Morphology
Word structure in generative grammar

John T. Jensen
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Volume 70

John T. Jensen

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Word Structure in Generative Grammar
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This work is a response to a perceived need for an up-to-date introduction to the field of morphology within the framework of generative grammar. I have presented it within the framework of the lexicalist hypothesis of Chomsky (1970) and the more recent development of lexical phonology and morphology in the works of Paul Kiparsky and others. I have noted the existence of other approaches, but I have not undertaken a systematic comparison of various approaches to morphology, since I prefer to present a unified, consistent theory and push it to its limits. In fact, I feel that this theory fares well with respect to a considerable body of data from a wide variety of languages.

The work is intended to be as self-contained as possible; however, by necessity, reference is frequently made to other areas of theoretical linguistics, primarily to phonology and syntax, and to a lesser extent semantics. I refer to formal elements such as phonological distinctive features and formal rule-writing conventions throughout, in most instances explaining those aspects that I feel may be unfamiliar.

Many people have given me support and assistance in the preparation of this volume. Susan Wheeler entered most of the text into the word processor. Konrad Koerner gave me much helpful advice and encouragement, as did Yola de Lusenet of Benjamins. Melanie Lukach helped with the problems and with the final proofreading and copy editing. My parents, Howard and Elsie Jensen, forewent a summer visit while I was in the final stages trying to meet the deadline. I wish to thank my wife Margaret for her patience and understanding, especially during the last few months of late nights as I was getting all those last-minute things done. Many classes of students used the book at various
stages of development, and some offered suggestions for improvement. Nevertheless, the responsibility for any remaining errors, omissions, or commissions remains mine alone.

Ottawa, August 1989

John T. Jensen

For this third printing I have taken advantage of the opportunity to correct a number of misprints. I am grateful to Vanessa Tveitane for her assistance in pointing out a number of these to me. Remaining errors, of course, are still my responsibility.

Ottawa, April 1995
Morphology is the study of the internal structure of words. What constitutes a word is fairly clear intuitively, but this concept has proved extremely elusive when it comes to giving it an exact definition. Part of the difficulty lies in the ambiguity of the term ‘word.’ The most familiar meaning is more technically called a word form, which is defined as a word as it appears in a linguistic text, either spoken or written. In another sense, ‘word’ refers to a more abstract entity, not an element of a linguistic text but rather part of the structure of the language, such as may be represented in a dictionary or in an individual’s mental dictionary or lexicon. In this second sense, the term lexeme is used for word. A lexeme may be simple, e.g. the English preposition of, or more complex, implying a whole paradigm of related forms, such as the French verb parler. Until we develop these concepts further, you can rely on your intuitive understanding of words. In English and French, a word is generally something that appears in print between spaces or marks of punctuation, and we will follow this orthographic convention in the problems.

1.1 Word Structure

The goal of morphology is to provide a theory within which word structure in all languages can be described. The morphological structures of any given language are quite complicated, as will be amply illustrated in our examples and problems. It would be a monumental task to construct such a description for all 6170 (by one estimate) languages in the world. Even if we restrict our attention to a small sample of languages representing a variety of morphological types, the task appears quite formidable. Some languages, such as Chinese, appear to have only simple words and compounds, and therefore very little morphology.
Such languages have been termed isolating (Sapir 1921). At the other end of the scale, a language like Eskimo has words that combine a great many concepts in a single unit. For example, Smith (1981) cites the word in (1). The hyphens separate the morphemes, which here are meaning units which cannot be further decomposed. The meaning of each morpheme is given directly below it and the English translation below that.

(1) niuvitti -u -giattu -giaqa -ni -nga
clerk be go to have to propositional his nominalizer

‘his having to go away and be a clerk’

Sapir calls languages of this type polysynthetic. It is clear that a theory of morphology must be quite rich in order to accommodate languages of both these types as well as others of intermediate status. At the same time, we seek a theory of morphology that is sufficiently constrained to allow us to formulate some morphological universals, i.e. some statements that cover the morphological structures of human languages generally.

1.2 Morphemes

The fundamental units of words are called morphemes. Morphemes are primarily structural units and they are typically but not necessarily meaningful. In our Eskimo example (1), each morpheme has a distinct meaning including ni-, whose function is to turn a verbal expression into a noun. A word form may contain only one morpheme, e.g. cat, or it may contain two or more, e.g. cats, where -s is a separate morpheme with the meaning ‘plural.’ Here, cat is a stem, while -s is an affix (literally ‘attached to’), specifically a suffix (literally, ‘attached under’), which means it follows the stem. The morpheme cat is a free morpheme, that is, it can stand as a word by itself. The morpheme -s, however, is bound, since it cannot stand by itself as a word. We indicate bound morphemes by using hyphens. Here the hyphen to the left of -s indicates that it must have another morpheme to its left. A hyphen to the right would indicate the need to have another morpheme to the right. All the morphemes in our Eskimo example (1) are bound. In Chapter 2 we will discuss various principles by which morphemes can be isolated.

In addition to morphemes, morphology uses processes in the formation of words. Unlike cats, the word feet is not composed of a stem plus a suffix.
INTRODUCTION

Some linguists, e.g. Nida, (1949), have argued that *feet* consists of *foot* plus the replacement of [u] by [i]. But this replacement is a process, not a morpheme. We will consider morphological processes in more detail in Chapter 4.

1.3. Problems and Data

Like much of linguistics, the best way to learn about morphology is to do it. There are a number of problems in this book to give you practice in working with real language data. Some problems are worked out in the text to show you how it’s done; others are left as exercises. It is important to realize that these problems present a necessarily restricted set of data, and so the solutions cannot necessarily be taken as representing a true picture of the grammars of the languages involved. In the case of the more familiar languages, especially English and French, we give more complete information, and the resulting analysis is, we believe, the best possible within the framework presented.

1.4 Language Universals

To most people, a foreign language is a thing of bewildering complexity, something quite different from the language they’re used to. To a linguist, however, all languages have a great deal in common. It is easy to see why this should be so. Under normal circumstances, all normal human beings are capable of learning a language, and they learn any language to which they have sufficient exposure. An English child brought up in England learns English, but if he is brought up in Japan, he speaks perfect Japanese. There is no specific genetic endowment for learning PARTICULAR languages, but there must be some genetic endowment enabling humans to learn LANGUAGE in general. Species other than man do not learn language no matter how much exposure they get; human children learn whatever language or languages they are exposed to sufficiently. Many English Canadian children go to schools where French is the language of instruction, and as a result become fully bilingual. There is no known upper limit on the number of languages that can be acquired in this way. Many people in Eastern Europe grow up speaking six or seven languages, just because the breakup of the old Austro-Hungarian empire has produced scattered

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1 See the appendix for a list of phonetic symbols.
pockets of speakers of such languages as German, Hungarian, Romanian, Czech, Polish, and others, in various countries, and the resulting complexity of social interactions provides an ideal environment for the acquisition of as many languages as necessary for communication.

The genetic endowment that makes language learning possible can be regarded as a universal grammar. This concept had been developed in the seventeenth century by Descartes and his followers, and it forms an important part of the *Grammaire générale et raisonnée* of Lancelot and Arnauld (1660) and Humboldt’s (1836) *Über die Verschiedenheit des menschlichen Sprachbaues*. Modern linguistics has done much to make specific claims about the content of universal grammar, especially under the aegis of Chomsky’s EXTENDED STANDARD THEORY. Important contributions come also from the works of Joseph Greenberg (1966) and the papers in Greenberg (1963).

Many proposed linguistic universals come from syntax. Chomsky (1971, 17) proposed SUBJACENCY as a constraint on movement rules, requiring that movement of constituents take place only to a site which is close to the original position, roughly moving no farther than from one clause into the immediately containing clause. Chomsky (1981, 188) proposes binding conditions on the reference of pronouns and anaphors, requiring that anaphors be bound to an antecedent within certain structures, while pronouns must be free (not bound) within those same structures. The X-BAR THEORY of phrase structure, first proposed by Chomsky (1970) and expanded on by Jackendoff (1977), claims that the major lexical categories (noun, verb, preposition, adjective, and adverb) have similar syntactic behaviour, which is captured with the formalism they propose. Other proposed universals come from phonology, where it is observed that languages tend to have certain assimilation phenomena in common, tend to show certain stress patterns, and so on. In morphology, however, some linguists have doubted the existence of universals, perhaps in view of the wide variety of language types such as discussed briefly in section 1.1. (See Matthews 1972, 1974 for this point of view.) Greenberg points to a number of morphological universals, however, in spite of the apparent diversity of word types. Many of these are implicational, in the sense that the presence of one feature implies the presence of the other, but not vice versa. For example, some languages have a dual number, meaning ‘exactly two.’ This always implies the presence in the same language of a category plural meaning ‘three or more.’

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2 Sometimes, in these languages, the plural can also mean ‘two,’ as in Homeric Greek.
dual number, for example, English and French. We will consider morphological universals in more detail in Chapter 3, where we will develop an approximation to a universal set of morphological features. We can have a brief look at this idea here.

### 1.5 Morphological Features

Just as in phonology there is assumed to be a universal set of features, developed in the work of Jakobson (1941), Chomsky and Halle (1968) and others, so in morphology we assume a universal set of features to represent at least part of the meaning of morphemes. One such feature is [plural] to which we have already alluded. These features are binary, just as in phonology. Therefore, [+plural] means 'plural' and [-plural] means 'singular.' The values assigned to the features are linked to **markedness** in the following way: the plus (+) value is marked and opposed to the unmarked minus (-) value. As in phonology, the term MARKED means that the item occurs less frequently in language than its unmarked counterpart, that it occurs more rarely than the unmarked in languages where both exist, along with other properties that will be discussed at greater length in Chapter 3.

### 1.6 Derivation, Inflection, and Compounding

Three aspects of morphology are normally considered: **derivation**, **inflection** and **compounding**. Derivational morphology derives one lexeme from another. For example, the adjective **derivational** itself is derived from the noun **derivation** by attaching the suffix **-al**, and **derivation** in turn is derived from the verb **derive** by suffixing **-ation**. We can use **labelled brackets** to indicate the various levels of derivation, as in (2). The abbreviations are A (adjective), N (noun), V (verb).

\[(2) \quad \text{a. } [\text{derive}]_V \]
\[\text{b. } [[\text{deriv}]_V \text{ation}]_N \]
\[\text{c. } [[[\text{deriv}]_V \text{ation}]_N \text{al}]_A \]

Sometimes derivation occurs without an overt affix: this is called **zero derivation** or **conversion**. An example is the noun **spy**, derived from the
verb spy, where we might have expected an overt suffix -er, but *spier does not exist. We will discuss zero derivation at greater length in Chapter 5, section 5.3.

Parallel examples can be adduced from French, but a small complication arises. From the verb dériver we can derive the noun dérivation, but only if we ignore the suffix -er. This suffix is inflectional, meaning ‘infinitive.’ The stem dériv- is not a word by itself in French; it is a bound morpheme. Inflections are different forms of the same lexeme, as dériver (infinitive), je dérive, nous dérivons, je dérivais, etc., which are all derived from the stem dériv-, which we write with a hyphen to show that it is bound. Since dériv- is a stem and not a word, we represent it not as V (verb) but as V⁻¹ (verb stem), where the superscript ‘-1’ indicates one level lower than the word. This notation and the notion of paradigm will be developed further in Chapter 7. We can give examples in French parallel to (2) as (3).

(3) a. [[dériv]V⁻¹ er]V
   b. [[dériv]V⁻¹ ation]N
   c. [[[dériv]V⁻¹ ation]N el]A

Inflections have a significance beyond the word on which they appear; they typically express agreement with other sentence elements or are required by other sentence elements which govern them. In other words, inflections are syntactically relevant (Anderson 1982). French verbs must agree in person and number with their subjects as je dérive, nous dérivons. English has very little inflection: she, he, it derives (3rd person singular) but derive with all other persons and numbers: I derive, you derive, we derive, they derive. A list of all the inflected forms of a word with all forms specified in terms of the relevant categories is called a paradigm of that word. We will consider paradigms and inflections further in Chapters 7 and 8.

By contrast, derivational morphology is not syntactically relevant. The noun derivation can be used in a sentence with no reference to the fact that it is derived from a verb, or that the verb is derive, or that it contains the suffix -ation. Syntactically it is simply a noun with its associated semantic properties (e.g. an abstract noun).

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3 The asterix (*) is commonly used to indicate an ungrammatical or nonexistent word.
Compounding derives new words by combining two (rarely more) other words (or stems). Compounding is like derivation in that it is syntactically irrelevant. In English, compounds may be formed from two nouns as in bedroom; from an adjective and a noun as in blackbird; from preposition and noun as in overdose; from verb and noun as in whetstone; from noun and adjective as in nationwide; from two adjectives as in highborn; and from preposition and verb as in overdo. Compounds of three or more words are usually formed by combining a compound with another word or with another compound, as in (4).


French also forms compounds in this manner: from two nouns as in chou-fleur, timbre-poste; from adjective and noun as in bas-relief; from noun and adjective as in coffre-fort; from adverb and noun as in arrière-plan; from two adjectives as in aigre-doux. Perhaps the greatest number of French compounds have two nouns separated by a preposition (sometimes with an article) e.g. pot-au-feu, pomme de terre, arc-en-ciel.

1.7 Morphophonemics

Morphophonemics refers to the changes in the shape of morphemes in different environments. Some such changes occur in purely phonological environments, as in the regular plural suffix in English, which has the form [uz] after sibilants (s, z, š, ž, č, ě), the form [s] after voiceless consonants (other than s, š, č), and the form [z] in all other environments. These variants are called phonologically derived variants or phonological alternants, because the choice among them is determined by phonological rules. We can account for this variation by assuming that the plural morpheme has the underlying form /−z/. The underlying form of a morpheme is a basic phonological form from which all its phonological alternants are derived by regular phonological rules. In this case, we assume that the grammar of English includes the phonological rules as in (5), which apply in the order given.
MORPHOLOGY

(5) a. $\emptyset \rightarrow i / \begin{array}{c} +\text{coronal} \\ +\text{strident} \end{array} + \underline{\text{z}}$ (Vowel Insertion)

b. $z \rightarrow s / [-\text{voice}] \underline{\text{}} \underline{\text{}}$ (Devoicing)

We are thus assuming that there are two steps in the derivation of the words in (6). First, the morphological rule that attaches the plural suffix applies, then the phonological rules of (5) apply, if applicable. Let us examine some sample derivations.

(6) Underived lexical items: a. /kaw/ b. /kæt/ c. /hɔrs/
Morphology: add plural /-z/ /kaw+z/ /kæt+z/ /hɔrs+z/
Phonology: (5a) $\underline{\text{}} \underline{\text{}}$
(5b) $\underline{\text{}} /kæt+s/ \underline{\text{}}$
Final form [kawz] [kæts] [hɔrsz]

The morphological rule in (6) is part of the word formation component, the LEXICON. The words formed in the lexicon are manipulated by the syntactic component (or simply the syntax) to form sentences. We will return to the relation of morphology to syntax and phonology in section 8 of this chapter and in Chapters 5, 6, and 7.

