being eaten) in all languages, a verb meaning 'please' will have an **experiencer** and a **stimulus** participant, and a verb that means 'steal, rob' will have an agent, a **theme** (the thing that is taken away) and a **source** participant. But this knowledge is not sufficient if we want to use these verbs, because the **syntactic functions** (such as subject, object, **oblique**) by which these participants are expressed differ

from language to language and from verb to verb. As a concrete example, the semantic-role structures and the syntactic-function structures of five English verbs are given in (11.1).

(11.1) a. *eat*:   SBJ   —   OBJ
               | |
             agent   patient
             (*Robert ate a mango.*)

  b. *like*:   SBJ   —   OBJ
                 | |
             experiencer stimulus
             (*I like this song.*)

  c. *please*: SBJ   —   OBJ
                  | |
              stimulus   experiencer
              (*This song pleases me.*)

  d. *steal*: SBJ   —   OBJ   —   OBL*from*
                 | | |
              agent   theme   source
              (*Baba stole my bike from me.*)

  e. *rob*:   SBJ   —   OBJ   —   OBL*of*
               | | |
             agent   source   theme
             (*Baba robbed me of my bike.*)

The verbs *please* and *like*, and the verbs *steal* and *rob*, are roughly synonymous, so there is no way to predict their different behaviour from their meanings. Hence speakers must store not only the meaning of every verb, but also the syntactic functions that are associated with the semantic roles. Thus, the lexical entries of the verbs *please* and *rob* would look as in (11.2).

(11.2) a. ⎡ /pli:z/v   ⎤   b. ⎡ /rɒb/v   ⎤
        ⎢   SBJ   —   OBJ   ⎢   ⎢   SBJ   —   OBJ   —   OBL*of* ⎢
        ⎢ | | ⎢   ⎢ | | | ⎢
        ⎢   stimulus   experiencer   ⎢   ⎢   agent   source   theme ⎢
        ⎣   'please'   ⎦   ⎣   'rob'   ⎦

The information that these entries contain in addition to the pronunciation, the word-class and the meaning is called the **valence** of the verb. The valence has two parts: the syntactic-function structure ('syntactic valence',

also called simply **function structure**),[1] and the semantic-role structure ('semantic valence', also called **argument structure**).[2]

The argument structure can in principle be derived from the meaning (or **conceptual structure**, or **event structure**) of a verb. For example, a formal decomposition of the meaning of *steal* or *rob* looks as in (11.3) (see Jackendoff 1990).

(11.3) $\left[\begin{array}{l} \text{CAUSE } ([A], [\text{GOPOSS } ([B], [\text{FROM } ([C])])]) \\ \{\text{BY-FORCE}\} \end{array} \right]$

(11.3) can be paraphrased as '*A* causes *B* to go from *C*'s possession by force' – i.e. *A* robs *C* of *B*. The participant *A* must be an agent because it is the first role of the semantic element CAUSE; the participant *B* must be a theme because it is the first role of the semantic element GO; and *C* must be a source because it is the participant of FROM. Thus, it would in principle be possible to formulate the linking rules as direct links between the conceptual structure and the syntactic-function structure. The lexical entry of the verb *steal* would then be as in (11.4), where there is no separate argument structure.

(11.4) $\left[\begin{array}{l} /\text{sti:l}/\text{v} \\ \quad\quad\quad \text{SBJ} \quad\quad \text{OBJ} \quad\quad \text{OBL}\textit{from} \\ \quad\quad\quad\quad | \quad\quad\quad\quad | \quad\quad\quad\quad | \\ \text{'CAUSE } ([A], [\text{GOPOSS } ([B], [\text{FROM } ([C])])])' \\ \{\text{BY-FORCE}\} \end{array} \right]$

Although it is actually quite likely that the format of (11.4) is closer to the truth than the format of (11.2), in the present context a practical problem is that there is much less agreement about the right form of the conceptual decomposition of verb meanings than about semantic roles. Thus, we will mostly continue to use the simplified format of (11.2), bearing in mind that this is just an abbreviation and that the complete picture requires a more elaborate specification of verb meaning along the lines of (11.3).

Now morphological operations may change the valence of a verb in two different ways. On the one hand, they may change the linking of semantic roles to syntactic functions. Such operations are called **function-changing operations** (or **voice**). On the other hand, they may change the conceptual

---

[1]   The most important syntactic functions are subject (SBJ), (direct) object (OBJ) and oblique (OBL – i.e. adpositional phrases and phrases in oblique cases). Two further functions that are needed less commonly are indirect object (IOBJ) and adverbial (ADV). A syntactic function that is needed for noun phrase structure is possessor (POSS).

[2]   The links between argument-structure positions and function-structure positions (indicated here by lines) are governed by a set of rules that have been extensively discussed by syntacticians and that we cannot go into here. The crucial point is that the rules cannot be entirely independent of knowledge of particular verbs. At least for some verbs such as *like* and *please* the function structure must be part of the lexical entry because it is idiosyncratic.

structure (or event structure) of the verb in such a way that the argument structure is affected. We will refer to such operations as **event-changing operations**. Examples of both subtypes of valence-changing operations will be seen in the following sections.

11.1.2 Agent-backgrounding operations

The best-known function-changing operation is the **passive**, where the agent is backgrounded in that it is no longer the subject. Instead, the patient usually becomes the subject. English has a passive construction, of course: compare the active sentence *Mark wrote a letter* with the corresponding passive one *The letter was written (by Mark)*. The passive in English has a complicated form, however, (involving both an auxiliary and a participle), so we will look here at the Chichewa passive, which is more clearly morphological and therefore serves our purposes better (the Chichewa type is far more common in the world's languages anyway). Examples of an active and a passive sentence from Chichewa are given in (11.5).

(11.5) a. *Naphiri*   *a-na-lemba*   *kalata.*
         Naphiri   3SG-PST-write   letter
         'Naphiri wrote a letter.'

      b. *Kalata*   *i-na-lemb-edwa*   *(ndi*   *Naphiri).*
         letter   3SG-PST-write-PASS   by   Naphiri
         'The letter was written (by Naphiri).'
                          (Dubinsky and Simango 1996: 751–2)

In Chichewa, the passive is marked by the suffix *-idw/-edw*, which is attached directly to the verb stem (the ending *-a* is a stem extension that need not concern us here). Its syntactic effect is that the patient is linked to the subject function and the agent is linked to the OBL*ndi* function. As in English, the oblique agent is optional, as is indicated by the parentheses. Thus, we can formulate the rule for passivization as in (11.6).

(11.6)
$$
\begin{bmatrix} /\text{Xa}/_\text{V} \\ \text{SBJ} \quad\text{—}\quad \text{OBJ} \\ | \qquad | \\ \text{agent} \quad \text{patient} \\ \text{'do}_\text{X}\text{'} \end{bmatrix}
\leftrightarrow
\begin{bmatrix} /\text{Xidwa}/_\text{V} \\ (\text{OBL}ndi) \quad\text{—}\quad \text{SBJ} \\ | \qquad | \\ \text{agent} \quad \text{patient} \\ \text{'be done}_\text{X}\text{'} \end{bmatrix}
$$

Here, all that changes is the phonological form of the verb and the function structure of the verb (as well as the linking to the semantic roles). The argument structure is unaffected – it still specifies both an agent participant and a patient participant. Even when the oblique agent is omitted, it is still present implicitly: the sentence *kalata inalembedwa* means that some unspecified agent wrote the letter (not just that some agentless letter writing

took place), as is clear from a sentence like (11.7), where the adverb *mwadala* 'deliberately' presupposes such an agent.

(11.7) *Chitseko   chi-na-tsek-edwa   mwadala.*
          door   3SG-PST-close-PASS   deliberately
          'The door was closed deliberately.'
                                                    (Dubinsky and Simango 1996: 751)

The passive is thus a prototypical example of a function-changing operation, or voice.

A clear example of an event-changing operation is the **anticausative**, where the agent-backgrounding is much more radical than in the passive. Here, the agent is completely removed from the argument structure. An example comes from Russian, where the anticausative is expressed by the suffix *-sja/-s'*.

(11.8) a. *Vera   zakryla   dver'.*
              Vera.NOM   closed   door.ACC
              'Vera closed the door.'

         b. *Dver'   zakryla-s'.*
              door.NOM   closed-ANTIC
              'The door closed.'

(11.9)
$$
\begin{bmatrix}
/X/_{\text{V}} \\
\text{SBJ} \quad\text{—}\quad \text{OBJ} \\
\quad|\qquad\quad| \\
\text{agent}\quad\text{patient} \\
\text{'CAUSE ([}A\text{], [BECOME ([STATE}_\text{X}\text{ ([}B\text{])])])'}
\end{bmatrix}
\leftrightarrow
\begin{bmatrix}
/X\text{sja}/_{\text{V}} \\
\text{SBJ} \\
| \\
\text{patient} \\
\text{'BECOME ([STATE}_\text{X}\text{ ([}B\text{])])'}
\end{bmatrix}
$$

In (11.9) we see that not only is the agent removed from the argument structure, but also the CAUSE element is eliminated from the conceptual structure (hence the term 'anticausative'). It is in this sense that the anticausative is event changing and not merely function changing. The function change (patient becoming subject) is an almost trivial consequence of the main function of the anticausative. That the agent is not present in the argument structure (and in the verb meaning) can also be seen from the fact that it cannot appear as an oblique argument *(*Dver' zakrylas' Veroj* 'The door closed by Vera'), and no agent-oriented adverbials may occur in the sentence *(*Dver' zakrylas' namerenno* 'The door closed deliberately'; this sentence is possible only in an unlikely world in which doors have intentions).

An even more radical change in the event structure of the verb is effected by the **resultative** (or **stative**) operation, which removes not only the 'cause' part of the event structure together with the agent, but also the 'become' part. An example of a resultative (marked by the suffix *-ik/-ek*) from Chichewa,

which contrasts with the passive in (11.7), is given in (11.10a). The active and resultative event structures are given in (11.10b).

(11.10) a. *Chitseko*   *chi-na-tsek-eka.*
              door   3SG-PST-close-RESULT
              'The door was closed (= in a closed state).'

        b. 'CAUSE ([*A*], [BECOME ([CLOSED ([*B*])])])' ↔ 'CLOSED ([*B*])'

As in the Russian anticausative, neither an oblique agent nor an agent-oriented adverb is permitted (**Chitseko chinatsekeka ndi Naphiri* 'The door was in a closed state by Naphiri'; **Chitseko chinatsekeka mwadala* 'The door was in a closed state deliberately') (Dubinsky and Simango 1996: 751). Note that an interesting feature of the anticausative and resultative operations is that they are semantically subtractive – i.e. the derived form removes part of the conceptual structure of the base.

   Finally, another example of a valence-changing operation is the **reflexive**, where the agent and the patient are **coreferential** and hence can be thought of as occupying a single syntactic function. Examples of an active and a reflexive verb in Eastern Armenian are given in (11.11a) and (11.11b), respectively, and the rule is given in (11.12).[3]

(11.11) a. *Mayr-ə*   *lvan-um*   *e*   *Seda-yi-n.*
              mother-ART   wash-PRS   AUX   Seda-DAT-ART
              'Mother is washing Seda.'

        b. *Seda-n*   *lva-cv-um*   *e.*
              Seda(NOM)-ART   wash-REFL-PRS   AUX
              'Seda is washing (herself).'
                                                        (Kozinceva 1981: 83)

$$
(11.12) \quad
\begin{bmatrix}
/\text{Xnum}/_V \\
\text{SBJ} \quad — \quad \text{OBJ} \\
| \qquad\qquad | \\
\text{agent} \quad\quad \text{patient} \\
\text{'A acts}_X \text{ on B'}
\end{bmatrix}
\leftrightarrow
\begin{bmatrix}
/\text{Xcvum}/_V \\
\text{SBJ} \\
\diagup \quad\quad \diagdown \\
\text{agént}_i \quad\quad \text{patient}_i \\
\text{'A acts}_X \text{ on self'}
\end{bmatrix}
$$

In the reflexive voice, the meaning of the verb remains the same, but it is specified that the agent and the patient are coreferential (indicated in the right-hand word-schema in (11.12)). Thus, although the reflexive is not really event-changing, its effect is not strictly limited to function changing either. It is thus a borderline case between the two subtypes of valence-changing operations.

---

[3]   Coreferentiality is conventionally indicated by subscript letters. So, the subscript *i* in both *agent$_i$* and *patient$_i$* in (11.12) indicates that the agent and patient refer to the same entity. Different subscript letters are used when two participants are not coreferential.

11.1.3 Patient-backgrounding operations

Antipassive is the term for a morphological operation whose effect is to background the patient in much the same way as the agent is backgrounded in the passive. An example of an active and an antipassive construction from West Greenlandic is shown in (11.13a–b). Note that the oblique patient is marked by the instrumental case in West Greenlandic. The relevant part from the antipassive rule is given in (11.14).

(11.13) a. *Qimmi-p*   *inu-it*   *tuqup-pai.*
             dog-ERG.SG   person-ABS.PL   kill-3SG.SBJ/3PL.OBJ.IND
             'The dog killed the people.'

       b. *Qimmiq*   *(inun-nik)*   *tuqut-si-vuq.*
             dog(ABS)   person-INST.PL   kill-ANTIP-3SG.IND
             'The dog killed (people).'

                                                        (Fortescue 1984: 86, 206)

(11.14) $\begin{bmatrix} \text{SBJ} & \text{—} & \text{OBJ} \\ | & & | \\ \text{agent} & & \text{patient} \end{bmatrix} \leftrightarrow \begin{bmatrix} \text{SBJ} & \text{—} & (\text{OBL}\textit{inst}) \\ | & & | \\ \text{agent} & & \text{patient} \end{bmatrix}$

Now we might ask whether there is also a patient-backgrounding operation that completely removes the patient from the argument structure (parallel to how the agent is removed from the argument structure in the anticausative). And, indeed, some languages have a valence-changing affix whose effect is that the patient cannot be expressed at all. We may call this operation **deobjective**. An example comes from Tzutujil.

(11.15) a. *x-Ø-uu-ch'ey*
             PST-3SG.OBJ-3SG.SBJ-hit
             'he hit him'

       b. *x-Ø-ch'ey-oon-i*
             PST-3SG.SBJ-hit-DEOBJ-PST
             'he was hitting'

                                                        (Dayley 1985: 89, 116)

(11.15b) is an intransitive verb in all respects: it has the suffix *-i* in addition to the prefix *x-* in the past tense (cf. *x-eel-i* 'he went out', contrasting with *x-uu-ch'ey* in (11.15a) where there is no *-i*), it has only a single person–number prefix for the subject, and it does not allow a patient to be expressed. However, it is unlikely that (11.15b) has a different event structure from (11.15a), because it is difficult to conceive of a hitting event without a patient participant – for hitting to occur, there must be something that is being hit. In anticausatives, agents can be eliminated from the event structure because the 'cause' element is eliminated: we can think of opening, breaking and similar events as occurring either through an external agent or spontaneously, but we

cannot easily think of such events as occurring without a patient. Thus, the most likely valence-changing effect of the deobjective is that shown in (11.16). The crossed linking line above 'patient' means that this semantic role cannot be linked to any syntactic function.

(11.16)
$$
\begin{bmatrix} \text{SBJ} & \text{---} & \text{OBJ} \\ | & & | \\ \text{agent} & & \text{patient} \end{bmatrix}
\leftrightarrow
\begin{bmatrix} \text{SBJ} & & \\ | & & \times \\ \text{agent} & \text{patient} \end{bmatrix}
$$

Thus, patient-backgrounding operations seem to be exclusively function changing.

11.1.4 Agent-adding operations: causatives

When a new participant is added to a verb, the event structure must be enriched as well, so the **causative** is clearly an event-changing operation. Two examples of causative constructions from Japanese are given in (11.17b)–(11.18b), and (11.17c)–(11.18c) show the valence-changing rules.

(11.17) a. *Taroo   ga   ik-u.*
Taro   NOM   go-PRS
'Taro goes.'

b. *Hanako   ga   Taroo   o   ik-ase-ta.*
Hanako   NOM   Taro   ACC   go-CAUS-PST
'Hanako made Taro go.'
(Shibatani 1990: 308–10)

c.
$$
\begin{bmatrix} \text{SBJ} \\ | \\ \text{agent} \end{bmatrix}
\leftrightarrow
\begin{bmatrix} \text{SBJ} & \text{---} & \text{OBJ} \\ | & & | \\ \text{causer} & & \text{agent} \end{bmatrix}
$$

(11.18) a. *Taroo   ga   hon   o   yom-u.*
Taro   NOM   book   ACC   read-PRS
'Taro reads a book.'

b. *Hanako   ga   Taroo   ni   hon   o   yom-ase-ta.*
Hanako   NOM   Taro   DAT   book   ACC   read-CAUS-PST
'Hanako made Taro read a book.'
(Shibatani 1990: 310)

c.
$$
\begin{bmatrix} \text{SBJ} & \text{---} & \text{OBJ} \\ | & & | \\ \text{agent} & & \text{patient} \end{bmatrix}
\leftrightarrow
\begin{bmatrix} \text{SBJ} & \text{---} & \text{IOBJ} & \text{---} & \text{OBJ} \\ | & & | & & | \\ \text{causer} & & \text{agent} & & \text{patient} \end{bmatrix}
$$

The semantic change in the event structure is obvious: it consists in adding the element 'cause' and with it a causer role (e.g. for 'go': [GO ([A])] ↔

[CAUSE ([D], GO ([A]))]). The linking of semantic roles to syntactic functions in causatives is complicated because languages cannot simply create a new syntactic function for the new role. Instead, causative verbs are made to fit into the existing function structures. The agent of an intransitive verb becomes an object as in (11.17b–c), but the agent of a transitive verb often becomes an indirect object (as in 11.18b–c), especially in languages that do not allow two equal objects.

Causatives are probably the most common type of morphological valence-changing operation in the world's languages, but since they happen to be rare in Europe, linguists have often paid more attention to the agent-backgrounding constructions that are so common and varied in Europe.

11.1.5 Object-creating operations: applicatives

The **applicative** operation creates a completely new object in the function structure of the verb or shifts a non-object to the object function. An example of the latter kind comes from German, where the productive verbal prefix *be-* can have the effect of turning an indirect object into a direct object. The original direct object can be omitted or expressed as an oblique phrase. Example (11.19b) is the applicative construction corresponding to (11.19a).

(11.19) a. *IKEA   liefert   dem Nachbar-n   die   Möbel.*
IKEA   delivers   the   neighbour-DAT   the   furniture.ACC
'IKEA delivers furniture to the neighbour.'

b. *IKEA   be-liefert   den   Nachbar-n   (mit   Möbeln).*
IKEA   APPL-delivers   the neighbour-ACC   with   furniture
'IKEA delivers furniture to the neighbour.'

c. $\begin{bmatrix} \text{SBJ} & — & \text{OBJ} & — & \text{IOBJ} \\ | & & | & & | \\ \text{agent} & \text{patient} & & \text{recipient} \end{bmatrix} \leftrightarrow \begin{bmatrix} \text{SBJ} & (\text{OBL}mit) & \text{OBJ} \\ | & | & | \\ \text{agent} & \text{patient} & \text{recipient} \end{bmatrix}$

This construction is called a **recipient applicative** because it is the recipient that becomes a direct object, and therefore receives accusative case. Cross-linguistically, almost all roles apart from the agent can become direct objects when an applicative marker is added to the verb. An example of a **locative applicative** from Ainu is shown in (11.20b).

(11.20) a. *A-kor   kotan   ta   sirepa-an.*
1SG-POSS   village   to   arrive-1SG.INTR
'I arrived at my village.'

b. *A-kor   kotan   a-e-sirepa.*
1SG-POSS   village   1SG.TR-APPL-arrive
'I arrived at my village.'

(Shibatani 1990: 65)

c. $\begin{bmatrix} \text{SBJ} & — & \text{ADV} \\ | & & | \\ \text{agent} & & \text{location} \end{bmatrix} \leftrightarrow \begin{bmatrix} \text{SBJ} & — & \text{OBJ} \\ | & & | \\ \text{agent} & & \text{location} \end{bmatrix}$

Ainu has no case marking, but the subject-agreement marker *a-*, which is restricted to transitive verbs, clearly shows that the applicative prefix *e-* creates a direct-object function in the derived verb's function structure.

However, an applicative may also add an object argument that was not in the function structure of the verb before. For example, Chamorro has a **benefactive applicative**, illustrated in (11.21b).

(11.21) a. *Ha   hatsa   i   acho'.*
          he.ERG lift   ABS   stone
          'He lifted the stone.'

      b. *Ha   hatsa-yi si   Pedro ni   acho'.*
          he-ERG lift-APPL ABS Pedro OBL stone
          'He lifted the stone for Pedro.'

                                  (Topping 1973: 253)

Thus, here the applicative adds a new participant (a beneficiary) to the argument structure:

(11.21) c. $\begin{bmatrix} \text{SBJ} & — & \text{OBJ} \\ | & & | \\ \text{agent} & & \text{patient} \end{bmatrix} \leftrightarrow \begin{bmatrix} \text{SBJ} & — & \text{OBL} & — & \text{OBJ} \\ | & & | & & | \\ \text{agent} & & \text{patient} & & \text{beneficiary} \end{bmatrix}$

In the non-applicative construction, the patient is associated with the syntactic function of the object (indicated by the **absolutive** case in (11.21a)), but in the applicative construction the new argument of the verb – the beneficiary – is linked to the object function, and so it receives absolutive case. Correspondingly, the patient is linked to the oblique.

This means that applicatives can be either function changing (as in (11.19) and (11.20)) or event changing (as in (11.21)). One might propose that these two subtypes of applicatives should be given different names, but it is in fact not so easy to keep them apart. One might argue, for instance, that the 'location argument' of the Ainu verb *sirepa* is not in fact an argument but an **adjunct**; this would make it event changing as well. Moreover, some languages use the same affix for both benefactive and recipient applicatives, suggesting that this is indeed the same kind of operation. Thus, a sharp distinction between event-changing and function-changing operations can be problematic.

11.1.6 General properties of valence-changing operations

As we have seen, valence-changing operations primarily affect agents/ subjects and patients/direct objects. Other participants can be promoted

to object (or occasionally to subject) status, but there are no operations that change an oblique to an indirect object, for example. Explaining such possible restrictions on valence changing is a matter for syntactic and semantic theories of verbal event structure and argument linking, and thus largely beyond the scope of this book.

However, here it still needs to be pointed out that the semantic/syntactic contrast between event-changing and function-changing operations shows a clear correlation with derivational and inflectional status of the valence-changing affixes. Passives and antipassives are primarily inflectional, whereas anticausatives, resultatives and causatives are primarily derivational. Reflexives and applicatives tend to show mixed behaviour, again correlating with their intermediate status with respect to the event-changing/function-changing contrast.

Since inflectional operations may apply after derivational ones, but the reverse is not typically true (see Chapter 5), an important consequence of this contrast is the prediction that it should be possible to apply a function-changing operation to an event-changing operation, but not vice versa. This seems generally to be true. For example, in Chichewa the passive suffix *-idw* (a function-changing operation; see (11.5) above) can be attached to a benefactive applicative verb in *-ir*.

(11.22) a. *Chibwe   a-na-phik-ir-idwa   nyemba.*
            Chibwe   3SG-PST-cook-APPL-PASS   beans
            'Chibwe was cooked beans for.'
                                    (Dubinsky and Simango 1996: 752)

b.   active: benefactive applicative: passive:

$$
\begin{bmatrix} \text{SBJ} & — & \text{OBJ} \\ | & & | \\ \text{agent} & & \text{patient} \end{bmatrix} \leftrightarrow \begin{bmatrix} \text{SBJ} & — & \text{OBJ} & — & \text{OBL}_\varnothing \\ | & & | & & | \\ \text{agent} & & \text{beneficiary} & & \text{patient} \end{bmatrix} \leftrightarrow \begin{bmatrix} (\text{OBL}ndi) & \text{SBJ} & \text{OBL}_\varnothing \\ | & | & | \\ \text{agent} & \text{beneficiary} & \text{patient} \end{bmatrix}
$$
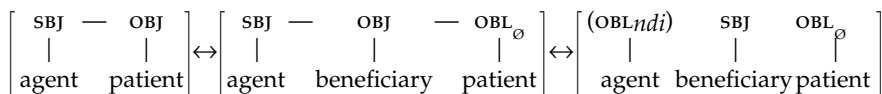
The reverse ordering is not possible in Chichewa, although it would make sense semantically (cf. 11.23a). However, the applicative suffix can follow the resultative suffix, as in (11.23b), because the applicative and the resultative are both event-changing operations.

(11.23) a. **Chitseko   chi-na-tsekul-idw-ira   Chibwe.*
             door   3SG-PST-open-PASS-APPL   Chibwe
             'The door was opened for Chibwe.'

       b. *Chitseko   chi-na-tseku-k-ira   Chibwe.*
            door   3SG-PST-open-RESULT-APPL Chibwe
            'The door was opened (= in an opened state) for Chibwe.'
                                    (Dubinsky and Simango 1996: 757)

Valence-changing operations are in many ways syntactic phenomena, and in languages where they are signalled by specific morphological patterns, they also clearly belong to morphology. However, most of the operations that we have seen in this section also occur with no specific formal coding. For instance, English has alternations such as (11.24)–(11.25).

(11.24) a. *I opened the door.*
      b. *The door opened.*

(11.25) a. *I baked a cake for her.*
      b. *I baked her a cake.*

The alternation in (11.24) clearly resembles the anticausative and the causative operation, and (11.25) is very much like a benefactive applicative. The English alternations are not usually discussed under the heading of morphology, but there is really no deep reason why they should not. Morphological operations need not be associated with a particular change in the pronunciation, as we saw earlier (e.g. Section 3.1.4). When they are not, morphologists speak of conversion, and, while this term is mostly applied to word-class-changing operations, it could easily be transferred to valence-changing operations. Note also that such valence-changing operations may vary in productivity, from sporadic to extremely productive, much like other morphological processes.

11.2 Valence in compounding

When one of the members of a compound takes arguments, this may be affected by the compound structure and the result may be a kind of valence change. We will look at valence change in three different compound types: noun incorporation, V–V compound verbs and synthetic compounds.

11.2.1 Noun incorporation

Noun incorporation is the traditional term for N–V compounds with a verbal head; we have encountered examples already in Sections 7.1 and 9.1. Since verbs typically require arguments, it is natural for incorporated nouns to occupy an argument position of the verb. Consider (11.26) from Guaraní.

(11.26) a. *A-jogua-ta   petei   mba'e.*
        1ACT-buy-FUT one   thing
        'I will buy something.'

      b. *A-mba'e-jogua-ta.*
        1ACT-thing-buy-FUT
        'I'll go shopping.'
        Lit: 'I'll thing-buy.'

                            (Velázquez-Castillo 1996: 107)

In incorporated structures like (11.26b), the dependent noun is clearly part of the compound verb, and not a separate word. For instance, as shown in (11.27), the incorporated noun cannot be modified by an adjective. (The different placement of the future marker in (11.26) and (11.27) is not directly relevant here.) This indicates that the dependent noun is not an independent word, but rather a member of the compound. (See Section 9.1 for discussion of compounding tests.)

(11.27) *A-ha-ta   a-mba'e-hepy-jogua
       1ACT-go-FUT   1ACT-thing-expensive-buy
       'I'll go shopping for expensive items.'
       Lit: 'I will go expensive-thing-buying.'
                           (Velázquez-Castillo 1996: 108)

Now, the interesting thing here is that in (11.26b) the noun is also the patient of the verbal action. This raises the question: In noun incorporation, is specification of valence necessarily part of the compounding rule?

One possibility would be to simply say that the semantic relation between the head verb and the dependent noun is vague, as in English N–N compounds (e.g. *lipstick*). The patient interpretation ('buy things') would then be a natural implicature, but not strictly speaking part of the compound verb's meaning. If this is so, we would expect incorporated nouns to be able to fulfil other semantic roles besides the patient, and this is indeed possible in quite a few languages with noun incorporation. Example (11.28) is from Huauhtla Nahuatl.

(11.28) *Ya'   ki-kocčillo-tete'ki   panci.*
       he   3SG.OBJ-knife-cut   bread
       'He cut the bread with the knife.'
                               (Merlan 1976: 185)

Here, the incorporated noun *-kocčillo-* 'knife' is the instrument of the action. Thus, it may be that the noun incorporation rule in these languages does not affect the syntax of the verb at all, and that the valence change is only apparent.

Still, languages seem to differ in this respect. In many languages there is clear morphosyntactic evidence for a valence-changing effect of noun incorporation. This is the case, for example, in Ainu, which has different subject-agreement affixes in transitive and intransitive sentences, as we saw earlier in (11.20) (e.g. *-an* for first person singular intransitive, *a-* for first person singular transitive).

(11.29) a. *Inaw   a-ke.*
           inaw   1SG.TR-make
           'I make an *inaw* (a wooden prayer symbol).'

   b. *Inaw-ke-an.*
      inaw-make-1SG.INTR
      'I make an *inaw*.'

<div align="right">(Shibatani 1990: 11, 28)</div>

In contrast to the transitive simple verb *ke* 'make', the compound verb *inaw-ke* 'make an *inaw*' is intransitive, as is clearly seen in the choice of the subject affix. Thus, it is not sufficient to say that the patient interpretation in (11.29b) arises as a pragmatic implicature – here, it must be part of the compounding rule, which can be formulated as in (11.30).

$$(11.30) \quad \begin{bmatrix} /\mathrm{X/N} \\ \\ \\ 'x' \end{bmatrix} \,\&\, \begin{bmatrix} /\mathrm{Y/v} \\ \mathrm{SBJ} \\ | \\ \mathrm{agent_i} \\ \text{'A}_i \text{ acts on B}_j\text{'} \end{bmatrix} \quad \begin{matrix} \text{—} \\ \\ \\ \end{matrix} \begin{matrix} \mathrm{OBJ} \\ | \\ \mathrm{patient_j} \end{matrix} \;\leftrightarrow\; \begin{bmatrix} /\mathrm{XY/v} \\ \mathrm{SBJ} \\ | \\ \mathrm{agent_i} \\ \text{'A}_i \text{ acts on } x\text{'} \end{bmatrix}$$

As this rule shows, the patient variable of the semantic structure of the simple verb is filled by the meaning of the incorporated noun, so that the semantic structure of the compound verb contains only a single variable and hence only a single argument. As in the case of the reflexive voice (Section 11.1.2), we have here a borderline case between event changing and function changing.

11.2.2 V–V compound verbs

A compound type that is rarely found in European languages, but that is very interesting from the point of view of valence, is V–V compounding. Two well-known languages in which such compounds are common are Chinese and Japanese.

    The simplest and least problematic case involves two verbs with the same argument structure – e.g. Japanese *ukare-sawagu* [make.merry-be.noisy] 'go on a spree', Mandarin Chinese *tang-huai* [iron-break] 'ruin by ironing'. Example (11.31) shows how the Chinese verb is used.

(11.31) *Meimei   tang-huai   le   nei   jian   xin   yi.*
       sister   iron-break   PRF that   CLF   new   clothes
       'Sister ruined those new clothes by ironing them.'

<div align="right">(C. H. Chang 1998: 82)</div>

The rule for Chinese *tang-huai* could be formulated as in (11.32).[4]

---

[4]   Here we use a simplified representation because we are only interested in the way that elements of argument structure combine in compounding. Naturally, in a full representation, function structure and links between it and argument structure would also be specified.