The suffix /-z/ and the rules of (5) do not exhaust the possibilities for the English plural. There are a number of irregular forms, which cannot be produced using only the underlying form /-z/ and the rules of (5). Table 1 gives a fairly complete list of the possibilities (based on Quirk et al. 1972, 175-187).

Those variants of a morpheme which are not phonologically predictable are called allomorphs. Allomorphs should be distinguished from the phonological alternants discussed before. As seen in Table 1b, the plural suffix has three irregular allomorphs: /-ən/, /-əm/, and /tə/. These are highly restricted. The allomorph /-ən/ occurs with only one unchanged noun, ox, and with two noun stem allomorphs, childr- and brethr-, the latter only in the special sense of ‘fellow member of a religious society’ (Quirk et al. 1972, 178). The allomorph /-tə/ occurs in only three nouns, originally Greek neuters, stigmata, schemata, and stomata. The allomorph /-əm/ occurs with a number of Hebrew nouns,
most of which, except perhaps *kibbutzim*, can also take the regular plural allomorph */-z/*.

<table>
<thead>
<tr>
<th>a. Noun allomorph with regular <em>/-z/</em> suffix</th>
<th>b. suffix allomorph noun stem regular</th>
</tr>
</thead>
<tbody>
<tr>
<td>bath</td>
<td>baths</td>
</tr>
<tr>
<td>calf</td>
<td>calves</td>
</tr>
<tr>
<td>house</td>
<td>houses</td>
</tr>
<tr>
<td>ox</td>
<td>oxen</td>
</tr>
<tr>
<td>cherub</td>
<td>cherubim</td>
</tr>
<tr>
<td>schema</td>
<td>schemata</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c. Noun allomorph by vowel change (umlaut), no suffix</th>
<th>d. End change in noun, no suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>mouse</td>
<td>mice</td>
</tr>
<tr>
<td>tooth</td>
<td>teeth</td>
</tr>
<tr>
<td>man</td>
<td>men</td>
</tr>
<tr>
<td>woman</td>
<td>women</td>
</tr>
<tr>
<td>alumnus</td>
<td>alumni</td>
</tr>
<tr>
<td>alumna</td>
<td>alumnae</td>
</tr>
<tr>
<td>genus</td>
<td>genera</td>
</tr>
<tr>
<td>stratum</td>
<td>strata</td>
</tr>
<tr>
<td>crisis</td>
<td>crises</td>
</tr>
<tr>
<td>matrix</td>
<td>matrices</td>
</tr>
<tr>
<td>phenomenon</td>
<td>phenomena</td>
</tr>
<tr>
<td>tempo</td>
<td>tempi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>e. Noun stem unchanged, no suffix</th>
<th>f. Noun allomorph, suffix allomorph</th>
</tr>
</thead>
<tbody>
<tr>
<td>sheep</td>
<td>sheep</td>
</tr>
<tr>
<td>Chinese (and other nationality names in -ese)</td>
<td>brother</td>
</tr>
<tr>
<td></td>
<td>brethren</td>
</tr>
<tr>
<td></td>
<td>child</td>
</tr>
<tr>
<td></td>
<td>children</td>
</tr>
</tbody>
</table>

| Table 1 |

---

4 Here the plural allomorph is stressed and is pronounced */-im/*. Apparently it is less assimilated than the other Hebrew borrowings, being a later loan. This is also the only Hebrew loan which does not accept the regular plural */-z/*.
In Table 1a are listed a number of nouns that require the regular plural morpheme /-z/, but where the noun itself shows allomorphy, the situation of having two or more allomorphs. These nouns all end in anterior voiceless fricatives, and represent the remnants of a productive phonological rule in Old English that makes fricatives voiced between vowels. It is no longer a productive phonological rule, but a rule of allomorphy that applies to a small number of cases. The nouns bath, mouth, and path are the only ones ending in /θ/ that invariably show voicing in the plural; many nouns such as truth and wreath vacillate, and many others such as birth, earth, and length never show voicing. This conversion of a phonologically conditioned rule to a morphologically conditioned one is called morphologization (Klausenburger 1979). This concept is developed further in section 9.5. Note too that many nouns with voicing plurals are regular in derived uses: lives but still lifes (paintings), Miller High Lifes (beer), leaves but Toronto Maple Leafs (hockey team). Kiparsky (1973a) has suggested that these cases involve the loss of an exception feature in derived forms. An exception feature is one which describes the exceptional behaviour of any item that does not conform to some rule or rules of the language. For example, the nouns of Table 1a are provided with an exception feature, call it [Vc], that induces voicing in the final segment of a noun. The underlying form of bath, from this point of view, is /bæθ/[Vc]. We consider the derivation of the plural in (7).

(7) underived lexical item
Morphology: add plural /-z/ /bæθ/ [Vc]
Phonology: Voice stem-final phoneme
before [+plural] suffix /bæθ + z /
(5a,b) __________
Final form /bæθz/

Notice that the rule that voices /θ/ to /ð/ applies BEFORE the phonological rule (5b) that would devoice the plural suffix. Since the voicing rule, by applying before the phonological rules of (5), prevents rule (5b) from applying, this is called a bleeding order of rules.

The nouns in Table 1c show the remnants of an even older phonological process, that of umlaut, which refers to the process whereby stressed back vowels become front when followed by front-vowel suffixes. The suffixes in question were lost before the Old English period, and now they must be related by a rule of morphology.
The nouns in Table 1d show various changes in the end of words in forming plurals. These words derive from a variety of regular forms of Latin, Greek, and Italian, but in English they must be regarded as irregular allomorphy.

The nouns in Table 1e show no change in the plural. Many are animal names, like grouse, sheep, plaice, salmon. Nationality names in -ese always have zero plurals, as do the names of certain tribes, e.g. Sioux, Bedouin, Navaho.

Usually, whenever a regular allomorph competes with irregular allomorphs, the regular allomorph tends to expand its domain at the expense of the irregular ones. Many nouns have lost their irregular plurals, e.g. campus, drama, album, demon, soprano. The irregular (though etymologically correct) plurals campi, dramata, alba, dema, and soprani could hardly be used, except in jest. Extension of irregular forms is also possible, but only to a very limited extent, and often produces ludicrous results. Many academic speakers say ['prost siz] on the analogy of apices (from apex) or indices (from index). Laymen sometimes use ['oxt pAy] (octopi) as a plural for octopus, although the correct Greek or Latin plural would be octopodes [,oxt pow diz]. In a similar vein, Statistics Canada asked me, in a telephone conversation, what the correct plural of census should be. They wanted to use censi, although the correct Latin plural is census. I told them to use censuses, the regular English form, like campuses. All this means that people know the irregular patterns, but only imperfectly—they don’t know how to apply them. The regular pattern, by contrast, is solidly known, and in the English plural case always follows the rules of (5) applied to the underlying form /-z/.

Incidentally, the reverse process is also possible: forming an incorrect singular from an irregular plural. This can happen with those nouns of Table 1e where the unsuffixed plural sounds as though it has the regular plural suffix. Phonetically, Chinese [cay’ni z] ends in [z], which may be wrongly interpreted as the regular plural suffix. A speaker may then use Chinee [cay’ni] as a singular. Such a change is called back formation. Changes of this type are not frequent, but they sometimes result in permanent changes to the language’s vocabulary. Modern English pea is from earlier pease (ultimately from Latinpisum ‘pea’), reinterpreted as a plural, just as in the case of Chinese. French, too, has a regular plural suffix /-z/, which, however, is pronounced only in liaison, in accordance with the regular rules concerning the pronunciation of final consonants. French also has certain irregular plurals, detailed in Table 2 (from Grevisse 1980, 287-8).
### MORPHOLOGY

<table>
<thead>
<tr>
<th>a. End change</th>
<th>b. End change</th>
</tr>
</thead>
<tbody>
<tr>
<td>[-al] (sg.)</td>
<td>[-ay] (sg.)</td>
</tr>
<tr>
<td>[-o] (pl)</td>
<td>[-o] (pl)</td>
</tr>
<tr>
<td>cheval</td>
<td>bail</td>
</tr>
<tr>
<td>général</td>
<td>corail</td>
</tr>
<tr>
<td>chevaux</td>
<td>baux</td>
</tr>
<tr>
<td>généraux</td>
<td>coraux</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c. Loss of final consonant (with rounding of final vowel)</th>
<th>d. irregular</th>
</tr>
</thead>
<tbody>
<tr>
<td>aieul, aieux</td>
<td>oeil, yeux</td>
</tr>
<tr>
<td>ciel, cieux</td>
<td></td>
</tr>
<tr>
<td>boeuf, boeufs</td>
<td></td>
</tr>
<tr>
<td>[bœf], [bɔ]</td>
<td></td>
</tr>
<tr>
<td>os, os</td>
<td></td>
</tr>
<tr>
<td>[ɔs], [ɔ]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>e. incorporated plural premodifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>gentilhomme, gentilshommes</td>
</tr>
<tr>
<td>bonhomme, bonshommes</td>
</tr>
<tr>
<td>madame, mesdames</td>
</tr>
<tr>
<td>monsieur, messieurs</td>
</tr>
<tr>
<td>mademoiselle, mesdemoiselles</td>
</tr>
<tr>
<td>monseigneur, messieurs/nosseigneurs</td>
</tr>
</tbody>
</table>

### Table 2

Of these, the only isolated example is Table 2d *œil*. The nouns in Table 2e contain an incorporated modifier before the noun: the modifier uses its normal plural, and if it terminates in *-s*, and the base noun begins with a vowel, the *s* is pronounced (*gentilshommes, bonshommes*). The nouns in Table 2c form a small, closed group that lose the final consonant segment in the plural. The resulting final vowel is tensed by a regular phonological rule *[bœf]*, *[bɔ]*, and rounded *[syɛl]*, *[syɔ]*.

The only really productive group in French irregular nouns is exemplified by Table 2a, although even this is marginal. Virtually all nouns (and masculine
adjectives) ending in -al form their plural by changing -al to -aux [o], although there are exceptions such as bal, cal, carnaval, chacal, festival, régal, and certain rarer words, that follow the regular rule and take -s in the plural. There is also some fluctuation in some words, such as finals, finaux. Schane (1968) accounted for the plurals of Table 2a by assuming a phonological rule that changes [-al] to [o] before a consonant, which is supported by the same change in the combination à + l + C, where à is a preposition, l is an abbreviated form of the definite article le, and C represents a consonant at the beginning of a noun: à + l + garçon becomes au garçon. The nouns like bal, etc., that take -s plurals, are considered exceptions to this rule. But there is some evidence that Schane’s analysis is not correct. Some words have the plural on the model of Table 2a only in fixed expressions, e.g. val in par monts et par vaux and in geographic names, e.g. les Vaux-de-Cernay. The plural of étal is usually étaux, but since this is also the plural of état, étaux is also found. The plural idéaux of idéal is used in the technical sense in philosophy and mathematics, otherwise the plural is idéals. Two plurals, universaux (philosophical term) and matériaux are derived from old singulars, universal and matériel, no longer in use, having been replaced by their doublets universel and matériel. (Doublets are two forms derived from the same ultimate source but by distinct historical developments.) From matériaux a new singular, matériau has been created by back formation (recall the discussion of pea in English).

1.8 Morphology in Relation to Syntax and Phonology

A generative grammar is usually divided into components, which interact in the production of sentences. These components are a LEXICON, the SYNTAX, the phonology, and the semantic or logical form component. The manner in which these components interact, and the responsibilities of each, have been subjects of some debate in the course of development of generative theory. The view that we present here is supported by a considerable consensus among scholars, but you should be aware that there are still controversies on many points. The diagram in (8) gives the general picture.

The view given in (8) is essentially that of Fiengo (1980), Anderson (1982) and others. It differs in some respects from the model of Chomsky (1981, 1982), where the lexicon is said to feed into the syntax rather than directly into S-structures. Chomsky does not attach much importance to this difference, and the arguments are complex and not really decisive either way.
The SYNTAX determines the linear and hierarchical arrangement of elements in sentences. The SEMANTIC COMPONENT determines the LOGICAL FORM (or logical meaning) of sentences. The (postlexical) PHONOLOGY determines aspects of the pronunciation of sentences. The LEXICON is responsible for word formation, both derivational and inflectional, and aspects of the pronunciation of words associated with word formation. These aspects are known as lexical phonology. For example, lexical phonology determines the different pronunciations of the first vowel in alternations such as *sane* [seyn] and *sanity* [ˈsæntɪti], since this vowel change is associated with the attachment of the suffix *-ity*. On the other hand, postlexical phonology determines that the *p* of *pin* is aspirated ([pʰɪn]) while that in *spin* is not ([spɪn]). This alternation depends only on the position of /p/ in the segmented string, not on any morphological process, since both words are monomorphemic, consisting of a single morpheme each. (We will consider lexical morphology and phonology in greater detail in Chapter 5.)

There has been much discussion of the question of which rules and structures are in each of these components. At the beginning of the history of generative linguistics, the lexicon was thought of as merely a list of what is unpredictable about the morphemes of a language, with no internal organization, essentially following Bloomfield’s feeling that “[t]he lexicon is really an appendix of the grammar, a list of basic irregularities” (1933, 274). Word formation was performed by syntactic rules. For example *sanity* was formed in the syntax by combining the word *sane* with the suffix *-ity*. In his paper “Remarks on nominalization,” Chomsky (1970) disputed this view. Words formed in this way are not always semantically compositional, that is,
their meanings cannot always be determined from the meanings of their parts. For example, the noun *marriage* (the institution) is not clearly derived from the meanings of *marry* and *-age* (compare also *carriage* with *carry*). Since the meaning of these words is idiosyncratic, they must be in the lexicon.

Somewhat more controversial is the relation between inflectional morphology and syntax. Anderson (1982) claims that only uninflected stems are listed in the lexicon, and inflectional affixes are added by rules of phonology. Consider the examples in (9).

(9) a. The boy eats beans.
   b. The boys eat beans.

In Anderson's view, the lexicon provides only the stem *eat*, and the syntax places this verb in the appropriate place in the sentence. In (9a), the phonological inflectional rule would attach the morpheme /-z/, by virtue of the subject being third person singular. The suffix is then subject to the phonological rule (5b), which devoices it to /s/. This can be called *interpretive* inflectional morphology, since the attachment of inflectional affixes is performed in an interpretive component, the phonology. The alternative *lexical* view of inflection states that the lexicon generates both forms *eat* and *eats*, and only the one that is consistent with the subject can be inserted into a sentence. We adopt the lexical view here. As we proceed we will continue to expand on the grammatical model of (8), concentrating especially on the role of the lexicon, developing the internal structure of this grammatical component.