(11.32) $\begin{bmatrix} /\text{X}/_\text{V} \\ \text{agent}_i \text{ patient}_j \\ \text{'A}_i \text{ acts}_x \text{ on B}_j\text{'} \end{bmatrix}$ & $\begin{bmatrix} /\text{Y}/_\text{V} \\ \text{agent}_i \text{ patient}_j \\ \text{'A}_i \text{ acts}_y \text{ on B}_j\text{'} \end{bmatrix}$ ↔ $\begin{bmatrix} /\text{XY}/_\text{V} \\ \text{agent}_i \text{ patient}_j \\ \text{'A}_i \text{ acts}_x \text{ and acts}_y \\ \text{ on B}_j\text{'} \end{bmatrix}$

However, both Chinese and Japanese allow verbs with different argument structures to be compounded as well. In Japanese, where compounds are usually right-headed, it is mostly the second verb that determines the argument structure of the compound. An example is given in (11.33), and the correspondence is shown in (11.34).

(11.33) *Sono booru wa   sora takaku (*Jon   ni yotte) uchi-agat-ta.*
the   ball   TOP sky high   John by   hit-go.up-PST
'The ball was hit high up in the air (by John).'
(Matsumoto 1996: 204)

(11.34) $\begin{bmatrix} /\text{uchi}/_\text{V} \\ \text{agent}_i \text{ patient}_j \\ \text{'A}_i \text{ hits B}_j\text{'} \end{bmatrix}$ & $\begin{bmatrix} /\text{agaru}/_\text{V} \\ \text{theme}_i \text{ direction}_k \\ \text{'A}_j \text{ goes up to B}_k\text{'} \end{bmatrix}$ ↔ $\begin{bmatrix} /\text{uchiagaru}/_\text{V} \\ \text{theme}_j \text{ direction}_k \\ \text{'A}_j \text{ is hit upwards} \\ \text{ to B}_k\text{'} \end{bmatrix}$

In *uchi-agaru* [hit-go.up] 'be hit high up in the air', the first verb is transitive and the second is intransitive (with an additional direction argument), and the theme of the head verb is identified with the patient of the dependent verb. The agent of the dependent verb completely disappears from the argument structure, as is shown by the fact that it cannot be expressed as a kind of passive agent. The head verb *agaru* contributes its arguments to the compound.

The association of intransitive theme and transitive patient is very natural (both of these semantic roles are affected by the processes in which they are involved), but an intransitive theme may also be identified with an intransitive agent:

(11.35) a. Japanese
hataraki-tsukareru   [work-get.tired]   'get tired from working'
tatakai-yabureru   [battle-lose]   'lose as a result of fighting'
(Matsumoto 1996: 204)

b. Chinese
zou-lei   [walk-get.tired]   'get tired from walking'
xiao-jiang   [laugh-stiff]   'be stiff from laughing'
(C. H. Chang 1998: 83)

(11.36) $\begin{bmatrix} /\text{hataraki}/_V \\ \text{agent}_i \\ \text{'A}_i \text{ works'} \end{bmatrix}$ & $\begin{bmatrix} /\text{tsukareru}/_V \\ \text{theme}_i \\ \text{'A}_i \text{ gets tired'} \end{bmatrix}$ ↔ $\begin{bmatrix} /\text{hataraki-tsukareru}/_V \\ \text{theme}_i \\ \text{'A}_i \text{ gets tired from A}_i \text{ working'} \end{bmatrix}$

Perhaps the most interesting type of V–V compound is the argument-mixing type, in which the compound verb's argument structure has arguments from both constituent verbs. An example is Japanese *mochi-kaeru* [have-return] 'bring back' – see (11.37) and the correspondence in (11.38).

(11.37) *Jon   wa   kamera   o   ie   ni   mochi-kaet-ta.*
       John TOP camera ACC house to have-return-PST
       'John brought the camera back home.'

(Matsumoto 1996: 208)

(11.38)
$\begin{bmatrix} /\text{mochi}/_V \\ \text{possessor}_i \text{ theme}_j \\ \text{'A}_i \text{ has B}_j\text{'} \end{bmatrix}$ & $\begin{bmatrix} /\text{kaeru}/_V \\ \text{agent}_i \quad \text{direction}_k \\ \text{'A}_i \text{ returns to C}_k\text{'} \end{bmatrix}$ ↔ $\begin{bmatrix} /\text{mochikaeru}/_V \\ \text{agent}_i \text{ theme}_j \text{ direction}_k \\ \text{'A}_i \text{ brings B}_j \text{ back to C}_k\text{'} \end{bmatrix}$

In this compound verb, all arguments of the constituent verbs end up as arguments of the compound verb. In this way, *mochikaeru* contrasts with *uchiagaru*. Clearly, Japanese V–V compounding consists of different sub-rules in which the argument linking is crucially different.

The final case to be mentioned here is the ambiguous type represented by Chinese *qi-lei* [ride-tired]. This can mean two different things:

(11.39) *Zhangsan   qi-lei   le   ma.*
       Zhangsan ride-tired PFV horse
       a. 'Zhangsan was tired from riding horses.'
       b. 'The horse was tired from Zhangsan's riding/Zhangsan rode the horse tired.'

(C. H. Chang 1998: 82)

Thus, here the theme argument of *lei* 'tired' can be identified either with the agent or with the patient of *qi* 'ride'.

11.2.3 Synthetic nominal compounds

A compound whose head is a deverbal noun and whose dependent member fills an argument position in the head's valence is often called a **synthetic compound**. Examples from English include N–N compounds of the following type:

(11.40) a. *truck driver*   b. *whale hunting*
              pipe smoker   *rat poisoning*
              air-cleaner   *duck-shooting*
              fire-fighter   *meter-feeding*

The deverbal head noun inherits the verb's valence requirements. Thus, the noun *driver* can be analyzed as taking a patient argument, like its base verb *drive*, and this argument is filled by *truck*, the dependent member of the compound. Likewise, the noun *hunting* can be analyzed as taking a patient argument, which is filled by *whale*. (Argument inheritance is discussed in Section 11.3 below.)

There are at least three different ways in which the semantic relationship between the head and the dependent member in a synthetic compound could be described. The first approach derives argument interpretation from a constituent structure that is different from that of ordinary N–N compounds. Consider the compounds in (11.41).

(11.41) a. *race driver*   b. *dog hunting*
              chain smoker   *food poisoning*
              vacuum cleaner   *gang shooting*
              freedom fighter   *breast feeding*
                              (some examples from Oshita 1995: 183, 189)

While formally similar to the examples in (11.40), these are not synthetic compounds because the dependent member does not fill an argument of the head. A chain smoker does not smoke chains (cf. *pipe-smoker*), a freedom fighter does not fight freedom (cf. *fire-fighter*), and food poisoning does not involve poisoning food (cf. *rat poisoning*). In this approach, the structure of *pipe-smoker* would be as in (11.42a), contrasting with that of *chain smoker* in (11.42b).

(11.42) a.   b.

An argument in favour of having different structures for synthetic and non-synthetic compounds is the fact that, in more complex compounds, a dependent noun that is interpreted as an argument must be closest to

the deverbal head: *chain pipe smoker*, but **pipe chain smoker*. The constituent structure analysis provides a natural account of the ungrammaticality of the second example.

However, the approach also makes some incorrect predictions. If synthetic compounds have the constituent structure $[[N\ V]_V\ \text{-}er]_N$, it is difficult to explain the systematic lack of N–V compounds in English: *pipe-smoker*, but **to pipe-smoke*; *hat-seller*, but **to hat-sell*; *churchgoer*, but **to churchgo*; *cab-driving*, but **to cab-drive*. And the few instances of N–V compounding that do exist seem to have been created by back-formation from the corresponding synthetic compounds, not directly as N–V compounds. For instance, *to skydive* is a backformation from *skydiving* and *skydiver*.

The second approach to synthetic compounds involves a special rule of argument linking, analogous to the incorporation rule above in Section 11.2.1 (ex (11.30)). Let us assume that the noun *hunting* has the argument structure [agent patient], just like the verb *hunt*, and the function structure [POSSESSOR*of* — OBLIQUE*by*] (e.g. *hunting of whales by traditional fishermen*). Then the compound *whale hunting* eliminates the patient/POSSESSOR*of* argument and the resulting compound is 'intransitive' – i.e. it takes only a single OBLIQUE*by* argument (e.g. *whale hunting by traditional fishermen*). The complete rule is shown in (11.43).

(11.43)
$$
\begin{bmatrix} /X/_N \\ \\ \\ \\ \\ 'x' \end{bmatrix}
\ \&\
\begin{bmatrix} /Y/_N \\ \text{POSS} \text{ — } \text{OBL}by \\ |\qquad\quad| \\ \text{patient}_j\ \ \text{agent}_i \\ \text{'event of A}_i\ \text{acting}_y \\ \text{on B}_j' \end{bmatrix}
\ \leftrightarrow\
\begin{bmatrix} /XY/_N \\ \text{OBL}by \\ | \\ \text{agent}_i \\ \text{'event of A}_i\ \text{acting}_y \\ \text{on } x' \end{bmatrix}
$$

This approach is less radical than the first approach in that it does not assume a completely different compounding structure for synthetic compounds. (11.43) is an instantiation of the general English compounding rule (3.30), being merely more specific in that it specifies what happens to the arguments and the syntactic functions. This seems necessary, at least for action nouns like *hunting*, because the possibilities of associating semantic roles and syntactic functions are severely restricted (for instance, we cannot have **fisherman hunting of whales*).

Finally, the simplest approach is to deny that any special rule is needed at all. In this view, compounds like *truck-driver* and *whale hunting* are described as ordinary N1–N2 compounds that do not mean more than 'N2 that has some relation to N1'. This is the approach that we took in Section 7.1 for other types of compounds (consider the semantic relationship of the dependent to the head in *lipstick* vs. *sea bird* vs. *swansong*). In *truck-driver*, this meaning ('driver who has some relation to a truck') is then naturally interpreted as 'driver who drives a truck' by a pragmatic implicature. Similarly, *whale hunting* really means only 'hunting that has some relation to

whales', but a natural pragmatic implicature gives rise to the interpretation 'hunting in which whales are hunted'. This analysis does not imply that individual compounds cannot acquire the argument interpretation. But it does mean that unlike in the second approach, there would be no general rule to account for argument interpretation in synthetic compounds.

This approach has the advantage of being able to capture similarities to other types of compounds. We can think of synthetic compounds as a special type of what are called **affix compounds** here. Affix compounds are patterns that consist of more than one stem plus an affix. In addition to the examples in (11.41) above (*chain smoker*, *food poisoning*), English also has affix compounds of the following type:

(11.44) *green-eyed*   'having green eyes'
         dark-haired 'having dark hair'
         red-roofed   'having a red roof'

Given that in affix compounds, the affix often attaches to a base that is not itself a compound (**a green-eye*, **to pipe-smoke*, **to race-drive*), the descriptions in (11.45) seem preferable to any kind of description that relies on hierarchical constituent structure for semantic interpretation. (Note that it is possible to say that someone has *a green eye*, but this is a phrase, not a compound – there is primary stress on both lexemes.)

(11.45) a. $\begin{bmatrix} /X/_A \\ 'x' \end{bmatrix}$ & $\begin{bmatrix} /Y/_N \\ 'y' \end{bmatrix}$ $\leftrightarrow$ $\begin{bmatrix} /XYd/_A \\ \text{'having (a) } y\text{(s) with} \\ \text{the property } x' \end{bmatrix}$

         b. $\begin{bmatrix} /X/_N \\ 'x' \end{bmatrix}$ & $\begin{bmatrix} /Y/_V \\ 'y' \end{bmatrix}$ $\leftrightarrow$ $\begin{bmatrix} /XYer/_N \\ \text{'A person who does } y, \\ \text{having to do with } x' \end{bmatrix}$

This approach utilizes the general rule of English compounding, but unlike the second approach, it leaves interpretation of the relationship between the head and the dependent to pragmatic implicature. This allows for a unified description of the formal similarities between synthetic and other types of affix compounds. Of course, not directly specifying the semantic relationship between the head and the dependent in synthetic compounds also creates the potential for overprediction. This approach has difficulty accounting for semantic restrictions of the kind **fisherman hunting of whales*.

Thus, there are arguments for all three approaches, and it is possible that different approaches are appropriate for different compounds or for different languages (synthetic compounding has been most intensively discussed for English). Other things being equal, it would of course be desirable to have just a single type of rule, but it remains to be seen whether

other things are in fact equal. Thus far, no consensus has formed about how to formally describe synthetic compounds.

11.3 Transpositional derivation

11.3.1 Transposition and argument inheritance

A derivational process is called **transpositional** when it changes the word-class of the base lexeme. Some typical examples of transpositional derivation are shown in (11.46).

(11.46) a. N → V English *computer → computerize*
b. V → N Russian *napolnit'* 'fill' → *napolnenie* 'filling'
c. A → V Basque *luze* 'large' → *luza-tu* 'lengthen'
d. V → A Italian *mangiare* 'eat' → *mangiabile* 'edible'
e. A → N Japanese *atarashii* 'new' → *atarashisa* 'newness'
f. N → A Indonesian *tahun* 'year' → *tahunan* 'annual'

Valence may be affected by transposition when a verb or an adjective is transposed into another word-class (non-derived nouns normally cannot be said to have a valence potential, so transpositional derivations of nouns are hardly relevant here). When a verb such as *examine* is transposed into an action noun such as *examination*, its basic meaning (referring to an event with an agent and patient) is still intact, but the arguments cannot be expressed in the same way as with the base verb. We can say *The vet examined the pet*, but not *[*The vet examination the pet*]NP *(took one hour)*. This is because deverbal nouns behave much like ordinary nouns in that they do not take subject and object arguments, but only possessor and oblique arguments. Thus, we have *The examination of the pet by the vet (took one hour)*. The patient argument becomes an *of*-possessor, and the agent argument becomes a *by*-oblique. The resulting noun phrase is similar to noun phrases with non-derived noun heads such as *the portrait of Charles V by Titian*. The relation between the valences of *examine* and *examination* can be described with our usual notation as in (11.47).

(11.47)
$$
\begin{bmatrix} /\text{examine}/_V \\ \text{SBJ} \quad\text{---}\quad \text{OBJ} \\ | \qquad\quad | \\ \text{agent} \quad \text{patient} \end{bmatrix}
\leftrightarrow
\begin{bmatrix} /\text{examination}/_N \\ (\text{OBL}by)\text{---} \quad \text{POSS}of \\ | \qquad\qquad | \\ \text{agent} \qquad \text{patient} \end{bmatrix}
$$

In transpositional derivation, when a derived word has a valence that corresponds to the valence of the base, we say that the derivative **inherits** the base's valence.

In the following subsections, we will take a closer look at various kinds of transpositional derivation.

11.3.2 Action nouns (V → N)

Perhaps the most interesting type of transpositional derivation is the **action noun** (or **event noun**) – one that refers to the event or action itself, not to a participant of the event – because action nouns show the greatest variety of argument structure phenomena both within a language and across languages. In English and other European languages, two different types of event noun can be distinguished, the **simple event noun** (e.g. (11.48a)) and the **complex event noun** (e.g. (11.48b)).

(11.48) a. *I have an examination tomorrow.*
      b. *The vet's careful examination of Fido's eyes took a long time.*
      c. *The examination is on your desk.*

The basic difference between them is that complex event nouns preserve more verbal properties than simple event nouns. Sometimes a third type of event noun is distinguished, called **concrete noun**, and illustrated in (11.48c). However, this is not really an event noun, because it does not refer to an event. But it is necessary to mention this type in the present context because this is a widespread phenomenon: in many languages, the derivational patterns used for action nouns can also have concrete meanings. However, the kinds of concrete meanings are unpredictable: the product of an action (*building, painting, judgement, composition*), a group of people (*management, government*) or a manner (*conjugation*). Concrete nouns seem to arise by ill-understood and unsystematic (though frequent) processes of metonymic meaning shift, not by a word-formation rule, so we need not discuss them further.

Returning to simple and complex event nouns, we note that when the verbal arguments are expressed with a complex event noun, it must be definite (see (11.49b)) and cannot be pluralized (see (11.49c)).

(11.49) a. *the examination of Fido's eyes by the vet*
      b. **an examination of Fido's eyes by the vet*
      c. **three examinations of Fido's eyes by the vet*

Simple event nouns are more like ordinary nouns in that they can be indefinite or definite (*Tomorrow I have an/the examination*), and they can be pluralized (*Tomorrow I have three examinations*). Moreover, complex event nouns can be modified by duration adverbs like *frequent* and *constant*, whereas simple event nouns cannot (cf. *the frequent examination of Fido's eyes/*a frequent examination*). But, in the present context, the most important

difference between complex event nouns and simple event nouns is that only the former inherit the verb's argument structure. Thus, for complex event nouns, the function-changing transposition rule in (11.47) is appropriate, whereas, in simple event nouns, the argument structure is not preserved. As a result, simple event nouns may occur on their own, with no arguments expressed, as in (11.50).

(11.50) a. *The examinations took a long time.*
      b. *We are witnessing a new development.*
      c. *The destruction was awful to see.*

By contrast, complex event nouns derived from transitive verbs require the overt expression of the patient, while the agent may be optionally present, as seen in (11.51).[5]

(11.51) a. *The frequent examination *(of the evidence) (by the scientists) is necessary.*
      b. *The constant development *(of new inexpensive housing) (by the city) was applauded.*
      c. *The continuing destruction *(of rainforests) (by humans) will speed up desertification.*

   In some languages, complex event nouns have an argument structure that is even more verb-like in that the patient is coded as an accusative NP. An example comes from Modern Hebrew.

(11.52) ha-hafcaca   ha-tedira   šel   ha-cava   et   ha-ʕir
        the-bombing the-frequent of   the-army ACC the-city
        'the army's frequent bombing of the city'

                                        (Siloni 1997: 170)

In English, only oblique arguments coded by a PP and clausal arguments may be retained in an action noun construction (e.g. *they rely on her → their reliance on her; they elected Maria as president → their election of Maria as president; I predict that it will rain → my prediction that it will rain*).

11.3.3 Agent nouns (V → N) and deverbal adjectives (V → A)

An **agent noun** is one that refers to the agent of the action, rather than the action itself. In contrast to (complex) event nouns, agent nouns in English and in many other languages do not seem to inherit the verb's argument

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[5]   An asterisk before an expression in parentheses means that the expression cannot be left out.

structure. Expressions such as *voter for Mitterrand, *thinker about deep problems or *claimer that Armageddon is near are systematically impossible. However, it is, of course, possible to have a possessive phrase that serves the same purpose as a verbal argument: *explorer of Antarctica, founder of Lund University, Mitterrand's voters*, and so on. One could see this as evidence that to some extent the verbal argument structure may be inherited after all, but a simpler account is available: possessive phrases have a very general meaning, and often the precise interpretation is left to pragmatic inferences from the context, as in the case of compounds (see Section 11.2). Given the meaning of an agent carrying out some action, the interpretation of a possessive phrase as a patient of that action is readily available, so we do not need to say that it arises as a result of argument inheritance. This view is also confirmed by the fact that agent nouns, unlike complex event nouns, do not admit an agent-oriented adverbial such as a purpose clause:

(11.53) a.   *an explorer of America in order to discover El Dorado
         b.   *the exploration of America in order to discover El Dorado*

Thus, the rule for deriving an agent noun of a transitive verb would be as in (11.54), where the derived noun lacks an argument structure.

$$(11.54) \quad \begin{bmatrix} /\text{X}/_\text{V} \\ \quad \text{SBJ} \quad — \quad \text{OBJ} \\ \quad \quad | \quad \quad \quad \quad | \\ \text{agent}_i \quad \quad \text{patient}_j \\ \text{'A}_i \text{ acts}_\text{X} \text{ on B}_j\text{'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /\text{X}er/_\text{N} \\ \\ \\ \text{'person who acts}_\text{X}\text{'} \end{bmatrix}$$

(Note that if this is the right analysis, we have to revise what we said about synthetic compounds above. The idea that agent nouns do not have an argument structure is incompatible with the second approach to describing synthetic compounds that was presented in Section 11.2.3 (see (11.43)). Perhaps we ought to say that the third approach to synthetic compounds outlined in that section, which rests on pragmatic inference, is appropriate for agent nouns and other deverbal formations that lack an argument structure, whereas the second approach is appropriate for complex event nouns.)
    English deverbal adjectives in -*able* seem to be similar to agent nouns in that they do not generally inherit oblique or clausal arguments from the base verb (*convincible of the eventual success, *emptiable of water, *persuadable that I'm right*, but cf. *deductible from income tax*).

11.3.4 Deadjectival transposition (A → N, A → V)

Adjectives are much less often associated with their own argument and function structure, but many languages have at least a few argument-

taking adjectives (such as English *proud of, full of, similar to, obedient to, different from, responsible for, ready to do something*). In English, most of these oblique arguments are preserved in deadjectival quality nouns (*similarity to, obedience to, responsibility for, readiness to do something, ??difference from*), though in some cases we have idiosyncratic changes (*pride in*, not **pride of*).

In deadjectival verbs, the oblique argument may also be preserved. The examples in (11.55)–(11.56) show that in Russian the adjectival argument structure is inherited. The adjective *gordyj* 'proud' takes an instrumental oblique argument, and so does the deadjectival verb *gordit´sja* 'to pride oneself (on)'. The adjective *gotovyj* 'ready' takes an infinitival argument, and so does the deadjectival verb *gotovit´sja* 'get ready'.

(11.55) a. *On   gord   svoimi   dostiženijami.*
            he   proud   self's.INST   achievements.INST
            'He is proud of his achievements.'

       b. *On   gorditsja   svoimi   dostiženijami.*
            he   proud.3SG.REFL   self's.INST   achievements.INST
            'He prides himself on his achievements.'

(11.56) a. *On   gotov   vyexat´   iz   strany.*
            he   ready   leave.INF   from   country
            'He is ready to leave the country.'

       b. *On   gotovitsja   vyexat´   iz   strany.*
            he   get.ready.3SG.REFL   leave.INF   from country
            'He is getting ready to leave the country.'

A counterexample would be English *fill*, which does not behave like *full* (cf. *full of, fill with*).

A difficulty in determining whether the adjectival argument structure is inherited is the fact that the choice of the preposition or oblique case that marks the adjectival argument is rarely completely arbitrary. In many cases, it could be argued that the choice of the preposition or case is determined semantically and is independent of the base adjective.

11.4 Transpositional inflection

A particular challenge for morphologists and syntacticians is the description of transpositional (word-class-changing) inflection. In transpositional inflection, not just some, but all of the argument structure of the base is preserved, plus its other combinatory possibilities. An inflectional V → A transposition is called a **participle** in many languages (see (11.57)

from German), and an inflectional V → N transposition is called a **masdar** in some languages (cf. example (11.58) from Lezgian).

(11.57) *der*   *im*   *Wald*   *laut*   *pfeif-end-e*   *Wanderer*
     the   in.the   forest   loud   whistle-PTCP-M.SG hiker
     'the hiker who is whistling loud in the forest'

(11.58) *Wun*   *fad*   *qarağ-un-i*   *čun*   *tažub*   *iji-zwa.*
     you.ABS early   get.up-MASD-ERG we.ABS surprise do-IMPF
     'That you are getting up early surprises us.'

                                   (Haspelmath 1993: 153)

A less well-known example of word-class-changing inflection is the Hungarian **proprietive** ('having', N → A):

(11.59) *rendkívül*   *nagy*   *hatalm-ú*   *uralkodó*
     extremely   great   power-PROPR   monarch
     'monarch with extremely great power'

                                   (Kenesei 1995–96: 164)

The participle is similar to the deverbal adjective (Section 11.3.3), but note that it also inherits the possibility to combine with a locative modifier (*im Wald* 'in the forest') and a manner modifier (*laut* 'loud'). The masdar is similar to the action noun, but it preserves the verbal valence completely: in (11.58), the agent argument is in the absolutive case, and in this respect it is very different from a noun's modifier or argument. Moreover, (11.58) also shows that the masdar is like a verb, not like an action noun, in that it can combine with an adverb (cf. the behaviour of English action nouns*: *My perusal carefully of the article* versus *my careful perusal of the article*). The Hungarian proprietive is similar to denominal adjectives like *powerful*, but, unlike such adjectives in English, Hungarian proprietives can take prenominal modifiers that only nouns can take.

   This suggests that, if we want to describe the syntactic behaviour of participles, masdars and proprietives (and other inflectional transpositions not mentioned here), instead of invoking a mechanism of inheritance from the base lexeme, we should say that we do not have a new lexeme here at all but an inflected word-form of the same lexeme. Participles and masdars are verbs, and Hungarian proprietives are nouns. Combined with their dependents (i.e. their arguments and modifiers), they yield verb phrases and noun phrases:

(11.60) German

```
                        VP
            _____/|_____
           PP          AdvP          V
         __/ \__        |            |
        P      NP       |            |
        |       |       |            |
        im    Walde    laut      pfeif-end
      in.the  forest   loud     whistle-PTCP
         'whistling loud in the forest'
```

(11.61) Lezgian

```
                        VP
            _____/|_____
           NP          AdvP          V
            |           |            |
            |           |            |
           wun         fad       qarağun-i
         you.ABS      early     get.up-MASD
            'you rising early'
```

(11.62) Hungarian

```
                        NP
            _____/ _____
           AP                        N
         __/ \__                      |
        Adv     A                     |
         |      |                      |
      rendívül nagy               hatalm-ú
      extremely great            power-PROPR
         'having extremely great power'
```
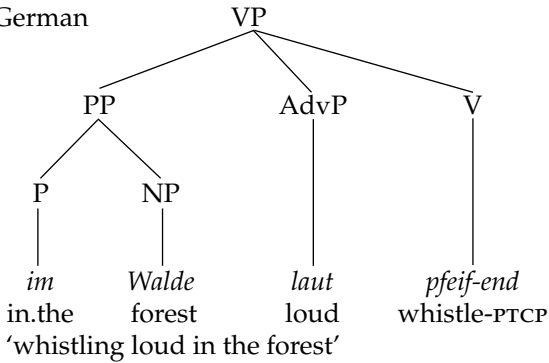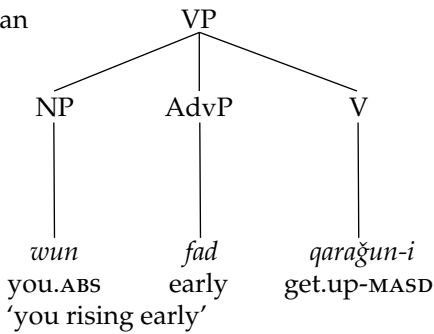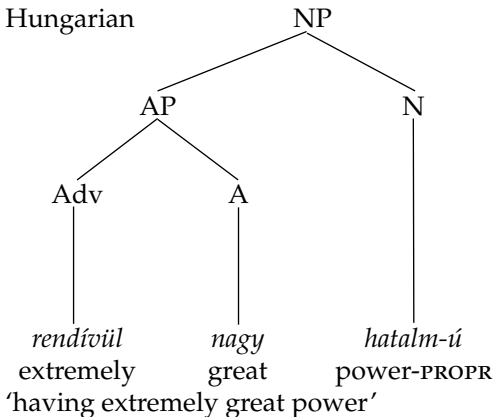
If we want to account for the behaviour with respect to their dependents, this description of these constructions is unexceptionable, but now we face a paradox: we have just said that participles, masdars and proprietives do not change the word-class of their base, although at the beginning of this section we said that they were examples of word-class-changing inflection.

And, of course, there are good reasons for saying that a participle is an adjective. For instance, in German it shows exactly the same agreement inflection as adjectives, and it precedes the noun in an NP. There are also good reasons for saying that the Lezgian masdar is a noun: it shows nominal case inflection and occurs in the same syntactic environment as non-derived nouns. The Hungarian proprietive, too, is adjective-like with respect to its position and its pluralization.

A possible solution to this paradox is the following. Participles, masdars and proprietives show dual behaviour – they act like verbs, verbs and nouns with respect to their dependents, but like adjectives, nouns and adjectives with respect to the other elements in the sentence. We conclude from this dual behaviour that they have a dual nature: a lexeme word-class and a word-form word-class (Haspelmath 1996). As a lexeme, a participle is a verb, just like the other verb forms. But, as a word-form, a participle is an adjective. The internal syntax of a word is determined by its lexeme word-class, and the external syntax of a word is determined by its word-form word-class.

Let us now see how we could describe the external syntax of the phrases in (11.60)–(11.62). One possibility would be to assume a structure as in (11.63) for the German phrase in (11.57).

(11.63)

der	*im Wald*	*laut*	*pfeif-*	*-end-e*	*Wanderer*
the	in.the forest	loud	whistle-	-PTCP-M.SG	hiker
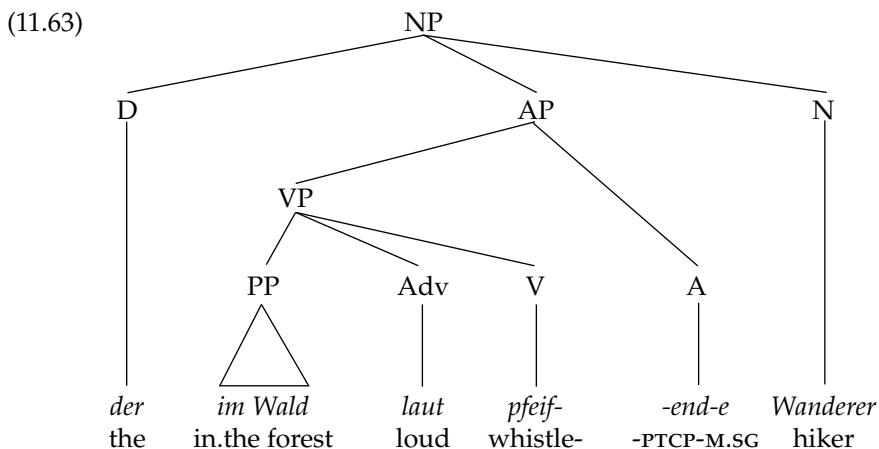
This representation has two disadvantages. First it makes the claim that the participle *pfeifende* belongs to two different syntactic constituents, although usually one assumes that a unitary word-form must also be a unitary syntactic constituent. Second, it works only for transpositional formations that are characterized by affixes. Participles such as Hebrew *šorek* 'whistling' behave just like German *pfeifend*, but they cannot be represented as in (11.63) because they have no participial affix – the participle is signalled by the vowel pattern *o-e* (cf. the past tense *šarak* of this verb).

An alternative proposal that does not have these disadvantages is to indicate the dual word-class membership in the syntactic trees. A participle can be represented as a word-syntactic tree as in (11.64a), contrasting with a derivational transpositional form such as an agent noun, given in (11.64b).

(11.64) a. *pfeifend* 'whistling'   b. *Pfeifer* 'whistler'

```
        ⟨⟨V⟩A⟩                          N
        /    \                         /  \
       V      A                       V     N
     pfeif   end                    Pfeif   er
```
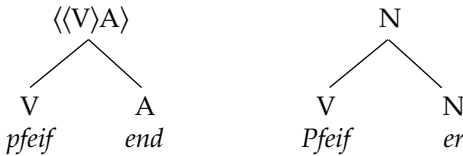
In (11.64a), the lexeme word-class is given in the inner angled brackets, and the word-form word-class is given in the outer angled brackets. Thus, in inflectional transposition, properties of the word-class of both constituents are preserved. By contrast, in derivational transposition, the derivative has primarily the head's word-class properties.

If such dual-word-class representations are admitted in the syntax, we get (11.65), where the phrasal node dominating *pfeifend* also has dual category membership. The notation '⟨⟨V⟩A⟩P' can be read as 'VP with respect to internal syntax, AP with respect to external syntax'.