### 1.9 Selected Readings

Bloomfield (1933) has several chapters that bear on morphology, especially chapters 13-16. Hockett (1958) discusses morphology in chapters 14-22, 24, 26-28, and 31-37. Harris (1951), chapters 12-19, develops a highly formalized morphological system. These three works belong to the pregenerative structuralist school of linguistics, but the problems raised here are still discussed and disputed, so it is valuable to get acquainted with them. Some earlier textbooks also provide a good background to the issues raised here such as Nida (1949), Merrifield et al. (1967) and Koutsoudas (1966). Sapir (1921) contains much interesting material and treats morphology in chapters 4, 5, and 6. Gleason (1961, chapters 5-10) is also relevant.
Recent studies of morphological questions are appearing at an accelerating rate. The *Interplay of Phonology, Morphology, and Syntax* (Richardson et al. 1983) contains many articles focusing on aspects of this question, but these articles are somewhat technical.

1.10 Terms to Learn

1.0 word  
word form  
lexicon  
lexeme  

1.1 isolating (language)  
morpheme  
polysynthetic (language)  

1.2 stem  
affix  
suffix  
free (morpheme)  
bound (morpheme)  
process  

1.4 implicational (universals)  

1.5 markedness  
marked (feature value)  
unmarked  

1.6 derivation  
inflection  
compounding  
labelled brackets  
zero derivation  
conversion  
verb stem (V-1)  
paradigm  

1.7 morphophonemics  
phonologically derived variants  
phonological alternants  
underlying form  
syntactic component  
syntax
allomorphs
allomorphy
morphologization
exception feature
bleeding order
umlaut
back formation
doublets

1.8 phonology
semantic (logical form) component
lexical phonology
monomorphemic (words)
compositional (semantics)
interpretive (morphology)
lexical (morphology)
In this chapter we will consider various techniques of isolating morphemes. Many linguists of the American structuralist school laid great stress on such techniques, and attempted to define a rigorous set of discovery procedures which, rigidly applied, would automatically give a morphemic analysis for any given set of data. Now, few linguists believe that such rigid discovery procedures are possible, following the arguments in Chomsky (1964) against them. However, such techniques provide a means of finding possible analyses for a set of morphological data. No such analysis can ever be final, because new data generally force us to revise our analysis or even change it altogether. Since the problems we consider here are artificially limited, there is usually one "right" solution, but this solution may not remain correct when new data are examined.

In analyzing words into morphemes in a language we know, we often easily discover the separate parts because we can recall similar words with which to compare the words under analysis. In working with an unfamiliar language, it is necessary to have a group of similar forms to compare and from which to extract the recurring parts. Nida (1949, 6) gives the example tinbeq from Kekchi (a Mayan language of Guatemala) which means 'I will walk.' Without other forms for comparison, it is impossible to decide on a division of this form into smaller units, or even to know if such a division is possible. However, comparison with forms such as tatbeq 'you (sg.) will walk' and ninbeq 'I am walking' show that the form tinbeq is composed of three morphemes: t- 'future' (contrasting with n- 'present progressive'), -in- 'first person singular subject' (contrasting with -at- 'second person singular subject' and -beq 'walk.')
While this example is relatively straightforward, others often involve complications to a greater or lesser degree. A common type of complication is the effect of phonological operations. In our discussion of English plural forms in Chapter 1, we noted that two phonological processes affect the shape of the plural morpheme which can appear in one of three shapes: [-z], [-s], [-uz]. This complicates the analysis, because we have to abstract away from this predictable variation in analyzing the data, and it is not always easy to know what variation is predictable. In effect, we must do morphological analysis in tandem with phonological analysis. In the beginning, however, the problems are constructed in such a way as to minimize phonological complications.

Nida (1949, Chapter 2) provides six principles for the identification of morphemes. The fourth of these principles isolates processes, not morphemes, and so we will not consider it here. We will discuss processes separately, in Chapter 4. Nida’s Principle 5 concerns a different problem, that of homophony and zero derivation. We will quote it here, but return to the problem of zero derivation in Chapter 5.

In Chapter 1 we described morphemes as structural units of words that are typically but not necessarily meaningful. If you prefer a more rigorous definition, none better than that of Bloomfield (1933, 161) has been proposed: “A linguistic form which bears no partial phonetic-semantic resemblances to any other form is ... a morpheme.” Others have defined the morpheme in more positive terms, such as this from Hockett (1958, 123): “Morphemes are the smallest individually meaningful elements in the utterances of a language.” The main problem with Hockett’s definition is that it makes idioms morphemes, e.g. in he kicked the bucket, meaning ‘he died,’ there would be three morphemes: he, kick ... the bucket ‘die,’ and -ed ‘past.’ But it seems strange to consider kick ... the bucket a single morpheme (a discontinuous one at that) when it consists of parts that would be morphemes in other contexts, namely kick, the, and bucket. Hockett’s definition does not allow bucket to be a morpheme in this idiom, but Bloomfield’s does, although it may be a distinct morpheme from bucket ‘pail’ similar to the pair hair, hare, which, in spite of their homophony, are distinct morphemes. Similarly, Bloomfield’s definition permits -ceive of perceive, receive, deceive, etc. as a morpheme, since it occurs in multiple combinations, even though -ceive has no meaning by itself. Aronoff (1976) points out another advantage of considering -ceive a separate morpheme: it has a common irregular allomorph -cept in all its combinations: perception, reception, deception. For these reasons we consider morphemes to be primarily structural units rather than semantic ones.
Before we quote Nida’s principles, this is as good a place as any to state a principle, not given by Nida, that seems crucial to an understanding of his principles. Let us call this Principle A.

(1) Principle A

A word must be exhaustively divided into morphemes.

This principle means that, if a word is divided into morphemes at all, each part must be a morpheme, i.e., there must not be any unanalyzed residue, as there would be if *otter*, for example, were analyzed as *ott-er* (where *-er* is identified as ‘agentive’ as in the discussion of Principle 1) since *ott-* cannot be analyzed as a morpheme. (See also the discussion of Nida’s Principle 6, section 2.2.)

Nida’s first principle for identifying morphemes reads as follows (1949, 7).

(2) Principle 1

Forms which have a common semantic distinctiveness and an identical phonemic form in all their occurrences constitute a single morpheme.

This principle allows us to isolate the morpheme *-er* ‘agentive’ (doer of an action) in such words as *writer, worker, dancer, singer*. This form has a single phonetic shape *[ər]* and the same meaning wherever it occurs. It is semantically distinct from another form of this same phonetic form *[ær]*, the comparative suffix *-er* of *higher, longer, thinner, tastier*. These two forms, *-er*, ‘agentive’ and *-er* ‘comparative’ bear a phonetic similarity (here, in fact, identity) but no semantic similarity and must therefore be counted as separate morphemes by Bloomfield’s definition of morpheme and by Nida’s Principle 1.

We will illustrate Principle 1 by considering problem 2-1 in some detail. Problems 2-2 through 2-8 give some further practice in the fairly straightforward application of this principle. These are left as exercises for you to do on your own.

---

1 Nida’s use of the term ‘phonemic’ in this and subsequent principles stems from an aspect of his theory with which we do not concur, namely that utterances can be represented as sequences of contrastive sounds, more abstract than a phonetic transcription but less abstract than our underlying representations. We will therefore use the term ‘phonetic’ for this level, although we do not mean to imply a narrow phonetic transcription by this use of the term.
Problem 2-1. Swahili (East Africa).
(Data from Perrott 1950; orthographic representations, j = [ƒ].)

1. ninakusikia ‘I hear you’
2. ninamsikia ‘I hear him’
3. ninakišikia ‘I hear it’
4. ninawasikia ‘I hear them’
5. anakusikia ‘he hears you’
6. anamsikia ‘he hears him’
7. anawasikia ‘he hears them’
8. anatusikia ‘he hears us’
9. unanisikia ‘you hear me’
10. unawasikia ‘you hear them’
11. tunakisikia ‘we hear it’
12. wanakusikia ‘they hear you’
13. ninakujibu ‘I answer you’
14. nitakujibu ‘I will answer you’
15. nimekujibu ‘I have answered you’
16. nilikujuhbu ‘I answered you’
17. unamjibu ‘you answer him’
18. utamjibu ‘you will answer him’
19. umemjibu ‘you have answered him’
20. ulimjibu ‘you answered him’
21. mnanisikia ‘you (pl.) hear me’
22. mmewasikia ‘you (pl.) have heard them’
23. mtatusikia ‘you (pl.) will hear us’
24. mlikisikia ‘you (pl.) heard it’
25. ninamjua ‘I know him’
26. niliwajua ‘I knew them’
27. atanisaïdia ‘he will help me’
28. warnekusaidia ‘they have helped you’

Note: there is no gender distinction in Swahili; the forms glossed ‘he’ or ‘him’ could equally be glossed ‘she’ or ‘her’ respectively.

By comparing the first two forms, we can determine that -ku- is ‘you (object)’ and -m- is ‘him (object).’ Continuing in this manner we isolate -ki- ‘it (object),’ -tu- ‘us (object),’ -ni- ‘me (object)’ and -wa- ‘them (object)’ by comparison of the remaining forms for ‘hear.’ Comparison of forms 2 and 6
allows us to isolate $a$- as ‘he (subject)’ and $ni$- ‘I (subject),’ conjecturing that
$-na$- is a present tense morpheme. Comparison of forms 1 and 9 gives $u$- ‘you
(subject),’ form 11 gives $tu$- ‘we (subject)’ and form 12 gives $wa$- ‘they
(subject).’ Form 14 confirms our conjecture that $-na$- is ‘present tense’ and
gives us $-ta$- as a future tense morpheme. It also shows shows that the two
stems so far are $-sikia$ ‘hear’ and $-jibu$ ‘answer.’ We have also established the
order of morphemes, given in (3).

(3) subject tense object verb
    prefix prefix prefix stem

It remains only to fill in the remaining stems and tense prefixes. It is helpful to
arrange the result in tabular form as follows:

(4)  
    (-3)  (-2)  (-1)  subjects tenses objects stems
    ni-  ‘I’ -ta- ‘future’ -ni- ‘me’ -sikia ‘hear’
    u-  ‘you’ -na- ‘present’ -ku- ‘you’ -jibu ‘answer’
    a-  ‘he’ -me- ‘perfect’ -m- ‘him’ -jua ‘know’
    tu-  ‘we’ -li- ‘past’ -ki- ‘it’ -saidia ‘help’
    m-  ‘you (pl.)’ -tu- ‘us’
    wa-  ‘they’ -wa- ‘them’

The numbers in parentheses above the terms ‘subjects,’ ‘tenses,’ and ‘objects’
in (4) represent the position of these affixes with respect to the stems. The
minus (-) sign before each number indicates a prefix position before the stem. A
suffix position would be numbered with a positive number (e.g. ‘+1’ or simply
‘1’ with no overt sign). Now we can supply PROBABLE meanings for new
words made up of these same morphemes in the correct order.

(5) atamsikia □□□□□□□□□□□□□□□□□□□□ tumekijua □□□□□□□□□□□□□□□□□□□□
walitujibu □□□□□□□□□□□□□□□□□□□□ nimemsaidia □□□□□□□□□□□□□□□□□□□□

And conversely, we can supply PROBABLE Swahili forms for meanings like the
following.
Notice that we say PROBABLE meanings and probable forms. We can never be absolutely certain that a given form has a given meaning unless we learn the language as well as a native speaker knows it. There may always be irregularities for which we have not yet seen evidence.

Affixes are given different terms according to their position with respect to stems. **Prefixes** are attached before stems; the subject, tense, and object affixes in the Swahili example are all prefixes. **Suffixes** are attached after stems, such as the English plural suffix /-z/ discussed in Chapter 1. A third type of affix is often considered: **infixes**. An infix appears inside of another morpheme, and is best described as a morphological process rather than as an affix.\(^2\) We will defer a formal analysis of infixes, however, until Chapter 4.

Nida's second principle for identifying morphemes reads as follows (1949, 14).

(7) **Principle 2**

Forms which have a common semantic distinctiveness but which differ in phonemic form (i.e. the phonemes or order of phonemes) may constitute a morpheme provided the distribution of formal differences is phonologically definable.

In effect, Principle 2 allows us to abstract away from the effects of purely phonological processes. We saw one example of this already in Chapter 1, for the regular cases of English plural and two phonological rules that give the other two possible realizations [-iz] and [-s]. Other examples in English and French follow.

In English, one negative prefix appears in five phonologically determined forms: *in-*, *im-*, *il-*, *ir-*, *ig-*, as in *in-tangible*, *in-numerable*, *in-nocent*, *im-mature*, *im-possible*, *il-legal*, *ir-replaceable*, *incompatible* (this last variant

\(^2\) The term *infix* is used in traditional grammars of French (and elsewhere) in a different sense: it is used to designate a morpheme that appears between a stem and a suffix, such as the *-iss- of nous rav-iss-ons* (Grevisse 1980, 765). We will not use the term in this sense here. In our terms, *-iss- is a suffix.*
MORPHEMES

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does not occur for all speakers). We can assign them all to a single morpheme
since they all have the same meaning and their phonological difference is
determined by a phonological rule of assimilation.\(^3\) When there is no
assimilation, i.e. when this morpheme appears before a vowel or \(h\), it has the
form \(in\) as in \(in\)-operative, \(in\)- hospitable. From this we conclude that the
underlying form is /\(\text{n}\)/ and that the nasal assimilates to the point of articulation
of a following stop or assimilates completely to a following liquid or nasal.

A similar morpheme appears in French, with the same meaning and similar
phonological distribution.

\[
\begin{array}{ll}
\text{(8)} & \text{il-légal, il-letrée } [\text{il-}] \\
& \text{ir-rationnel, ir-réel } [\text{ir-}] \\
& \text{in-odore, in-nombrable } [\text{in-}] \\
& \text{im-modeste } [\text{im-}] \\
& \text{in-fini, im-possible } [\text{ë-}] \\
& \text{in-sensée, in-trouvable }
\end{array}
\]

Once again, we choose an underlying form with /\(\text{n}\)/, since this is what appears
before vowels. Before nasals and liquids, complete assimilation takes place, as
in English. Before stops and fricatives, however, the vowel is nasalized (and
lowered) and the nasal consonant disappears, producing the form [ë]. While
some would argue that this last variant is not phonologically generated, it is
clear that the others are. The spelling difference between \(im\)-possible and \(in\)-
trouvable is purely graphic in modern French, since the nasal consonant is
deleted from these forms.

Similar assimilations occur in many languages. In Totonac, the first person
singular object prefix has three different forms (Nida 1949, 15). \(Kin\) occurs
before stems beginning with \(t\), \(c\), \(č\), \(k\), and \(q\); \(kim\) occurs before stems
beginning with \(p\); and \(ki\)- occurs before continuant, as \(kin\)-\(ta\)-\(wal\) ‘he treated
me,’ \(kim\)-\(pa\)-\(skil\) ‘he loved me,’ and \(ki\)-\(wanil\) ‘he said to me.’

There are many examples of phonologically defined distribution that involve
no assimilations or other phonetically natural processes. For example, the
English indefinite article has two forms: \(a\) [æ] before consonants and \(an\)
[æn]/[ən] before vowels. Although it is phonetically natural to avoid a hiatus of
two vowels (*\(a\) apple), this alternation does not appear in other morphemes of

\(^{3}\) Assimilation is discussed more completely in Chapter 9, section 9.2.1.
English (compare the [ði] apple with the [ðə] pear). In this case we have two allomorphs whose distribution is phonologically defined.

Nida’s Principle 3 allows us to identify forms as a single morpheme even when their distribution is not phonologically determined provided that they have a common meaning and are in complementary distribution. We will not quote this principle in its entirety, since Nida’s statement is quite complicated and it is not all necessary for our purposes. It is important to understand the concept of complementary distribution, which is best introduced by way of an example. In Chapter 1 we discussed an example of this in some detail: the irregular allomorphs of the English plural morpheme. Their distribution is not phonologically determined: there is no phonological reason why ox should have the plural oxen while box has the regular plural boxes, and similarly with the other classes we discussed. They are in complementary distribution, defined as in (9).

\[(9) \quad \text{Complementary Distribution}\]

Two or more allomorphs are in complementary distribution if the environment in which one occurs is not an environment where any of the others can occur.

If two forms can occur in an identical environment, they are said to contrast. Notice that the irregular plural allomorphs are not entirely in complementary distribution. We noticed that several irregular plurals alternate with regular ones. Some of these are listed in (10).

\[(10)\]

<table>
<thead>
<tr>
<th>singular</th>
<th>irregular</th>
<th>regular</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>plural</td>
<td>plural</td>
</tr>
<tr>
<td>cherub</td>
<td>cherubim</td>
<td>cherubs</td>
</tr>
<tr>
<td>schema</td>
<td>schemata</td>
<td>schemas</td>
</tr>
<tr>
<td>myth [mθ]</td>
<td>[mθz]</td>
<td>[mθs]</td>
</tr>
<tr>
<td>thesis</td>
<td>theses</td>
<td>thesises</td>
</tr>
</tbody>
</table>

Similarly we noted that, in French, certain nouns vacillate between a regular and an irregular plural. Some of these are listed in (11).
However, Nida allows such forms to belong to the same morpheme “if the difference in meaning of the allomorphs reflects the distribution of these forms” (1949, 42). In other words, forms like cherubim and cherubs have slightly different connotations which parallel the distribution of the two plural allomorphs. We noted a particularly clear example in French: idéaux is used primarily in philosophy and mathematics, idéals in other contexts. Therefore, in both English and French, we can allow the irregular plural allomorph to stand as part of a single morpheme meaning plural.

Another case where two forms may be considered as belonging to a single morpheme occurs when the forms are found in free variation, defined in (12).

(12)  Free Variation

Two or more forms are in free variation if they have the same meaning, are phonetically distinct, and may occur in exactly the same environments.

Many linguists would argue that there is no such thing as truly free variation: variant forms are always associated with stylistic, social, class, or other differences. Nevertheless, words like either ([ˈɛðər], [ˈæðər]), vase ([væz], [veyz], [veys]), economics ([ˌɪkəˈnɒmɪks], [ˌɛkəˈnɒmɪks]), and others, are nearly equivalent for many speakers. These can be considered cases of free variation, and therefore as instances of the same morpheme with two (or more) phonetic realizations.

2.2  Lexical Entries of Morphemes

In terms of the lexical model of morphology that we introduced at the end of Chapter 1, it is not entirely clear what it means to subsume irregular allomorphs into a single morpheme, since the regular allomorph /-z/ and all the irregular
allomorphs will require separate lexical entries in this theory. Let us see what this discussion amounts to in formal terms.

A lexical entry of a morpheme consists of three (or four) parts. The first is the underlying phonological form of the morpheme given as a matrix of phonological distinctive features. The second is a set of syntactic features, which tells what part of speech the lexical item belongs to and what syntactic environments it may appear in. Then, there is the semantics of the morpheme (its meaning) expressed in terms of semantic features. Finally, there may be ad hoc features, giving information about morphological classes or exceptions to various rules. Such features will be considered in more detail in Chapter 7 (especially section 7.3); we won't be particularly concerned with them here. As an example, consider the lexical entry for cat in (13).

(13)  
\[
\begin{array}{ll}
\text{cat} & [/kæt/] \\
& [+N, -V] \\
& \text{Felis domesticus} \\
\end{array}
\]

Phonological form  
Syntactic features  
Semantics

Now let us consider the lexical entry for the regular plural allomorph, given in (14).

(14)  
\[
\begin{array}{ll}
\text{-s} & [-z/] \\
& [+N, -V] \\
& [+plural] \\
\end{array}
\]

Phonological form  
Syntactic features  
Semantics

Here the phonological form is given as /-z/, its underlying form, as we discussed in Chapter 1. The syntactic feature of this morpheme is its subcategorization frame, which gives the environment in which the morpheme occurs. This subcategorization frame states that /-z/ can occur in the position immediately following a noun, expressed with the syntactic features [+N, -V]. The plural morpheme has no inherent category features of its own. Finally we have the semantics of this morpheme, which is simply the feature

---

4 In fact, only COUNTABLE nouns can be pluralized. Countable nouns are those that can appear after numerals, as in two trees or five houses. Nouns denoting an indefinite quantity of something, such as wine, sand are not normally pluralized, although sands is possible in the meaning 'a great deal of sand' or in the expression the sands of time, while wines would be interpreted as meaning 'kinds of wine.'
MORPHES

The subcategorization of the plural morpheme allows it to be attached to any noun, say *cat*, to produce a plural noun, *cats*. But nothing so far prevents us from attaching the plural morpheme */-z/* to the noun *ox* to produce the incorrect plural *oxes*.

Suppose that the allomorph */-en/* has its own lexical entry, as in (15).

(15) */-en/*

| */-un/ | Phonological form |
| [+N, -V, {ox, childr-, brethr-}] | Syntactic features |
| [+plural] | Semantics |

The subcategorization frame of */-en/* says that it can attach after the noun *ox* and after the irregular allomorphs *childr-* and *brethr-* of the nouns *child* and *brother.*

Kiparsky (1973b) has proposed a general principle which applies in this case, following a principle formulated as early as the fifth century B.C. by the Indian grammarian Pāṇini. Kiparsky’s principle, the Elsewhere Condition, was originally intended to govern the application of phonological rules, but it can be extended to govern the attachment of morphemes in accordance with their subcategorization frames. Let us state the principle in the latter terms in (16).

(16) Elsewhere Condition

If two or more morphemes can be attached to a third form, the morpheme with the more specific subcategorization frame takes precedence and blocks the attachment of the other morpheme. A subcategorization frame, A, is more specific than another, B, if A specifies everything that B specifies and more.

---

5 The Old English plural of *cild* is *cild* + */-ru/* with the plural affix */-ru/*. Because this plural affix was relatively rare, the */r/* was reanalyzed as part of the stem, and another plural affix was added, */-n/*. This kind of “double plural” is not common, but there is another example in English, the archaic *kine* ‘cows,’ from */ky/*, umlaut plural of *cow*, plus the same */n/* plural (minus the vowel) that appears in *children*. 
Now we see that the subcategorization frame of *-en is more specific than that of *-s. Both specify attachment to a noun, but *-en specifies that the attachment must be to one of three specific nouns. Therefore, in these three cases, *-en takes precedence, and *-s is not allowed, thus ruling out *oxes, *childs, *brethers. Notice that, to achieve this result, it is necessary to consider child⁶ /eiːld/ and childr- /eiːldr-/ as distinct phonological matrices belonging to a single morpheme, and to assume that, if some morpheme (or allomorph) is blocked from attaching to an allomorph of a morpheme, it is blocked from attaching to all allomorphs of that morpheme. The case of brethren is a bit different. Recall that we noted that brethren has the special sense of ‘fellow member of a religious society’ (Quirk et al. 1972, 179). This suggests that brethr- is not simply an allomorph of brother, as childr- is of child, but belongs to a separate lexical item. Let us clarify this by showing the lexical entries for child, brother (‘male sibling’) and brother (‘fellow member of a religious society’), in (17).

(17)  
   a. child  
   [ /eiːld/, /eiːldr-/ ]  
   [+N, -V]  
   ‘young human’  
   Phonological forms  
   Syntactic features  
   Semantics  

   b. brother  
   [ /brəðər/ ]  
   [+N, -V]  
   ‘male sibling’  
   Phonological form  
   Syntactic features  
   Semantics  

   c. brother  
   [ /brəθər/ , /breθər-/]  
   [+N, -V]  
   ‘fellow member of 
   a religious society’  
   Phonological forms  
   Syntactic features  
   Semantics

The allomorphs of the plural, *-en, *-to -um, Ø cannot be grouped together in the manner of /eiːld/, /eiːldr-/ in (17a), since their syntactic features are distinct:

---

⁶ I assume /iː/ in the underlying form of this allomorph, with later rules (of vowel shift) converting this to phonetic [ay].
they have different subcategorization frames. We therefore give them separate
lexical entries, without denying that they are allomorphs of a single morpheme.

Nida's Principle 4 discusses morphological processes as morphemes. Since
we do not consider processes to be morphemes, we defer discussion of these
until Chapter 4.

Nida's Principle 5 discusses the conditions under which homophonous
forms are identified as the same or different morphemes. We can quote the two
parts of the Principle (1949, 56).

(18) Principle 5

1. Homophonous forms with distinctly different meanings constitute
different morphemes.

2. Homophonous forms with related meanings constitute a single
morpheme if the meaning classes are paralleled by distributional
differences, but they constitute multiple morphemes if the meaning
classes are not paralleled by distributional differences.

By part 1 of Principle 5, forms such as pair, pare, and pear constitute separate
morphemes. A similar set in French is verre, vers ('verse'), vers ('toward'),
vert, vair, and ver. Examples of homophonous forms with related meanings are
often derivatives. An example is (a) fish and (to) fish, the latter process
characteristically associated with the noun fish. Here, according to part 2 of
Principle 5, fish constitutes a single morpheme, but there is more to say than
that. Since fish is a noun, we can symbolize this by providing it with a labelled
bracket: [fish]N. Now, the verb to fish is derived from this noun by ZERO
DERIVATION. In Chapter 1 we discussed the derivation of derivation from
derive by means of an affix and gave the word the structure [(deriv]V ation]N.
Similarly we can give the verb fish the structure [[fish]N Ø]V, which shows
that it is derived from the noun fish. We will discuss more interesting cases of
zero derivation in Chapter 5, but we can mention one case here. The verb
protést is stressed on the last (stem) syllable. From this the noun protèst is
derived, with primary stress on the first syllable, as is characteristic of nouns of
this type. This noun has the structure [[protèst]V Ø]N. Now, protèst can also
be a verb, in the sense of 'stage a protest.' We consider this verb as derived by
a zero affix from the noun protest, and give it the structure
[[[protèst]V Ø]N Ø]V.
Nida's final principle is given in (19) (1949, 58-9).

(19) Principle 6

A morpheme is isolatable if it occurs under the following conditions:

1. in isolation.

2. in multiple combinations in at least one of which the unit with which it is combined occurs in isolation or in other combinations.

3. in a single combination provided the element with which it is combined occurs in isolation or in combinations with nonunique constituents.

Condition 1 of Principle 6 allows us to isolate as morphemes such forms as *girl, cat, play, work, out, he, that, and hey*, which all occur in isolation, provided there is no way of analyzing the forms into smaller morphemes, as is the case with these examples.

Condition 2 allows us to isolate forms such as agentive *-er* as morphemes. This never occurs in isolation but it does occur with forms that occur in isolation, as *dance, play, work* in *dancer, player, worker*. Of course, *-er* can also be isolated as a morpheme by Principle 1.

Condition 2 also allows us to consider the prefix *con-* a morpheme, since it occurs in *conceive, consume, contain, condense*. *Dense* occurs in isolation and the other stems occur in other combinations, e.g. *perceive, resume, detain*. These roots and stems occur in multiple combinations, as shown in (20).

(20) a. *English*

| repel  | compel | impel | demit | permit |
| remit  | commit | infer | defer |
| refer  | confer | infer | defer |
| resume | consume | infer | defer |
| receive | conceive | infer | defer |
| reduce | conduce | induce | deduce |
Aronoff (1976) provides another reason for regarding certain of the stems of (15a), -pel, -mit, -sume, -ceive, and -duce as morphemes. In all the combinations in which -sume occurs, for example, it has the same allomorph -sump- in nominalized forms: resumption, consumption. Similarly, -pel has the allomorph -puls- as in repulsion, compulsion, impulsion. Likewise, -mit has -miss- (remission, commission, demission, permission), -ceive has -cept- (reception, conception, deception, perception) and -duce has -duct- (reduction, conduction, induction, deduction).

Condition 3 permits us to isolate the morpheme cran- in cranberry. Cran- occurs just in this single combination, but the element with which it is combined, berry, occurs in isolation and in combinations with other constituents, such as strawberry, blueberry, raspberry, etc. Likewise, boysen- as in boysenberry can be isolated as a morpheme, for the same reasons. Notice that we cannot assign any meaning to either cran- or boysen-. They seem simply to convey the meaning of ‘a kind of berry, different from other named berries.’ This meaning follows from the notion of blocking, discussed in Chapter 5, section 5.4.

However, not all recurring phonetic elements can be isolated as morphemes. Principle 6 specifically excludes the element -er from morphemic status in hammer, ladder, otter, badger, under, linger, and bitter (examples from Nida 1949, 60; other examples include udder and rudder). In these examples, the elements with which this -er occurs, namely hamm-, ladd-, ott- etc. occur only in combination with -er. A second type of recurring element that is specifically excluded from morphemic status by Principle 6 goes by the name phonetic symbolism. Nida (1949, 61) gives this example.

In the English series slide, slush, slurp, slip, slop, slime, slobber, and slick we can recognize a common phonemic element sl with a common meaningful relationship which may be defined as ‘smoothly wet.’ A series such as flash, flare, flame, flicker, flimmer
have an analogous relationship involving the meaning ‘moving light.’ [A footnote refers to Bloomfield 1933, 245 for these and similar examples in English.] Despite these partial phonetic-semantic resemblances, however, we do not isolate either \( sl - \) or \( fl - \) as morphemes, since they do not occur with free forms or with forms which occur in other combinations.\(^7\)

Therefore Principle 6 serves as a constraint on Nida’s other principles, here especially Principle 1. Even if \( sl - \) or \( fl - \) could be isolated as morphemes by virtue of Principle 1, Principle 6 disallows this move on the grounds that the remainders of the words in question are not morphemes. In other words, you cannot isolate a morpheme in a word that leaves the rest of the word stranded, with no morphemic content. (Cf. Principle A (1).) Furthermore, the apparent meaning of \( sl - \) and \( fl - \) may be purely accidental, given the many forms beginning with these clusters with no such meaning. For example, \( sl - \) does not mean ‘smoothly wet’ in \( slab, slack, slash, sleep, \) or \( slight. \) Similarly, there is no element of ‘moving light’ in \( float, flag, flat, flea, \) or \( floor. \)

### 2.3 Types of Morphemes

In Chapter 1 we distinguished between bound and free morphemes. Bound morphemes do not occur in isolation.\(^8\)

We also distinguish AFFIX morphemes from roots, a distinction we tacitly assumed in Chapter 1. The root is generally the principle carrier of the lexical meaning of a word, while affixes generally carry grammatical meanings. For example, in \( cats, \) the root \( car \) carries the basic meaning \( Felis domesticus, \) while \( -s \) carries the grammatical information ‘plural.’ In some languages, roots characteristically occur in a particular position. For example, in Turkish and Eskimo, the root occupies the first position in a word. Furthermore, a count of the morphemes in any language will reveal many more root morphemes than affixes. The set of affixes is closed and can only rarely gain or lose members.