(11.65)

```
                          NP
              /            |              \
             D          ⟨⟨V⟩A⟩P            N
             |         /   |     \          |
             |        PP   Adv   ⟨⟨V⟩A⟩     |
             |        /\    |       |       |
            der   im Wald  laut  pfeifende  Wanderer
            the  in.the forest  loud  whistle.PTCP  hiker
```
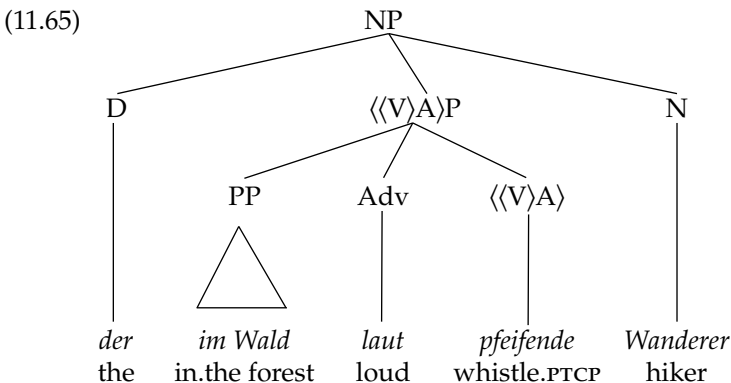
The difference between transpositional inflection and transpositional derivation is interestingly similar to the difference between event-changing and function-changing operations that we saw in Section 11.1. Event-changing operations are generally derivational and involve a change in the argument structure of the base, like most transpositional derivation. Function-changing operations are generally inflectional and involve no change in the argument structure of the base, like transpositional inflection.

The main difference is that function-changing operations of course change syntactic functions, whereas in prototypical transpositional inflection no functions are changed.

Moreover, it should be recalled that the difference between event-changing and function-changing operations is not always clear-cut, and we often find intermediate cases. Transpositional operations are no different. Some inflectional forms do require some limited function changing – e.g. English masdar-like expressions of the type *Maria's criticizing Robert*, *the guest's arriving late*, where the verb's subject is coded not as a subject but as a prenominal possessor. On the other hand, derivational formations in some languages allow the expression of adverbials. Examples (11.66a–b) are from Spanish (adverbials: *hoy* 'today' and *todavía más* 'even more'), and example (11.67) is from Modern Greek (adverbial: *prosektiká* 'carefully').

(11.66) a. *la   inauguración   hoy   en Barcelona   del   Congreso*
             the inauguration today in Barcelona of.the Congress
             'the inauguration today in Barcelona of Congress'

        b. *la   caída   de los   precios   todavía   más*
             the falling of the prices   still   more
             'the falling of the prices even more'

                                                   (Rainer 1993: 214)

(11.67) *i   katastrofí   ton   engráfon   prosektiká*
            the destruction the.GENPL documents.GENPL carefully
            'the destruction of the documents carefully'
                                                   (Alexiadou 1999: 19)

However, this blurring of the boundaries between word-class-changing inflection and derivation is not surprising if we remember what we said in Chapter 5 – that there is reason to view the boundary between inflection and derivation generally as a continuum, rather than a dichotomy.

Summary of Chapter 11

The most interesting inflectional values and derivational meanings are those that affect the valence of the base: valence-changing operations, some types of compounding and transpositional derivation (in transpositional inflection, the base's valence remains unaffected). Valence-changing operations may be event changing (i.e. the event structure of the base and therefore its argument structure are modified) or function changing (i.e. only the function structure of the base is modified). The most important valence-changing operations

are passive, reflexive, anticausative, resultative, antipassive, causative and applicative. In compounds, valence is potentially affected if at least one of the bases is a verb (as in incorporation and V–V compounding) or a deverbal derivative (as in synthetic nominal compounds). Transpositional derivatives such as action nouns and agent nouns inherit the base's valence to a greater or lesser extent. In transpositional inflection, the base's valence is completely preserved, but, in order to arrive at a coherent description, one needs to differentiate between a word's lexeme word-class and word-form word-class.

Further reading

For syntactic theories that are deeply concerned with semantic valence (argument structure) and syntactic valence (function structure), see Dik (1997), Van Valin and LaPolla (1997) and Bresnan (2001).

Passive morphology is discussed in Haspelmath (1990). For antipassives, see Cooreman (1994), for resultatives, Nedjalkov (1988), and for causatives, Dixon (2000).

An overview of noun incorporation is given in Mithun (1984), and see Mithun and Corbett (1999) for noun incorporation and valence.

Japanese compound verbs are discussed in Matsumoto (1996); for Chinese compounds, see Packard (2000). Synthetic compounds are discussed lucidly in Oshita (1995). For action nouns, see Koptjevskaja-Tamm (1993) and Grimshaw (1990).

Transpositional inflection is discussed in Haspelmath (1996).

Comprehension exercises

1. Formulate the morphological rule for adjectives of the type *supportive of* (derived from the verb *support*) (cf. Sections 11.3.3–11.3.4), analogous to the rule in (11.47).

2. English has one kind of verbal valence-changing prefix that can be regarded as an applicative marker, the prefix *out-*, as in

    run   outrun
    play   outplay
    shine   outshine

    Formulate the rule for *out-*, stating how the function structure, the argument structure and the meaning are affected.

3. The phrase *ruler over a large empire* is accepted by many speakers of English. Which generalization of this chapter is the phrase a counterexample to?

Frequency effects in morphology 12

The ways in which speakers use language have a profound influence on language structure, and frequency is one of the most important sources for system-external explanation of language structure. In fact, we have already seen examples in this book of frequency affecting the content of the lexicon (Section 4.3), productivity (Sections 6.4.1–6.4.2) and word-class shift (Chapter 8). In this chapter we explore how frequency matters for language structure, and why. Frequency influences word structure in many ways, but one of the most striking effects is found in inflection, where frequency asymmetries result in asymmetrical structural behaviour of various kinds. We look at some examples of this interaction.

12.1 Asymmetries in inflectional values

In inflectional systems, we often observe asymmetries in the behaviour of inflectional values that belong to the same inflectional feature, including number (singular versus plural), case (nominative versus accusative), voice (active versus passive) and polarity (affirmative versus negative).

12.1.1 Frequent and rare values

Frequency differences among some common inflectional values are summarized in Table 12.1, where '>' means 'is more frequent than'. It should be noted that not every word in a language will exhibit these frequency asymmetries. These generalizations should instead be taken as describing the overall pattern of a language. Also, not all languages have inflection for all these features, but the claim is that, when a language has inflection for one of these features and values, it will conform to the generalization expressed in the table.

Feature	Values, ordered by frequency
number	singular > plural > dual
case	nominative > accusative > dative
person	3rd > non-3rd (1st/2nd)
degree	positive > comparative > superlative
voice	active > passive
mood	indicative > subjunctive
polarity	affirmative > negative
tense	present > future

Table 12.1 Frequent and rare values

The generalizations in Table 12.1 can be illustrated by examining the results produced by counting usage of number values in six languages:

(12.1)	Singular	Plural	Dual	Number of nouns
French	74.3%	25.7%		1,000
Latin	85.2%	14.8%		8,342
Russian	77.7%	22.3%		8,194
Sanskrit	70.3%	25.1%	4.6%	93,277
Slovene	72.5%	26.9%	0.6%	11,711
Upper Sorbian	64%	30%	6%	unknown

(Corbett 2000: 281; data partly from Greenberg 1966: 31–2)

The differences between languages that we see here could be due to slight differences in the meanings of the number values, or they might simply be due to the genre or style of the text chosen. Ideally, the token frequency of inflectional values should be counted in a text that is representative of the everyday spoken language in the community, and finding such representative texts is not straightforward. But, fortunately, the asymmetries in the usage of number values are so robust that the same result is generally obtained, no matter which texts we look at. So we can safely say that the singular has a higher frequency than the plural.

   Why should such frequency asymmetries exist? To start with, the nominative can be expected to be more frequent than the accusative, at least in languages that do not allow unexpressed arguments, because all verbs require a nominative argument (i.e. a subject), but only transitive verbs also have an accusative. Similarly, the subjunctive must be rarer than the indicative because subjunctives are used primarily in subordinate clauses, and a subordinate clause presupposes a main clause with, at least typically, an indicative verb. However, the ultimate reason for the different frequencies

of different inflectional values is outside language. Some expressions are more frequent simply because humans find them more relevant: we all talk more about singular entities than about plural entities, more about third persons and things than about speech act participants (first/second person), more about present events than about future events, and so on. The linguist has no privileged skills for explaining these preferences, so we will not discuss them further. Instead, we will focus on structural properties that correlate with frequency.

12.1.2 The correlation between frequency and shortness

Quite generally, frequent expressions tend to be short in human languages. Frequent words are shorter than rare words. For example, in French the 10 most frequent words are *de, le, la, et, les, des, est, un, une, du*, and long words like *éléphant* or *questionnaire* are used rarely.

Even more strikingly, frequently used inflectional values may not be expressed overtly at all but are left to be inferred from the context – i.e. they sometimes show zero expression. This is just one more manifestation of the correlation between frequency and shortness. As an example, consider the partial inflectional paradigm of regular nouns in Udmurt, given in (12.2).

(12.2)

	SINGULAR	PLURAL	
NOMINATIVE	*val*	*valjos*	'horse(s)'
ACCUSATIVE	*valez*	*valjosty*	'horse(s) (dir. obj.)'
ABLATIVE	*valleś*	*valjosleś*	'from the horse(s)'
ABESSIVE	*valtek*	*valjostek*	'without the horse(s)'
			(Perevoščikov 1962: 86–7)

In this paradigm, the more rarely used cases, ablative and abessive, have a longer form than the more frequently used accusative. The nominative and the singular are the shortest: they are both expressed by zero. This Udmurt paradigm is quite typical of inflectional systems. Zero expression is found in frequent values, and when two contrasting values are both overtly coded, typically the more frequently used value has the shorter expression. Two more examples from verbal inflection are given in (12.3) and (12.4).

(12.3) Tzutujil

	COMPLETIVE	INCOMPLETIVE	POTENTIAL
1SG	*x-in-wari*	*n-in-wari*	*xk-in-wari*
2SG	*x-at-wari*	*n-at-wari*	*xk-at-wari*
3SG	*x-wari*	*n-wari*	*xti-wari*
1PL	*x-oq-wari*	*n-oq-wari*	*xq-oo-wari*
2PL	*x-ix-wari*	*n-ix-wari*	*xk-ix-wari*
3PL	*x-ee-wari*	*n-ee-wari*	*xk-ee-wari*
			(Dayley 1985: 87–8)

(12.4) Kobon   PRESENT   FUTURE   CONDITIONAL
        1SG   *ar-ab-in*   *ar-nab-in*   *ar-bnep*
        2SG   *ar-ab-ön*   *ar-nab-ön*   *ar-bnap*
        3SG   *ar-ab*   *ar-nab*   *ar-böp*
        1DU   *ar-ab-ul*   *ar-nab-ul*   *ar-blop*
        2/3DU   *ar-ab-il*   *ar-nab-il*   *ar-blep*
        1PL   *ar-ab-un*   *ar-nab-un*   *ar-bnop*
        2PL   *ar-ab-im*   *ar-nab-im*   *ar-bep*
        3PL   *ar-ab-öl*   *ar-nab-öl*   *ar-blap*

(Davies 1981: 166, 181)

Both these paradigms show zero expression in the third person singular. The Tzutujil paradigm shows that the non-indicative form (called 'potential') has a longer marker than the indicative forms, and the Kobon paradigm shows a longer marker for future tense than for present tense. The conditional mood in Kobon is marked by the two consonants *b* and *p*, so it is longer than the present indicative form, which has just a single consonant (this assumes that consonants are more important in counting length than vowels).

12.1.3 The correlation between frequency and differentiation

In three different senses, frequently used values tend to be more differentiated than rarely used values.[1] First, frequent values show *less syncretism* than rare values. Consider the partial paradigm of the Old English verb *bindan* 'bind' in (12.5).

(12.5)   PRESENT IND   PRESENT SBJV   PAST IND   PAST SBJV
        1   SG   *binde*   *binde*   *band*   *bunde*
        2   SG   *bintst*   *binde*   *bunde*   *bunde*
        3   SG   *bint*   *binde*   *band*   *bunde*
        1–3 PL   *bindaþ*   *binden*   *bundon*   *bunden*

This paradigm shows that there is more syncretism in the plural than in the singular (in fact, all plural forms of all verbs are syncretized in Old English), more syncretism in the subjunctive than in the indicative, and more syncretism in the past indicative than in the present indicative. The same tendency is found in Khanty possessive suffixes:

---

[1]   Generalizations about a correlation between frequency of use and linguistic structure are based on strong tendencies, but should not be treated as inviolable principles. For every generalization there are counterexamples.

(12.6)

	SINGULAR	PLURAL	DUAL
1ST	-ēm	-ēw	-ēmən
2ND	-ēn	-lən	-lən
3RD	-l	-ēl	-lən

(Nikolaeva 1999: 14)

Here, syncretism is found in the rarest of the three number values, the dual, and in one of the rarer person values, second person. (More syncretism in the dual can also be seen in Kobon (see (12.4) above)). More syncretism in the passive than in the active voice can be exemplified from Gothic (*niman* 'take').

(12.7)

	ACTIVE		PASSIVE	
	SINGULAR	PLURAL	SINGULAR	PLURAL
1ST	*nima*	*nimam*	*nimada*	*nimanda*
2ND	*nimis*	*nimiþ*	*nimaza*	*nimanda*
3RD	*nimiþ*	*nimand*	*nimada*	*nimanda*

The active has five different shapes, and the passive has only three.

The second sense in which frequent values are more differentiated is that inflection classes differ primarily with respect to the frequent values, less so with respect to rare values. In other words, the classes have *fewer shared exponents* in the frequently used values. This can be seen in Russian noun inflection. The endings of the four most important Russian inflection classes are shown in (12.8) (the inflection classes are labelled I–IV, as is traditional. See Exercise 5 of Chapter 8 for full word-forms belonging to each of these classes).

(12.8)

	SINGULAR			
	IV	I	III	II
NOM	-o	Ø		-a
ACC				-u
GEN	-a		-i	
DAT	-u		-i	-e
LOC	-e			
INSTR	-om		-ju	-oj

	PLURAL			
	IV	I	III	II
NOM	-a		-i	
ACC				
GEN	Ø	-ov	-ej	Ø
DAT	-am			
LOC	-ax			
INSTR	-ami			

The contrast between singular and plural is clear: in the singular, there are at least twelve distinct endings, while in the plural there are at most eight. And, at least in the plural, the rarer cases (dative, locative, instrumental) show fewer allomorphs than the more frequent cases. Likewise in Standard

Arabic, transitive verbs belong to one of four inflection classes, characterized by different vowels before the final stem consonant. However, in the rarer passive voice the inflection is uniform and the difference between the inflection classes disappears (see (12.9)).

(12.9)

	ACTIVE		PASSIVE		
	PERFECT	IMPERFECT	PERFECT	IMPERFECT	
a-u:	*qatala*	*yaqtulu*	i-a: *qutila*	*yuqtalu*	'kill'
a-i:	*ḍaraba*	*yaḍribu*	i-a: *ḍuriba*	*yuḍrabu*	'hit'
i-a:	*ḥafiẓa*	*yaḥfaẓu*	i-a: *ḥufiẓa*	*yuḥfaẓu*	'protect'
a-a:	*jamaʕa*	*yajmaʕu*	i-a: *jumiʕa*	*yujmaʕu*	'gather'

The third sense in which frequently used values are more differentiated is that they tend to show *more cross-cutting values*. For example, as we saw in Section 5.1, the Latin future tense lacks a subjunctive mood (or one could alternatively say that the subjunctive mood lacks a future tense). In (12.10), we again see the third person singular of the verb *laudare* 'praise'.

(12.10)

	PRESENT TENSE	PAST TENSE	FUTURE TENSE
INDICATIVE	*laudat*	*laudabat*	*laudabit*
SUBJUNCTIVE	*laudet*	*laudaret*	—

Lack of cross-cutting values is similar, but not identical to syncretism. In Latin, the distinction between indicative and subjunctive is not neutralized in the future tense. The form *laudabit* ('she will praise') expresses only the indicative, and future tense cannot be expressed directly in the subjunctive.

12.1.4 Local frequency reversals

Table 12.1 shows the frequency asymmetries that hold in general in languages. However, in particular lexemes, the frequency relations may be reversed. For instance, while most nouns (such as 'table', 'head' or 'doctor') occur more often in the singular than in the plural, a small group of nouns tend to occur more often in the plural in many, if not all, languages. These are nouns referring to some paired or multiple body parts ('eyes', 'lips', 'hair(s)'), small animals ('ants', 'fish', 'mice'), small parts of plants ('beans', 'strawberries', 'leaves'), and some others ('sand grains', 'splinters').

In the case feature, nouns that denote a place occur in the locative case more often than in the nominative, in contrast to other nouns. And, while the greater relative frequency of the nominative case is clearly true of animate nouns that may occur as subjects of transitive clauses, it is not so clear that inanimate nouns, which are typically patients, are also used more frequently in the nominative than in the accusative case.

Local frequency reversals may also be found in particular cross-cutting

values. While in general the third person is more frequent than the second person, in the imperative mood this relation is reversed: commands are more often addressed to the person who is supposed to carry them out, and indirect imperatives (with the subject in the third person) are rare in all languages.

Structural effects of these frequency reversals can be observed in many languages. In Welsh, plurals are normally marked by suffixes as in other Indo-European languages (*cath/cathod* 'cat/cats', *draenog/draenogod* 'hedgehog/hedgehogs'; see (8.10) for more examples). However, in certain nouns that are used frequently in the plural, it is the singular that is marked by a special suffix:

(12.11)	*dail*	'leaves'	*deilen*	'leaf'
	pysgod	'fish (PL)'	*pysgodyn*	'fish (SG)'
	ffa	'beans'	*ffäen*	'bean'
	cacwn	'wasps'	*cacynen*	'wasp'
	mefus	'strawberries'	*mefusen*	'strawberry'
	tywys	'corn'	*tywysen*	'ear of corn'
				(King 1993: 67–9)

There are also languages in which case marking is found only in inanimate nouns (or non-personal pronouns). Godoberi is such a language, and here it is the (transitive) subject case that is overtly marked, whereas the direct-object case is zero (12.12).[2] Presumably, this is connected to the fact that inanimate nouns are more likely to be used as objects than as subjects.

(12.12)	(transitive) subject case	*den-Ø*	'I'	*hanqu-di*	'house'
	direct-object case	*den-Ø*	'me'	*hanqu-Ø*	'house'
				(Kibrik 1996: 119, 36)	

And in the imperative, the second person form is often zero while the third person form is overtly marked (e.g. Latin second person imperative *lauda* 'praise!', third person imperative *laudato* 'let him/her praise!').

Local frequency reversals occur in derivational morphology as well. In many languages female person nouns are derived by a special affix from the corresponding male or general person noun – e.g. Dutch *handelaar* '(male) merchant', *handelaarster* 'female merchant', Hausa *àbookii* '(male) friend', *àbookìyaa* 'female friend'. From the point of view of the semantics, it would be equally possible to have a special affix that denotes male persons, but such affixes seem to be extremely rare. One reason for this asymmetry is probably that, in most societies, men tended to have more specialized

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[2] Instead of the familiar terms 'nominative/accusative', the terms subject case/object case are used here, because overtly marked subject cases are usually called 'ergative' rather than 'nominative'.

roles, so that at least person nouns that denote professions and occupations are more frequently applied to men. Thus, the direction of derivation (from male/general to female) is related to frequency of use. However, the frequency relations tend to be reversed with nouns like *nurse* (because more women are nurses than men) and *widow* (probably not because husbands die more often than wives, but because marital status has traditionally been considered more relevant for women than for men). As a result of the unusual frequency relations, we get unusual male forms with overt marking (*widow-er, male nurse*).

12.1.5 Explaining the correlations

The correlation between frequency and shortness is clearly motivated by language users' preference for economical structures. Speakers can afford shorter expressions (or even zero expressions) when these are frequent, because frequent expressions are more predictable and are therefore those that are expected by default. The basic principle here is the same as in many other areas of human communication. For instance, in many countries local phone calls do not require an area code because phone calls to the local area are more common than phone calls to other areas.

In language, such economical structures may arise when a new distinction is introduced that is coded only in one of the two contrasting values. For instance, Spanish has a new subject/object distinction, which is marked by the preposition *a* with animate NPs (e.g. *Veo a mi hermano* [see.1SG to my brother] 'I see my brother'). This does not have morphological status yet, but if it becomes grammaticalized as an accusative case prefix, we will have a case system that conforms to the pattern in (12.12), in which the less frequently used case form gets the overt marking. The nominative was never marked overtly from the beginning of this change.

Another way in which an economical case-marking system may arise is by selectively preserving older markers. For example, in the Old High German *n*-declension, animate and inanimate nouns alike had a distinction between nominative and accusative (see (12.13)).

	Old High German		Modern German	
NOM.SG	*affo*	*knoto*	*Affe*	*Knoten*
ACC.SG	*affon*	*knoton*	*Affen*	*Knoten*
	'ape'	'knot'	'ape'	'knot'

(12.13)

Then the nominative/accusative distinction was lost in inanimate nouns, and in Modern German only animates preserve the zero marking in the nominative. Again, the resulting pattern conforms to (12.12), but it has come into existence via a different diachronic route.

The correlation between frequency and differentiation is due to the

greater **memory strength** of frequent values. When a value occurs rarely, it is more difficult to remember all the details of that value, so syncretism is more common in rare values, and various suppletive allomorphs are more easily kept apart in the frequent values.

12.2 The direction of analogical levelling

Analogical levelling is a common type of morphological change. Levelling eliminates morphophonological alternations by extending one stem alternant to other word-forms in the paradigm. For instance, many speakers of English have eliminated the alternation in *house/houses*, which in the traditional pronunciation has a voiced final stem consonant in the plural: [haʊs]/[haʊzəz]. Now crucially, it is the form of the singular stem that is extended by the innovating speakers ([haʊs]/[haʊsəz]), not the plural stem. There are no English speakers that pronounce the singular noun *house* as [haʊz].

This change is typical of analogical levelling in general: the form of the stem that is extended within the paradigm is usually the value with higher frequency. That frequency is the crucial factor is particularly clear from cases of local frequency reversals. A particularly striking case of this comes from West Frisian, where in the traditional language many nouns show a vowel alternation in singular–plural pairs. In innovative varieties of the language, this alternation is eliminated and the singular and plural stems are identical again, (see (12.14)).

(12.14)   conservative   innovative
    a. *hoer/hworren*   *hoer/hoeren*   'whore(s)'
       koal/kwallen   *koal/koalen*   'coal'
       miel/mjillen   *miel/mielen*   'meal, milking'
       poel/pwollen   *poel/poelen*   'pool(s)'

    b. *earm/jermen*   *jerm/jermen*   'arm(s)'
       kies/kjizzen   *kjizze/kjizzen*   'tooth / teeth'
       hoarn/hwarnen   *hwarne/hwarnen*   'horn(s)'
       trien/trjinnen   *trjin/trjinnen*   'tear(s)'
                                                      (Tiersma 1982: 834)

In (12.14a), the singular stem form is extended in analogical levelling, but, in (12.14b), the plural stem form is extended. The choice of the form that is extended is by no means arbitrary: when the noun denotes a thing that tends to occur in groups and hence is more frequent in the plural, the plural stem wins out.

An example from case inflection is Latin *oleum* 'olive tree', which goes back to an earlier form *oleivum* (cf. *oleiva,* later *olīva,* 'fruit of the olive tree,

olive'). Then three sound changes occurred: (i) the diphthong *ei* turned into *ē* and later into *ī*, (ii) the semivowel *v* [w] was dropped before *u* and (iii) long vowels were shortened before another vowel. As a result, the nominative/accusative form *oleivum* successively became *olēvum*, *olēum* and *oleum*, whereas the genitive and dative forms *oleivī/oleivō* became *olīvī/olīvō*. Then, analogical levelling extended the nominative/accusative stem to the other case forms (*oleiva* became *olīva* and retained the stem *olīv-*, because the *v* never dropped from its paradigm):

(12.15)	oldest form	later form	Classical Latin
NOM/ACC.SG	*oleivum*	*oleum*	*oleum*
GEN.SG	*oleivī*	*olīvī*	*oleī*
DAT.SG	*oleivō*	*olīvō*	*oleō*

The greater stability of frequent stem forms can be explained again by memory strength and speed of lexical access. The genitive singular *olīvī* is replaced by *oleī* because the stem *ole-* has higher memory strength and may thus be used when a speaker (temporarily) forgets the old form *olīv-*, or because *ole-* can be retrieved more quickly from the lexicon and combined with the suffix *-ī* than the form *olīvī*, with its rarer stem form *olīv-*.

12.3 Frequency and irregularity

In language after language, if there are irregularities in inflection, these primarily affect the most frequent lexemes. Our first example comes from Koromfe, which has scores of regular verbs like those in (12.16a), and a few irregular verbs like those in (12.16b).

(12.16) a.	HABITUAL	PAST		b.	HABITUAL	PAST	
	kam	*kamɛ*	'squeeze'		*bɛ*	*bɛn-ɛ*	'come'
	tarɪ	*tarɛ*	'plaster'		*bo*	*bol-e*	'say'
	leli	*lele*	'sing'		*tɛ*	*tɛr-ɛ*	'arrive'

(Rennison 1997: 271–5)

In Welsh, there are four irregular verbs whose past tense is totally unlike the past tense of a regular verb such as *gwel-* in (12.17a). Three of them are shown in (12.17b).

(12.17)	a. *gwel-d* 'see'	b. *myn-d* 'go'	*gwneu-d* 'do'	*do-d* 'come'
1SG	*gwel-es i*	*es i*	*nes i*	*des i*
2SG	*gwel-est ti*	*est ti*	*nest ti*	*dest ti*
3SG	*gwel-odd e*	*aeth e*	*naeth e*	*daeth e*

(King 1993: 183)

In Old English, grammars list just four verbs that are totally irregular and cannot be fitted into any of the inflectional classes. These are shown in (12.18b), and a regular verb is shown in (12.18a).

(12.18)		a. 'bind'	b. 'be'	'do'	'go'	'want'
	1SG.PRS	binde	eom	dō	gā	wille
	2SG.PRS	bintst	eart	dēst	gǣst	wilt
	3SG.PRS	bint	is	dēþ	gǣþ	wille
	1–3PL.PRS	bindaþ	sint	dōþ	gāþ	willaþ
	1SG.PST	band	wæs	dyde	ēode	wolde
	PARTICIPLE	gebunden	—	gedōn	gegān	—

Thus, the verbs that tend to show irregularities are those that mean 'be', 'do', 'go', 'come', 'say', and so on – i.e. precisely those verbs that are used the most frequently across languages.

In nouns, the situation is more or less the same. For example, in Lango regular plural suffixes are *-ê, -nì* and *-í*. Some regular and most of the irregular nouns are listed in (12.19).

(12.19) a.	*réc*	*réc-ê*	'fish(es)'	b.	*dákô*	*món*	'woman/women'
	púnô	*pùn-nì*	'pig(s)'		*ɲákô*	*àɲìrà*	'girl(s)'
	lɛ̀	*ley-í*	'axe(s)'		*ìcɔ̀*	*cɔ̀*	'man/men'
					dánô	*jɔ̀*	'person/people'
					dyàŋ	*dòk*	'cattle'
					gìn	*gìgù*	'thing(s)'

<div align="right">(Noonan 1992: 83–5)</div>

Irregular noun plurals in Bulgarian include *oko/oči* 'eye(s)', *uxo/uši* 'ear(s)', *dete/deca* 'child(ren)', and Italian has the three irregular nouns *uomo/uomini* 'man/men', *dio/dei* 'god(s)', *bue/buoi* 'ox(en)'. The appearance of words for 'cattle' and 'ox' on several of these lists may at first seem surprising – these are certainly not among the most frequent nouns in modern Italian and modern English. But in modern Lango they may well be (cattle herding is one of the main economic activities of Lango speakers), and in older Italian and older English the situation may have been similar.

There are two rather different ways in which frequency may cause irregularity in morphology. On the one hand, frequency leads to phonological reduction, because frequent expressions are relatively predictable, so that speakers can afford to articulate less clearly. This factor must be invoked to explain the irregularities in Koromfe verbs in (12.16). Examples from English are the verbs *have*, *say* and *make*, which were completely regular in earlier English (*haved, sayed, maked*), but became irregular because they were subjected to greater phonological reduction than comparable rarer verbs (e.g. *said* versus *played*, *had* versus *behaved*, *made* versus *faked*).

On the other hand, frequency leads to memory strength and fast lexical access, so that frequent items are less susceptible to analogical levelling and other regularizations. So, while frequency causes faster phonological change, with respect to morphology it has a conserving, decelerating function. For example, the irregular Italian noun *uomo/uomini* 'man / men' preserves an old declension type inherited from Latin (*homo/homines*) that was otherwise eliminated by regularizing changes (cf. Latin *virgo/virgines* 'virgin(s)', Italian *vergine/vergini*). This conserving effect of frequency is also the cause of the Bulgarian irregular plurals *oči* 'eyes' and *uši* 'ears'. These were originally dual forms, and, because eyes and ears typically occur in pairs, these word-forms were probably the most frequent forms in the paradigm. Since eyes and ears are among the most frequently used paired body parts, it is not surprising that these forms survive.

From a diachronic point of view, the least well-understood type of irregularity is stem suppletion, as seen in Welsh *myn-/es-/aeth*, Old English *is/wæs*, *gǣþ/ēode*, and Lango *dákô/món*. It is difficult to understand why speakers would begin to associate roots that originally came from two different lexemes and integrate them as word-forms of the same lexeme. But, granted that speakers sometimes do that, the conserving effect of frequency will maintain the suppletion in the most frequent lexemes. It is also worth pointing out that inflection class differentiation (which we discussed in Section 12.1.3) works in exactly the same way: different markers for the same meaning/inflectional values can be maintained if the items affected are sufficiently frequent, whether owing to the frequency of the inflectional value or to lexeme frequency.

Summary of Chapter 12

Token frequency is relevant to morphology because frequent words occur more predictably in context, are more easily remembered and are retrieved faster than rare words. Because speakers favour economical structures, the greater predictability of frequent values typically results in zero expression (or otherwise short expression). Frequent values are also more differentiated – they show less syncretism, fewer shared exponents and more cross-cutting values. Because frequent words and values are more easily remembered, they are less subject to analogical levelling, and this is also one of the reasons why irregularities exist mostly in frequent words. Another reason is that frequent words are subject to greater phonological reduction, again because of predictability. Over time, frequency effects thus shape (inflectional) morphological structure in a number of ways.

Further reading

Frequency differences between inflectional values of the same feature are discussed (under the name of 'markedness') by Greenberg (1966) and Croft (1990: ch. 4). Haspelmath (2006) argues that an abstract notion of markedness is superfluous once the role of frequency is appreciated.

   The insight that frequency is the explanation for shortness was already emphasized by Zipf (1935). For local frequency reversals, see Tiersma (1982). For the relation between frequency and irregularity, see Mańczak (1980a, b), Werner (1989), Bybee (1995), Nübling (2001), Corbett *et al.* (2001) and Brown *et al.* (2007). For the view that grammatical structure (including morphology) cannot be adequately understood without considering frequency effects, see Bybee (2006) and the papers in Bybee and Hopper (2001).

Comprehension exercises

1.   The general correlation between frequency and shortness leads to certain expectations about inflectional paradigms. Consider the following (partial) paradigms and determine where these expectations are fulfilled, and where we should be surprised.

a. Udmurt conjugation: past tense of *ućk-* 'look'

1SG	*ućki*	1PL	*ućkimy*
2SG	*ućkid*	2PL	*ućkidy*
3SG	*ućkiz*	3PL	*ućkizy*

(Perevoščikov 1962: 203)

b. Even declension: *ǰuu* 'house'

	SG	PL
NOM	*ǰuu*	*ǰuul*
ACC	*ǰuuw*	*ǰuulbu*
DAT	*ǰuudu*	*ǰuuldu*
COM	*ǰuuñun*	*ǰuulñun*
ABL	*ǰuuduk*	*ǰuulduk*

(Malchukov 1995: 9)

c. Pipil possessive inflection: *nu-chi:l* 'my chilli pepper', etc.