---

\(^7\) Marchand apparently accepts the word-forming status of such elements as \( sl - , fl - , \) which he calls “symbols,” without admitting them as “full morphemes.” “Symbols differ from full morphemes in that they combine into units which are not syntagmas in a grammatical sense, but monenes (one-morpheme words)” (1969, 403).

\(^8\) Bound morphemes may occur in isolation in certain linguistic discourses, e.g. “What suffix is that?” “-Ing.” (This was pointed out by Nida 1949, 81.)
The set of roots is open, and a normal speaker of a language adds new roots to his lexicon throughout his life.

In addition to roots, we also distinguish stems. A stem may be also a root, as cat in cats. Often, a stem consists of a root plus something else. The present tense of the Latin verb amō 'love' is formed from the root am- plus the theme vowel -ā plus the person-number suffixes. The second person singular am-ā-s therefore consists of three morphemes. The -ā- is itself meaningless, but there is ample justification for assigning it morphemic status—see Chapter 8 for the details of this analysis.

2.4 Constituent Structure and Subcategorization

A word is not necessarily a simple concatenation of morphemes. In words of three or more morphemes, some pairs of morphemes are more closely related than others. In Chapter 1 we gave some examples, such as derivational in (2c) of that chapter, repeated here as (21).

(21) [[[deriv]v ation]N al]A

A representation equivalent to (16) employs a tree structure, familiar from syntax. This is shown in (22).

(22)

```
            A
           /\  
          N  V
         /   /  
deriv ation al
```

The constituent structure of a complex word generally conforms to the criteria given as (23), (25), and (27).

(23) Immediate constituents conform to the meaning of the word.

Unfriendly has the constituent structure in (24), since the meaning is 'not friendly,' not 'the quality of being an unfriend.'
Similarly, the meaning of *derivational* is ‘pertaining to derivation.’

(25) Constituents preserve their **subcategorization requirements** in various combinations.

The subcategorization requirements of a morpheme are the restrictions on its occurrence with other constituents. For example, *un-* is prefixed to adjectives to form adjectives, as in *un-kind, un-just, un-fair*. We say that *un-* is **subcategorized** to occur before an adjective, a restriction that can be formalized as in (26).

(26) \[
\begin{array}{c}
\text{un-} \\
\text{A}
\end{array}
\] 

There are a few exceptions to this generalization, such as *unbelief*, (noted by Nida 1949, 93) and *unforgiveness, unfaith, unbeliever, unbirthday, unhealth*, and *unclarity*, pointed out to me by Dana Mullen (personal communication). In like manner, *-ly* is added to nouns to form adjectives, as in *cowardly, manly*. This supports the division of unfriendly as in (24) rather than as [[un friend]N ly]A.

(27) Immediate constituents are often binary; however a division into three or more immediate constituents occurs when no evidence exists to regard one division as superior to another.

Examples of ternary constructions are *foot-pound-second*, French *rouge-blanc-bleu*, and the reduplicative *mu:amu:amu:a* ‘to rise and fall successively (as of little ripples)’ in San Blas, a language of Panama. (The word *mu:a* means ‘to rise and fall’; reduplicated once as *mu:amu:a* it means ‘to rise and fall successively (as of large waves).’) (Examples from Nida 1949, 69 and 92.)
Sometimes a word consists of quite a large number of morphemes without any internal groupings of morphemes. For example, in Swahili, verbs may have a number of suffixes that indicate the subject, the tense, and the object, as in problem 2-1, which we have already analyzed. A sample form is given in (28).

(28) ni - na - ku - sikia
     'I'    'present'    'you'    'hear'    'I hear you'
     (subject)  (object)

There is no reason to consider this form as having any more structure than the flat form given in (29). By flat structure we simply mean that there is no internal branching, i.e. that all the morphemes including the stem are dominated by the same node (V in this case).

(29)

\[ V \]

\[ \text{ni} \quad \text{na} \quad \text{ku} \quad \text{sikia} \]

\[ \text{V-1} \]

\[ \text{(verb)} \]

\[ \text{(verb stem)} \]

\[ \text{ni} \quad \text{na} \quad \text{ku} \quad \text{sikia} \]

\[ \text{(morphemes)} \]

We use the symbol ‘V-1’ to indicate verb stem, as in Chapter 1, section 1.6. See Chapter 8 for more detail on this notation.

2.5 Terms to Learn

2.1 discovery procedures
prefix
infix
complementary distribution
contrast
free variation
2.2 subcategorization frame
Elsewhere Condition
vowel shift
blocking
phonicetic symbolism
2.3 root
### MORPHOLOGY

- **closed (set)**
- **open (set)**

#### 2.4 subcategorization requirements

- **subcategorized**

#### 2.6 Problems

For each of the following problems, isolate all the morphemes and distinguish stems from affixes. Give your result in the most compact form possible, with a central column for the stems and columns to the left for one or more prefix positions and to the right for one or more suffix positions. The general format is thus (30); cf. the solution to problem 2-1 given in (4).

<table>
<thead>
<tr>
<th>(30)</th>
<th>prefixes</th>
<th>stems</th>
<th>suffixes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>+1</td>
<td>+2</td>
<td>+3</td>
</tr>
</tbody>
</table>

In this schema, the numbers indicate affix positions, negative numbers are prefix positions and positive numbers are suffix positions. Of course, not all problems exhibit all positions. The Swahili example (problem 2-1) had only prefixes, and you may encounter examples in the problems that have only suffixes. On the other hand, the number of prefix and suffix positions is not limited to three each, and in Chapter 9 you will encounter a problem that has six suffix positions but no prefixes (problem 9-9).

It is very important to give this kind of general schema from which all the forms given in the problem can be generated. Do not give a separate analysis for each form, but give the most general analysis that accounts for all the forms. The best answer is the shortest answer that is a complete account of all the data.

You should also note any morphophonemic changes that occur in the data. To get you used to the idea, there are only relatively straightforward examples of morphophonemics here. In Chapter 9, we will see somewhat more complex examples of this type.
**Problem 2-2. Finnish.**
(Data from Lehtinen 1964; orthographic; j = [y], geminate letters indicate long segments.)

<table>
<thead>
<tr>
<th></th>
<th>‘drink’</th>
<th>‘receive’</th>
<th>‘ring’</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘I’</td>
<td>juon</td>
<td>saan</td>
<td>soin</td>
</tr>
<tr>
<td>‘you’</td>
<td>juot</td>
<td>saat</td>
<td>soit</td>
</tr>
<tr>
<td>‘he’</td>
<td>juo</td>
<td>saa</td>
<td>soi</td>
</tr>
<tr>
<td>‘we’</td>
<td>juomme</td>
<td>saamme</td>
<td>soimme</td>
</tr>
<tr>
<td>‘you (pl.)’</td>
<td>juotte</td>
<td>saatte</td>
<td>soitte</td>
</tr>
<tr>
<td>‘they’</td>
<td>juovat</td>
<td>saavat</td>
<td>soivat</td>
</tr>
</tbody>
</table>

**Problem 2-3. Estonian.**
(Data from Oinas 1966; orthographic; geminate letters indicate long segments.)

<table>
<thead>
<tr>
<th>raamat</th>
<th>‘book’</th>
<th>kohvik</th>
<th>‘coffee house’</th>
</tr>
</thead>
<tbody>
<tr>
<td>raamatu</td>
<td>‘of (a) book’</td>
<td>kohviku</td>
<td>‘of (a) coffee house’</td>
</tr>
<tr>
<td>raamatusse</td>
<td>‘into (a) book’</td>
<td>kohvikusse</td>
<td>‘into (a) coffee house’</td>
</tr>
<tr>
<td>raamatus</td>
<td>‘in (a) book’</td>
<td>kohvikus</td>
<td>‘in (a) coffee house’</td>
</tr>
<tr>
<td>raamatust</td>
<td>‘out of (a) book’</td>
<td>kohvikust</td>
<td>‘out of (a) coffee house’</td>
</tr>
</tbody>
</table>
### Problem 2-4. Turkish.
(Data from Lewis 1967; orthographic.)

<table>
<thead>
<tr>
<th>Turkish Form</th>
<th>English Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>geldim</td>
<td>'I came'</td>
</tr>
<tr>
<td>yedim</td>
<td>'I ate'</td>
</tr>
<tr>
<td>gelin</td>
<td>'you came'</td>
</tr>
<tr>
<td>yedin</td>
<td>'you ate'</td>
</tr>
<tr>
<td>gelfi</td>
<td>'he came'</td>
</tr>
<tr>
<td>yedi</td>
<td>'he ate'</td>
</tr>
<tr>
<td>geldik</td>
<td>'we came'</td>
</tr>
<tr>
<td>yedik</td>
<td>'we ate'</td>
</tr>
<tr>
<td>geldiniz</td>
<td>'you (pl.) came'</td>
</tr>
<tr>
<td>yediniz</td>
<td>'you (pl.) ate'</td>
</tr>
<tr>
<td>geldiler</td>
<td>'they came'</td>
</tr>
<tr>
<td>yediler</td>
<td>'they ate'</td>
</tr>
<tr>
<td>gelmedim</td>
<td>'I didn’t come'</td>
</tr>
<tr>
<td>yemedim</td>
<td>'I didn’t eat'</td>
</tr>
<tr>
<td>gelmedin</td>
<td>'you didn’t come'</td>
</tr>
<tr>
<td>yemedin</td>
<td>'you didn’t eat'</td>
</tr>
<tr>
<td>gelmedi</td>
<td>'he didn’t come'</td>
</tr>
<tr>
<td>yemedi</td>
<td>'he didn’t eat'</td>
</tr>
<tr>
<td>gelmedik</td>
<td>'we didn’t come'</td>
</tr>
<tr>
<td>yemedik</td>
<td>'we didn’t eat'</td>
</tr>
<tr>
<td>gelmediniz</td>
<td>'you (pl.) didn’t come'</td>
</tr>
<tr>
<td>yemediniz</td>
<td>'you (pl.) didn’t eat'</td>
</tr>
<tr>
<td>gelmediler</td>
<td>'they didn’t come'</td>
</tr>
<tr>
<td>yemediler</td>
<td>'they didn’t eat'</td>
</tr>
</tbody>
</table>

### Problem 2-5. Czech.
(Data from Lee & Lee 1959; orthographic; acute accent indicates vowel length; \( j = [y] \)).

<table>
<thead>
<tr>
<th>Czech Form</th>
<th>English Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>'have'</td>
<td>mám</td>
</tr>
<tr>
<td>'know'</td>
<td>znám</td>
</tr>
<tr>
<td>'pick'</td>
<td>trhám</td>
</tr>
<tr>
<td>'get up'</td>
<td>vstávám</td>
</tr>
<tr>
<td>'listen to'</td>
<td>poslouchám</td>
</tr>
<tr>
<td>'you'</td>
<td>máš</td>
</tr>
<tr>
<td>'you'</td>
<td>znáš</td>
</tr>
<tr>
<td>'he'</td>
<td>má</td>
</tr>
<tr>
<td>'he'</td>
<td>zná</td>
</tr>
<tr>
<td>'we'</td>
<td>máme</td>
</tr>
<tr>
<td>'we'</td>
<td>známe</td>
</tr>
<tr>
<td>'you (pl.)'</td>
<td>máte</td>
</tr>
<tr>
<td>'you (pl.)'</td>
<td>znáte</td>
</tr>
<tr>
<td>'they'</td>
<td>májí</td>
</tr>
<tr>
<td>'they'</td>
<td>znájí</td>
</tr>
<tr>
<td></td>
<td>trháť</td>
</tr>
<tr>
<td></td>
<td>vstáváť</td>
</tr>
<tr>
<td></td>
<td>posloucháť</td>
</tr>
<tr>
<td></td>
<td>vstáváť</td>
</tr>
<tr>
<td></td>
<td>posloucháme</td>
</tr>
<tr>
<td></td>
<td>posloucháť</td>
</tr>
<tr>
<td></td>
<td>posloucháť</td>
</tr>
</tbody>
</table>
**Problem 2-6. Estonian.**
*(Orthographic.)*

<table>
<thead>
<tr>
<th>Word</th>
<th>Singular</th>
<th>Dual</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>magan</td>
<td>'I sleep'</td>
<td>magasin</td>
<td>'I slept'</td>
</tr>
<tr>
<td>magad</td>
<td>'you sleep'</td>
<td>magasid</td>
<td>'you slept'</td>
</tr>
<tr>
<td>magab</td>
<td>'he sleeps'</td>
<td>magas</td>
<td>'he slept'</td>
</tr>
<tr>
<td>magame</td>
<td>'we sleep'</td>
<td>magasime</td>
<td>'we slept'</td>
</tr>
<tr>
<td>magate</td>
<td>'you (pl.) sleep'</td>
<td>magasite</td>
<td>'you (pl.) slept'</td>
</tr>
<tr>
<td>magavad</td>
<td>'they sleep'</td>
<td>magasid</td>
<td>'they slept'</td>
</tr>
</tbody>
</table>

**Problem 2-7. Vogul (Northwestern Siberia).**
*(Data from Kálmán 1964, 36; his transcriptions; ë = vowel length; í = [+].)*

<table>
<thead>
<tr>
<th>'cradle'</th>
<th>singular</th>
<th>dual</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>nominative</td>
<td>Ṡpa</td>
<td>Ṡpaγ</td>
<td>Ṡpat</td>
</tr>
<tr>
<td>locative</td>
<td>Ṡpat</td>
<td>Ṡpatγ</td>
<td>Ṡpatτ</td>
</tr>
<tr>
<td>lative</td>
<td>Ṡpan</td>
<td>Ṡpanγ</td>
<td>Ṡpanн</td>
</tr>
<tr>
<td>ablative</td>
<td>Ṡpanaёl</td>
<td>Ṡpanaёl</td>
<td>Ṡpanaёl</td>
</tr>
<tr>
<td>translative</td>
<td>Ṡpaγ</td>
<td>Ṡpaγёl</td>
<td>Ṡpaγёl</td>
</tr>
<tr>
<td>instrumental</td>
<td>Ṡpal</td>
<td>Ṡpalёl</td>
<td>Ṡpalёl</td>
</tr>
</tbody>
</table>
**Problem 2-8. Hungarian.**
(Data from Whitney 1950; orthographic; s = [š], sz = [s], acute accent indicates vowel length.)