1SG	*nu-chi:l*	1PL	*tu-chi:l*
2SG	*mu-chi:l*	2PL	*amu-chi:l*
3SG	*i-chi:l*	3PL	*in-chi:l*

(Campbell 1985: 43)

    d. Tauya possessive inflection: *ya-potiyafo* 'my hand', etc.

1SG	*ya-potiyafo*	1PL	*sono-potiyafo*
2SG	*na-potiyafo*	2PL	*tono-potiyafo*
3SG	*potiyafo*	3PL	*nono-potiyafo*

                                                                 (MacDonald 1990: 129–30)

2. The Modern French verb *trouver* 'find' used to have two different forms of the stem in older French, *trouv-* and *treuv-*. The former occurred in word-forms that were stressed on the suffix, and the latter occurred in word-forms that were stressed on the stem. (A dot below the syllable indicates the position of the stress.) This stem alternation no longer exists in modern French: all forms of the verb *trouver* have the same stem vowel. Why is this change surprising after what we learned in this chapter?

	older French	modern French
'I find'	*je treu̞ve*	*je trou̞ve*
'you find'	*tu treu̞ves*	*tu trou̞ves*
'he finds'	*il treu̞ve*	*il trou̞ve*
'we find'	*nous trouvo̞ns*	*nous trouvo̞ns*
'you(PL) find'	*vous trouve̞z*	*vous trouve̞z*
'they find'	*ils treu̞vent*	*ils trou̞vent*

3. Go back to Chapter 10, where morphophonological alternations were discussed. Where did we make reference to frequency in that chapter? How did what we said there fit with the claims of this chapter?

Exploratory exercise

In this chapter we saw that frequency asymmetries and structural asymmetries are correlated. For instance, a noun lexeme's singular forms tend to be more frequently used than its plural forms, and correspondingly, case forms tend to be more differentiated in the singular and singular exponents tend to be shorter than their plural counterparts. This pattern can be seen even at the level of individual lexemes. Where the plural is more frequently used (a frequency reversal), that lexeme is likely to exhibit more differentiation in the plural, and shorter plural forms.

    We also claimed that frequent lexemes tend to be irregular. The reader may have noticed, however, that this discussion was based on a different type of frequency comparison. Rather than looking at the relative frequency of different paradigm cells, we compared the frequency of use of different lexemes. We did not consider whether irregularity correlates with frequency asymmetries within a lexeme. But given the importance of frequency at this level, we might ask whether such a correlation exists. In other words,

are more frequently used cells in a paradigm more (or less) likely to be irregular? You will develop an answer to this question.

This exercise is based on (but simplifies) Corbett *et al.*'s (2001) study of Russian, and we use Russian for demonstration purposes below. You need not choose this language to investigate, but a good frequency dictionary or frequency list, with information for individual word-forms, must be available. (Hint: to make the process of finding word-form frequencies more efficient, it is helpful if the frequency dictionary/list is available for electronic searching.)

Instructions

Step 1: Choose a morphological pattern that exhibits (strong) stem suppletion in at least a handful of lexemes. A few examples of Russian singular–plural noun pairs are given below. As can be seen, the examples in (12.20a) have the same stem for the singular and plural, but the ones in (12.20b) exhibit suppletion.

(12.20) SINGULAR   PLURAL   GLOSS
   a. *zavod* *zavody* 'factory'
    student *studenty* 'student'

   b. *syn*   *synov'ja* 'son'
    rebënok *deti*   'child'
    čelovek *ljudi* 'person'

Since suppletion in the Russian examples is according to number, we want to ask how frequently the plural is used, compared to the singular, and whether this differs depending on whether the noun is regular or suppletive. An appropriate measure is thus the ratio of plural frequency to singular frequency, e.g. token frequency of *ljudi* divided by token frequency of *čelovek*. (For demonstration purposes we are ignoring the fact that Russian has nominal cases.)

Step 2: Develop a hypothesis. Based on what you have read in this chapter and elsewhere in the book (e.g. discussion of frequency in Section 4.3), make a guess about what the answer to the research question will be. For instance, would you expect Russian lexemes with suppletive stems in the plural to be more/less frequently used in the plural than in the singular? What would you expect for lexemes with the same stem throughout? Explain your reasoning.

Step 3: Build a list of lexemes with stem suppletion. Identify as many relevant words as possible.

Step 4: Using a frequency dictionary or frequency list, gather token frequency counts. For each of the suppletive lexemes from Step 3, find the token frequency of each word-form in its paradigm. Then, do the same for at least 10 lexemes that have the same stem throughout the paradigm (the

(12.20a) type), and which are of similar overall frequency to the suppletive lexemes (or as close as possible).

Step 5: For each lexeme, calculate the relevant frequency ratio. For instance, according to one count, the lexeme ČELOVEK occurs in the singular 1678 times per million words of text, and in the plural 1267 times per million words of text (Sharoff 2002). Its ratio is thus 0.755 (= 1267/1678).

Step 6: Evaluate the data and draw conclusions. Compare the relative frequency ratios for the two groups. Are there any notable differences in the frequency ratios? Do the results match your predictions? Consider the implications for understanding the relationship (or lack thereof) between the frequency of paradigm cells and irregularity.

Alternative: Irregularity can be treated as a scale ranging from strong suppletion to full regularity (see Chapter 2). Rank different kinds of stem irregularity, and look for a correlation between *degree* of irregularity and frequency. (This is much harder!)

Key to comprehension exercises

Chapter 1

1. complex words:
   nights (*night-nights, cat-cats, trick-tricks, lap-laps,…*)
   playing (*play-playing, think-thinking, run-running, hop-hopping,…*)
   affordable (*afford-affordable, accept-acceptable, form-formable,…*)
   indecent (*decent-indecent, accurate-inaccurate, adequate-inadequate,…*)
   searched (*search-searched, cough-coughed, pass-passed, laugh-laughed,…*)
   hopeful (*hope-hopeful, mercy-merciful, colour-colourful, deceit-deceitful,…*)
   redo (*do-redo, think-rethink, absorb-reabsorb, read-reread,…*)

   not complex: *owl, religion, indolent, bubble, during*

2. | | | | |
   |---|---|---|---|
   | *chàng* | 'music' | *chē* | 'vehicle' |
   | *chuán* | 'ship' | *cí* | 'word' |
   | *dēng* | 'lamp, light' | *diàn* | 'electric' |
   | *dǐng* | 'top' | *dòngwù* | 'animal' |
   | *fáng* | 'house' | *fēi* | 'fly' |
   | *huā* | 'flower' | *jī* | 'machine' |
   | *jiǎo* | 'leg' | *kè* | 'customer, visitor' |
   | *lì* | 'power' | *qì* | 'steam, gas' |
   | *shān* | 'mountain' | *shì* | 'sight, see' |
   | *shù* | 'number' | *shuǐ* | 'water' |
   | *wěi* | 'tail, part' | *xué* | 'study of' |
   | *yóu* | 'oil' | *yú* | 'fish' |
   | *yuán* | 'garden' | *zhǐ* | 'paper' |

3. | | | | |
   |---|---|---|---|
   | *wari* | 'sleep' | *eeli* | 'leave' |
   | *in-* | 'I' | *e7-* | 'they' |
   | *ix-* | 'you(PL)' | *at-* | 'you(SG)' |
   | *oq-* | 'we' | *n-* | 'PRESENT TENSE' |
   | *x-* | 'PAST TENSE' | | |

Note that the third person singular ('he or she') does not correspond to a morphological constituent, but the word *neeli* 'he or she leaves' can (and must) be interpreted as having the meaning 'he or she' because of the absence of any other person marker.

4. In Hebrew, the lexical meaning is represented by the consonants, so the root *dbr* corresponds to SPEAK, which shows up in the word-forms *diber* 'he spoke', *dibra* 'she spoke', *dibur* 'speech'. The vowels correspond to grammatical information and word-class. There are four identifiable sets of word pairs in this data that exhibit a morphological relationship.

Set 1:   *diber*   'he spoke'   *dibra*   'she spoke'
        kimet   'he wrinkled'   *kimta*   'she wrinkled'
        milmel   'he muttered'   *milmla*   'she muttered'

In Set 1, the masculine ('he') past tense has the structure C*i*C(C)*e*C, where C indicates a consonant, and anything in parentheses is optional. The feminine ('she') past tense has the structure C*i*CC(C)*a*. The difference between masculine and feminine (past tense) verbs thus has to do with both the vowel quality, and the position of the vowel in the word.

Set 2:   *ħašav*   'he thought'   *ħašva*   'she thought'
        kalat   'he received'   *kalta*   'she received'
        sagar   'he shut'   *sagra*   'she shut'

Set 2 is similar to Set 1, except that the masculine and the feminine have *a* for both vowels. The difference between masculine and feminine (past tense) verbs is thus represented only by the position of the vowel in the word.

Set 3:   *dibur*   'speech'
        kimut   'wrinkling'

Set 3 contains abstract nouns derived from verbs. These nouns have the form C*i*C*u*C.

Set 4:   *ma-klet*   'radio receiver'
        ma-sger   'lock'
        ma-ħšev   'computer'

Set 4 contains concrete nouns. In this set, there is a prefix *ma-*, and a stem with the form CC*e*C.

Chapter 2

1. Allomorph 1: *-ayaal* (e.g. *awowe, awowayaal* 'grandfather(s)'). Conditions: Used when the stem ends in an [e], which is removed in the plural form.

   Allomorph 2: *-oyin* (e.g. *baabaco, baabacooyin* 'palm(s)'). Conditions: Used when the stem ends in an [o].

Allomorph 3: -*aC*, where C stands for a consonant that is the same as the final consonant in the stem (e.g. *beed, beedad* 'egg(s)'). Conditions: Used when the stem has only one syllable (and ends in a consonant).

Allomorph 4: -*Co*, where C stands for a consonant that is the same as the final consonant in the stem (e.g. *cashar, casharro* 'lesson(s)'). Conditions: Used when the stem has (at least) two syllables and ends in a consonant.

Plurals: *tuulooyin, togag, albaabbo, bustayaal*

2. Phonologically conditioned. The past tense allomorph [d] appears in verbs whose stems end in a vowel or any voiced consonant except [d]. The allomorph [t] appears in verbs whose stems end in any voiceless consonant except [t]. The allomorph [əd] appears in verbs whose stems end in [t] or [d].

3.

Venezi-a	*Venezi-ano*	(0 segments difference)
Trent-o	*Trent-ino*	(0)
Milan-o	*Milan-ese*	(0)
Savon-a	*Savon-ese*	(0)
Volterr-a	*Vol<u>a</u>terr-ano*	(1)
Piacen<u>z</u>-a	*Piacen<u>t</u>-ino*	(1)
Ancon-a	*Ancon<u>et</u>-ano*	(2)
Palerm-o	*Palerm<u>it</u>-ano*	(2)
Trevi<u>s</u>-o	*Trevi<u>gi</u>-ano*	(2)
Gub<u>bi</u>-o	*<u>Eu</u>-gub-ino*	(3)
Bress<u>ano</u>n-e	*Bri<u>ss</u>in-ese*	(4)
P<u>a</u>lestr<u>i</u>n-a	*P<u>r</u>enest-ino*	(6)
Domod<u>osso</u>l-a	*Dom-ese*	(7)
<u>I</u>vre-a	*Epore<u>di</u>-ese*	(7+)
Napoli	*Partenopeo*	(full suppletion)
Bologn-a	*Petroni-ano*	(full suppletion)

Chapter 3

1. a. tonal change
   b. suffixation
   c. vowel change (fronting)
   d. reduplication
   e. infixation
   f. circumfixation, vowel change

2. $\begin{bmatrix} /hiɹ/ \\ N \\ \text{'hear'} \end{bmatrix}$ $\begin{bmatrix} /ɪŋ/ \\ V \underline{\quad} \\ \text{'PROG'} \end{bmatrix}$ $\begin{bmatrix} /ɹi/ \\ \underline{\quad} V \\ \text{'again'} \end{bmatrix}$ $\begin{bmatrix} /gʊd/ \\ \text{ADJ} \\ \text{'good'} \end{bmatrix}$ $\begin{bmatrix} /z/ \\ V \underline{\quad} \\ \text{'3SG PRES'} \end{bmatrix}$

3. $\begin{bmatrix} /X/_{\text{ADJ}} \\ \text{'x'} \end{bmatrix}$ $\leftrightarrow$ $\begin{bmatrix} /Xɹ/_{\text{ADJ}} \\ \text{'more x'} \end{bmatrix}$

$$\begin{bmatrix} /X/_{ADJ} \\ \text{'}x\text{'} \end{bmatrix} \quad \leftrightarrow \quad \begin{bmatrix} /\text{ən}X/_{ADJ} \\ \text{'not } x\text{'} \end{bmatrix}$$

$$\begin{bmatrix} /X/_{V} \\ \text{'}x\text{'} \end{bmatrix} \quad \leftrightarrow \quad \begin{bmatrix} /\text{ɹi}X/_{V} \\ \text{'do}_{x} \text{ again'} \end{bmatrix}$$

$$\begin{bmatrix} /Xi/_{ADJ} \\ \text{'}x\text{'} \end{bmatrix} \quad \leftrightarrow \quad \begin{bmatrix} /X\text{ɪli}/_{ADV} \\ \text{'in a } x \text{ manner'} \end{bmatrix}$$

4. $\begin{bmatrix} /C\acute{V}CVC/_{N} \\ \text{'}x\text{'} \end{bmatrix} \quad \leftrightarrow \quad \begin{bmatrix} /CVC\acute{V}C/_{ADJ} \\ \text{'having the quality } x\text{'} \end{bmatrix}$

5. $\begin{bmatrix} /Xi/_{N} \\ \text{'field of study } x\text{'} \end{bmatrix} \quad \leftrightarrow \quad \begin{bmatrix} /X\text{ɪ}/_{N} \\ \text{'person who studies } x\text{'} \end{bmatrix}$

6. Subtraction is an attractive analysis because the final consonant of the feminine is different in each of the given words ([t,d,g,l,z]). A morphological relationship exists if a group of words shows identical partial resemblances in both form and meaning. These words show partial resemblance in meaning (they are masculine/feminine pairs), but since the final consonant is different in each of the feminine forms, the only generalization that can be made about form of all of the words is that the masculine form is one phonological segment shorter than the feminine form. If we tried to derive the feminine from the masculine, each word would require a different rule. If we delete a segment of the feminine to form the masculine, only one rule is needed.

Chapter 4

1. actual: *abundance, libertarian, replay*
   possible: *fraternitarian, itinerance, rebagelize*
   impossible: *happytarian*: The morpheme *-(t)arian* can attach only to bases that end in *t* or *ty*, e.g. *liberty-libertarian, humanity-humanitarian, document-documentarian*. (It is possible to have a base that is truncated at /t/, e.g. *vegetable-vegetarian*, but this does not apply to *happy*.)
   penchance: While *penchant-penchance* looks formally similar to *abundant-abundance*, in the latter pair, the noun *abundance* is derived from the adjective *abundant*. In the first pair, *penchant* is a noun, so *penchance* cannot be derived from it.
   reknow: *re-* must attach to a verb that expresses a repeatable action.

2. compositional meaning: *ability, legalize, modernize, morality, popularity, vaporize*
   non-compositional meaning: *authority, community, materialize, specialize*

3. The (a) forms all have allomorphy (stress placement is different in the base form and in the derived form, e.g. *pópular, populárity*); the (b) forms have no allomorphy (e.g. *módern, módernize*).

4. Finnish: cumulative expression for person and number (e.g. *me* indicates both 1ST PERSON and PLURAL NUMBER), and zero expression in the nominative (unlike in the other cases, there is no form overtly marking the nominative case).

 Ndebele: empty morph. When the root contains only a consonant or consonant cluster, *yi-* is prefixed to the root in the imperative form. (The underlying generalization is that the word-form must have at least two syllables, and *yi-* is added when this condition would not otherwise be met.) However, these forms bear an imperative marker (*-a*, e.g. *yi-dl-a* 'eat!'). Since *yi-* does not express any distinct inflectional or lexical meaning, it is an empty morph.

 Serbian: the answer depends on the segmentation that is assumed. One possibility is:

	SINGULAR	PLURAL		SINGULAR	PLURAL
1ST PERSON	*govor-i-m*	*govor-i-mo*	1ST PERSON	*tres-e-m*	*tres-e-mo*
2ND PERSON	*govor-i-š*	*govor-i-te*	2ND PERSON	*tres-e-š*	*tres-e-te*
3RD PERSON	*govor-i*	*govor-e*	3RD PERSON	*tres-e*	*tres-u*

Under this analysis, the Serbian data exhibit all three phenomena. The morphemes *-m*, *-mo*, *-š*, *-te, and -e/-u* express person and number cumulatively because it is not possible to subdivide them into morphemes meaning 'singular', 'plural', '1st person', etc. The forms *-i* and *-e*, which occurs in five of the six word-forms, are empty morphs because they do not directly correspond to any aspect of meaning. The third person singular has zero expression because there is no morpheme directly corresponding to this grammatical meaning.

 Another possible segmentation is:

	SINGULAR	PLURAL		SINGULAR	PLURAL
1ST PERSON	*govor-im*	*govor-imo*	1ST PERSON	*tres-em*	*tres-emo*
2ND PERSON	*govor-iš*	*govor-ite*	2ND PERSON	*tres-eš*	*tres-ete*
3RD PERSON	*govor-i*	*govor-e*	3RD PERSON	*tres-e*	*tres-u*

This analysis has a disadvantage, in that it does not capture that the suffixes that attach to *govor-* and very similar to the ones that attach to *tres-*. However, under this segmentation, the Serbian data still has cumulative expression, but no empty morphs or zero expression.

Chapter 5

1. *caminabas*
$$\begin{bmatrix} \text{TENSE: PAST} \\ \text{PERSON: 2ND} \\ \text{NUMBER: SINGULAR} \end{bmatrix}$$

 insulam
$$\begin{bmatrix} \text{CASE: ACCUSATIVE} \\ \text{NUMBER: SINGULAR} \end{bmatrix}$$

cantabit	$\begin{bmatrix} \text{MOOD: INDICATIVE} \\ \text{ASPECT: INFECTUM} \\ \text{TENSE: FUTURE} \\ \text{PERSON: 3RD} \\ \text{NUMBER: SINGULAR} \end{bmatrix}$
books	$\begin{bmatrix} \text{NUMBER: PLURAL} \end{bmatrix}$
ovci	$\begin{bmatrix} \text{CASE: DATIVE} \\ \text{NUMBER: SINGULAR} \end{bmatrix}$
incal	$\begin{bmatrix} \text{PERSON: 3RD} \\ \text{NUMBER: PLURAL} \end{bmatrix}$
bigger	$\begin{bmatrix} \text{DEGREE: COMPARATIVE} \end{bmatrix}$

2. affirmative polarity

	IMPERFECTIVE	PERFECT	HABITUAL
PRESENT	*kat-zawa*	*kat-nawa*	*kat-da*
PAST	*kat-zawa-j*	*kat-nawa-j*	*kat-da-j*

negative polarity

	IMPERFECTIVE	PERFECT	HABITUAL
PRESENT	*kat-zawa-č*	*kat-nawa-č*	*kat-da-č*
PAST	*kat-zawa-č-ir*	*kat-nawa-č-ir*	*kat-da-č-ir*

3. Denominal verbs
    act like N: *cannibaliz*e
    put into N: *categorize*
    cover with N: *butter*
    use N: *phone, skate, ski* (new category)
    create N: *unionize, terrorize, peel* (new category)

   Deadjectival verbs
    factitive: *flatten, legalize, blacken, modernize*

4. *-ly*
    (i)   not relevant to the syntax (= derivational)
    (ii) not obligatory expression (= derivational)
    (iii) limited applicability (= derivational) (e.g. **longly, *brownly*, etc.)
    (iv) (difficult to apply)
    (v)   relatively abstract meaning (= more typical of inflection than derivation)

(vi) compositional meaning (= typical of inflection, but also possible for derivation)

(vii) expression close to the base (= derivational) (there are examples of derivation followed by -ly, e.g. *abus-ive-ly*, *content-ed-ly*, but this is consistent with either derivation or inflection. The decisive examples are -ly followed by derivation, e.g. *clean-li-ness, man-li-ness, like-li-hood*).

(viii) no base allomorphy (= typical of inflection, but also possible for derivation)

(ix) changes word-class (= derivational)

(x) no cumulative expression (= derivational)

(xi) not iterable (= typical of inflection, but also possible for derivation) (e.g. *nicelyly*)

Chapter 6

1. The primary restriction prohibiting *bountifulity*, *sonorantity*, *aimlessity*, *darkishity* and *fearsomity* has to do with borrowed vocabulary strata. The suffix -ity attaches only to Latinate bases. The suffixes -ic, -able, -ive, -ous and -al are all Latinate, so they create the Latinate bases *electric*, *probable*, *captive*, *curious* and *abnormal*. However, -ful, -ant, -less, -ish and -some are all Germanic, so bases ending in these suffixes are also Germanic. (Also, since Germanic bases routinely form abstract nouns with -ness, even if it were possible to add -ity, some of the impossible words would be subject to synonymy blocking (e.g. *aimlessness* would likely block *aimlessity*)).

2. *reknow* is subject to semantic restrictions. The prefix must attach to a verb that expresses a repeatable action.

    happytarian is subject to phonological restrictions. The morpheme -(t)arian can attach only to bases that end in *t* or *ty*, e.g. *liberty-libertarian, humanity-humanitarian, document-documentarian*. (It is possible to have a base that is truncated at /t/, e.g. *vegetable-vegetarian*, but this does not apply to *happy*.)

3. The suffix -simo is used when the stem is monosyllabic. The suffix -ma is used when the stem has (at least) two syllables.

ɖjávas-ma	'reading'	kóp-simo	'cutting'
mángo-ma	'squeezing'	lú-simo	'bathing'
skónda-ma	'stumbling'	pjá-simo	'seizing'
tínaɣ-ma	'shaking'	trék-simo	'running'

4. *musting* is not an example of blocking; MUST does not have a form *musting* because it is a modal verb (and *have to* and *must* are interchangeable otherwise, e.g. *I have to go/I must go*.)

    foots is blocked by *feet*. Irregular (inflectional) forms, including

feet, must be stored in the lexicon and lexical items block otherwise productive rule application.

 *cooker is blocked by *cook.*

 *bishopdom is blocked by *bishopric*.

 *teacheress is blocked by *teacher*.

 *slickize is not an example of blocking; *-ize* does not attach monosyllabic words, or words that end in a stressed syllable.

 *certainness is blocked by *certainty*.

 sisterlily is not an example of blocking; the impossibility of this word probably represents a phonological constraint against adjacent identical syllables (-li-ly*).

5. The suffix *-(er)ati* developed from analogical extensions. *Literati* is an established term and was the model for the original analogical extension. *Glitter-ati* (< *glitter*) was the first term coined by analogy, and not coincidentally the two stems contain both the sequence *lit(t)er*, which was the basis for the analogy. By analogy the pattern then spread to other stems ending in *er* (*liber-ati* (cf. *liber-al*), *chatter-ati*, *soccer-ati*), and was even further extended to stems that do not end in *er* (*digit-erati*, cf. *digit-al*).

 The suffix *-scape* is similarly the result of analogy, with *landscape* as the original model, and *seascape* as the first term coined by analogy. This was followed by *cloudscape, skyscape, waterscape, winterscape*, etc. This example is exactly parallel to *-gate* (*Watergate, Irangate, coingate*).

Chapter 7

1.

```
                          N
                         /‖
                        N ‖
                       /‖ ‖
                      N ‖ ‖
                     /‖ ‖ ‖
                    N N N N
                    | | | |
               undersea cable repair team
```

```
                          N
                        /   ‖
                       N     N
                      /‖    /‖
                    ADJ N  N  N
                     |  |  |  |
                  fixed- line phone system
```

```
                          N
                         /‖
                        N ‖
                       /‖ ‖
                      N ‖ ‖
                     /‖ ‖ ‖
                   ADJ N N N
                    |  |  |  |
                   mad cow disease hysteria
```
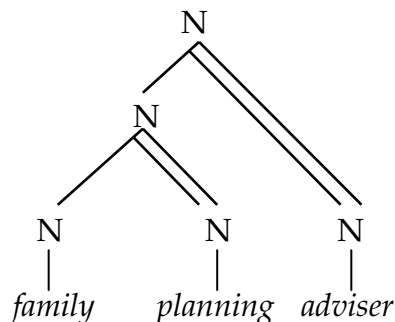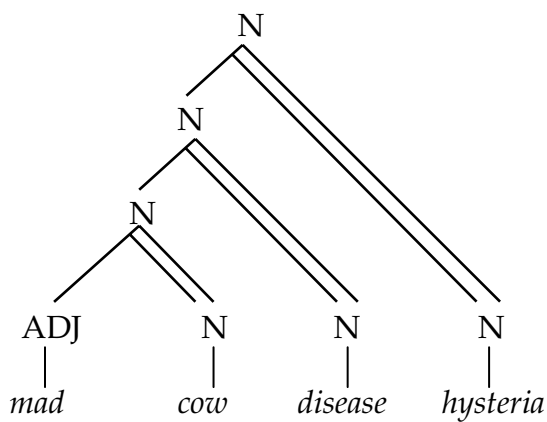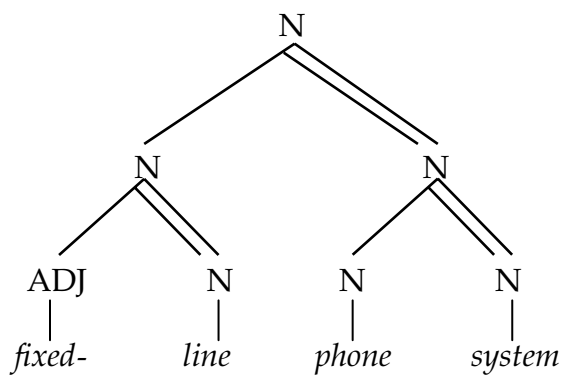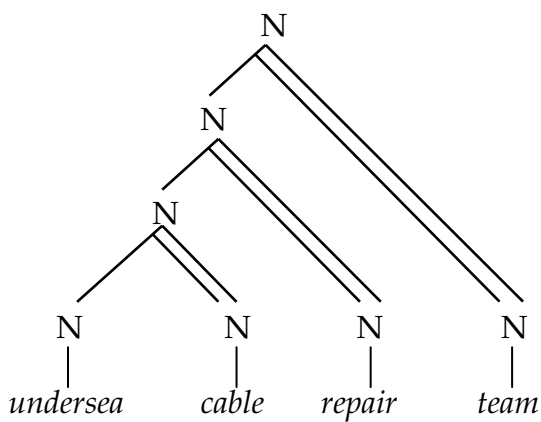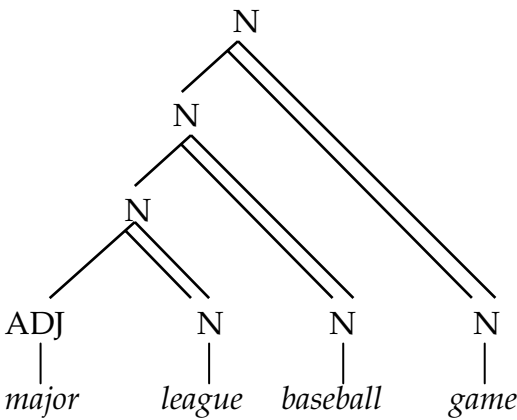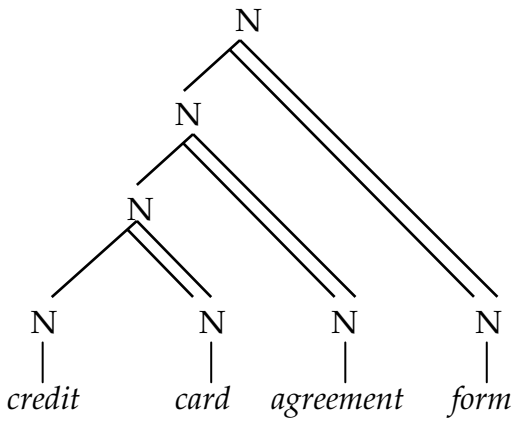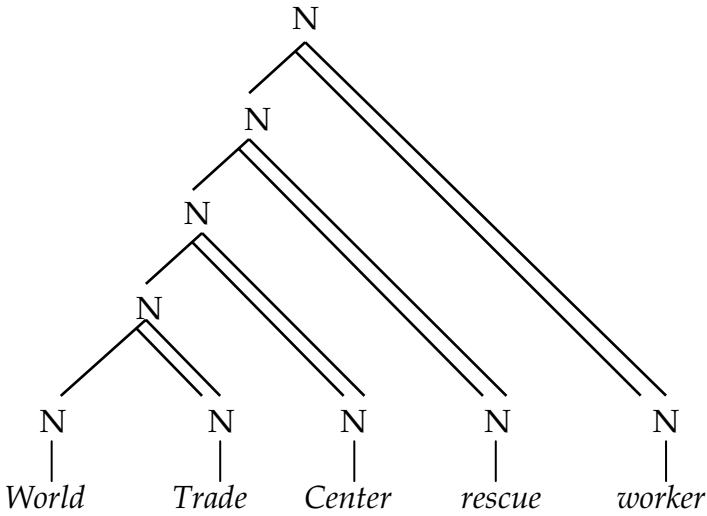
2.

aśvakovida-	endocentric
bahuvrīhi-	exocentric
divyarūpa-	exocentric
gr̥hapati-	endocentric
mahārāja-	endocentric
mahātman-	exocentric
priyasakhī-	endocentric
rājarṣi-	appositional
śuklakr̥ṣṇa-	appositional
sukhaduḥkha-	coordinative

3.