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>adok</code> 'I give'</td>
<td><code>mosok</code> 'I wash'</td>
</tr>
<tr>
<td><code>adsz</code> 'you give'</td>
<td><code>mosol</code> 'you wash'</td>
</tr>
<tr>
<td><code>ad</code> 'he gives'</td>
<td><code>mos</code> 'he washes'</td>
</tr>
<tr>
<td><code>adunk</code> 'we give'</td>
<td><code>mosunk</code> 'we wash'</td>
</tr>
<tr>
<td><code>adtok</code> 'you (pl.) give'</td>
<td><code>mostok</code> 'you (pl.) wash'</td>
</tr>
<tr>
<td><code>adnak</code> 'they give'</td>
<td><code>mosnak</code> 'they wash'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>állok</code> 'I stand'</td>
<td><code>húzok</code> 'I pull'</td>
</tr>
<tr>
<td><code>állosz</code> 'you stand'</td>
<td><code>húzol</code> 'you pull'</td>
</tr>
<tr>
<td><code>áll</code> 'he stands'</td>
<td><code>húz</code> 'he pulls'</td>
</tr>
<tr>
<td><code>állunk</code> 'we stand'</td>
<td><code>húzunk</code> 'we pull'</td>
</tr>
<tr>
<td><code>álltok</code> 'you (pl.) stand'</td>
<td><code>húztok</code> 'you (pl.) pull'</td>
</tr>
<tr>
<td><code>állnak</code> 'they stand'</td>
<td><code>húznak</code> 'they pull'</td>
</tr>
</tbody>
</table>
3

Morphological Features

3.1 Sense and Grammatical Meaning

In Chapter 2 we introduced the form of lexical entries for morphemes, providing phonological, syntactic, and semantic information for each item, along with whatever other idiosyncratic information is required. We can distinguish two types of lexical meaning: the sense of a morpheme and the grammatical meaning. Some morphemes have both types of meaning, but generally a given morpheme will have one or the other, but not both. Most commonly, a stem is associated with a sense. Affixes can be associated with both types of meaning. An example of an affix with grammatical meaning is the plural suffix -z, discussed in Chapters 1 and 2, as in the example cats. Other affixes (generally derivational) are associated with sense meaning such as the -less of senseless ‘lacking sense.’ There is no agreement on a system to represent the sense of morphemes: generally the sense is given as a translation (as Kekchi beq ‘walk,’ discussed in section 2.1) or related to a scientific taxonomy (as cat ‘Felis domesticus,’ discussed in section 2.2). We will continue this practice here, without concerning ourselves too much with the precise representation of the sense meanings, which requires a book in itself.

Grammatical meaning relates the sense to grammatical concepts such as number (singular, dual, or plural), gender (masculine, feminine, or neuter), tense (past, present, or future), or aspect (perfect or imperfect). Grammatical meanings are represented by morphological features, such as [+plural], which we have assigned to the plural suffix /-z/ in English. An example of a morpheme with both a sense and a grammatical meaning is English went, which combines the sense of ‘go’ with the grammatical feature [+past].
Problem 3-1.

Divide the following words into morphemes, following the principles of Chapter 2. State which morphemes have only sense, which have only grammatical meaning, and which have both.

<table>
<thead>
<tr>
<th>English</th>
<th></th>
<th>French</th>
</tr>
</thead>
<tbody>
<tr>
<td>walk</td>
<td>are</td>
<td>parler</td>
</tr>
<tr>
<td>walked</td>
<td>was</td>
<td>parlais</td>
</tr>
<tr>
<td>arrive</td>
<td>were</td>
<td>parlait</td>
</tr>
<tr>
<td>arrived</td>
<td>be</td>
<td>parlions</td>
</tr>
<tr>
<td>paint</td>
<td></td>
<td>parliez</td>
</tr>
<tr>
<td>painted</td>
<td></td>
<td>parlaient</td>
</tr>
<tr>
<td>go</td>
<td></td>
<td>irai</td>
</tr>
<tr>
<td>went</td>
<td></td>
<td>irais</td>
</tr>
<tr>
<td>am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>is</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We can refer to morphemes that carry only grammatical meaning as **grammatical morphemes**.

Some grammatical morphemes have only a single morphological feature associated with them (English /-z/ [+plural] again is an example). Other grammatical morphemes have two or more features associated with them. In problem 3-1 you probably found a number of cases like this. As an additional example, consider the English pronoun *we* or the corresponding French pronoun *nous*. These both combine the two grammatical meanings ‘first person’ ([+I]) and ‘plural’ ([+plural]). *We* is a single morpheme; it cannot be broken down into separate morphemes each having just one of these meanings. Compare *I* ([+I, -plural]) and *they* for example. A morpheme that combines two or more grammatical meanings is called a **portmanteau morpheme**.

3.2 Features of Person and Number

Consider the data in problem 3-2, which presents an example of a slightly more complex pronoun system, that of Palaung.
Problem 3-2. Palaung (Burma).
(Data from Burling 1970, 14-17.)

1. ar 'you and I’
2. ε 'you and I and other(s)'
3. θ ‘I’
4. yar ‘we two (not including addressee)’
5. ye 'we (three or more, not including addressee)’
6. mi 'you (singular)’
7. par 'you two’
8. πε 'you (three or more)’
9. Δn ‘he or she’
10. gar ‘they two’
11. χε ‘they (three or more)’

We can analyze these forms into their components of meaning (whence this type of analysis is often called componential analysis). The first five forms (1-5) include the meaning of ‘first person.’ Forms 1, 2, 6, 7, and 8 include the meaning of ‘second person.’ Forms 4 and 5 specifically exclude the addressee, and hence are called exclusive first person forms. Forms 1 and 2 are inclusive first person forms, since they specifically include the addressee. The last three forms (9, 10 and 11) exclude both the speaker and the addressee. Some forms refer to a single individual, others to exactly two (dual), others to three or more. Let us assume the following features to represent these meanings:

(1) [+plural] = more than one
[-plural] = exactly one
[+dual] = exactly two
[+I] = first person
[-I] = non-first person
[+II] = second person
[-II] = non-second person

These features allow for the cross-classification of meaning in the same way that phonological features cross-classify the sounds of language. We can thus analyze the semantics of the Palaung pronouns as in (2).
(2) Componential analysis of Palaung pronouns

<table>
<thead>
<tr>
<th></th>
<th>[+I]</th>
<th>[-I]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+II]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[-plural]</td>
<td>ar</td>
<td>mi</td>
</tr>
<tr>
<td>[+dual]</td>
<td>ε</td>
<td>par</td>
</tr>
<tr>
<td>[+plural, -dual]</td>
<td></td>
<td>pe</td>
</tr>
<tr>
<td>[-II]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[-plural]</td>
<td>ɔ</td>
<td>ʌn</td>
</tr>
<tr>
<td>[+dual]</td>
<td>yar</td>
<td>gar</td>
</tr>
<tr>
<td>[+plural, -dual]</td>
<td>yɛ</td>
<td>gɛ</td>
</tr>
</tbody>
</table>

Notice that there is a gap in the table of forms in (2). No form expresses the combination *[+I, +II, -pl]*, since the presence of both [+I] and [+II] implies that more than one person is involved, which is contradicted by the specification [-pl]. This is therefore no accidental gap, but one determined by the incompatibility of the features.

In this system, the two numbers *plural* and *dual* are both [+plural], and in this sense they form a natural class. As in phonology, we define a natural class in morphology as one which requires fewer feature specifications than any of its individual members. We can specify the class containing *dual* and *plural* by one feature, [+plural], which contrasts with the specification of *dual* as [+plural, +dual] and of *plural* as [+plural, -dual], with two features each. *Singular* and *plural* are [-dual], and so form another natural class.

### 3.3 Features of Tense

The data of problem 3-3 provide an example of the representation of various tenses in Sanskrit.
Problem 3-3. Sanskrit.
(Based on Whitney 1889; j is a voiced palatal stop.)

<table>
<thead>
<tr>
<th>Present</th>
<th>Imperfect</th>
<th>Future</th>
<th>Conditional</th>
</tr>
</thead>
<tbody>
<tr>
<td>'cross'</td>
<td>tarati</td>
<td>atarat</td>
<td>tarisyati</td>
</tr>
<tr>
<td>'move'</td>
<td>carati</td>
<td>acarat</td>
<td>carisyati</td>
</tr>
<tr>
<td>'forsake'</td>
<td>tyajati</td>
<td>atyajat</td>
<td>tyajisyati</td>
</tr>
<tr>
<td>'hold'</td>
<td>dharati</td>
<td>adharat</td>
<td>dharisyati</td>
</tr>
</tbody>
</table>

The verb system of Sanskrit is quite complicated, and so we have chosen verb forms that illustrate the point at hand. The forms illustrated here are all third person singular indicative active. Here, we can isolate verb stems tar- 'cross,' car- 'move,' tyaj- 'forsake,' and dhar- 'hold.' The present tense is characterized by the suffix -ati, which is a portmanteau morpheme meaning 'third person singular' ([I, II, -plural]). The imperfect is characterized by a prefix, a-, and a distinct third person singular suffix, -at. We know from other data that the prefix is optional, at least in the earlier stages of the language, so we can consider that the prefix is an optional morpheme that accompanies the imperfect tense, but does not carry the meaning itself. Thus, we can assign the difference between the two tenses to the suffixes, -ati meaning 'present' and -at meaning 'past.' The future is characterized by the suffix -isy- and the personal suffix that is the same as in the present tense. The conditional combines aspects of both the imperfect and the future: it has the prefix a-, which is found with past tenses, along with the personal suffix -at, also found with past tenses, and, between the stem and the personal suffix, the conditional has the future morpheme -isy. We therefore expect the conditional to have features for both 'past' and 'future.' If this sounds contradictory, it is well to remember that English and French do the same thing, in effect. In English, the conditional is formed periphrastically (that is using more than one word) using the auxiliary verb would, which, historically at least, is the past tense of the auxiliary will, which is used for the future. Similarly, in French, a conditional verb such as je parler-ais is formed by suffixing the imperfect ending -ais to the stem parler- of the future (parler-ai). Therefore, we use the two features [past] and [future] to define four tenses as shown in the table in (3).
### 3.4 Markedness

An important concept in distinctive feature analysis is that of **MARKEDNESS**. In phonology, one sound is considered more **MARKED** than another if (among other things) it occurs less frequently among languages, less frequently in languages that have it, or if its presence implies the presence of the less marked sound. All languages probably have a phoneme /a/; this is considered the least marked vowel. The vowel /ö/ is marked with respect to its unrounded counterpart /e/: /ö/ is less frequent (many languages have /e/ but not /ö/, e.g. English), /ö/ is less common than /e/ in languages that have both (e.g. French), and the presence of /ö/ implies the presence of /e/ but not vice versa.

Similar considerations apply in morphology. We consider dual a highly marked number, since it occurs in relatively few languages, it is less frequent than singular or plural in languages that have it, and its presence implies the presence of singular and plural. The earliest work on markedness in phonological theory assumed that the minus value of any feature was **UNMARKED** with respect to the plus value of that feature. However, it was found necessary to abandon this simple algorithm, and Chomsky and Halle (1968) develop a complex set of rules specifying the markedness values of various features in different contexts. In morphology, however, the simple procedure seems to hold: the plus value of features is marked, the minus value is unmarked. For example, third is the least marked person, being specified as [-I, -II]. Likewise present is the least marked tense being [-past, -future].

Greenberg 1966, Chapter 3 notes the following characteristics of this distinction. Frequently, an unmarked term is ambiguous between the generic category and the specific opposite of the marked term, as *man* means either 'a human being' or a 'male human being.' An unmarked term frequently has zero expression, as *author* as opposed to *authoress*. Syncretisms (see section 3.9 and Chapter 7, section 7.4) are more frequent in marked categories; for example, the definite article in German distinguishes gender in the singular but not in the plural. In some languages the overt expression of a marked category may be omitted. For example, in Korean, a word without `-tul` may be interpreted as either singular or plural, while a word with `-tul` is only plural. If

<table>
<thead>
<tr>
<th></th>
<th>past</th>
<th>present</th>
<th>future</th>
<th>conditional</th>
</tr>
</thead>
<tbody>
<tr>
<td>[past]</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>[future]</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
the opposition between marked and unmarked is suspended, the unmarked term appears. For example, in Hungarian, the singular form of nouns appears after cardinal numbers.

Marked forms often exhibit a lesser degree of morphological irregularity. Marked categories often lack certain distinctions present in the corresponding unmarked categories, as Latin has only four tense-aspect distinctions in the subjunctive (marked) compared to six in the indicative (unmarked). A set can be named by the plural (or dual) of the unmarked category of the set, as Spanish padres (literally ‘fathers’) is used for ‘parents.’ Agreement often requires the unmarked category in a modifier of a phrase that includes both: in Spanish, an adjective modifying a noun phrase that includes both masculine and feminine nouns is masculine. Finally, the unmarked term appears more frequently in running texts.

Occasionally, these criteria don’t all coincide. In English, the third person singular, the least marked person-number ([-I, -II, -pl]) is the only one that carries an overt affix (in non-modal verbs): I sing but he sings. By and large, however, we find that these criteria most often agree in determining the marked and unmarked morphological categories in many languages.

3.5 Portmanteaux and Feature Nesting

Like phonological features, we regard these morphological features as universal, providing a range of possible feature combinations that languages can make use of. Of course, all languages do not use the same features and combinations of features, just as languages differ in their exploitation of the phonological features. For example, English and French do not distinguish the dual number, and so the feature [dual] is absent from the grammars of these languages. However, the distinctions we have been discussing recur in many languages, although unexpected portmanteaux sometimes occur. Consider the forms from Mezquital Otomí given in Problem 3-4.
MORPHOLOGY

Problem 3-4. Mezquital Otomí.
(Data from Merrifield et al. 1967, 11; 
' = high tone; ' = rising tone; low tone is unmarked.)

1. dímpení 'I launder' 10. bíntíhi 'he hurries'
2. dántíhi 'I hurried' 11. gimpení 'you will launder'
3. dampení 'he will launder' 12. gántíhi 'you hurried'
4. díntíhi 'I hurry' 13. bímpení 'he launders'
5. bimpení 'he laundered' 14. gantíhi 'I will hurry'
6. bíntíhi 'he hurried' 15. gampení 'I will launder'
7. gíntíhi 'you will hurry' 16. dantíhi 'he will hurry'
8. dámpení 'I laundered' 17. gámpení 'you laundered'
9. gímpení 'you launder' 18. gíntíhi 'you hurry'

Examination of the data allows us to isolate two stems mpení 'launder' and ntíhi 'hurry.' We cannot, however, isolate affixes meaning 'I,' 'you,' 'he,' 'past,' 'present,' and 'future.' The prefixes combine person and tense, as shown in the table of (4).

(4) [+I, -II] [-I, +II] [-I, -II]
   [-past, -future] df gi bf
   [-past, +future] ga gi da
   [+past, -future] dá gá bi

Some languages have portmanteau representation of subject and object as a verbal affix. The data of problem 3-5 illustrate this.
Problem 3-5. Sayula Popoluca.
(Data from Merrifield et al. 1967, 12.)