'immobilizable'   'unmobilizable'

4.
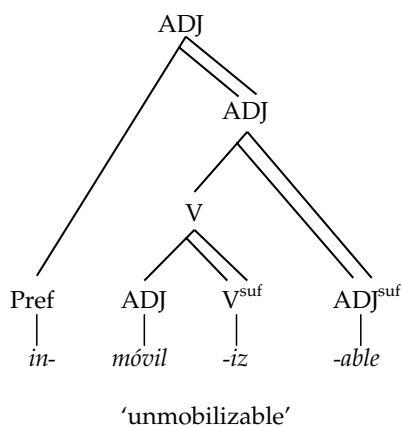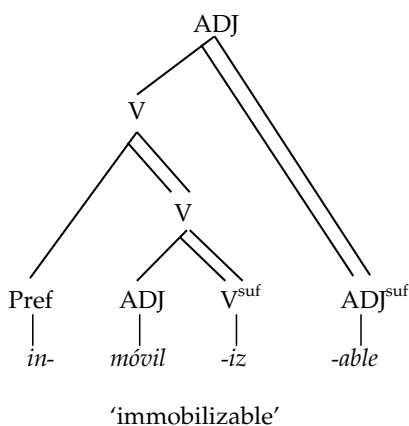
$$\begin{bmatrix} /Xyj/_{\text{ADJ}} \\ \text{'}x\text{'} \end{bmatrix} \ \& \ \begin{bmatrix} /Ya/_{\text{N}} \\ \text{'}y\text{'} \end{bmatrix} \ \leftrightarrow \ \begin{bmatrix} /XoYyj/_{\text{ADJ}} \\ \text{'having } y \text{ with} \\ \text{the property } x\text{'} \end{bmatrix}$$

Chapter 8

1. *lumangoy*
wumagayway
natakot
nauhaw
binuhat
pinunit
pinunasan

2. If the description in Figure 8.3 were adopted, the following rule schema from Figure 8.2 could be eliminated:

$\{ [/XVs/_{\text{NOM.SG}}] , [/XV/_{\text{ACC.SG}}] , [/XV/_{\text{GEN.SG}}] , [/XVZ/_{\text{NOM.PL}}] ,$
$[/XVs/_{\text{ACC.PL}}] , [/Xon/_{\text{GEN.PL}}] \}$

The modified version of Figure 8.2 would look like:

XVZ	XVs
XV	XVs
XVZ	Xon

XVs	Xes
XV	Xes
XV	Xon

XV	XVs
XV	XVs
XVs	Xon

Xos	!Xi
Xo	!Xus
Xu	Xon

Xas	Xes
Xa	Xes
Xa	Xon

Xus	Xuðes
Xu	Xuðes
Xu	Xuðon

XV	Xes
XV	Xes
XVs	Xon

Xi	Xis
Xi	Xis
Xeos	Xeon

Xa	Xes
Xa	Xes
Xas	Xon

Xi	Xes
Xi	Xes
Xis	Xon

Xu	Xuðes
Xu	Xuðes
Xus	Xuðon
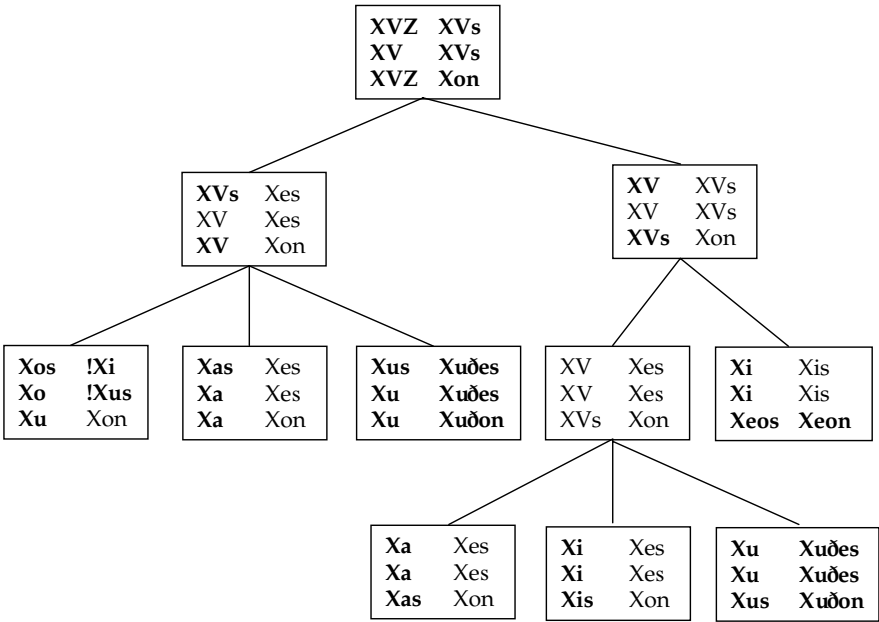
3. An answer to this question depends on how we choose to define the classes. On a narrow definition, it is possible to identify at least 46 'irregular' past tense patterns (shown below). Of these, 22 contain only one word (*catch/caught*), or have only words built on the same stem (*stand/stood, understand/understood, withstand/withstood*). One answer, then, is that the words belonging to these 22 classes are truly irregular, whereas words belonging to the remaining 24 groups at least exhibit some kind of shared pattern and therefore belong to an inflection class.

   Looking more broadly, however, some of these small and singleton groups have traits in common. For instance, there is only one word with the pattern [æC] → [ɔt] (*catch/caught*), but there are five other words with past tense [ɔt]: *seek/sought, teach/taught, bring/brought, think/thought* and *buy/bought*. Also, words that have both vowel change and a suffix ([d] or [t]) can plausibly be grouped with words that have only one or the other pattern. And so on. The only verb that does not form a past tense in any way similarly to other words is *be/was* (even highly suppletive *go/went* has a final [t]!).

   Thus, for almost all 'irregular' verbs, inflection classes can be established at a broad level.

[d] or [t] patterns

[k] → [d]:   *make/made*

[d] → [t]:   *bend/bent, build/built, lend/lent, send/sent, spend/spent*

Ø → [t]:   *burn/burnt, learn/learnt, spill/spilt*

Vowel change patterns

[i] → [e]:   *eat/ate*

[i] → [ɛ]:   *bleed/bled, breed/bred, feed/fed, lead/led, meet/met, plead/pled, read/ read, speed/sped*

[i] → [ɔ]:   *see/saw*

[i] → [o]:   *freeze/froze, shear/shore, speak/spoke, steal/stole, weave/wove*

[ɪ] → [e]:   *bid/bade, forbid/forbade, forgive/forgave, give/gave*

[ɪ] → [æ]:   *begin/began, drink/drank, ring/rang, shrink/shrank, sing/sang, sink/ sank, sit/sat, spit/spat, spring/sprang, stink/stank, swim/swam*

[ɪ] → [ʌ]:   *cling/clung, dig/dug, fling/flung, sling/slung, spin/spun, spring/ sprung, stick/stuck, sting/stung, string/strung, swing/swung, win/ won, wring/wrung*

[e] → [o]:   *awake/awoke, break/broke, wake/woke*

[e] → [ʊ]:   *forsake/forsook, mistake/mistook, overtake/overtook, shake/shook, take/took*

[ɛ] → [ɔ]:   *forget/forgot, get/got, tread/trod*

[ɛ] → [o]:   *bear/bore, swear/swore, tear/tore, wear/wore*

[a] → [ɛ]:   *fall/fell*

[æ] → [ʌ]:   *hang/hung*

[aj] → [ɪ]:   *hide/hid, slide/slid*

[aj] → [e]:   *lie/lay*

[aj] → [æ]:   *bind/bound, find/found, grind/ground, wind/wound*

[aj] → [o]:   *dive/dove, drive/drove, ride/rode, rise/rose, shine/shone, strive/strove*

[aj] → [u]:   *fly/flew*

[aj] → [ʌ]:   *strike/struck*

[ɔ] → [u]:   *draw/drew*

[o] → [ɛ]:   *hold/held, uphold/upheld, withhold/withheld*

[o] → [u]:   *blow/blew, grow/grew, know/knew, overthrow/overthrew, throw/ threw*

[u] → [ɔ]:   *shoot/shot*

[u] → [o]:   *choose/chose*

[ʌj] → [ɪ]:   *bite/bit, light/lit*

[ʌ] → [e]:   *become/became, come/came, overcome/overcame*

[ʌ] → [æ]:   *run/ran*

[ʌj] → [ɔ]:   *fight/fought*

[aj]/[ʌj] → [o]: *smite/smote, stride/strode, write/wrote*

Past tense vowel change + [d] or [t] patterns

[i] → [ɛd]:   *flee/fled*

[iC] → [εCt]:	*creep/crept, deal/dealt, dream/dreamt, feel/felt, keep/kept, kneel/knelt, leap/leapt, leave/left, mean/meant, sleep/slept, sweep/swept, weep/wept*
[e] → [εd]:	*say/said*
[εl] → [old]:	*sell/sold, tell/told*
[u] → [ɪd]:	*do/did, overdo/overdid*
[uC] → [ɔCt]:	*lose/lost*

<u>Weak suppletive patterns with past tense [ɔt]</u>

[iC] → [ɔt]:	*seek/sought, teach/taught*
[ɪŋ(C)] → [ɔt]:	*bring/brought, think/thought*
[æC] → [ɔt]:	*catch/caught*
[aj] → [ɔt]:	*buy/bought*

<u>Other suppletive patterns</u>
be/was,were
forego/forewent, go/went
stand/stood, understand/understood, withstand/withstood

<u>Zero expression</u>
beat/beat, beset/beset, bet/bet, bid/bid, broadcast/broadcast, burst/burst, cast/cast, cost/cost, cut/cut, fit/fit, forbid/forbid, hit/hit, hurt/hurt, knit/knit, let/let, put/put, quit/quit, rid/rid, set/set, shed/shed, shut/shut, slit/slit, spit/spit, split/split, spread/spread, thrust/thrust, upset/upset, wed/wed

4. Based on the given data, there are two factors that may have motivated the change. The first issue is grammatical gender. Both class (ii) and class (iii) contain masculine nouns, whereas class (i) contains feminine nouns. If the inflectional pattern for class (i) was considered by speakers to be the canonical feminine pattern, and class (iii) was considered to be the canonical masculine pattern, this could have motivated inflectional change in class (ii) towards the more canonical masculine pattern.

    The second potential factor is overlapping inflectional patterns. Class (i/ii) and class (iii) have similar patterns in the accusative (final [n]) and the dative (final [i]). The similarity of class (ii) to the class (iii) pattern in these paradigm cells could have served as the basis for shift in the other cells (NOM and GEN) to be more similar to class (iii).

5. The following is an inheritance hierarchy for Russian nominal inflection classes. Inflectional information that is shared by most or all of the classes is introduced at the highest node in the hierarchy (e.g. dative, instrumental and locative plural forms), and more specific information is introduced at lower nodes (e.g. the genitive plural form). In a few instances information at lower nodes overrides the inherited information (e.g. nominative plural form in (iv)).

	SG	PL
NOM	XZ	Xy
ACC	XZ	Xy
GEN	XV	XZ
DAT	XV	Xam
INST	XZ	Xami
LOC	Xe	Xax

ACC = NOM

	SG	PL
NOM	XZ	Xy
ACC	XZ	Xy
GEN	Xa	XZ
DAT	Xu	Xam
INST	Xom	Xami
LOC	Xe	Xax

ACC = NOM

(i)

	SG	PL
NOM	X	Xy
ACC	X	Xy
GEN	Xa	Xov
DAT	Xu	Xam
INST	Xom	Xami
LOC	Xe	Xax

ACC = NOM

(iv)

	SG	PL
NOM	Xo	!Xa
ACC	Xo	!Xa
GEN	Xa	X
DAT	Xu	Xam
INST	Xom	Xami
LOC	Xe	Xax

ACC = NOM

(ii)

	SG	PL
NOM	Xa	Xy
ACC	Xu	Xy
GEN	Xy	X
DAT	Xe	Xam
INST	Xoj	Xami
LOC	Xe	Xax

!ACCSG = NOMSG

(iii)

	SG	PL
NOM	X'	X'i
ACC	X'	X'i
GEN	X' i	X'ej
DAT	X' i	X'am
INST	X' ju	X'ami
LOC	!X' i	X'ax

ACC = NOM

Intuitively, an important fact about this data is that the accusative is almost always the same as the nominative; the singular forms in (ii) (*komnata, komnatu*) are the exception. This generalization is captured at the highest node with the notation that ACC = NOM, and it then is inherited by lower nodes, and overridden in the class represented by *komnata*. (Note that all of the nouns in this exercise are inanimate. Animate nouns belonging to class (i), however, exhibit the pattern in ACC = GEN in the singular, as do all animates in the plural.)

6. The quantitative criterion does not provide clear evidence on the issue. In other inflection classes the second person singular is syncretic with the plural, but so is the first person singular (unlike in the verb *be*). The two inflection classes thus do not exhibit identical patterns of syncretism. Moreover, the relevance of this criterion is particularly unclear in the past tense – only *be* has more than one form.

I	*am*	*walk*	*was*	*walked*
you(SG)	*are*	*walk*	*were*	*walked*
he/she	*is*	walks	*was*	*walked*
we	*are*	*walk*	*were*	*walked*
you(PL)	*are*	*walk*	*were*	*walked*
they	*are*	*walk*	*were*	*walked*

According to the syntactic criterion, 2SG *are/were* is systematically syncretic with plural *are/were*. When the verb has to agree simultaneously with the second person singular and a plural subject, the same verb can agree with both: *Either we or you are/were supposed to play in the Bulgaria match.*

The diachronic evidence also suggests systematic syncretism. In the history of English, the 2sg had a form distinct from the plural form: *art* in the present tense, *wast* in the past tense (*wast* had earlier replaced etymological *were* under influence of other verbs that had the form X*t* in the 2sg past tense). Over time, the pronoun *you* displaced *thou*, and around the same time, *are/were* displaced *art/wast*. The ultimate result was that the 2SG was reformed on the basis of the 2PL.

	PRS	PST				
I	*am*	*was*				
thou(SG)	*art*	*wast*	>	you	*are*	*were*
he/she	*is*	*was*				
we	*are*	*were*				
you(PL)	*are*	*were*				
they	*are*	*were*				

Chapter 9

1. Referentiality and morphological cohesion are not relevant to these examples. Moreover, English does not generally use special segmental markers (e.g. interfixes) to indicate compounds, so this criterion is uninformative. However, four tests can be applied: phonological cohesion, anaphoric replacement, expandability and coordination ellipsis.

backboard: compound
   a. Phonological cohesion: one main word stress on the first syllable (*báckboard*)
   b. Anaphoric replacement impossible: **Every basketball court has one scoreboard and two back ones.* (i.e. two backboards)
   c. Not expandable: **The ball hit the very backboard.* (i.e. the board in the very back)
   d. Coordination ellipsis impossible: **The back and scoreboards were damaged by vandals.*

backdoor: phrase
  a. Lacks phonological cohesion: two main word stresses (*báckdóor*)
  b. Anaphoric replacement possible: *My house has one front door and two back ones.* (i.e. two backdoors)
  c. Expandable: *When you get to the house, go through the far backdoor* (i.e. the door in the far back of the house).
  d. Coordination ellipsis possible: *The back and side doors were mistakenly left open*.

back seat: phrase
  a. Lacks phonological cohesion: two main word stresses (*báck séat*)
  b. Anaphoric replacement possible: *My car has one front seat and two back ones.* (i.e two back seats)
  c. Expandable: *There is a lever in the trunk to release the far back seat* (i.e. the seat in the far back of the car).
  d. Coordination ellipsis possible: *The back and front seats we had upholstered in red velvet, but the middle row we upholstered in purple leather.*

2. Third singular present tense *-s* has no freedom of stem selection; it must attach to verbs. It also has no freedom of movement. For instance, it cannot be clefted separately from its verb. (**It is -s that Mary walk.*) Finally, it undergoes morphophonological alternation: [-s], [-əz] or [-z], depending on the final consonant of the verb stem.

3. Polish: clitics attach after their hosts (they are *enclitic*), so the clitic *go* cannot occur in sentence-initial position.

   French: the pronoun occurs in a position that requires emphatic (technically, contrastive) stress, so use of the clitic *tu* is not grammatical. Free form *toi* should be used.

   Serbian: the clitic *je* is a second-position clitic, but in this sentence it occurs in fourth position.

   Ponapean: the position of the completive suffix *-la* indicates that *keng-wini-* is a compound verb with an incorporated noun (*wini-* 'medicine' is the dependent member). However, dependent members generally cannot be referential (including in Ponapean), so the demonstrative *-o* (which is associated with *wini-*) makes the word ungrammatical.

4. As discussed in this chapter, the pronominals are outside of the domain of word stress. This is evidence that they are clitics. However, clitics do not generally undergo morphophonological alternations; in this respect the pronominals behave like affixes.

5. In Lithuanian, *s(i)* is like a clitic in that it appears either after the verb root (when not negated), or before it (when negated). It thus has freedom of host selection. It is like an affix in that it undergoes a morphophonological alternation.

6. Two criteria from Table 9.1 seem to be relevant. First, the first person active marker *a-* is prefixed to the verb root *jogua* 'buy' in (11.26a), but immediately precedes the noun *mba'e* 'thing' in (11.26b). If we assume that *a-* attaches only to verbs, and not to nouns, then the entire incorporated structure apparently serves as the domain of affixation. This is parallel to example (9.4). Second, as (11.27) shows, the dependent noun *mba'e* is not expandable – it cannot be modified by the adjective *hepy* 'expensive'. Both of these criteria suggest that (11.26b) is a compound.

Chapter 10

1. Morphophonological alternation. The most important issue is that stem voicing is both morphologically and lexically conditioned. It occurs in the plural, but not under the same phonological conditions in the possessive (e.g. [fs] in *leaf's*), and does not occur in all relevant words (e.g., *briefs, roofs, cuffs*).

   The affected sounds form a natural class (voiceless obstruents), and produce a natural class (voiced obstruents). The 'input' and 'output' are also phonetically close. While phonetic coherence and phonetic closeness are typical traits of automatic alternations, morphophonological alternations may or may not be phonetically coherent. These properties thus provide no solid evidence either way.

   Finally, the alternation does not apply to loanwords, its application is not sensitive to speech style, and it does not create a new segment (voiced obstruents exist in English independently of the alternation). It does not apply across word boundaries (*a lea[f] sat on the porch*; **a lea[v] sat on the porch*).

2. Relic alternation. The alternation applies to very few words, all of which are comparative adjectives: *long/longer*, *strong/stronger*, *young/younger*. (The rare example *wrong/wronger* seems to vary; some speakers have the alternation, and some have only [ŋ] in both word-forms.) Nouns do not exhibit the alternation (e.g. *sing/singer*). And it is not productive even in comparatives (e.g. *winningest*, *blinger than bling*).

3. a. Morphophonological alternation: the palatalization rule does not apply to loanwords (*laasiisìi* 'licence') or to new instances of the conditioning environment (*tèebà* 'cooked cassava flour'), so it must be at least in part lexically conditioned.

   b. Automatic alternation: the rule applies across word boundaries and in a phonetically motivated environment.

   c. Automatic alternation: the palatalization rule applies in a phonetically motivated environment, and whenever that environment arises. This rule is similar to the Hausa example in (a),

but the crucial difference is that in Modern Greek, the palatalization rule applies to loanwords (Greek [cinino] 'chinine').

d. Morphophonological alternation: the fact that the alternation occurs only in 'certain morphological forms' indicates that the rule is morphologically conditioned. It is also lexically conditioned, as evidenced by the fact that it fails to apply to some (native) words.

4. Phonetic distance: the sounds that are affected sometimes differ from their replacements by more than one phonological feature (e.g. *ph* and *sh* differ in both place (labial vs. alveolar) and manner (stop vs. fricative) of articulation).

No new segments: based on the given data, at least some of the output sounds are independently attested: *j* in *gijimisa* 'make run'; *sh* in *shaya* 'beat'. It is unclear from this data whether the remaining output sounds (esp. *ny*, *nj*) are new segments, or also independently exist in the language.

Phonological motivation: in (10.11), the affected sounds are not immediately adjacent to the conditioning environment (-*w*). Given that automatic alternations are phonologically motivated, and phonological rules generally apply to adjacent sounds, we can take this as further evidence that the alternation in (10.11) is morphophonological in nature.

Chapter 11

1. $$\begin{bmatrix} /\text{support}/_V \\ \text{SBJ} \quad — \quad \text{OBJ} \\ | \quad\quad | \\ \text{agent} \quad \text{patient} \end{bmatrix} \leftrightarrow \begin{bmatrix} /\text{supportive}/_A \\ \text{OBL}_{of} \\ | \\ \text{patient} \end{bmatrix}$$

2. $$\begin{bmatrix} /X/_V \\ \text{SBJ} \\ | \\ \text{agent}_i \\ \text{'A}_i \text{ acts}_X\text{'} \end{bmatrix} \leftrightarrow \begin{bmatrix} /\text{out}X/_V \\ \text{SBJ} \quad — \quad \text{OBJ} \\ | \quad\quad | \\ \text{agent}_i \quad \text{patient}_j \\ \text{'A}_i \text{ acts}_X \text{ better than B}_j \end{bmatrix}$$

3. Section 11.3.3: 'In contrast to (complex) event nouns, agent nouns in English … do not seem to inherit the verb's argument structure.' In the example *ruler over a large empire*, *ruler* is an agent noun derived from the verb *rule*, but it seems to have inherited the argument structure of the verb (*The king rules over a large empire*). *Ruler over a large empire* has a possessive phrase, similar to *explorer of Antarctica*.

Chapter 12

1. a. The plural is usually less frequent than the singular, so we expect that in Udmurt, plural inflected forms will be longer than singular

inflected forms. This expectation is fulfilled. Since the third person is usually more frequent than other values of the feature PERSON, we likewise expect that the third person will be shorter. This expectation is not fulfilled; the first person singular form is shorter than the third person singular form.

b. The plural forms are longer than the singular forms in Even; this fits expectations for the same reasons as in (a). The nominative is also shorter than the other case forms; this is expected given that the nominative is usually the more frequently used form.

c. In the Pipil example, the plural forms are longer than the corresponding singular form in two instances; they are the same length in one (1SG *nuchi:l* 'my chilli pepper'; 1PL *tuchi:l* 'your chilli pepper'). This mostly matches expectations. Also, the third person singular form is the shortest – this also matches expectations.

d. The Tauya data entirely matches expectations. The plural forms are longer than the singular forms, and the third person singular form exhibits zero expression and is therefore the shortest of all forms.

2. In this chapter it was noted that within a paradigm, the forms with higher relative frequency usually serve as the model for analogical levelling, and forms with lower relative frequency usually undergo analogical levelling. Since singular forms are usually more frequent than plural forms, we would expect the singular to have served as the model for analogical levelling in the French example. The change is therefore surprising because the singular forms have undergone stem levelling based on the (presumably less common) plural forms.

3. Frequency was discussed in Section 10.2, where it was noted that in German, the lexeme BE, which has high absolute frequency, preserves an alternation between *r* and *s* (*war/ge-wes-en* 'is/been') that has been levelled in other words (*las/ge-les-en* 'read(PRS)/read(PART))'. This fact fits with the discussion in this chapter in that lexemes with high absolute frequency resist analogical change, whereas lexemes with low absolute frequency are likely to undergo it.

References

Abraham, R.C. 1940. *The principles of Tiv*. London: Crown Agents for the Colonies, on behalf of the Government of Nigeria.

Ackema, Peter and Neeleman, Ad. 2004. *Beyond morphology: interface conditions on word formation*. Oxford: Oxford University Press.

Ackerman, Farrell, and LeSourd, Philip S. 1997. Toward a lexical representation of phrasal predicates. In Alsina, Alex, Bresnan, Joan, and Sells, Peter (eds), *Complex predicates*. Stanford, CA: CSLI, 67–106.

Ackerman, Farrell, and Stump, Gregory T. 2004. Paradigms and periphrastic expression: a study in realization-based lexicalism. In Sadler, Louisa and Spencer, Andrew (eds), *Projecting morphology*. Stanford, CA: CSLI, 111–158.

Aikhenvald, Alexandra Y. 2002. Typological parameters of clitics, with special reference to Tariana. In Dixon, R.M.W. and Aikhenvakd, Alexandra Y. (eds), *Word: a cross-linguistic typology*. Cambridge: Cambridge University Press, 1–41.

Albright, Adam. 2003. A quantitative study of Spanish paradigm gaps. In Garding, Gina and Tsujimura, Mimu (eds), *West Coast Conference on Formal Linguistics 22 proceedings*. Somerville, MA: Cascadilla Press, 1–14.

—— and Hayes, Bruce. 2002. Modeling English past tense intuitions with minimal generalization. In Maxwell, Michael (ed.), *Proceedings of the Sixth Meeting of the Association for Computational Linguistics Special Interest Group in Computational Phonology in Philadelphia, July 2002*. Cambridge, MA: Association for Computational Linguistics, 58–69.

Aldrich, R.I. 1966. The development of -scape. *American Speech* 41: 155–7.

Alegre, Maria and Gordon, Peter. 1999. Rule-based versus associate processes in derivational morphology. *Brain and Language* 68.2: 347–54.

Alexiadou, Artemis. 1999. On the syntax of nominalization and possession: remarks on patterns of ergativity. Unpublished. Habilschrift, Universität Potsdam.

Algeo, John (ed.) 1991. *Fifty years among the new words: a dictionary of neologisms 1941–1991*. Cambridge: Cambridge University Press.

Allen, Barbara J., Frantz, Donald G., Gardiner, Donna B. and Perlmutter, David M. 1990. Verb agreement, possessor ascension, and multistratal representation in Southern Tiwa. In Postal, Paul M. and Joseph, Brian D. (eds), *Studies in relational grammar 3*. Chicago: University of Chicago Press, 321–83.

Anderson, Stephen R. 1988. Morphological change. In Newmeyer, Frederick (ed.), *Linguistics: the Cambridge survey*. Vol. I. Cambridge: Cambridge University Press, 324–62.

—— 1992. *A-morphous morphology.* Cambridge: Cambridge University Press.

—— 2005. *Aspects of the theory of clitics*. Oxford: Oxford University Press.

Annamalai, E. and Steever, Sanford B. 1998. Modern Tamil. In Steever, Sanford B. (ed.), *The Dravidian languages.* London: Routledge, 121–53.

Anshen, F. and Aronoff, Mark. 1988. Producing morphologically complex words. *Linguistics* 26: 641–55.

Arensen, Jon. 1982. *Murle grammar*. Juba: SIL Sudan.

Aronoff, Mark. 1976. *Word formation in generative grammar.* Cambridge, MA: MIT Press.

—— 1980. The relevance of productivity in a synchronic description of word formation. In Fisiak, J. (ed.), *Historical morphology.* The Hague: Mouton, 71–82.

—— (ed.) 1992. *Morphology now.* Albany, NY: SUNY Press.

—— 1994. *Morphology by itself: stems and inflectional classes.* Cambridge, MA: MIT Press.

—— 2007. In the beginning was the word. *Language* 83(4), 803–30.

—— and Fudeman, Kirsten. 2005. *What is morphology?* Malden, MA: Blackwell.

—— and Fuhrhop, Nanna. 2002. Restricting suffix combinations in German and English: closing suffixes and the monosuffix constraint. *Natural Language and Linguistic Theory* 20.3: 451–90.

Ashton, E. O. 1947. *Swahili grammar.* London: Longman.

Baayen, R. Harald. 1993. On frequency, transparency and productivity. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1992*. Dordrecht: Kluwer, 181–208.

—— and Lieber, Rochelle. 1991. Productivity and English derivation: a corpus-based study. *Linguistics* 29: 801–43.

——, Piepenbrock, R. and Gulikers, L. 1995. *The CELEX Lexical Database (Release 2)*. Philadelphia: Linguistic Data Consortium.

—— and Schreuder, Robert (eds) 2003. *Morphological structure in language processing*. Berlin: Mouton de Gruyter.

Baerman, Matthew. 2002. *The Surrey person syncretism database*. http://www.smg.surrey.ac.uk/personsyncretism/index.aspx.

—— 2008. Historical observations on defectiveness: the first singular non-past. *Russian Linguistics* 32(1): 81–97.

——, Brown, Dunstan, and Corbett, Greville. 2005. *The syntax-morphology interface: a study of syncretism*. Cambridge: Cambridge University Press.

——, Corbett, Greville, and Brown, Dunstan (eds) 2010. *Defective paradigms: missing forms and what they tell us*. London: British Academy Press in coordination with Oxford University Press.

——, Corbett, Greville G., Brown, Dunstan, and Hippisley, Andrew (eds) 2007. *Deponency and morphological mismatches*. London: British Academy Press in coordination with Oxford University Press.

Baker, Mark. 1985. The Mirror Principle and morphosyntactic explanation. *Linguistic Inquiry* 16.3: 373–415.

Baker, Mark C. 1988. *Incorporation*. Chicago: University of Chicago Press.

—— 1998. Comments on the paper by Sadock. In Lapointe, Steven G. *et al.* (eds), 188–212.

Barker, Chris. 1998. Episodic -*ee* in English: a thematic role constraint on new word formation. *Language* 74.4: 695–727.

Baroni, Marco. 2001. The representation of prefixed forms in the Italian lexicon: evidence from the distribution of intervocalic [s] and [z] in Northern Italian. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1999*. Dordrecht: Kluwer, 121–52.

Bauer, Laurie. 1983. *English word-formation*. Cambridge: Cambridge University Press.

—— 1990. Be-heading the word. *Journal of Linguistics* 26: 1–31.

—— 1992. Scalar productivity and -*lily* adverbs. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1991*. Dordrecht: Kluwer, 185–91.

—— 1998. When is a sequence of two nouns a compound in English? *English Language and Linguistics* 2.1: 65–86.

—— 2001a. Compounding. In Haspelmath, Martin *et al*. (eds) *Language typology and language universals*. Vol. I. Berlin: Walter de Gruyter, 695–707.

—— 2001b. *Morphological productivity*. Cambridge: Cambridge University Press.

—— 2002. What you can do with derivational morphology. In Bendjaballah, Sabrina, Dressler, Wolfgang U., Pfeiffer, Oskar and Voeikova, Maria (eds), *Morphology 2000: selected papers from the 9th Morphology Meeting, Vienna, 24–28 February 2000*. Amsterdam: Benjamins, 37–48.

—— 2003. *Introducing linguistic morphology*. 2nd edn. Washington, DC: Georgetown University Press.

—— 2004. *A glossary of morphology*. Washington, DC: Georgetown University Press.

—— 2005. Productivity: theories. In Štekauer, Pavol and Lieber, Rochelle (eds), *Handbook of word-formation*. Dordrecht: Springer, 315–34.

—— and Renouf, Antoinette. 2001. A corpus-based study of compounding in English. *Journal of English Linguistics* 29.2: 101–23.

Beard, Robert and Szymanek, Bogdan. 1988. *Bibliography of morphology 1960–85.* Amsterdam: Benjamins.

Becker, Thomas. 1990. *Analogie und morphologische Theorie.* Munich: Fink.

—— 1993a. 'Back-formation, cross-formation, and 'bracketing paradoxes' in paradigmatic morphology. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1993.* Dordrecht: Kluwer, 1–25.

—— 1993b. Morphologische Ersetzungsbildungen im Deutschen. *Zeitschrift für Sprachwissenschaft* 12.2: 185–217.

Berchem, Jörg. 1991. *Referenzgrammatik des Somali.* Cologne: Omimee.

Bertram, Raymond, Schreuder, Robert and Baayen, R. Harald. 2000. The balance of storage and computation in morphological processing: the role of word formation type, affixal homonymy and productivity. *Journal of Experimental Psychology: Learning, Memory and Cognition* 26.2: 489–511.

Beukema, Frits and den Dikken, Marcel (eds) 2000. *Clitic phenomena in European languages*. Philadelphia: J. Benjamins.

Beyer, Stephan B. 1992. *The Classical Tibetan language.* Albany, NY: SUNY Press.

Bickel, Balthasar and Nichols, Johanna. 2007. Inflectional morphology. In Shopen, Timothy (ed.), *Language typology and syntactic description, vol. 3: grammatical categories and the lexicon.* 2nd edn. Cambridge: Cambridge University Press, 169–240.

Bisetto, Antonietta and Scalise, Sergio. 1999. Compounding: morphology and/or syntax? In Mereu (ed.), 31–48.

Blevins, James P. 2003. Stems and paradigms. *Language* 79.4: 737–67.

—— and Blevins, Juliette (eds) 2009. *Analogy in grammar: form and acquisition*. Oxford: Oxford University Press.

Bloomfield, Leonard. 1933. *Language*. New York: Holt.

Bochner, Harry. 1993. *Simplicity in generative morphology.* Berlin: de Gruyter.

Booij, Geert. 1993. Against split morphology. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1993.* Dordrecht: Kluwer, 27–49.

—— 1996. Inherent versus contextual inflection and the split morphology hypothesis. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1995.* Dordrecht: Kluwer, 1–16.

—— 2007. *The grammar of words: an introduction to linguistic morphology*. Oxford: Oxford University Press.

—— 2009. Lexical integrity as a formal universal: a constructionist view. In Scalise *et al.* (eds), 83–100.

—— Lehmann, Christian and Mugdan, Joachim (eds) 2000–2004. *Morphologie/Morphology: ein internationales Handbuch zur Flexion und Wortbildung/An international handbook on inflection and word-formation.* Vol. 1: 2000, Vol. 2: 2004. Berlin: de Gruyter.

Börjars, Kersti, Vincent, Nigel and Chapman, Carol. 1997. Paradigms, periphrases and pronominal inflection: a feature-based account. In Booij,

Geert and van Marle, Jaap (eds), *Yearbook of morphology 1996*. Dordrecht: Kluwer, 155–80.

Bošković, Željko. 2001. *On the nature of the syntax-phonology interface: cliticization and related phenomena*. Amsterdam: Elsevier.

Botha, Rudolf. 1981. A base rule theory of Afrikaans synthetic compounding. In Moortgat, M., van der Hulst, H. and Hoekstra, T. (eds), *The scope of lexical rules*. Dordrecht: Foris, 1–77.

Bowe, Heather J. 1990. *Categories, constituents, and constituent order in Pitjantjatjara: an aboriginal language of Australia*. New York: Routledge.

Bresnan, Joan. 2001. *Lexical functional syntax.* Malden, MA: Blackwell.

—— and Mchombo, Sam M. 1995. The lexical integrity principle: evidence from Bantu. *Natural Language and Linguistic Theory* 13.2: 181–254.

Brown, Dunstan, Tiberius, Carol and Corbett, Greville. 2007. The alignment of form and function: corpus-based evidence from Russian. *International Journal of Corpus Linguistics* 12.4: 511–34.

Bubenik, Vit. 1999. *An introduction to the study of morphology.* (Lincom coursebooks in linguistics, 7.) Munich: Lincom Europa.

Buchholz, Oda and Fiedler, Wilfried. 1987. *Albanische Grammatik.* Leipzig: Enzyklopädie.

Bugenhagen, Robert D. 1995. *A grammar of Mangap-Mbula: an Austronesian language of Papua New Guinea.* (Pacific linguistics, C-101.) Canberra: Australian National University.

Butterworth, Brian. 1983. Lexical representation. In Butterworth, Brian (ed.), *Language production, vol. 2: development, writing and other language processes*. London: Academic Press, 257–94.

Bybee, Joan L. 1985. *Morphology: a study of the relation between meaning and form.* Amsterdam: Benjamins.

—— 1988. Morphology as lexical organization. In Hammond and Noonan (eds), 119–41.

—— 1995. Regular morphology and the lexicon. *Language and Cognitive Processes* 10.5: 425–55.

—— 2001. *Phonology and language use.* Cambridge: Cambridge University Press.

—— 2006. From usage to grammar: the mind's response to repetition. *Language* 82.4: 711–33.

—— and Hopper, Paul (eds) 2001. *Frequency and the emergence of linguistic structure*. Amsterdam: Benjamins.

—— and Moder, Carol. 1983. Morphological classes as natural categories. *Language* 59.2: 251–70.

—— and Newman, Jean E. 1995. Are stem changes as natural as affixes? *Linguistics* 33: 633–54.

—— and Slobin, Dan. 1982. Rules and schemas in the development and use of the English past tense. *Language* 58.2: 265–89.

Campbell, Lyle. 1985. *The Pipil language of El Salvador.* Berlin: Mouton de Gruyter.

Caramazza, Alfonso, Laudanna, Alessandro and Romani, Christina. 1988. Lexical access and inflectional morphology. *Cognition* 28.3: 297–332.

Carstairs, Andrew. 1987. *Allomorphy in inflexion.* Beckenham: Croom Helm.

Carstairs-McCarthy, Andrew. 1991. *Current morphology*. London: Routledge.

—— 1993. Morphology without word-internal constituents: a review of Stephen R. Anderson's *A-Morphous morphology*. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1992.* Dordrecht: Kluwer, 209–33.

—— 2005. Phrases inside compounds: a puzzle for lexicon-free morphology. *SKASE Journal of Theoretical Linguistics* 2.3: 34–42.

Chang, Claire Hsun-huei. 1998. V–V compounds in Mandarin Chinese: argument structure and semantics. In Packard, Jerome (ed.), *New approaches to Chinese word-formation.* Berlin: Mouton de Gruyter, 77–101.

Chang, Suk-Jin. 1996. *Korean*. Amsterdam: Benjamins.

Chomsky, Noam A. and Halle, Morris. 1968. *The sound pattern of English.* New York: Harper & Row.

Clahsen, Harald, Eisenbeiss, Sonja and Sonnenstuhl-Henning, Ingrid. 1997. Morphological structure and the processing of inflected words. *Theoretical linguistics* 23.3: 201–49.

Coates, Richard. 1999. *Word structure.* (Language workbooks.) London: Routledge.

Comrie, Bernard. 1981. *The languages of the Soviet Union.* Cambridge: Cambridge University Press.

Cooreman, Ann. 1994. A functional typology of antipassives. In Fox, Barbara and Hopper, Paul (eds), *Voice: form and function.* Amsterdam: Benjamins, 49–88.

Corbett, Greville. 1982. Gender in Russian: an account of gender specification and its relationship to declension. *Russian Linguistics* 6: 197–232.

—— 1987. The morphology/syntax interface: evidence from possessive adjectives in Slavonic. *Language* 63.2: 299–345.

—— 1991. *Gender*. Cambridge: Cambridge University Press.

—— 2000. *Number*. Cambridge: Cambridge University Press.

—— and Fraser, Norman M. 1993. Network Morphology: a DATR account of Russian nominal inflection. *Journal of Linguistics* 29: 113–42.

—— and Hippisley, Andrew, Brown, Dunstan and Marriott, Paul. 2001. Frequency, regularity and the paradigm: a perspective from Russian on a complex relation. In Bybee and Hopper (eds), 201–26.

Crocco-Galèas, Grazia. 1991. *Gli etnici italiani: studio di morfologia naturale*. Padova: Unipress.

Croft, William. 1990. *Typology and universals.* Cambridge: Cambridge University Press.

Daland, Robert, Sims, Andrea D. and Pierrehumbert, Janet. 2007. Much ado about nothing: a social network model of Russian paradigmatic

gaps. In Zaenen, Annie and van den Bosch, Antal (eds), *Proceedings of the 45th Annual Meeting of the Association for Computational Linguistics in Prague, Czech Republic, June 24th–29th, 2007.* Prague: Association for Computational Linguistics, 936–43.

Dasgupta, Probal, Ford, Alan and Singh, Rajendra. 2000. *After etymology: towards a substantivist linguistics.* Munich: Lincom Europa.

Daugherty, Kim G. and Seidenberg, Mark S. 1994. Beyond rules and exceptions: a connectionist approach to inflectional morphology. In Lima *et al.* (eds), 353–88.

Davies, John. 1981. *Kobon.* (Lingua Descriptive Studies, 3.) Amsterdam: North-Holland.

Dayley, Jon P. 1985. *Tzutujil grammar.* (University of California Publications in Linguistics, 107.) Berkeley: University of California Press.

—— 1989. *Tümpisa (Panamint) Shoshone grammar.* (University of California Publications in Linguistics, 115.) Berkeley: University of California Press.

Derwing, Bruce L. 1990. Morphology and the mental lexicon: psycholinguistic evidence. In Dressler, Wolfgang U., Luschutszky, Hans C., Pfeiffer, Oskar E. and Rennison, John R. (eds), *Contemporary morphology*. Berlin: Mouton de Gruyter, 249–65.

—— and Skousen, Royal. 1994. Productivity and the English past tense: testing Skousen's analogy model. In Lima *et al.* (eds), 193–218.

Dik, Simon. 1997. *The theory of Functional Grammar.* Parts 1–2. Berlin: Mouton de Gruyter.

Di Sciullo, Anne-Marie and Williams, Edwin. 1987. *On the definition of word.* Cambridge, MA: MIT Press.

Dixon, R.M.W. 2000. A typology of causatives: form, syntax and meaning. In Dixon, R.M.W. and Aikhenvald, Alexandra Y. (eds), *Changing valency.* Cambridge: Cambridge University Press, 30–83.

Dressler, Wolfgang U. 1981. General principles of poetic license in word-formation. In *Logos semantikos: studia linguistica in honorem Eugenio Coseriu*. Vol. II. Tübingen: Narr, 423–31.

—— 1985. *Morphonology*. Ann Arbor: Karoma.

—— 1989. Prototypical differences between inflection and derivation. *Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung* 42: 3–10.

—— 1997. *On productivity and potentiality in inflectional morphology.* (CLASNET Working Papers, 7.) Montreal: University of Montreal.

—— and Ladányi, Mária. 2000. Productivity in word-formation: a morphological approach. *Acta Linguistica Hungarica* 47: 103–44.

—— and Mayerthaler, Willi and Panagl, Oswald and Wurzel, Wolfgang U. 1987. *Leitmotifs in natural morphology.* Amsterdam: Benjamins.

Dryer, Matthew S. 2008a. Order of subject, object and verb. In Haspelmath *et al.* (eds), Chapter 81.

—— 2008b. Order of adposition and noun phrase. In Haspelmath *et al*. (eds), Chapter 85.

—— 2008c. Prefixing vs. suffixing in inflectional morphology. In Haspelmath *et al*. (eds), Chapter 26.

—— 2008d. Order of object and verb. In Haspelmath *et al*. (eds), Chapter 83.

Dubinsky, Stanley and Simango, Silvester Ron. 1996. Passive and stative in Chichewa: evidence for modular distinctions in grammar. *Language* 72.4: 749–81.

Dunn, John Asher. 1979. *A reference grammar for the Coast Tsimshian language.* (Canadian Ethnology Service Paper, 55.) Ottawa: National Museum of Canada.

Embick, David. 2000. Features, syntax, and categories in the Latin perfect. *Linguistic Inquiry* 31.2: 185–230.

Embick, David and Noyer, Rolf. 2007. Distributed Morphology and the syntax/morphology interface. In Ramchand, Gillian and Reiss, Charles (eds), *Oxford handbook of linguistic interfaces*. Oxford: Oxford University Press, 289–324.

Fabb, Nigel. 1988. English suffixation is constrained only by selectional restrictions. *Natural Language and Linguistic Theory* 6.4: 527–39.

Feldman, Laurie Beth (ed.) 1995. *Morphological aspects of language processing*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Foley, William A. 1991. *The Yimas language of New Guinea.* Stanford, CA: Stanford University Press.

Fortescue, Michael. 1984. *West Greenlandic.* (Croom Helm descriptive grammars.) London: Croom Helm.

Fox, G.J. 1979. *Big Nambas grammar.* Canberra: Australian National University.

Franks, Steven and King, Tracy Holloway. 2000. *A handbook of Slavic clitics*. Oxford: Oxford University Press.

Gerlach, Birgit, and Grijzenhout, Janet (eds) 2000. *Clitics in phonology, morphology and syntax*. Amsterdam: J. Benjamins.

Greenberg, Joseph. 1959. A quantitative approach to the morphological typology of language. *International Journal of American Linguistics* 26: 178–94.

—— 1966. *Language universals, with special reference to feature hierarchies.* (Janua Linguarum, Series Minor, 59.) The Hague: Mouton.

Grimshaw, Jane. 1990. *Argument structure.* Cambridge, MA: MIT Press.

Guevara, Emiliano and Scalise, Sergio. 2009. Searching for universals in compounding. In Scalise, *et al.* (eds), 101–28.

Gussenhoven, Carlos and Jacobs, Haike. 2005. *Understanding phonology*, 2nd edition. London: Arnold.

Hall, Christopher J. 1992. *Morphology and mind: a unified approach to explanation in linguistics.* London: Routledge.

Halle, Morris and Marantz, Alex. 1993. Distributed morphology and the pieces of inflection. In Hale, Kenneth and Keyser, Samuel Jay (eds), *The view from Building 20*. Cambridge, MA: MIT Press, 111–76.

—— 1994. Some key features of Distributed Morphology. *MIT Working Papers in Linguistics* 21: 275–88.

Halpern, Aaron 1995. *On the placement and morphology of clitics*. Stanford, CA: CSLI.

Hammond, Michael and Noonan, Michael (eds) 1988. *Theoretical morphology: approaches in modern linguistics.* Orlando: Academic Press.

Hankamer, Jorge. 1989. Morphological parsing and the lexicon. In Marslen-Wilson, William (ed.), *Lexical representation and process.* Cambridge, MA: MIT Press, 392–408.

Hansson, Gunnar Olafur. 1999. 'When in doubt…': intraparadigmatic dependencies and gaps in Icelandic. In Tamanji, Pius, Hirotani, Masako and Hall, Nancy (eds), *NELS 29: Proceedings of the 29th Meeting of the North Eastern Linguistic Society*. Amherst, MA: GLSA Publications, The University of Massachusetts, 105–19.

Harley, Heidi and Noyer, Rolf. 1998. Licensing the non-lexicalist lexicon: nominalizations, vocabulary items and the encyclopedia. *MIT Working Papers in Linguistics* 32: 119–37.

Harris, Alice C. 2000. Where in the word is the Udi clitic? *Language* 76.3: 593–616.

—— 2002. *Endoclitics and the origins of Udi morphosyntax*. Oxford: Oxford University Press.

Haspelmath, Martin. 1990. The grammaticization of passive morphology. *Studies in Language* 14.1: 25–71.

—— 1992. Grammaticization theory and heads in morphology. In Aronoff, Mark (ed.), *Morphology now.* Albany, NY: SUNY Press, 69–82; 194–8.

—— 1993. *A grammar of Lezgian.* Berlin: Mouton de Gruyter.

—— 1995. The growth of affixes in morphological reanalysis. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1994.* Dordrecht: Kluwer, 1–29.

—— 1996. Word-class-changing inflection and morphological theory. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1995.* Dordrecht: Kluwer, 43–66.

—— 2000. Periphrasis. In Booij, Geert, Lehmann, Christian and Mugdan, Joachim (eds), *Morphology: a handbook on inflection and word formation. vol. 1.* (Handbücher zur Sprach- und Kommunikationswissenschaft.) Berlin: de Gruyter, 654–64.

—— 2006. Against markedness (and what to replace it with). *Journal of Linguistics* 42.1: 25–70.

——, Dryer, Matthew S., Gil, David and Comrie, Bernard (eds) 2008. *The world atlas of language structures online.* Munich: Max Planck Digital Library. Available online at: http://wals.info/feature.

Hay, Jennifer. 2001. Lexical frequency in morphology: is everything relative? *Linguistics* 39.6: 1041–70.

—— 2003. *Causes and consequences of word structure*. New York: Routledge.

—— and Baayen, R. Harald. 2002. Parsing and productivity. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 2001*. Dordrecht: Kluwer, 203–35.

—— and Plag, Ingo. 2004. What constrains possible suffix combinations? On the interaction of grammatical and processing restrictions in derivational morphology. *Natural Language and Linguistic Theory* 22.3: 565–96.

Hooper, Joan B. 1976. *An introduction to Natural Generative Phonology*. New York: Academic Press.

Inkelas, Sharon and Zoll, Cheryl. 2000. Reduplication as morphological doubling. *Rutgers Optimality Archive*: http://roa.rutgers.edu/view. php3?id=425. Access date: July 2010.

Isaev, M.I. 1966. Osetinskij jazyk. In Vinogradov, V.V (ed.), *Jazyki narodov SSSR. Tom I: Indoevropejskie jazyki*. Moscow: Nauka, 237–56.

Jackendoff, Ray. 1990. *Semantic structures.* Cambridge, MA: MIT Press.

Jacobsen, Thorkild. 1974. Very ancient linguistics: Babylonian grammatical texts. In Hymes, Dell (ed.), *Studies in the history of linguistics: traditions and paradigms*. Bloomington: Indiana University Press, 41–62.

Janda, Richard D. 1982. On limiting the form of morphological rules: German umlaut, diacritics, and 'cluster constraint'. *NELS* 12: 140–52.

—— 1984. Why morphological metathesis rules are rare: on the possibility of historical explanation in linguistics. *Proceedings of the annual meeting of the Berkeley Linguistics Society* 10: 87–103.

Jarema, Gonia and Libben, Gary (eds) 2007. *The mental lexicon: core perspectives*. Amsterdam: Elsevier.

Jarvikivi, Juhani, Bertram, Raymond and Niemi, Jussi. 2006. Affixal salience and the processing of derivational morphology: the role of suffixal allomorphy. *Language and cognitive processes* 21.4: 394–431.

Joseph, Brian D. 1998. Diachronic morphology. In Spencer and Zwicky (eds), 351–73.

—— 2003. Morphologization from syntax. In Joseph, Brian D. and Janda, Richard D. (eds), *The handbook of historical linguistics*. Oxford: Blackwell Publishing, 472–92.

—— and Janda, Richard. 1988. The how and why of diachronic morphologization and demorphologization. In Hammond and Noonan (eds), 193–210.

Kager, René. 1999. *Optimality theory*. Cambridge: Cambridge University Press.

Kageyama, Taro. 1982. Word formation in Japanese. *Lingua* 57: 215–58.

Kaisse, E. and Shaw, Patricia A. 1985. On the theory of Lexical Phonology. *Phonology yearbook* 2: 1–30.

Kanerva, Jonni M. 1987. Morphological integrity and syntax: the evidence from Finnish possessive suffixes. *Language* 63.3: 498–521.

Kastovsky, Dieter. 1986. The problem of productivity in word-formation. *Linguistics* 24: 585–600.

Katamba, Francis and Stonham, John. 2006. *Morphology*. New York: Palgrave Macmillan.

Keegan, John M. 1997. *A reference grammar of Mbay*. Munich: Lincom Europa.

Keenan, Edward L. and Polinsky, Maria. 1998. Malagasy. In Spencer and Zwicky (eds), 563–623.

Kemmer, Suzanne. 2003. Schemas and lexical blends. In Cuyckens, Hubert, Berg, Thomas, Dirven, Rene and Panther, Klaus-Uwe (eds), *Motivation in language: studies in honor of Günter Radden*. Amsterdam: Benjamins, 69–98.

Kenesei, István. 1995–6. Bracketing paradoxes in Hungarian. *Acta Linguistica Hungarica* 43: 153–73.

Kibrik, Aleksandr E. (ed.) 1996. *Godoberi*. Munich: Lincom Europa.

King, Gareth. 1993. *Modern Welsh: a comprehensive grammar.* London: Routledge.

Kiparsky, Paul. 1982. Lexical morphology and phonology. In Linguistic Society of Korea (ed.), *Linguistics in the morning calm: selected papers from SICOL-1981.* Seoul: Hanshin, 3–91.

—— 1985. Some consequences of Lexical Phonology. *Phonology yearbook* 2: 85–138.

—— 1996. Allomorphy or morphophonology? In Singh (ed.), 12–42.

—— 2005. Blocking and periphrasis in inflectional paradigms. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 2004*. Dordrecht: Springer, 113–35.

Klavans, Judith L. 1985. The independence of syntax and phonology in cliticization. *Language* 61.1: 95–120.

Koptjevskaja-Tamm, Maria. 1993. *Nominalizations*. London: Routledge.

—— and Muravyova, Irina A. 1993. Alutor causatives, noun incorporation, and the Mirror Principle. In Comrie, Bernard and Polinsky, Maria (eds), *Causatives and transitivity.* Amsterdam: Benjamins, 287–313.

Kornfilt, Jaklin. 1997. *Turkish*. London: Routledge.

Kozinceva, Natalija A. 1981. Refleksivnye glagoly v armjanskom jazyke. In Xrakovskij, V[iktor] S. (ed.), *Zalogovye konstrukcii v raznostrukturnyx jazykax.* Leningrad: Nauka, 81–98.

Lapointe, Steven G. 1980. A theory of grammatical agreement. Ph.D. dissertation, University of Massachusetts, Amherst.

——, Brentari, Diane K. and Farrell, Patrick M. (eds) 1998. *Morphology and its relation to phonology and syntax*. Stanford: CSLI.

Layton, Bentley. 2000. *A Coptic grammar with chrestomathy and glossary: Sahidic dialect*. Wiesbaden: Harrassowitz Verlag.

Libben, Gary and Jarema, Gonia (eds) 2006. *The representation and processing of compound words*. Oxford: Oxford University Press.

Lieber, Rochelle. 1992. *Deconstructing morphology*. Chicago: University of Chicago Press.

—— and Scalise, Sergio. 2007. The Lexical Integrity Hypothesis in a new theoretical universe. In Booij, Geert, Ducceschi, Luca, Fradin, Bernard, Guevara, Emiliano, Ralli, Angela, and Scalise, Sergio (eds), *On-line proceedings of the Fifth Mediterranean Morphology Meeting (MMM5), Fréjus 15-18 September 2005.* http://mmm.lingue.unibo.it/mmm-proc/MMM5/001-024-Lieber-Scalise.pdf. Access date: July 2010.

Lima, Susan D., Corrigan, Roberta L. and Iverson, Gregory (eds) 1994. *The reality of linguistic rules*. Amsterdam: John Benjamins.

Macaulay, Monica. 1996. *A grammar of Chalcatongo Mixtec.* (University of California Publications in Linguistics, 127.) Berkeley: University of California Press.

MacDonald, Lorna. 1990. *A grammar of Tauya*. Berlin: Mouton de Gruyter.

MacWhinney, Brian and Leinbach, Jared. 1991. Implementations are not conceptualizations: Revising the verb learning model. *Cognition* 40.1–2: 121–57.

Mahootian, Shahrzad. 1997. *Persian*. London: Routledge.

Malchukov, Andrei L. 1995. *Even*. Munich: Lincom Europa.

Mańczak, Witold. 1980a. Frequenz und Sprachwandel. In Lüdtke, Helmut (ed.), *Kommunikationstheoretische Grundlagen des Sprachwandels*. Berlin/New York: de Gruyter, 37–79.

—— 1980b. Laws of analogy. In Fisiak, Jacek (ed.), *Historical morphology*. The Hague: Mouton, 283–8.

Marchand, Hans. 1969. *The categories and types of present-day English word-formation: a synchronic-diachronic approach*. München: Beck.

Matsumoto, Yo. 1996. *Complex predicates in Japanese: a syntactic and semantic study of the notion 'word'.* Stanford, CA: CSLI Publications.

Matthews, Peter. 1972. *Inflectional morphology: a theoretical study based on aspects of Latin verb conjugation*. Cambridge: Cambridge University Press.

—— 1991. *Morphology.* 2nd edn. Cambridge: Cambridge University Press.

McCarthy, John J. and Prince, Alan. 1993a. Generalized alignment. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1993*. Dordrecht: Kluwer, 79–153.

—— 1993b. Prosodic morphology: constraint interaction and satisfaction. Rutgers Optimality Archive: http://roa.rutgers.edu/view.php3?id=590. Accessed July 2010.

Mel'čuk, Igor A. 1993–2000. *Cours de morphologie générale.* Vols. 1–5. Montreal: Presses universitaires de Montréal.

Mereu, Lunella (ed.) 1999. *Boundaries of morphology and syntax*. Amsterdam: Benjamins.

Merlan, Francesca. 1976. Noun incorporation and discourse reference in modern Nahuatl. *International Journal of American Linguistics* 42: 177–91.

Mithun, Marianne. 1984. The evolution of noun incorporation. *Language* 60: 847–94.

—— 1998. The sequencing of grammaticization effects: a twist from North America. In Schmid, Monika S., Austin, Jennifer R. and Stein, Dieter (eds), *Historical linguistics 1997.* Amsterdam: Benjamins, 291–314.

—— and Corbett, Greville G. 1999. The effect of noun incorporation on argument structure. In Mereu (ed.), 49–71.

Mohanan, Tara. 1995. Wordhood and lexicality: noun incorporation in Hindi. *Natural Language and Linguistic Theory* 13: 75–134.

Nedjalkov, Vladimir P. (ed.) 1988. *Typology of resultative constructions.* (Typological Studies in Language, 12.) Amsterdam: Benjamins.

Nevis, Joel A., Joseph, Brian D., Wanner, Dieter, and Zwicky, Arnold M. (eds) 1994. *Clitics: a comprehensive bibliography, 1892–1991*. Amsterdam: J. Benjamins.

Newman, Paul. 2000. *The Hausa language: an encyclopedic reference grammar.* New Haven: Yale University Press.

Nguyen, Dinh-Hoa. 1997. Vietnamese. (London Oriental and African Language Library, 9.) Amsterdam: Benjamins.

Nikolaeva, Irina. 1999. *Ostyak*. Munich: Lincom Europa.

Noonan, Michael. 1992. *A grammar of Lango.* (Mouton Grammar Library, 8.) Berlin: Mouton de Gruyter.

Noyer, Rolf. 1998. Impoverishment theory and morphosyntactic markedness. In Lapointe *et al*. (eds), 264–85.

Nübling, Damaris. 2001. The development of 'junk': Irregularization strategies of HAVE and SAY in the Germanic languages. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1999.* Dordrecht: Kluwer, 53–74.

Olsen, Susan. 2001. Copulative compounds: a closer look at the interface between syntax and morphology. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 2000.* Dordrecht: Kluwer, 279–320.

Oshita, Hiroyuki. 1995. Compounds: a view from suffixation and a-structure alteration. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1994.* Dordrecht: Kluwer, 179–205.

Packard, Jerome L. 2000. *The morphology of Chinese.* Cambridge: Cambridge University Press.

Payne, Doris L. 1990. Morphological characteristics of Lowland South American Languages. In Payne, Doris L. (ed.), *Amazonian linguistics.* Austin, TX: University of Texas Press, 213–41.

Perevoščikov, P.N. (ed.) 1962. *Grammatika sovremennogo udmurtskogo jazyka: Fonetika i morfologija.* Iževsk: Udmurtskoe knižnoe izdatel´stvo.

Perlmutter, David. 1988. The split-morphology hypothesis: evidence from Yiddish. In Hammond and Noonan (eds), 79–100.

Pesetsky, David. 1985. Morphology and logical form. *Linguistic Inquiry* 16.2: 193–246.

Pinker, Steven. 1991. Rules of language. *Science* 253.5019: 530–35.

—— and Prince, Alan. 1988. On language and connectionism: analysis of a parallel distributed processing model of language acquisition. *Cognition* 28.1: 73–193.

Plag, Ingo. 1999. *Morphological productivity: structural constraints in English derivation*. Berlin: Mouton de Gruyter.

—— 2003. *Word-formation in English*. Cambridge: Cambridge University Press.

—— and Baayen, R. Harald. 2009. Suffix ordering and morphological processing. *Language* 85.1: 109–52.

Plank, Frans. 1981. *Morphologische (Ir-)Regularitäten*. Tübingen: Narr.

—— (ed.) 1991. *Paradigms: the economy of inflection*. Berlin: Mouton de Gruyter.

—— 1994. Inflection and derivation. In R.E. Asher (ed.), *The encyclopedia of language and linguistics,* vol. 3. Oxford: Pergamon Press, 1671–8.

Plungian, Vladimir A. 2000. *Obščaja morfologija: vvedenie v problematiku.* Moscow: Èditorial URSS.

Prince, Alan and Smolensky, Paul. 1993. Optimality Theory: constraint interaction in generative grammar. *Rutgers Optimality Archive*: http://roa.rutgers.edu/view.php3?id=845. Accessed July 2010.

Raffelsiefen, Renate. 1996. Gaps in word-formation. In Kleinhenz, Ursula (ed.), *Interfaces in phonology.* Berlin: Akademie Verlag, 194–209.

—— 1999a. Phonological constraints on English word-formation. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1998*. Dordrecht: Kluwer, 225–87.

—— 1999b. Diagnostics for prosodic words revisited: the case of historically prefixed words in English. In Hall, T. Alan and Kleinhenz, Ursula (eds.) *Studies on the phonological word.* Amsterdam: Benjamins, 133–201.

Rainer, Franz. 1988. Towards a theory of blocking: Italian and German quality nouns. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1988*. Dordrecht: Foris, 155–85.

—— 1993. *Spanische Wortbildungslehre.* Tübingen: Niemeyer.

Reh, Mechthild. 1985. *Die Krongo-Sprache (nìino mó-dì). Beschreibung, Texte, Wörterverzeichnis.* (Kölner Beiträge zur Afrikanistik, 12.) Berlin: Reimer.

Rehg, Kenneth L. 1981. *Ponapean reference grammar.* Honolulu: University of Hawaii Press.

Reis, Marga. 1983. Gegen die Kompositionstheorie der Affigierung. *Zeitschrift für Sprachwissenschaft* 2: 110–29.

Rennison, John R. 1997. *Koromfe*. (Descriptive grammars.) London: Routledge.

Rosen, Sara Thomas. 1989. Two types of noun incorporation: a lexical analysis. *Language* 65.2: 294–317.

Rowlands, E.C. 1969. *Yoruba*. (Teach Yourself Books.) Sevenoaks: Hodder & Stoughton.

Rumelhart, David E. and McClelland, James L. 1986. On learning the past tenses of English verbs. In McClelland, James L. and Rumelhard, David E. (eds), *Parallel distributed processing: explorations in the microstructure of cognition, vol. 2: foundations.* Cambridge, MA: MIT Press, 216–71.

Sadock, Jerrold M. 1991. *Autolexical syntax: a theory of parallel grammatical representations.* Chicago: The University of Chicago Press.

—— 1998. On the autonomy of compounding morphology. In Lapointe, Steven G. *et al*. (eds), 161–87.

Scalise, Sergio. 1988a. Inflection and derivation. *Linguistics* 26: 561–81.

—— 1988b. The notion of 'head' in morphology. In Booij, Geert and van Marle, Jaap (eds), *Yearbook of morphology 1988.* Dordrecht: Foris, 229–45.

—— 1994. *Morfologia*. Bologna: Il Mulino.

—— Magni, Elisabetta and Bisetto, Antonietta (eds) 2009. *Universals of language today*. Amsterdam: Springer.

Schachter, Paul and Otanes, Fe T. 1972. *Tagalog reference grammar.* Berkeley: University of California Press.

Schleicher, August. 1859. *Zur Morphologie der Sprache*. Ser. VII. Vol. I, No. 7. St Petersburg: Eggers.

Schreuder, Robert and R. Harald Baayen, 1999. War and peace: morphemes and full forms in a noninteractive activation parallel dual-route model. *Brain and Language* 68: 27–32.

Schultink, Henk. 1961. Produktiviteit als morfologisch fenomeen. *Forum der Letteren* 2: 110–25.

Selkirk, Elizabeth. 1982. *The syntax of words.* Cambridge, MA: MIT Press.

Sharoff, Serge. 2002. *Častotnyj spisok, vtoraja versija*. http://www.artint.ru/projects/frqlist.asp. Accessed: July 2010.

Shibatani, Masayoshi. 1990. *The languages of Japan.* Cambridge: Cambridge University Press.

Siloni, Tal. 1997. Event nominals and the construct state. In Haegeman, Liliana (ed.), *The new comparative syntax.* London: Longman, 165–88.

Sims, Andrea D. 2006. Minding the gaps: inflectional defectiveness in paradigmatic morphology. Ph.D. dissertation, The Ohio State University.

Singh, Rajendra (ed.) 1996. *Trubetzkoy's orphan.* Amsterdam: Benjamins.

—— and Starosta, Stanley (eds) 2003. *Explorations in seamless morphology*. New Delhi: Sage.

Skousen, Royal. 1989. *Analogical modeling of language*. Dordrecht: Kluwer.

—— 1992. *Analogy and structure*. Dordrecht: Kluwer.

Smirniotopoulus, Jane C. and Joseph, Brian D. 1998. Syntax versus the lexicon: incorporation and compounding in Modern Greek. *Journal of Linguistics* 34.2: 447–88.

Sneddon, James Neil. 1996. *Indonesian*: *a comprehensive grammar.* London: Routledge.