1. tlcemmp 'I am seeking you'
2. tlncemmp 'I am seeking him or it'
3. ?lncesmp 'you are seeking him or it'
4. ?lcesmp 'he is seeking him or it'
5. ?lišcemmp 'he is seeking you or you are seeking me'
6. tlišcemmp 'he is seeking me'
7. tlemp 'I am looking at you'
8. tlnemp 'I am looking at him or it'
9. ?inemp 'you are looking at him or it.'
10. ?iemp 'he is looking at him or it'
11. ?išemp 'he is looking at you or you are looking at me'
12. tlišemp 'he is looking at me'
13. tlnhųyp 'I am buying it'
14. ?lnhųyp 'you are buying it'
15. ?ihųyp 'he is buying it'
16. tlnhųyheap 'I am buying it for him'
17. ?lnhųyheap 'you are buying it for him'
18. ?ihųyheap 'he is buying it for him'
19. tlnhųyheap 'I am buying it for you'
20. išhųyheap 'he is buying it for you or you are buying it for me'
21. tlišhųyheap 'he is buying it for me'
22. tlnhųyw 'I bought it'
23. tlišhųyheapw 'he bought it for me'

Here we can isolate three stems: če?m 'seek,' ?e? 'see,' and hųy 'buy.' The first position after the stem permits an optional suffix -ha, which makes the object indirect. The second position after the stem contains a tense morpheme -p 'present' or -w 'past.' The prefix position is for a portmanteau morpheme incorporating the subject and the object, according to the table in (5).
Notice the lack of forms whose subject and object are both either first or second person. This is not due to a conflict of features, as was the case with the Palaung pronouns, but follows from a more general constraint called Disjoint Reference, which prevents two noun phrases in the same simplex clause from referring to the same individual, except with explicit reflexives or certain idiomatic expressions. Thus while (6) is fine in English, (7) is ruled out by Disjoint Reference, and the two pronouns in (8) must refer to two different people.

(6) a. I see myself.
    b. Joe craned his neck.

(7) a. *I see me.
    b. *You hurt you.

(8) He saw him.

Notice that the morpheme $t\Lambda$- in Sayula Popoluca apparently contains contrary feature specifications—it is marked [+I, -II] for the subject but [-I, +II] for the object. Of course, these features are not really contradictory, since they refer to different aspects of the meaning of the verb. Anderson (1977) has proposed a convention on nesting of features in cases like this. In this system, the feature representation of $t\Lambda$- can be given as in (9).

(9) $t\Lambda$- $\left[ \begin{array}{ll} +I & -I \\ -II & +II \end{array} \right]$ 
    (subject) (object)
The features in the outer layer represent the subject and those in the inner layer represent the object. Since these have different functional relations to the verb, they appear in distinct layers, and opposite specifications for the same feature count as contradicting only when they appear in the same layer.

### 3.6 Features of Aspect

We can now introduce several additional syntactic features that play a role in inflectional systems. Latin has six combinations of tense and aspect, of which representative forms are given in (10).

\[
\begin{array}{ll}
(10) & \text{am-\textbar} & \text{am-\textbar}\text{-}\textbar-
\\
& 'I love' & 'I have loved'
\\
& (present) & (perfect)
\\
& am-\textbar\textbar-\textbar-m & am-\textbar\textbar-\textbar-\textbar-m
\\
& 'I loved' & 'I had loved'
\\
& (imperfect) & (pluperfect)
\\
& am-\textbar-\textbar-\textbar & am-\textbar-\textbar-\textbar
\\
& 'I will love' & 'I will have loved'
\\
& (future) & (future perfect)
\end{array}
\]

We can consider the imperfect and pluperfect to be defined by the feature [+past] and the future and future perfect as defined by [+future]. The right column is distinguished from the left by a new feature [perfect]: the forms on the right are [+perfect] while those on the left are [-perfect]. **Perfect** is an aspectual concept which implies the completion of an action. Other aspectual concepts include **iterative**, which implies the repetition of an action, **durative**, which emphasizes the duration of an action, and **inchoative**, which stresses the beginning of an action. We will not introduce special features for all these aspectual types here, however. We can lay out the tense and aspect system of Latin in the array in (11).
In Chapter 8 we will discuss the Latin verb system in greater detail. We will include a discussion of the moods, for which we will use the feature [subjunctive], where the subjunctive is distinguished as [+subjunctive] as opposed to the indicative, [-subjunctive]. A more complete system would include the imperative in the feature system. Other languages have still richer mood systems; for example, Classical Greek has an optative mood. These four moods could be distinguished in terms of two binary features as in (12).

\[
\begin{array}{cccc}
\text{indicative} & \text{subjunctive} & \text{optative} & \text{imperative} \\
[-] & + & + & - \\
[-] & - & + & + \\
\end{array}
\]

This makes the indicative mood the least marked, and the optative the most marked, which seems to accord with the facts. However, this richer feature system will not be needed for our immediate purposes.

We will also want to distinguish \textbf{finite} verb forms from \textbf{infinitive} verb forms. The most straightforward way to do this would be to have the feature [finite]. While this is not really a mood, it is often classified as such. In English, finite verb forms are marked for tense, as in the difference between \textit{he sings} and \textit{he sang}, and so are often referred to in syntactic discussions as ‘tensed’ verb forms, since infinitives in English do not show tense (\textit{to sing}). Nevertheless, in Latin, there are different tenses of infinitives, and so it is useful to keep the two notions separate. The verb ‘love’ illustrated in (10) has
the present infinitive *amāre*, the perfect infinitive *amāvisse*, the future infinitive *amātūrus esse*, and also passive infinitives for these same tenses. Finite verb forms are marked for person and number in Latin, and, to a limited extent, in English, as shown by the difference between *I sing* and *he sings*. European Portuguese is said to have an “inflected infinitive,” which, however, derives from a finite verb form (the imperfect subjunctive) in Latin.

### 3.8 Features of Lexical Categories

Major lexical categories are also distinguished by features. Chomsky (1981) has proposed the features [N] and [V], where adjectives and nouns are [+N] and adjectives and verbs are [+V]; the full array is given in (13).

(13) -N +N

- V P (preposition) N (noun)
+ V V (verb) A (adjective)

### 3.9 Grammatical Gender

Many languages show distinctions of grammatical gender. This concept does not necessarily correlate with the semantic notion of sex, in the biological sense, although the two are related. In English, the correlation is fairly close, although exceptionally some inanimate objects are treated as feminine, as when ships, countries, and cars are referred to by the feminine pronoun *she*. In French inanimate objects are obligatorily masculine or feminine since French has only these two genders. In German, which has a neuter gender in addition to masculine and feminine, many inanimate objects are masculine or feminine, and some animate beings are neuter (see the examples in (14)). In English, gender is distinguished only in pronouns and in a few noun suffixes. The pronouns *he*, *she*, and *it* are masculine, feminine, and neuter respectively. The suffix *-ess* makes feminine nouns, as *waitress* from *waiter*, *stewardess* from *steward*. This is evidence that feminine is marked with respect to masculine, since the feminine requires a suffix while the masculine has none. This suggests a feature [feminine], with [+feminine] as ‘feminine’ and [-feminine] as ‘masculine.’ The only reverse case in English, where masculine *widower* is formed from feminine *widow*, seems to derive from the fact that widows are more common than widowers; in this context, then, the masculine can be considered marked.
This has been called **local markedness** by Tiersma (1982). In French, the gender distinction is grammatical, and not strictly related to biological sex. Nouns are feminine or masculine, and adjectives must agree in gender with the nouns they modify.

(14)  

<table>
<thead>
<tr>
<th>Feminine nouns</th>
<th>Masculine nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>la table</td>
<td>le crayon</td>
</tr>
<tr>
<td>la fille</td>
<td>le garçon</td>
</tr>
<tr>
<td>la plume</td>
<td>le livre</td>
</tr>
<tr>
<td>la bonne table</td>
<td>le bon crayon</td>
</tr>
<tr>
<td>la bonne fille</td>
<td>le bon garçon</td>
</tr>
<tr>
<td>la bonne plume</td>
<td>le bon livre</td>
</tr>
</tbody>
</table>

For languages like German, Latin, and Greek, which have a neuter gender, we can assume the feature \([\text{animate}]\) to distinguish between masculine and feminine on the one hand (both \([\text{+animate}]\)) and neuter on the other \((-\text{animate})\). Some German examples are given in (15).

(15)  

<table>
<thead>
<tr>
<th>Feminine nouns</th>
<th>Masculine nouns</th>
<th>Neuter nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>die Frau ‘woman’</td>
<td>der Mann ‘man’</td>
<td>das Kind ‘child’</td>
</tr>
<tr>
<td>die Feder ‘pen’</td>
<td>der Bleistift ‘pencil’</td>
<td>das Wasser ‘water’</td>
</tr>
</tbody>
</table>

In German, as in French, gender is not equivalent to sex, although the two concepts often correlate. German *Kind* is neuter, although it is biologically male or female. Another word for ‘woman’ in German is the neuter *das Weib*, which is cognate with English *wife*, itself from the Old English neuter noun *wif* ‘woman, wife.’ Old English even has a masculine word for ‘woman’ *wifmann*, later *wimman*. It is masculine because it is a compound of *wif* and *mann* ‘man’ (masculine), and in Old English, as in German, compound nouns take the gender of their last member. In many languages certain semantic categories

---

1 This terminology should not be interpreted as meaning that \([\text{+animate}]\) is restricted to semantically animate beings. It is simply a convenient label for grouping the grammatical genders ‘masculine’ and ‘feminine.’
belong to particular genders. For example, in Latin, trees are feminine, such as *quercus* 'oak,' even though it belongs to a declension class which is normally masculine. We can represent the grammatical genders with the features in (16), with the understanding that biological sex does not necessarily coincide with gender in any particular case.

(16)  

<table>
<thead>
<tr>
<th></th>
<th>Masculine</th>
<th>Feminine</th>
<th>Neuter</th>
</tr>
</thead>
<tbody>
<tr>
<td>feminine</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>animate</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

This scheme is justified by a number of considerations. Masculine and neuter form a natural class and share a number of forms in languages with all three genders. In German, the demonstrative *dieser* is declined as in (17).

(17)  

<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>plurals</th>
</tr>
</thead>
<tbody>
<tr>
<td>masculine</td>
<td>dieser</td>
<td>diese</td>
</tr>
<tr>
<td>neuter</td>
<td>diesen</td>
<td>diese</td>
</tr>
<tr>
<td>feminine</td>
<td>diese</td>
<td>die</td>
</tr>
</tbody>
</table>

In the paradigm of (17) the boxes show *syncretisms*: the same formal expression for distinct categories that form a natural class. Masculine and neuter have the same form in the dative singular (*diesem*) and in the genitive singular (*dieser*). This paradigm does not show any reason to group masculine and feminine together in opposition to neuter, but there are Latin adjectives that show exactly this distribution, the third declension adjectives of two terminations, e.g. *levis* (masc., fem.), *leve* (neuter) 'light.'

There is also historical evidence that (16) is correct. The Romance languages (except perhaps Romanian) have lost the Latin neuter, which generally coalesces with the masculine. This can be viewed as a neutralization of the feature [animate], which then ceases to function in the
language. Swedish and Danish, on the other hand, have lost the distinction between masculine and feminine, which can be seen as a neutralization of the feature [feminine].

3.10 Features of Case

Finally, let us consider how the cases of a language like German or Latin would be represented in features. Most linguists would agree that nominative, accusative, and vocative should form a natural class, and these are often grouped together as nonoblique cases, opposed to the oblique cases genitive, dative, and ablative. The nominative, accusative, and vocative often syncretize in Latin, always so in neuter nouns. The accusative, dative, and ablative can be grouped together as cases associated with objects of verbs, and so we can unite them with the feature [+theme]. The genitive, ablative, and vocative can be thought of as the source of something else, as the genitive and ablative both express source or material and the vocative implies a call to someone intended as the source of something wanted by the speaker. We capture these relations with the features of (18).

(18)  

\[
\begin{array}{cccccc}
\text{nom} & \text{acc} & \text{dat} & \text{gen} & \text{abl} & \text{voc} \\
\text{[oblique]} & - & - & + & + & + \\
\text{[theme]} & - & + & + & - & - \\
\text{[source]} & - & + & + & + & + \\
\end{array}
\]

We will return to these features in our discussion of inflectional systems in Chapters 7 and 8. Meanwhile, you will find it useful to analyze the morphemes that occur in the problems in terms of features. For some problems you may need additional features, but their application should be obvious.

3.11 Feature Percolation

In general, the features of a complex word is determined by the features that belong to the morphemes that comprise that word. Lieber (1980, 1983) has proposed feature percolation conventions that govern the assignment of features to complex words. Reduced to its essentials, the features of all morphemes percolate to (i.e. become part of) the node dominating the whole
word, with affix morphemes taking precedence over stem morphemes. For example, the noun *derivation*, derived from the verb *derive*, is shown in (19).

\[(19) \quad [+N, -V] \]

\[\text{[+V, -N]} \quad \text{[+N, -V]} \]

\text{derive} \quad \text{ation}

Because *-ation* is a nominal suffix, its category features take precedence over those of the stem to which it is attached. Similarly, in German, nouns formed with the diminutive suffixes *-chen* and *-lein* are neuter. We predict this by assigning the suffixes *-chen* and *-lein* the features [-feminine, -animate], which, by the principle of feature percolation, take precedence over the gender features of any stem to which it is attached, as shown in (20).

\[(20) \quad \text{stem} \quad \text{derived diminutive (neuter)} \]

<table>
<thead>
<tr>
<th></th>
<th>masculine</th>
<th>feminize</th>
<th>neuter</th>
</tr>
</thead>
<tbody>
<tr>
<td>der Bach</td>
<td>das Bächlein</td>
<td>die Kirche</td>
<td>das Kirchlein</td>
</tr>
<tr>
<td>‘stream’</td>
<td>‘brook’</td>
<td>‘church’</td>
<td>‘little church’</td>
</tr>
<tr>
<td>das Buch</td>
<td>das Büchlein</td>
<td>das Buch</td>
<td>‘booklet’</td>
</tr>
</tbody>
</table>

Sometimes, the diminutive does not just mean a little version of the base. An example is *Brötchen* ‘roll’ from *das Brot* ‘bread.’ A more extreme example is *Stiefmütterchen* ‘pancy’ from *die Stiefmutter* ‘stepmother.’ There are also diminutives, like *Kaninchen* ‘rabbit,’ whose bases do not exist on their own. There is no word *Kanin*.

3.12 Terms to Learn

3.1 sense
grammatical meaning
morphological features
grammatical morphemes
portmanteau morpheme

3.2 componential analysis
exclusive (first person)
inclusive (first person)
dual
natural class

3.3 periphrastically
feature nesting

3.5 Disjoint Reference

3.6 perfect
iterative
durative
inchoative

3.7 finite (verb form)
infinitive

3.9 local markedness
syncretism
neutralization

3.11 feature percolation conventions

3.13 Selected Readings

Our discussion of morphological features is intended to parallel the use of features in phonology; for the latter, see Chomsky and Halle (1968, Chapter 7). For a somewhat different view of morphological features, to which our discussion nevertheless owes a great debt, see Bierwisch (1967).

3.14 Problems

In problems 3-6 and 3-7, analyze all the forms into morphemes, as in the problems of Chapter 2, and give a feature representation for each affix, using Anderson’s nested feature convention illustrated in (9) if necessary. Problem 3-7 requires a phonological rule.
Problem 3-6. Georgian.
(Data from Aronson 1982; ē is a glottalized dental affricate.)