Sohn, Ho-min. 1994. *Korean.* (Descriptive grammars.) London: Routledge.

Spencer, Andrew. 1991. *Morphological theory: an introduction to word structure in generative grammar*. Oxford: Blackwell.

—— 1997. Inflectional morphology and functional heads. In Dressler, Wolfgang U. Prinzhorn, Martin and Rennison, John R. (eds), *Advances in morphology*. Berlin: Mouton de Gruyter, 31–50.

—— 2002. Gender as an inflectional category. *Journal of Linguistics* 38.2: 279–312.

—— and Zwicky, Arnold M. (eds) 1998. *The handbook of morphology.* Oxford: Blackwell.

Sridhar, S.N. 1990. *Kannada*. (Descriptive grammars.) London: Routledge.

Štekauer, Pavol. 2000. Beheading the word? Please, stop the execution. *Folia Linguistica* 34: 333–55.

Stephany, Ursula. 1982. Inflectional and lexical morphology: a linguistic continuum. *Glossologia* 1: 27–55.

Stump, Gregory T. 2001a. *Inflectional morphology: a theory of paradigm structure*. Cambridge: Cambridge University Press.

—— 2001b. Default inheritance hierarchies and the evolution of inflectional classes. In Brinton, Laurel (ed.), *Historical linguistics 1999.* Amsterdam: Benjamins, 293–307.

Sullivan, Thelma D. 1988. *Compendium of Nahuatl grammar.* Salt Lake City: University of Utah Press.

Sutton-Spence, Rachel and Woll, Bencie. 1999. *The linguistics of British sign language: an introduction*. Cambridge: Cambridge University Press.

Švedova, N. Ju. (ed.) 1980. *Russkaja grammatika. Tom I.* Moscow: Nauka.

Taft, Marcus. 1994. Interactive-activation as a framework for understanding morphological processing. *Language and cognitive processes* 9.3: 271–94.

—— and Forster, Kenneth. 1975. Lexical storage and retrieval of prefixed words. *Journal of Verbal Learning and Verbal Behavior* 14.6: 638–47.

Thompson, Laurence and Thompson, M. Terry. 1969. Metathesis as a grammatical device. *International Journal of American Linguistics* 35: 213–19.

Tiersma, Peter. 1982. Local and general markedness. *Language* 58.4: 832–49.

Toman, Jindrich. 1998. Word syntax. In Spencer and Zwicky (eds), 306–21.

Topping, Donald M. 1973. *Chamorro reference grammar.* Honolulu: University Press of Hawaii.

Vance, Timothy J. 1987. *An introduction to Japanese phonology.* Albany, NY: SUNY Press.

van Marle, Jaap. 1985. *On the paradigmatic dimension of morphological creativity.* Dordrecht: Foris.

Van Valin, Robert D. and LaPolla, Randy. 1997. *Syntax: structure, meaning and function.* Cambridge: Cambridge University Press.

Velázquez-Castillo, Maura. 1996. *The grammar of possession: inalienability, incorporation and possessor ascension in Guaraní.* Amsterdam: Benjamins.

Wasow, Thomas. 1977. Transformations and the lexicon. In Culicover, Peter, Wasow, Thomas and Akmajian, Adrian (eds), *Formal syntax*. New York: Academic Press, 327–60.

Weber, David John. 1989. *A grammar of Huallaga (Huánuco) Quechua.* Berkeley: University of California Press.

Werner, Otmar. 1989. Sprachökonomie und Natürlichkeit im Bereich der Morphologie. *Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung* 42: 34–47.

Wiese, Richard. 1996. Phrasal compounds and the theory of word syntax. *Linguistic Inquiry* 27.1: 183–93.

Wilkins, David. 1989. Mparntwe Arrernte (Aranda): studies in the structure and semantics of grammar. Ph.D. dissertation, Australian National University.

Williams, Edwin. 1981a. On the notions 'lexically related' and 'head of a word'. *Linguistic Inquiry* 12: 245–74.

—— 1981b. Argument structure and morphology. *Linguistic Review* 1: 81–114.

Wurzel, Wolfgang Ulrich. 1980. Ways of morphologizing phonological rules. In Fisak, Jacek (ed.), *Historical morphology.* The Hague: Mouton, 43–62.

—— 1987. System-dependent morphological naturalness in inflection. In Dressler *et al.*, 59–96.

—— 1989. *Inflectional morphology and naturalness.* Dordrecht: Kluwer.

—— 1996. On similarities and differences between inflectional and derivational morphology. *Sprachtypologie und Universalienforschung* 49: 267–79.

Ziervogel, D., Louw, J. A. and Taljaard, P. C. 1981. *A handbook of the Zulu language.* Pretoria: J. L. van Schaik.

Zipf, George Kingsley. 1935. *The psycho-biology of language: an introduction to dynamic philology.* Boston: Houghton Mifflin.

Zwicky, Arnold. 1977. *On clitics.* Bloomington: Indiana University Linguistics Club.

——1985a. How to describe inflection. In Niepokuj, Mary, VanClay, Mary, Nikiforidou, Vassili (eds), *Proceedings of the Eleventh Annual Meeting of the Berkeley Linguistics Society*. Berkeley, CA: Department of Linguistics, University of California Berkeley, 371–86.

—— 1985b. Clitics and particles. *Language* 61: 283–305.

—— 1991. Systematic vs. accidental phonological identity. In Plank (ed.), 113–31.

—— and Pullum, Geoffrey. 1983. Cliticization vs. inflection: English *n't*. *Language* 59.3: 502–13.

Glossary of technical terms

abessive: an inflectional value of the feature CASE: 'without, lacking' (e.g. Udmurt *val-tek* [horse-ABE.SG] 'without the horse') (Section 12.1.2).

ablative: an inflectional value of the feature CASE: '(away) from' (e.g. Huallaga Quechua *mayu-pita* [river-ABL.SG] '(away) from the river') (Section 5.1).

absolutive: an inflectional value of the feature CASE that is used to mark both the subject of an intransitive verb and the object of a transitive verb (Section 11.1.5).

acceptability judgement: a native speaker's assessment of whether a word or sentence is a possible word/sentence of the language (Section 6.1).

accusative: an inflectional value of the feature CASE that is used to mark the direct object (e.g. Latin *Marcus rosa-m* [rose-ACC] *vidit* 'Marcus saw a rose') (Section 5.1).

acronym: an abbreviation consisting of initial letters that are read like an ordinary word, e.g. *NATO* [neitoʊ] (as opposed to *alphabetism*) (Section 3.1.5).

action noun = **event noun**.

active: an inflectional value of the feature VOICE ('semantic agent is the syntactic subject') (Section 5.1).

actual word (= **usual word**): a lexeme that is familiar to most speakers (Section 4.2) (cf. *neologism, possible word, occasionalism*).

adjunct: a participant in an event that is optionally expressed (Section 11.1.5) (cf. *argument*).

adposition: a term that refers collectively to prepositions and postpositions (Chapter 7 Exploratory Exercise).

affirmative: an inflectional value of the feature MOOD that indicates the veracity of the argument.

affix: a morpheme that must attach to a base and cannot occur by itself. Usually a short morpheme with an abstract meaning (Section 2.2) (subtypes: *circumfix, infix, prefix, suffix*).

affixation: the operation of stringing together a base and an affix (Section 3.1.1).

affix compound: a morphological pattern that involves at least two stems and one affix (Section 11.2.3).

agent: a semantic role; the instigator of an action (Chapter 11).

agentive adjective: a deverbal adjective denoting an action performed by the modified noun, e.g. English *typing*, as in *a typing monkey sat on the floor* (Section 5.2).

agent noun: a deverbal noun that refers to the agent participant of the action, e.g. English *drinker* (Sections 5.2, 11.3.3).

agglutination = **concatenation.**

agglutinative language: a language in which almost all words are formed by concatenation of morphemes (cf. *fusional language, isolating language*) (Section 4.2).

agreement: a syntactic relation that requires related constituents to show identical marking for certain inflectional values (e.g. verbs often agree for number with subject or object nouns) (Section 5.3).

allative: an inflectional value of the feature CASE: 'motion towards, onto'.

allomorph (= **morpheme alternant**): two roots or morphological patterns are allomorphs (of the same abstract morpheme) if they express the same meaning and occur in complementary distribution (Section 2.3) (subtypes: *phonological allomorph, suppletive allomorph*).

alphabetism: an abbreviation consisting of initial letters that are read with the letters' alphabet values, e.g. *CD* [si:di:] (Section 3.1.5).

alternation: the differences in pronunciation between two (or more) phonological allomorphs (Section 2.3, Chapter 10) (subtypes: *automatic alternation, morphophonological alternation*).

analogical extension: a kind of analogical change in which an existing morphological pattern is applied to a different or new lexeme (Section 6.4.3).

analogical levelling (= **levelling**): a kind of analogical change in which a word-form is changed based on another word-form belonging to the same lexeme (Sections 10.2, 12.2).

analogy (= **analogical change**): the use of similar existing words as models in the modification and creation of words (Section 6.4.3).

analytic language: a language that uses little morphology (Section 1.2) (cf. *polysynthetic language, synthetic language*).

animacy: a semantic property of nouns that has to do with whether a noun denotes a living (or sentient) thing (Section 8.2.1).

anticausative: an event-changing operation signalling that there is no 'cause' element and no agent role in the derived event structure (e.g. Russian anticausative *Tarelka slomalas'*. 'The plate broke.' vs. *Ona slomala tarelku* 'She broke the plate') (Section 11.1.2).

antipassive: a function-changing operation that backgrounds the patient (Section 11.1.3).

aorist: an inflectional value for verbs of the feature TENSE that indicates the occurrence of an action in the past, without indicating whether the action is completed.

applicative: a valence-changing operation that creates a new object argument (e.g. German *beladen* 'load onto' requires a direct object, whereas *laden* 'load' does not) (Section 11.1.5) (subtypes: *recipient applicative*, *locative applicative*, *benefactive applicative*).

appositional compound: a compound denoting an entity that fulfils several descriptions simultaneously, e.g. English *student worker* 'worker who is also a student' (Section 7.1).

argument: a semantic role that is assigned to a noun by the verb (Section 11.1.1) (cf. *adjunct*).

argument inheritance: a deverbal derived word is said to exhibit argument inheritance when its argument structure (and function structure) match and are dependent upon the argument/function structure of the verbal base from which it is derived (Section 11.3.1).

argument structure (= **semantic valence**): a verb's argument structure is the set of semantic roles that it assigns (Chapter 11).

aspect: an inflectional feature of verbs that has to do with the internal temporal constituency of an event (values: *perfective, imperfective, habitual*, etc.) (Section 5.1).

attenuative adjective: a deadjectival adjective that denotes a reduced degree of the base (e.g. English *bluish* from *blue*) (Section 5.2) (cf. *intensive adjective*).

augmentative noun: a denominal noun denoting a larger (or otherwise pragmatically special) version of the base noun, e.g. Russian *borodišča* 'huge beard' is an augmentative of *boroda* 'beard' (Section 5.2).

automatic alternation: a sound alternation that is purely phonologically conditioned (Section 10.1).

auxiliary: a verb that co-occurs with a main verb in a phrase to indicate values of verbal features such as TENSE or MOOD.

back-formation: the formation of a shorter, simpler word from a longer word that is perceived as morphologically complex (Section 3.2.2).

bahuvrihi compound = **exocentric compound**.

base: the base of a morphologically complex word is the element to which a morphological operation applies (Sections 2.2, 3.1.2).

base modification: a collective term for morphological operations that change the pronunciation of part of the base, usually without adding segmentable material (Sections 3.1.2, 10.5).

benefactive applicative: a valence-changing operation that creates a new direct object argument for the participant who is the beneficiary of the action (Section 11.1.5).

blend: a lexeme whose stem was created by combining parts of two other lexeme stems, e.g. *smog* from *smoke* and *fog* (Section 3.1.5).

blocking (= **synonymy blocking**): when the application of a productive rule is pre-empted by an existing word with the same meaning (Section 6.4.2).

bound form: an element (word-form or affix) that is prosodically dependent on its host and cannot stand on its own in a variety of ways (Section 9.3).

bound stem: a base that is not by itself a word-form and which therefore occurs only in combination with another morpheme (Section 2.2).

case: an inflectional feature of nouns that serves to code the noun phrase's semantic role (values: *nominative, accusative, genitive, dative, locative, ablative, instrumental*, etc.) (Section 5.1).

categorial periphrasis: when a given inflectional value is always expressed by a periphrastic (multi-word) expression (e.g. the French future always involves a multi-word expression) (Section 8.8).

category-conditioned degree of productivity: a measure of productivity; the ratio of the number of hapax legomena with a given morphological pattern to the total sum token frequency of all word-forms with that morphological pattern (Section 6.5).

causative: an event-changing operation referring to an event that is a caused version of the base event (Section 11.1.4).

causative verb: a deverbal verb denoting an action that has caused the action represented by the base verb to occur, e.g. Korean *cwuk-i-* 'kill' is the causative of *cwuk-* 'die' (Section 5.2).

cell: a position in a paradigm defined by the possible combinations of inflectional values (Chapter 2 Exploratory Exercise, Appendix to Chapter 5).

circumfix: a discontinuous affix that occurs on both sides of the base (Section 2.2).

citation form: a word-form that is used by convention to refer to a lexeme – e.g. when listing a lexeme in a dictionary.

classifier: a morpheme, usually a lexeme stem, used to classify a noun as belonging to a semantically-based group.

clipping: (a method of forming) a shortened word that does not differ semantically from the longer version (Section 3.1.5).

clitic: a bound word-form – i.e. a word-form that is prosodically dependent on a host (Sections 9.2–9.3).

clitic group: an expression formed by one or more clitics and the host (Section 9.3).

coalescence: a diachronic change whereby two formerly free syntactic elements turn into a single word-form (Section 3.2.2) (cf. *grammaticalization*).

combinatory potential (= **subcategorization frame**): the information in a lexical entry about the surrounding elements with which a word or morpheme can or must combine (Section 3.1.1).

combining form: a bound stem that occurs only in a compound.

comparative: an inflectional value of the feature DEGREE ('having a higher degree, more') (Section 5.1).

competence: the speaker's knowledge of the linguistic system (Section 6.1) (cf. *performance*).

complementary distribution: when two morphs occur in non-overlapping environments, they are in complementary distribution; a partial criterion for identifying allomorphs of the same morpheme (Section 2.3).

complex event noun: a deverbal noun that refers to the event or action itself, and which inherits the base verb's argument structure (Section 11.3.2).

complex word: a word that is one of a group of words that show systematic covariation in their form and meaning – i.e. morphological structure (Section 1.1).

complexity-based ordering: the idea that restrictions on affix order are emergent from the structure of the lexicon: affixes that are more likely to be stored in the lexicon together with their stems must occur closer to the root

than affixes that are likely to be decomposed during lexical access (Section 10.4) (cf. *level ordering*).

compositional meaning: when the meaning of a complex word is equal to the sum of the meanings of its component morphemes (Sections 4.1, 5.3).

compound (= **compound lexeme**): a complex lexeme that is made up of more than one lexeme stem (Sections 2.1, 7.1) (subtypes include *affix compound, appositional compound, coordinative compound, endocentric compound, exocentric compound, phrasal compound, synthetic compound*).

compounding: the formation of compounds (Sections 2.1, 3.1.1).

concatenative operation: an operation that consists of stringing morphemes together – i.e. affixation or compounding (as opposed to non-concatenative operations such as base modification or reduplication) (Section 3.1.1).

conceptual structure (= **event structure**): the formal semantic decomposition of a verb's meaning (Section 11.1.1).

concrete noun: a deverbal noun that is similar to an event noun, but which does not refer to the event or action itself; instead, it refers to the product of the action (e.g. *building*), a group of people associated with the action (e.g. *management*), etc. (Section 11.3.2).

conditional: an inflectional value of the feature MOOD that indicates a hypothetical, unrealized action.

conditioning: the environments in which different allomorphs of the same morpheme occur (Section 2.3) (subtypes: *phonological conditioning, morphological conditioning, lexical conditioning*).

conjugation: (i) an inflection class of a verb; (ii) verb inflection in general (Section 8.2).

constituent: a subgrouping within the structure of a word or sentence (Sections 1.1, 3.2.1).

contextual inflection: a part of inflectional morphology consisting of features that are assigned to a word because of the syntactic context in which it appears, i.e. as a result of agreement or government; an inflectional feature may be inherent for one word-class and contextual for another (Section 5.4.1) (cf. *inherent inflection*).

continuative: an inflectional value of the feature ASPECT that indicates an ongoing action.

continuum approach: a hypothesis according to which morphological patterns are understood as lying on a continuum ranging from canonical inflection to canonical derivation, without sharp boundaries between types (Section 5.3) (cf. *dichotomy approach*).

controller (of agreement): in syntax, the constituent whose properties determine the properties of the agreeing constituent, e.g., when a noun determines the gender property of an adjective that agrees with it, the noun is the controller (Section 5.3) (cf. *target*).

converb: a verb-form that is used for adverbial subordination (Section 5.1).

conversion: a morphological pattern in which the pronunciation of the base does not change (Section 3.1.4).

coordination ellipsis: a test for word status; one of two identical elements in a coordinated phrase can usually be deleted, but a compound member cannot be deleted in this way (Section 9.1).

coordinative compound (= **dvandva compound**): a compound that refers to multiple referents corresponding to the compound members: e.g. Korean *elun-ai* 'adult and child' (*elun* 'adult', *ai* 'child') (Section 7.1).

coreferential: two nouns are coreferential if they refer to the same entity (Section 11.1.2).

count noun: a noun that can refer to individual entities, and can have both singular and plural forms (e.g. English *table*) (Section 8.2) (cf. *mass noun*).

creativity: the creation of neologisms by unproductive patterns (Section 6.2).

cross-formation: the formation of a complex word from a base that is itself complex, by removing part of the base (Section 3.2.2).

cumulative expression (= **fusion**): the expression of multiple morphological meanings simultaneously by a single un-analyzable element (Section 4.1).

dative: an inflectional value of the feature CASE that indicates the indirect object of a verb (Section 5.1).

deadjectival: a formation whose base is an adjective is called *deadjectival* (Section 5.2).

declarative: an inflectional value of the feature MOOD that indicates the proposition expressed is an unqualified statement of fact.

declension: (i) an inflection class of a noun; (ii) noun inflection in general (Section 8.2).

decomposition route: a means of lexical access in which a complex word is broken up into component morphemes, and information about the word (e.g. meaning) is retrieved from the individual morphemes' lexical entries (Section 4.3) (cf. *direct route*).

default rule: a default rule is one that applies in the general case, when no more specific rule applies (Sections 8.4, 8.6.2).

defective: a lexeme is defective if some cells of its inflectional paradigm are not filled – i.e. if there are some inflectional meanings that it cannot express (Section 8.7.1).

definite: an inflectional value of the feature DEFINITENESS.

degree: an inflectional feature of adjectives having to do with comparison of gradable properties (values: *comparative, superlative*).

degree of exhaustion: a measure of productivity; the ratio of words exhibiting a given morphological pattern to all words within the domain of that pattern (Section 6.5).

degree of generalization (= **profitability**): a measure of productivity; the type frequency of the relevant morphological pattern (Section 6.5).

denominal: a formation whose base is a noun is called *denominal* (Section 5.2).

deobjective: a valence-changing operation in which the patient is removed from argument structure, or not linked to any element in function structure (Section 11.1.3).

dependent: an element in a compound or syntactic phrase that modifies the head (Sections 7.1–7.3).

dependent verb: a verb that is confined to a subordinate clause – i.e. to a clause that cannot stand alone as a sentence. Dependent verbs are nonfinite (Section 5.1).

deponency: a type of mismatch between form and meaning. Imagine that a language has inflectional feature A with value {a}, usually expressed by form *a*, and value {b}, usually expressed by form *b.* A lexeme is deponent if it has a paradigm with the form *a*, but this form expresses the meaning {b}. In other words, a deponent verb has inflectional values that are 'opposite' to what is expected, given its formal marking (Section 8.7.2).

derivation$_1$ (= **derivational morphology**): the relationship between lexemes of a word family; a part of morphology that is characterized by relatively concrete morphological meanings, potential semantic irregularity, restrictions on applicability, etc. (Section 2.1 and Chapter 5) (Note: *derivation$_1$* is closely related neither to *derive$_1$* nor to *derive$_2$*!).

derivation$_2$: the process of deriving$_1$ or deriving$_2$.

derivational morphology = **derivation$_1$**.

derivative: a lexeme that is related to another lexeme by virtue of having been derived$_1$ from it (Section 2.1).

derive$_1$ (A from B): build or form a complex word A on the basis of a base B (Chapter 3).

derive₂ (A from B): construct a (phonological) surface representation A by applying a series of modifying rules to an underlying representation B (Section 10.4).

desiderative: a deverbal derivational meaning: 'want to do', e.g. Inuktitut *sinikkuma-* 'want to sleep' is the desiderative of *sini-* 'sleep' (Section 5.2).

deverbal: a deverbal lexeme is one whose base is a verb (Section 5.2).

diachronic: having to do with language change over time (Section 6.1) (cf. *synchronic*).

diachronic productivity: a measure of productivity; the number of neologisms with a given morphological pattern attested over a period of time (Section 6.5).

dichotomy approach: a hypothesis according to which inflectional and derivational patterns have sufficiently different traits as to suggest that they represent distinct subsystems in morphological architecture (Section 5.3) (cf. *continuum approach*).

diminutive noun: a denominal noun denoting a smaller (or otherwise pragmatically special) version of the base noun, e.g. Spanish *gatito* 'little cat' is a diminutive of *gato* 'cat' (diminutive adjectives, adverbs and verbs are also possible) (Section 5.2).

direct route: a means of lexical access in which information about a complex word (e.g. meaning) is retrieved directly from the lexical entry for the complex word (Section 4.3) (cf. *decomposition route*).

domain: the domain of a rule is the set of bases to which a rule could apply in principle (Sections 6.1, 6.3).

dual: an inflectional value of the feature NUMBER ('two') (Section 5.1).

dual-processing model: a psycholinguistic model of inflection that assumes two completely separate modes of mental processing and storage of inflected forms (Section 4.3).

duplifix: an element attached to the base that consists of both copied segments and fixed segments (= a mixture of affix and reduplicant) (Section 3.1.3).

durative: an inflectional value of the feature ASPECT that indicates an ongoing action or state.

dvandva compound = **coordinative compound.**

economy: a common way of measure the elegance of a description, particularly in the context of the lexicon (smaller lexicon = more economical description = more elegance) (Section 4.1).

elative: an inflectional value of the feature CASE ('motion away from') (Chapter 4 Comprehension Exercises).

elsewhere condition: the principle that more specific conditions apply before more general conditions. For instance, if two word-forms are compatible with syntactic requirements, the word-form that expresses the more specific set of features will be inserted into syntactic structure (Section 8.6.2).

empty morph: a morph (generally an affix) that has no meaning but that must be posited for the sake of descriptive elegance (Section 4.1).

enclitic: a clitic that follows its host.

endocentric compound: a compound that consists of a head and a dependent (or several dependents); the meaning of the semantic head is a hyponym of the meaning of the entire compound (Section 7.1).

ergative: an inflectional value of the feature CASE that indicates the agent of a transitive verb.

ergative-absolutive language: a language that uses the same grammatical markers to indicate the argument of an intransitive verb and the object of a transitive verb, and a different grammatical marker to indicate the agent of a transitive verb (cf. *nominative-accusative language*).

essive: an inflectional value of the feature CASE that indicates a state of being (Chapter 4 Comprehension Exercises).

event-changing operation: A morphological operation that changes the argument structure of a verb (Section 11.1) (cf. *function-changing operation*).

event noun (= **action noun**): a deverbal noun that refers to the event or action itself, e.g. English *replacement* 'act of replacing' (Section 11.3.2) (subtypes: *simple event noun*, *complex event noun*).

event structure = **conceptual structure**.

exclusive first person: refers to a group including the speaker but not including the addressee (Chapter 8 Exploratory Exercise) (cf. *inclusive first person*).

exocentric compound (= **bahuvrihi compound**): a compound pattern that does not contain a (semantic) head and a dependent (Section 7.1).

expandability: a test for compound status; dependents in phrases can be expanded by modifiers (adjectives and adverbs), but dependent members in compounds generally cannot (Section 9.1).

experiencer: a semantic role: the participant that experiences an experiential situation (Section 11.1).

exponent: when a morphological pattern (e.g. *-ed*) expresses an inflectional feature value (e.g. past tense), it is the *exponent* of that feature value (Chapter 12).

facilitative adjective: a deverbal derivational meaning: 'able to undergo an action' (e.g. Basque *jangarri* 'edible' is the facilitative adjective corresponding to *jan* 'eat') (Section 5.2).

factitive verb: a deadjectival verb with the derivational meaning 'cause something to be Adj' (e.g. Russian *černit'* 'to blacken' is the factitive of *černyj* 'black') (Sections 5.2–5.3).

feature = **inflectional feature.**

feature-value compatibility: the principle that the morphology must provide to the syntax a word-form whose morphosyntactic values do not conflict with those required by the syntax (Section 8.6.2) (cf. *feature-value identity*).

feature-value identity: the principle that the morphology must provide to the syntax a word-form whose morphosyntactic values exactly match those required by the syntax (Section 8.6.2) (cf. *feature-value compatibility*).

feature-value notation: a convention for representing the inflectional values associated with a word-form, e.g. [CASE: GENITIVE].

female noun: a derivational meaning of nouns ('female') – e.g. English *poetess* (derived from *poet*) (Section 5.2).

feminine: an inflectional value of the feature GENDER.

first (person): an inflectional value of the feature PERSON ('refers to the speaker') (Section 5.1).

focus: indicates prominent or new information in a discourse.

formal head: in (endocentric) compounds, the lexeme that serves as the morphosyntactic locus and determines word-class, gender and inflection class (Sections 7.2–7.4).

formalist orientation = **generative orientation.**

free form: a word-form that is not bound (Section 9.2).

freedom of host selection: a property of clitics such that they can take various syntactic categories as a host (Section 9.3).

freedom of movement: a test for word status; constituents of a phrase may be clefted, topicalized, etc., but constituents of a word may not (Section 9.2).

fronting: a type of base modification that involves changing the place of articulation of a sound (usually a vowel) so that it is pronounced closer to the front of the mouth (Section 3.1.2).

function-changing operation: A morphological operation that changes the way semantic roles are linked to syntactic functions; function-changing operations are often encoded by the inflectional feature of voice (Section 11.1) (cf. *event-changing operation*).

function structure (= **syntactic valence**): the set of syntactic functions of a verb's arguments (Section 11.1.1).

functionalist orientation: an approach to (morphological) research that emphasizes system-external explanation (Section 1.3) (cf. *generative orientation*).

fusion = **cumulative expression.**

fusional language: A language that makes a fair amount of use of morphology, but in which there is not usually a one-to-one correspondence between morphs and meanings (cf. *agglutinative language*, *isolating language*).

future: an inflectional value of the feature TENSE ('occurring later than the moment of speech') (Section 5.1).

gemination: a type of base modification that involves making a sound (usually a consonant) longer (Section 3.1.2).

gender: an inherent property of nouns in some languages that is reflected in agreement (by adjectives, verbs and other agreement targets) and that serves to group the nouns into classes. Gender is an inflectional feature for agreement targets; typical values are masculine, feminine, but sometimes simply gender 1, gender 2, etc.

generality: a common way of measuring the elegance of a description, according to which fewer descriptions capturing a larger portion of the data each is deemed more general (and thus more elegant) than more descriptions capturing a smaller portion of the data each (Section 1.3).

generative orientation (= **formalist orientation**): an approach to (morphological) research that seeks to discover the principles of Universal Grammar, and emphasizes this mode of explanation (Section 1.3) (cf. *functionalist orientation*).

generic: in a phrase or sentence, an expression is generic if it refers to a whole class, rather than a particular item (Section 9.1) (cf. *referential*).

genitive: an inflectional value of the feature CASE ('possessor', e.g. English *'s* in *student's book*) (Section 5.1).

Germanic suffixes: A class of suffixes in English that historically were mostly inherited from Germanic (Section 6.3.5).

government: a syntactic relation in which one word requires another word or phrase to have a particular inflectional value (e.g. assigning a case value to a noun) (Section 5.3) (cf. *agreement*).

gradable adjective: an adjective that is semantically compatible with the feature DEGREE (e.g. English *happy* is gradable because the comparative form *happier* can be formed from it) (Section 5.3).

grammatical theory: an architecture for the description of grammatical structure (Section 1.3).

grid: a notation convention for representing paradigms (Chapter 2 Exploratory Exercise, Appendix to Chapter 5).

habitual: an inflectional value of the feature ASPECT ('an event that is repeated regularly') (Section 5.1).

hapax (legomenon): a word that occurs exactly once in some corpus (Section 6.5).

hapax-conditioned degree of productivity: a measure of productivity; the ratio of the number of hapax legomena with a given morphological pattern to the number of hapax legomena with all morphological patterns (Section 6.5).

head: see *semantic head* and *formal head*.

head-final language: a language in which syntactic heads are located at the end of their phrases (e.g. adpositions come after nouns) (Chapter 7 Exploratory Exercise).

head-initial language: a language in which syntactic heads are located at the beginning of their phrases (e.g. adpositions come before nouns) (Chapter 7 Exploratory Exercise).

hierarchical structure: the constituent structure of and dominance relations between elements in a word (morphemes, bases) or elements in a sentence (words, phrases) (Section 3.2.1, Chapter 7).

homonymy: two word-forms are homonymous if their pronunciation is identical (Section 8.6).

host: a clitic's host is the element that a clitic combines with; a clitic's prosodic host and syntactic host may differ (Section 9.2).

hypothetical: an inflectional value of the feature MOOD ('counterfactual but possible event').

idiomaticity = **non-compositional meaning**.

imperative: an inflectional value of the feature MOOD ('speaker issues command to hearer') (Section 5.1).

imperfective: an inflectional value of the feature ASPECT ('an event seen from within or as not completed') (Section 5.1).

implicational relationship: a predictive relationship such that if A is true, B must also true, but not necessarily the reverse; in language typology, implicational relationships are usually probabilistic (if A is true, B has a high probability of being true), rather than absolute (Chapter 7 Exploratory Exercise).

inalienable possession: indicates a relationship such that the possessor of an object cannot be changed; body parts are classic examples of inalienably possessed objects (Section 9.1).

inchoative verb: a deadjectival verb expressing the derivational meaning 'begin to be Adj., become Adj.' (e.g. Spanish *verdear* 'become green' is the inchoative of *verde* 'green') (Sections 5.2–5.3).

inclusive first person: refers to a group including both the speaker and the addressee (Chapter 8 Exploratory Exercise) (cf. *exclusive first person*).

indeclinable: a lexeme that does not have different inflected forms, and differs from other lexemes in this respect (Section 8.2.3).

indicative: an inflectional value of the feature MOOD ('an event thought of as occurring in reality') (Section 5.1).

inessive: an inflectional value of the feature CASE ('inside of') (Chapter 4 Comprehension Exercises).

infinitive: an inflectional meaning of verbs: a nonfinite form used for clausal complements when the complement subject is identical to the matrix subject; often has nominal properties (Section 5.1).

infix: an affix that occurs inside the base (Section 2.2).

inflect: When we say that a word INFLECTS (for some value) we mean that it has (inflectional) WORD-FORMS for that value, e.g. 'Russian verbs inflect for gender', i.e. Russian verbs distinguish different word-forms for different genders (of the subject argument).

inflection (= **inflectional morphology**): the relationship between word-forms of a lexeme; a part of morphology that is characterized by relatively abstract morphological meanings, semantic regularity, almost unlimited applicability, etc. (Section 2.1 and Chapter 5).

inflection class: a class of lexemes that inflect in the same way – i.e. that show the same suppletive allomorphy in all word-forms of their paradigm (Sections 8.2, Chapter 12).

(inflection) class shift: a diachronic change in which a lexeme belonging to one inflection class becomes associated with a different class (Sections 8.3, 6.4.3).

inflectional exponent = **exponent.**

(inflectional) feature (= **inflectional category**): a set of inflectional values that share a semantic property and are mutually exclusive, e.g. TENSE, CASE and VOICE (Section 5.1).

(inflectional) value (= **inflectional property, inflectional feature value**): a specified value within an inflectional feature – e.g. FUTURE (from the feature TENSE), ACCUSATIVE (from the feature CASE), PASSIVE (from the feature VOICE) (Section 5.1).

inherent case: a value of the feature CASE that meets the criteria for inherent inflection, e.g. locative, ablative, and instrumental for nouns (Section 5.4.1) (cf. *structural case*).

inherent inflection: a part of inflectional morphology consisting of features that are relevant to the syntax but convey a certain amount of independent information; inherent inflection is distinguished from *contextual inflection* by virtue of sharing properties with derivation; an inflectional feature may be inherent for one word-class and contextual for another (Section 5.4.1).

inheritance₁ hierarchy: a descriptive device in which a tree structure is used to represent similarities among inflection classes (i.e. similarities among rule schemas). Shared information is specified on higher nodes, and information that is specific to individual classes on lower nodes. A lower node inherits information from its mother node in the default situation (Section 8.4).

inheritance₂ = **argument inheritance.**

instrumental: an inflectional value of the feature CASE that indicates that the marked noun is the means by which an action is accomplished (e.g. Russian *rezat'* [cut.INF] *nož-om* [knife-INS] 'to cut with a knife') (Section 5.4.1).

integrated affix: an affix that triggers or undergoes a morphophonological alternation, exhibits the phonotactics of a monomorphemic word, and tends to occur close to the root (Section 10.4) (cf. *neutral affix*).

intensive adjective: a deadjectival adjective signalling an increased degree of the base, e.g. Turkish *yepyeni* 'brand new' is derived from *yeni* 'new' (Section 5.2) (cf. *attenuative adjective*).

interfix: a semantically empty affix that occurs between the two members of a N + N compound (especially in German and some other European languages) (Section 7.1).

interlinear (morpheme-by-morpheme) gloss: a notation convention used by linguists to help readers understand the structure of a morphological example (Appendix to Chapter 2).

intransitive: a verb that does not take a direct object is called *intransitive* (cf. *transitive*).

isolating language: a language that makes only minimal use of morphology (Section 1.2) (cf. *agglutinative language, fusional language*).

Latinate suffixes: A class of suffixes in English that historically derive mostly from Latin or Greek via large-scale borrowing of vocabulary; Latinate suffixes combine (almost) exclusively with Latinate bases (i.e. bases of Latin or Greek origin) (Section 6.3.5).

lengthening: a type of base modification that involves making a sound (usually a vowel) longer (Section 3.1.2).

lenition = **weakening.**

level ordering: a hypothesis about grammar architecture, according to which affixation rules are separated into two or more levels. These levels are ordered relative to each other in derivation$_2$, and within each level, affixation rules operate prior to sets of phonological rules that are associated with that level (Section 10.4).

levelling = **analogical levelling.**

lexeme: a word in an abstract sense; an abstract concept representing the core meaning shared by a set of closely-related word-forms (e.g. *lives, live, lived*) that form a paradigm (Section 2.1).

lexeme formation = **word-formation.**

lexical access: the mental process of looking up a word in the lexicon (Section 4.3).

lexical alternation = **morphophonological alternation.**

lexical category = **word-class.**

lexical conditioning: when the choice of allomorph is determined by the lexeme it attaches to (Section 2.3).

lexical entry: a listing in the lexicon (Chapter 3).

(lexical) gang: a group of words that shares an (inflectional) morphological pattern and that is also highly similar in phonological form, e.g. *sling, wring, swing* (Section 6.4.3).

Lexical Integrity Hypothesis (= **Lexical Integrity Principle**): a hypothesis about the universal nature of language, stating that rules of syntax can refer and/or apply to entire words or the properties of entire words, but not to the internal parts of words or the properties of the internal parts of words (Section 9.4).

lexical item: any item that is listed in the lexicon, ranging from morphemes to words to phrases (e.g. idioms) (Chapter 4).

lexical neighbourhood: a set of words that are minimally (phonologically) different from some other word.

lexical periphrasis: when a given set of inflectional values is expressed by a periphrastic (multi-word) expression for some lexemes, but the same set is expressed as a single word for other lexemes (e.g. *happier* versus periphrastic *more beautiful* – both are comparatives) (Section 8.8).

lexicon: the list of elements that speakers have to know in addition to the rules of grammar (Chapter 4, Section 6.4).

loanword (= **borrowing**): a word taken from another language (Section 8.2.3).

locative: an inflectional value of the feature CASE that indicates a location: 'in, on, at, by,…' (e.g. Turkish *ev-de* [house-loc] 'in the house') (Section 5.4.1).

locative applicative: a valence-changing operation that creates a new direct object argument for the locational participant (Section 11.1.5).

masculine: an inflectional value of the feature GENDER.

masdar: an inflectional action noun (Sections 5.1, 11.4).

mass noun: a noun that refers to a group of objects as a collective entity, rather than as a group of individual member entities; often has a form for only one number value (e.g. English *information*, **informations*, or *furniture*, **furnitures*) (Sections 5.3, 8.2) (cf. *count noun*).

memory strength (= **resting activation level**): the relative strength of the representation of a word or morphological pattern in the lexicon (e.g. as a result of token frequency) (Sections 4.3, Chapter 12).

metathesis: a type of base modification that involves switching the order of two contiguous sounds or groups of sounds (e.g. syllables) (Section 3.1.2).

moderate word-form lexicon: the hypothesis that a speaker's lexicon includes simple and complex words, morphemes (or morphological patterns), and derived stems. Whether any particular complex word is listed in the lexicon depends on a variety of factors (Sections 4.3, 6.4.1) (cf. *morpheme lexicon*, *strict word-form lexicon*).

monomorphemic: containing one morpheme.

monosyllabic: containing one syllable.

mood: an inflectional feature of verbs that has to do with the speaker's level of commitment to the actuality of the event, or its desirability or conditionality (values: *imperative, subjunctive, indicative, conditional, optative*, etc.) (Section 5.1).

morph: a concrete primitive element of morphological analysis.

morpheme: the smallest meaningful part of a linguistic expression that can be identified by segmentation; a frequently occurring subtype of morphological pattern (Section 1.1).

morpheme alternant = **allomorph.**

morpheme-based model: a collective term for approaches to morphological analysis in which morphological rules are thought of as combining morphemes in much the same way as syntactic rules combine words (Section 3.2.1) (cf. *word-based model*).

morpheme lexicon: the hypothesis that a speaker's lexicon lists (to the extent possible) only simple monomorphemic elements, i.e. roots and affixes, rather than complex words (Section 4.1) (cf. *moderate word-form lexicon, strict word-form lexicon*).

morpheme structure condition: a restriction on the co-occurrence of sounds within a morpheme (Sections 4.2, 10.5).

morphological conditioning: when the morphological context (usually, grammatical function) determines the choice of allomorph (Section 2.3).

(morphological) correspondence: a convention used to represent the association between morphologically related sets of words; a morphological rule in the word-based model (Section 3.2.2).

morphological pattern: a pattern across words in which a recurrent aspect of meaning corresponds to a recurrent aspect of form (Section 3.1).

(morphological) rule: a formal description of a morphological pattern (Chapter 3).

morphology: (the study of) systematic covariation in the form and meaning of words (Section 1.1).

morphophonological alternation (= **lexical alternation**): an alternation that is at least partly morphologically or lexically conditioned (Chapter 10).

morphophonological rule: a formal description of an alternation; a rule that derives$_2$ a surface representation from an underlying representation by changing the shape of the word when certain (morpho)phonological conditions are met (Section 2.3).

morphophonology: the study of morphophonological alternations.

morphosyntactic feature: a(n inflectional) feature that is relevant to both morphology and syntax, such as case.

morphosyntactic locus: the stem in a compound where morphosyntactic features are expressed (Sections 7.2, 7.4).

morphosyntactic representation: a set of (inflectional) values that can be combined with a lexeme and that are relevant to both morphology and

syntax; in some theories, the bottom node in syntactic trees consists of morphosyntactic representations (i.e. inflectional values + word-class, but without specification of a particular lexeme).

natural class: a group of inflected forms constitute a natural class if they are all and the only forms that express some set of inflectional values (Section 8.6.2). This term has a parallel use in phonology – a group of sounds constitute a natural class if they share some phonological feature or set of features (e.g. labial) (Section 10.1).

natural syncretism: a pattern of syncretism in which the syncretic forms constitute a natural class (Section 8.6.2).

negative adjective: a deadjectival adjective signalling a reversal of the (positive) quality of the base (e.g. English *unhappy*, derived from *happy*).

neologism: a new lexeme that is attested, but had not previously been observed in the language. (Section 4.2, Chapter 6) (cf. *actual word, occasionalism, possible word*).

neuter: an inflectional value of the feature GENDER.

neutral affix: an affix that does not trigger or undergo a morphophonological alternation, may show phonotactic peculiarities, and tends to occur further from the root (Section 10.4) (cf. *integrated affix*).

nominative: an inflectional value of the feature CASE ('the case of the subject, the case-form that is used as citation form') (Section 5.1).

nominative-accusative language: a language that uses the same grammatical markers to indicate the argument of an intransitive verb and the agent of a transitive verb, and a different grammatical marker to indicate the patient of a transitive verb (cf. *ergative-absolutive language*).

nonce formation = occasionalism.

non-compositional meaning (= **idiomaticity**): see *compositional meaning* (Sections 3.2.2, 5.3, 9.1).

non-concatenative operation: a morphological operation that cannot be straightforwardly described as stringing together of two morphemes (Sections 3.1.2–3.1.4).

non-gradable adjective: see *gradable adjective* (Section 5.3).

non-word: a sequence of sounds that adheres to the phonological rules of a language, and therefore sounds like a word, but has no meaning (Chapter 3 Exploratory Exercise).

noun incorporation: N + V compounding in which the verb is the head; found especially in polysynthetic languages (Sections 7.1, 9.1, 11.2.1).

NP = **noun phrase.**

number: an inflectional feature of nouns, having to do with the number of items a noun refers to (values: *singular, plural, dual, paucal*, etc.) (Section 5.1).

objective case: an inflectional value of the feature CASE that indicates an object role (Section 8.5).

oblique₁: oblique cases are all morphological cases apart from the most basic ones (e.g. all but the nominative and accusative).

oblique₂: syntactic functions other than the subject and direct object; the term is often used even when these functions are expressed by syntactic means, rather than morphological case (Section 11.1.1).

occasionalism (= **nonce formation**): a neologism that has not caught on and is restricted to occasional occurrences (Sections 4.2, 6.1) (cf. *actual word, neologism, possible word*).

optative: an inflectional value of the feature MOOD that indicates a desire or wish for some event to occur.

palatalization: a type of base modification that involves changing the place of articulation of a sound (usually a consonant) so that it is pronounced at the palate (Section 3.1.2).

paradigm: the structured set of word-forms of a lexeme (Section 2.1). (Often subsets that belong together (e.g. all past-tense forms of a verb) are also referred to as paradigms.)

paradigm rule: a word-based rule consisting of multiple correspondences between word-forms in an inflectional paradigm (Section 8.3).

paradigmatic gap: the 'missing' word-form in a defective lexeme.

paradigmatic periphrasis: when a given set of inflectional values is always expressed by a periphrastic (multi-word) expression, but individual values in the set are expressed by a single-word expression elsewhere in the paradigm (e.g. in Latin, the combination of perfect and passive is always periphrastic, but the combination of perfect and active is not periphrastic) (Section 8.8).

paradigmatic relations: relations between units that could (potentially) occur in the same slot (Section 8.1).

parsing ratio: the percentage of words with a given morphological pattern that are decomposed (parsed) in lexical access, according to a parallel dual route model of lexical access (Section 6.4.1).

participle: a deverbal adjective that may retain some verbal properties (Sections 5.1, 11.4).

partitive: an inflectional value of the feature CASE that denotes a subpart of a collective entity (Chapter 4 Comprehension Exercises).

passive: an inflectional value of the feature VOICE that signals that the patient is the grammatical subject; a function-changing operation in which the agent is backgrounded (Sections 5.1, 11.1.2).

past: an inflectional value of the feature TENSE ('occurring earlier than the moment of speech') (Section 5.1).

patient: a semantic role; the participant that undergoes an action (Chapter 11).

patient noun: a deverbal noun that refers to the verb's patient, e.g. English *invit-ee* (derived from the verb *invite*, and indicating the person who is the recipient of the action) (Section 5.2).

paucal: an inflectional value of the feature NUMBER ('a few') (Section 5.1).

perfect: an inflectional value of the feature ASPECT ('an event that took place in the past but has current relevance').

perfective: an inflectional value of the feature ASPECT ('an event seen from the outside or as completed') (Section 5.1).

performance: use of language (Section 6.1) (cf. *competence*).

periphrastic construction: a multi-word phrase that cumulatively expresses some set of inflectional values. A periphrastic construction fills a cell of an inflectional paradigm (Sections 8.8, 9.4) (subtypes: *lexical periphrasis, paradigmatic periphrasis, categorial periphrasis*).

person: an inflectional agreement feature of verbs (person of subject or object) and nouns (person of possessor) (values: *1st, 2nd, 3rd*) (Section 5.1).

phonetic alternation = **automatic alternation.**

phonological allomorph: two allomorphs are phonological if they have quite similar phonological shape (Section 2.3, Chapter 10).

phonological conditioning: when the phonological context determines the choice of allomorph (Section 2.3).

phrasal compound: a compound in which an entire phrase is the dependent member, e.g. a [[*floor of the birdcage*] *taste*] (Chapter 9 Exploratory Exercise).

phrasal node: a non-terminal node in a syntactic tree diagram, representing a phrasal constituent (Section 7.4).

phrase structure rule: in syntax, a rule stating how words may be combined to form a phrase (Section 3.2.1).

plural: an inflectional value of the feature NUMBER ('more than one') (Section 5.1).

poetic licence: the creation of neologisms by unproductive rules in a way that violates ordinary language norms (Section 6.2).

polarity: an inflectional feature of verbs that indicates the positive or negative status of the event (e.g. Japanese *kir-u* [cut-PRS] 'cuts', *kir-ana-i* [cut-NEG-PRS] 'doesn't cut') (Section 5.1).

polysyllabic: containing multiple syllables.

polysynthetic language: a language that makes very extensive use of morphology (Section 1.2) (cf. *analytic language, synthetic language*).

portmanteau morph: an affix or stem that cumulatively expresses two meanings that would be expected to be expressed separately (Section 4.1).

possible word (= **potential word**): a lexeme that could be formed according to word-formation rules but is novel and perhaps never used before (Sections 4.2) (cf. *actual word, neologism, occasionalism*).

postposition: similar to a preposition, except that postpositions are syntactically positioned after noun phrases rather than before them (Chapter 7 Exploratory Exercise).

potential word = **possible word.**

prefix: an affix that precedes the base (Section 2.2).

present: an inflectional value of the feature TENSE ('occurring simultaneously with the moment of speech') (Section 5.1).

Priscianic formation: the formation of an inflected form on the basis of another inflected form that is not closely related semantically (Section 8.5).

privative adjective: a denominal adjective signalling lack of possession of the base noun (N-PRIV 'lacking N', e.g. Russian *bezgolosyj* 'voiceless', derived from the noun *golos* 'voice') (Section 5.2).

proclitic: a clitic that precedes its host.

productivity: a morphological pattern or rule is productive if it can be applied to new bases to create new words (Section 4.2, Chapter 6).

profitability = **degree of generalization.**

progressive: an inflectional value of the feature of ASPECT ('an event that is in progress').

proportional equation: a way of representing the relationship between the model and the target in analogical change (Section 6.4.3).

proprietive adjective: a denominal adjective signalling possession of the base noun ('having N', e.g. Hungarian *nagy hatalm-ú uralkodó* [great power-PROPR monarch] 'monarch having great power') (Sections 5.2, 11.4).

prosodic dependence: a property of clitics and affixes; a prosodically dependent element is smaller than a prosodic word and must 'lean on' a host (Section 9.2).

prosodic word: a unit that acts as the domain for word stress (Section 9.2).

prototypical member: in a lexical gang, one or more word-forms that exhibit the most specific set of phonological properties relevant to the gang; the 'centre' of the gang (Section 6.4.3).

pure stem: a stem that is not identical to any member of the inflectional paradigm (Section 7.1).

purposive: a derivational meaning expressing purpose or goal-oriented action.

quality noun: a derivational meaning of deadjectival nouns (e.g. English *goodness* from *good*) (Section 5.2).

recipient applicative: a valence-changing operation that creates a new object argument for the recipient participant (Section 11.1.5).

reduplicant: the copied element in a reduplication (Section 3.1.3).

reduplication: a formal operation whereby (part of) the base is copied and attached to the base (Section 3.1.3).

referential: in a phrase or sentence, an expression is referential if it refers to some specific, existing entity (Section 9.1) (cf. *generic*).

reflexive: a primarily function-changing operation signalling that agent and patient are coreferential (Section 11.1.2).

relational adjective: a denominal adjective signalling some kind of relation to the base noun, e.g. Russian *korolevskij* 'royal' is the relational form derived from *korol'* 'king' (Section 5.2).

relative clause: a subordinate clause that modifies a noun (e.g. 'the man *who ate everything*').

relic alternation: an instance of allomorphy that occurs in very few words and is not productive. Typically, relic alternations were productive at an earlier stage of the language, but subsequently levelled in all but a few (high frequency) words (Section 10.2).

repetitive: a deverbal derivational meaning of verbs: 'again' (e.g. English *rewrite*, derived from *write*) (Section 5.2).

restrictions = **selectional restrictions**.

resultative: an event-changing operation signalling that there is no 'cause' and 'become' element in the event structure (Section 11.1.2).

reversive: a deverbal derivational meaning of verbs: 'reverse or undo the effect of the base verb' (e.g. English *unfasten*, derived from *fasten*) (Section 5.2).

root: a base that cannot be analyzed further – i.e. a base that consists of a single morpheme (Section 2.2).

rule = **morphological rule.**

rule of referral: an inflectional rule stating that two cells in a paradigm have the same phonological form (Section 8.6.3).

rule schema: a schema that generalizes over several different morphological rules that exhibit similarities (Section 8.4).

schema = **word-schema.**

second (person): an inflectional value of the feature PERSON ('refers to the addressee') (Section 5.1).

second-position clitic (= **Wackernagel clitic**): a well-known type of special clitic; second-position clitics appear after the first element (word or syntactic constituent) of a simple sentence (Section 9.3).

segment: to break-up complex words into individually meaningful parts (Chapter 2).

selectional restrictions (= **restrictions**): conditions that define the domain of a rule, e.g. some affixes 'select' only bases that have a particular phonological shape, particular semantic meaning, etc. (Sections 3.1.1, 6.1, 6.3).

semantic head: the semantic head of a compound or a syntactic phrase is the hyponym of the whole expression (Sections 7.1–7.2).

semantic role (= **thematic relation**): the semantic role of a noun phrase is the manner in which the noun participates in the action or state expressed by the verb, e.g. as agent, patient, theme, etc. (Chapter 11).

semantic scope: when an affix C combines with a complex unit AB, C has semantic scope over AB; the meaning of ABC should be equal to the meaning of AB + the meaning of C (which crucially may be different than the meaning of A + the meaning of BC) (Section 7.3).

semantic valence = **argument structure.**

separability: a syntactic test of word status; phrasal constituents can be separated by other words, but words cannot intervene between parts of a word (incl. compound members) (Section 9.1).

shortening: a type of base modification that involves making a sound shorter (Section 3.1.2).

simple clitic: a clitic that can appear in the same syntactic positions as a free form of the same word-class (Section 9.3) (cf. *special clitic*).

simple event noun: a deverbal noun that refers to the event or action itself, but which does not preserve the base verb's argument structure (Section 11.3.2).

single-component hypothesis: a hypothesis about the architecture of the linguistic system according to which morphological rules are collected together into a single grammatical component that applies before, or in parallel to, syntax (Section 5.4.2) (cf. *split-morphology hypothesis*).

singular: an inflectional value of the feature NUMBER ('one') (Section 5.1).

source: a semantic role: the participant that is the initiating location or state for the action (Section 11.1.1).

special clitic: a clitic whose syntactic distribution differs from that of free forms of the same word-class, and must be described in its own right (Section 9.3) (cf. *simple clitic*).

split-morphology hypothesis: a hypothesis about the architecture of the linguistic system according to which morphology is divided between two grammatical components: word-formation rules apply before syntactic rules, whereas inflectional rules apply after syntactic rules (Section 5.5.1) (cf. *single-component hypothesis*).

stative verb: a verb with the semantic property of referring to a state of existence, rather than a physical action (e.g. *be* is a stative verb in English) (Section 5.3).

stem: the base of an inflected word-form (Section 2.2).

stimulus$_1$: a semantic role: the participant that represents the content of the experiencer's experience (Section 11.1.1).

stimulus$_2$: in psycholinguistics, a test item presented to a participant during the course of an experiment.

stress shift: a type of base modification that involves changing the syllable in a word with which primary stress is associated (Section 3.1.2).

strict word-form lexicon: the hypothesis that a speaker's mental dictionary lists both simple and complex words, regardless of whether the complex words have predictable meaning or form, but does not list affixes (Section 4.2) (cf. *moderate word-form lexicon*, *morpheme lexicon*).

strong suppletion: a kind of allomorphy in which allomorphs of the same morpheme are phonologically radically different (Section 2.3).

structural case: a value of the feature CASE that meets the criteria for contextual inflection, e.g. nominative, accusative, and genitive for nouns (Section 5.4.1) (cf. *inherent case*).

structure preservation: the property of morphophonological alternations of not introducing new segments (Section 10.1).

subcategorization frame = **combinatory potential.**

subjunctive: an inflectional value of the feature MOOD ('a non-realized event in a subordinate clause') (Section 5.1).

subtraction: a type of base modification that consists in deleting a segment (or more than a segment) from the base (Section 3.1.2).

suffix: an affix that follows the base (Section 2.2).

superlative: an inflectional value of the feature DEGREE ('highest degree, most') (Section 5.1).

suppletion: a kind of allomorphy in which two allomorphs of the same morpheme are not similar in pronunciation (Sections 2.3, 8.2) (subtypes: *strong suppletion, weak suppletion*).

suppletive allomorph: two allomorphs are suppletive (= show suppletion) if they are not similar in pronunciation (i.e. cannot be related to each other by (morpho)phonological rules) (Sections 2.3, 8.2).

surface representation: a word-form as it is actually pronounced by speakers; a form derived$_2$ from an underlying representation by morphophonological rules (rules of derivational phonology) (Sections 2.3, 10.3).

synchronic: having to do with language at a given point in time (Section 6.1) (cf. *diachronic*).

syncretism: systematic homonymy of inflected words in a paradigm (Sections 8.6, 12.1.3).

synonymy blocking = **blocking.**

syntactic agreement = **agreement.**

syntactic function: the syntactic function of a noun phrase is the way in which the noun phrase's semantic role is encoded in syntactic structure, e.g. as subject, object, oblique (Chapter 11).

syntactic government = **government.**

syntactic valence = **function structure.**

syntagmatic relations: relations between units that (potentially) follow each other in speech (Section 8.1).

synthetic compound: an N–N compound with a deverbal nominal head and with a dependent noun that fills an argument position in the head's valence (Section 11.2.3).

synthetic language: a language that uses a fair amount of morphology (Section 1.2) (cf. *analytic language, polysynthetic language*).

target (for agreement): in syntax, the constituent whose properties are determined by the properties of another constituent, e.g. when a noun determines the gender property of an adjective that agrees with it, the adjective is the target (Section 5.3) (cf. *controller*).

tense: an inflectional feature of verbs that has to do with the temporal location of the verbal event, especially with respect to the speech event (values: *present, future, past*, etc.) (Section 5.1).

thematic relation = **semantic role.**

theme₁: a semantic role: the participant that undergoes a movement or other change of state (Section 11.1.1).

theme₂: an older term for 'stem'.

third (person): an inflectional value of the feature PERSON ('refers to a third party') (Section 5.1).

token frequency: a count of how frequently some structure (word-form, morpheme, lexeme, etc.) is used in some sample of language (Section 4.3, Chapter 12) (cf. *type frequency*).

tonal change: a type of base modification that involves changing the tone pattern of a word (Section 3.1.2).

transitive: a verb that takes a direct object is called *transitive. Transitivity* is the property of being either transitive or *intransitive* (Section 8.2.1).

transposition: change of word-class by a morphological operation (Sections 11.3–11.4).

tree diagram: in syntax and morphology, a convention for representing hierarchical constituent structure (Sections 3.2.1, 7.2–7.4).

type frequency (of a morphological pattern): the number of lexemes that exhibit a given morphological pattern is that pattern's type frequency (Chapter 3 Exploratory Exercise; Section 6.5) (cf. *token frequency*).

underlying representation: an abstract representation that is not actually used by speakers, but that linguists postulate to simplify the rule system; morphophonological rules (rules of derivational phonology) operate on underlying representations to produce actually pronounced surface representations (Sections 2.3, 10.3).

underspecification (of inflectional value): a descriptive device in which a word-form or morpheme is not specified for a given inflectional value; used to formally describe some types of syncretism, esp. natural syncretisms (Section 8.6.2).

Universal Grammar: the innate part of speakers' grammatical knowledge (Section 1.3).

unproductive pattern: see *productivity*.

usual word = **actual word.**

valence: information about the semantic roles and syntactic functions of a verb (or sometimes another word-class) (Chapter 11).

value = **inflectional value.**

voice: an inflectional (and sometimes derivational) feature of verbs that indicates a function-changing operation (values: *active, passive, reflexive, antipassive*) (Section 5.1).

voicing: a type of base modification that involves changing an unvoiced sound to its voiced counterpart (Section 3.1.2).

vowel harmony: a phonological assimilation process that constrains the co-occurrence of vowels in the same word-form or lexeme, e.g. in Chukchi, the vowels in a word-form must be either all [i,e,u], or all [ə,a,o] (Section 9.1).

VP = **verb phrase.**

Wackernagel clitic = **second-position clitic.**

weakening (= **lenition**): a type of base modification that involves changing the manner of articulation of a sound so that it is produced with less constriction (e.g. stops become fricatives, or fricatives become sonorants) (Section 3.1.2).

weak suppletion: a kind of allomorphy in which allomorphs of the same morpheme are not radically different phonologically, but neither are they similar enough to be related by (morpho)phonological rules (Section 2.3).

word: a word-form or a lexeme, or less commonly, a word token (Section 2.1, Chapter 9).

word-based model: a collective term for approaches to morphological analysis in which the fundamental significance of the word is emphasized and the relationship between complex words is captured by formulating word-schemas that represent common features (Section 3.2.2) (cf. *morpheme-based model*).

word-class: a category of words such as 'noun', 'verb', 'adjective', 'adverb', etc. (Section 3.1.1).

word family: a set of morphologically related lexemes (Section 2.1).

word-form: a word in a concrete sense; a sequence of sounds that express the combination of a lexeme and a set of grammatical meanings; a word-form can be isolated from surrounding elements in speech because it is either prosodically independent (= a free form) or a clitic and not an affix (Section 2.1, Chapter 9).

word-formation (= **lexeme formation**): derivation and compounding (Section 2.1).

word-schema: a representation of a set of morphologically related words (Section 3.2.2).

word-structure rule: in the morpheme-based model, a rule stating how morphemes may combine to form a word (Section 3.2.1).

word token: an instance of use of a word in some text or in speech (Section 2.1, Chapter 9 intro).

zero affix (= **zero expression**): an inflectional value is said to be expressed by zero if there is nothing in the pronunciation that corresponds to the value, so that the presence of the value's meaning must be inferred from this absence of form. (In derivational morphology, morphologists usually talk about *conversion* rather than *zero expression*, though there is really no deep difference); a device used within the morpheme-based model to preserve the principle of having only concatenative rules (Sections 3.2.1, 4.1).

Language index

Language	Family	Geographical area	ISO 639-3 code[1]	Page numbers
Afrikaans	Indo-European, West Germanic	southern Africa	afr	98
Ainu	Isolate	northern Japan (Hokkaido)	ain	242–243, 246
Akkadian	Semitic	ancient Mesopotamia	akk	1
Albanian	Indo-European	Albania	sqi	28, 35, 36, 45, 154, 229
Alutor	Chukotko-Kamchatkan	Russian Far East (Kamchatka Peninsula)	alr	138
Arabic Standard	Afro-Asiatic, Semitic	Middle East, northern Africa	arb	9, 20, 36, 87, 95–96, 101, 149, 160, 162, 177–178, 270
Armenian (Eastern)	Indo-European	Armenia	hye	160, 239
Arrernte (Mparntwe)	Pama-Nyungan	central Australia	aer	86, 154
Basque	Isolate	Spain and France	eus	89, 253, 328
Bella Coola	Salishan	central British Columbia coast	blc	21

[1] ISO 639-3 is an international standard for identifying the world's languages. Every language is assigned a unique three-letter code. The reader is encouraged to use these codes to find more information about the languages discussed in the book; the online language encyclopaedia Ethnologue (www.ethnologue.com) is helpful in this regard.

Language	Family	Geographical area	ISO 639-3 code[1]	Page numbers
Lakhota	Siouan	North and South Dakota	lkt	191–192
Lango	Nilo-Saharan, Eastern Sudanic, Nilotic	southern Sudan	lno	190–192, 275–276
Latin	Indo-European, Italic	Italy	lat	2, 16–19, 28–29, 83–84, 92, 94, 96, 98, 103–105, 110, 122, 159–160, 165–167, 172–173, 183–186, 227, 266, 270–271, 273–274, 276, 318, 333, 337
Lezgian	East Caucasian, Lezgic, Nakh-Daghestanian	southern Daghestan (Russia) and northern Azerbaijan (eastern Caucasus)	lez	5–6, 64-66, 110, 160, 223-224, 230, 258–260
Lithuanian	Indo-European, Baltic	Lithuania	lit	176–178, 208
Malagasy	Austronesian, Malayo-Polynesian, Barito	Madagascar	mlg	38
Malay	Austronesian, Malayo-Polynesian, Malayic	Malaysia, Indonesia	zlm	121
Mangap-Mbula	Austronesian, Malayo-Polynesian, Oceanic	Papua New Guinea	mna	38-39
Mbay	Nilo-Saharan, Central Sudanic	Chad	myb	55
Mixtec (Chalcatongo)	Oto-Manguean, Mixtecan	Oaxaca (Mexico)	mig	37, 154

Language	Family	Geographical area	ISO 639-3 code[1]	Page numbers
Urdu	Indo-European, Indic, Western Hindi	Pakistan, India, Nepal, etc.	urd	36-37, 48, 86
Vietnamese	Austro-Asiatic, Mon-Khmer	Vietnam	vie	4–6, 82
Welsh	Indo-European, Celtic	Wales	cym	160–161, 164–165, 271, 274, 276
Yimas	Sepik-Ramu	Papua New Guinea	yee	55, 91
Yoruba	Niger-Congo, Benue-Congo, Defoid	Nigeria	yor	4–7
Zulu	Niger-Congo, Benue-Congo, Bantu	southern Africa	zul	162, 221–222, 233

Subject index

Page numbers in bold are pages where the term in question is in bold within the text.