1. davčer  I will write it/them'
2. dačer  'you will write it/them'
3. dačers  'he will write it/them'
4. davčert  'we will write it/them'
5. dačert  'you (pl.) will write it/them'
6. dačeren  'they will write it/them'
7. včer  'I am writing it/them'
8. čer  'you are writing it/them'
9. čers  'he is writing it/them'
10. včert  'we are writing it/them'
11. čert  'you (pl.) are writing it/them'
12. čeren  'they are writing it/them'
13. davčerdi  'I would write it/them'
14. dačerdi  'you would write it/them'
15. dačerda  'he would write it/them'
16. davčerdit  'we would write it/them'
17. dačerdit  'you (pl.) would write it/them'
18. dačerdnen  they would write it/them'
19. včerdi  'I was writing it/them'
20. čerdi  'you were writing it/them'
21. čerda  'he was writing it/them'
22. včerdit  'we were writing it/them'
23. čerdit  'you (pl.) were writing it/them'
24. čerdnen  'they were writing it/them'
Problem 3-7. Zacapoaxtla dialect of Aztec, restricted.
(Based on Nida 1967, problems 2 and 209.)

-ita 'see'

1. nikita 'I see it'
2. tikita 'you (sg.) see it'
3. tikinita 'you (sg.) see them'
4. nikinita 'I see them'
5. kita 'he sees it'
6. kitah 'they see it'
7. tikitah 'we see it'
8. nankitah 'you (pl.) see it'
9. tikinitah 'we see them'
10. kinitah 'they see them'
11. kinita 'he sees them'
12. kitas 'he will see it'
13. kitak 'he saw it'
14. nikitak 'I saw it'
15. nikinitak 'I saw them'
16. kitakeh 'they saw it'
17. kinitakeh 'they saw them'
18. tikitas 'you (sg.) will see it'
19. kitaya 'he was seeing it'
20. tikitaya 'you (sg.) were seeing it'
4 Morphological Processes

4.1 Preliminaries

A morphological process can be defined as one that simultaneously changes the form of a morpheme, usually a stem, and adds an element of meaning to that morpheme. The change in the form of the morpheme effected by such a process cannot be stated as an affixation, and the result of such a process cannot be divided neatly into two (or more) parts, as can examples consisting of two or more morphemes, such as those examined in Chapter 2.

We regard morphological processes as marked with respect to affixes. This means that we prefer to assign meaning to morphemes whenever possible. We assigned the meaning 'plural' to the affix /-z/ in English in Chapter 1 because it is unnecessary to state this affixation as a process. The processes examined in this chapter cannot be regarded as simple affixations, and so we are forced to regard them as morphological processes.

In Chapter 9 we will discuss another kind of process that is encountered in morphology: morphophonemic processes. Morphophonemic processes differ from purely phonological processes in that they may require morphological conditions for their operation, or they may alter the sequence of morphemes in a word. On the other hand, morphophonemic processes differ from morphological processes in that they do not change the meanings of forms. Some examples of morphological processes are infixation (inserting material inside a morpheme), reduplication (repeating part or all of a morpheme), ablaut and UMLAUT (changing the vowel of a stem), and tone rules (adding tone or changing the tone of a morpheme). We will give examples of each of these in turn. Morphological processes are generally given in the form of a transformation, a type of rule that may be familiar from...
phonology and syntax. A transformation specifies a sequence of terms that form its structural description, and the change which that sequence undergoes, the structural change.

4.2 Infixation

To illustrate the concept, let us consider an infixation process first, and show how a transformation serves to describe it.

**Problem 4-1. Oaxaca Chontal.**
(Data from Waterhouse 1962, 95 and Merrifield et al. 1967, 3.)

<table>
<thead>
<tr>
<th>singular</th>
<th>plural</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>cece</td>
<td>cece</td>
<td>squirrel</td>
</tr>
<tr>
<td>tuwa</td>
<td>tuwa</td>
<td>foreigner</td>
</tr>
<tr>
<td>teʔa</td>
<td>teʔa</td>
<td>elder</td>
</tr>
<tr>
<td>akaʔoʔ?</td>
<td>akaʔoʔ?</td>
<td>woman</td>
</tr>
<tr>
<td>koʔiʔ?</td>
<td>koʔiʔ?</td>
<td>grandchild</td>
</tr>
<tr>
<td>tiʔpo</td>
<td>tiʔpo</td>
<td>possum</td>
</tr>
<tr>
<td>seʔwiʔ?</td>
<td>seʔwiʔ?</td>
<td>magpie</td>
</tr>
<tr>
<td>meʔkoʔ?</td>
<td>meʔkoʔ?</td>
<td>spoon</td>
</tr>
<tr>
<td>kweʔpoʔ?</td>
<td>kweʔpoʔ?</td>
<td>lizard</td>
</tr>
</tbody>
</table>

An examination of the data shows that the plural is formed in this class of nouns in Oaxaca Chontal by infixing -ʔʔ- before the final syllable of the singular. This can be symbolized as in (1).

\[
\begin{array}{ccccccc}
X & C & V & (\text{?}) & N \\
1 & 2 & 3 & 4 & 5 & \rightarrow & 1 & + & 2 & 3 & 4 & 5 \\
& & & & & \text{opt} & & & & & & \text{[+plural]}
\end{array}
\]

---

1 There are a number of noun classes in Oaxaca Chontal, each of which uses a different method of forming plurals. There are no criteria for determining which noun belongs to which class; the division is entirely arbitrary. Problem 7-1 illustrates various stem classes in this language. Section 7.3 discusses stem classes in a more familiar language, Latin.
To make it easier to read the rule, we assign a number to each term of the structural description. Number 1 is the variable X, which can be anything at all. Number 2 is C (any consonant), number 3 is V (any vowel), number 4 is an optional glottal stop (optionality is indicated by parentheses), and number 5 is the end of the stem, shown by a LABELLED BRACKET, where the label N shows that the rule applies to nouns. (We introduced labelled brackets in Chapter 1 in discussing levels of derivational morphology.) Here we consider ʰ and ʰ to be single, glottalized consonants. The indication ‘opt’ under the arrow shows that the rule is optional. If the rule does not apply, no change takes place, and the form is interpreted as singular ([-plural]), since this is the unmarked value of this feature. If the rule applies, it infixes -+ in the correct location and gives the resulting form the feature [+plural]. This analysis is consistent with the lexical view of morphology. The lexicon must generate both singular and plural forms of nouns so that both are available for syntactic processing.

A somewhat more complex example of morphological processes occurs in Arabic.

**Problem 4-2. Arabic.**
(Data from Hayward & Nahmad 1962.)

<table>
<thead>
<tr>
<th></th>
<th>Active, past</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>masc.</td>
<td>[-I, -II]</td>
<td></td>
<td>[+I, -II]</td>
</tr>
<tr>
<td>fem.</td>
<td>[-I, +II]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'write' kataba</td>
<td>katabat</td>
<td>katabta</td>
<td>katabti</td>
</tr>
<tr>
<td>'break' kasara</td>
<td>kasarat</td>
<td>kasarta</td>
<td>kasarti</td>
</tr>
<tr>
<td>'send' baṣaθə</td>
<td>baṣaθat</td>
<td>baṣaθta</td>
<td>baṣaθti</td>
</tr>
<tr>
<td>'push' dafaθa</td>
<td>dafaθat</td>
<td>dafaθta</td>
<td>dafaθti</td>
</tr>
<tr>
<td>'find' wajada</td>
<td>wajadat</td>
<td>wajdta</td>
<td>wajdta</td>
</tr>
<tr>
<td>'see' nazara</td>
<td>nazarat</td>
<td>nazarta</td>
<td>nazarti</td>
</tr>
<tr>
<td>'carry' ḥamala</td>
<td>ḥamalat</td>
<td>ḥamalta</td>
<td>ḥamalti</td>
</tr>
<tr>
<td>'strike' ḏaraba</td>
<td>ḏarabat</td>
<td>ḏarabta</td>
<td>ḏarabti</td>
</tr>
</tbody>
</table>
Here we can isolate the stems as *ktb* ‘write’, *ksr* ‘break’, *bšt* ‘send,’ *dfš* ‘push,’ *wjd* ‘find,’ *nžr* ‘see,’ *hmīl* ‘carry,’ and *dṛb* ‘strike.’ None of these stems is pronounceable by itself—they are discontinuous morphemes.

To form actual words it is necessary to provide each stem with a vowel pattern, one for the active past forms and another for the passive past forms. This again can be stated transformationally, as in (2).

\[
\begin{align*}
\text{(2) a. } & C \ C \ C \ \text{[V-1]} \\
& \begin{array}{cccc}
1 & 2 & 3 & 4 \\
\rightarrow & a & 2 & a \\
\text{opt} & \text{3} & 4
\end{array} \\
& \begin{array}{c}
+\text{past} \\
-\text{passive}
\end{array}
\end{align*}
\]

\[
\begin{align*}
\text{(2) b. } & C \ C \ C \ \text{[V-1]} \\
& \begin{array}{cccc}
1 & 2 & 3 & 4 \\
\rightarrow & u & 2 & i \\
\text{opt} & 3 & 4
\end{array} \\
& \begin{array}{c}
-\text{past} \\
+\text{passive}
\end{array}
\end{align*}
\]

Here the rules state that the verb stem (V-1) is provided with vowels after the first two consonants and simultaneously acquires the morphological features indicated. Although we did not discuss the feature [passive] in Chapter 3, it simply serves to distinguish active from passive verb forms.

This problem illustrates certain verb suffixes also, which serve to indicate the person and gender of the subject. There are also other suffixes denoting dual and plural subjects, which we have omitted here for simplicity. The suffixes with their feature composition are set out in (3). (The first person suffix has no
gender mark, and serves equally for the representation of both masculine and feminine.)

(3)  
a.  -a  [-I, -II, -fem, -dual, -plural]  
b.  -at  [-I, -II, +fem, -dual, -plural]  
c.  -ta  [-I, +II, -fem, -dual, -plural]  
d.  -ti  [-I, +I, +fem, -dual, -plural]  
e.  -tu  [+I, -II, -dual, -plural]  

4.3 Morphemic Representation of Processes

McCarthy (1981) has proposed an alternative analysis for such examples as problem 4-2. His proposal falls within the framework of autosegmental phonology, which provides a formalism for associating strings of segments with higher-level units of various sorts. Originally developed to deal with certain phenomena of tone, its application in morphology can be viewed as follows. An Arabic form such as *kataba* is analyzed as a root *ktb* plus a vowel pattern (or melody) *aa* plus the masculine suffix *-a* given in (3a) that are fit together as in (4).

(4)  
\[\mu\]
\[\begin{array}{c}
\mu \\
k \\
\end{array} \begin{array}{cccc}
  a & t & a & b + a \\
\end{array}\]

Here, the Greek letter $\mu$ (mu) stands for morpheme. By presenting the morphemes in distinct planes with respect to the segmental string, the discontinuous morphemes in this example are accounted for without a transformation. McCarthy claims that the greatest advantage of his approach is that it doesn’t need transformations. It is not clear that he dispenses with transformations entirely, however. One form of the Arabic verb paradigm (the eighth Binyan, to adopt the Hebrew terminology that McCarthy uses) has an infixed *t*. His form looks like (5), with the root *ktb*. 
In order to position this \( t \) correctly, he states a rule which is very much like the infix rule we stated in (1), which in fact is a transformation. Nevertheless, McCarthy develops an explanation for a number of facts of Arabic morphology and phonology using this framework.

However, McCarthy's treatment does not generalize readily to other phenomena that are superficially similar to Arabic. For example, English foot cannot be analyzed as a root \( ft \) plus a 'singular' morpheme \( oo \), since \( ft \) doesn't mean 'foot' in the same way that Arabic \( ktb \) means 'write,' as shown by words like fat, fit, fight, fought, and fate. In English, an ablaut transformation seems to be required. We will continue to develop the notion of transformations for describing morphological processes, bearing in mind that future research may make it possible to constrain the transformational format appropriately.

### 4.4 Reduplication

The second type of morphological process we mentioned at the outset is REDUPLICATION. Reduplication is defined as the repetition of all or part of a morpheme to express a morphological category. If an entire morpheme is reduplicated it is complete reduplication; if only part is reduplicated, it is partial reduplication. Complete reduplication can be thought of as compounding, in which the reduplicated morpheme is compounded with itself. In partial reduplication, the reduplicated part of the morpheme may be prefixed, suffixed, or infixed to the original morpheme. Complete reduplication occurs to a limited extent in English, as in goofy-goody, pooh-pooh, and thick-thick 'very thick.' This last form illustrates one common meaning of reduplication, that of intensification, but it can have many other meanings as well. Complete reduplication occurs also in Québec French, usually with monosyllabic adjectives. I owe these examples to Dominique Bossé (personal communication). Again the meaning is intensive, usually in a negative sense.
(6)  

a. Elle est pas fine fine.
   "She's not brilliant (or nice), she's stupid"

b. Elle est pas fine fine fine.
   "She's not very nice"

c. Il est pas beau beau.
   "He's not handsome, he's ugly"

d. Il est pas beau beau beau.
   "He's not very handsome"

e. C'était pas dur dur.
   "It was not difficult, 'It was easy"

f. Je ne suis pas fou fou de ça.
   "I'm not crazy about that"

As another example of complete reduplication, consider the following forms from Indonesian Malay (Koutsoudas 1966, 61).

(7)  

a. kursi "chair" kursikursi "chairs"

b. lalat "fly" lalatlalat "flies"

c. ibu "mother" ibuibu "mothers"

d. gazdah "elephant" gazdahgazdah "elephants"

e. rumah "house" rumahrumah "houses"

f. medzah "table" medzahmedzah "tables"

Plurality is another common meaning of reduplicated forms. We can assume a compound structure for the plural nouns in Malay, as diagrammed in (8).
Partial reduplication is perhaps more common than complete reduplication. An example from Ilocano, a language of the Philippine Islands, is as follows, where it again forms plurals (Gleason 1955, 28).

(9)  
\[
\begin{align*}
\text{píŋgan} & \quad \text{‘dishes’} \\
\text{tálon} & \quad \text{‘fields’} \\
\text{dálan} & \quad \text{‘roads’} \\
\text{bíag} & \quad \text{‘lives’} \\
\text{nuá} & \quad \text{‘carabaos’} \\
\text{úlo} & \quad \text{‘heads’}
\end{align*}
\]

Notice that no single unit of the stem is reduplicated: the first (C)V(C) of the stem is reduplicated, whether or not this forms a single syllable. We can write a rule for this prefixed partial reduplication as in (10).

(10) \[N (C) V (C) X \]

\[
\begin{array}{ccccc}
1 & 2 & 3 & 4 & 5 \\
\rightarrow & 1 & 2 & 3 & 4 & 3 & 4 & 5
\end{array}
\]

\ [+plural] \ [-stress]

An example of a reduplicative infix (or infixed reduplication) comes from Samoan (Gleason 1955, 29; Marsack 1962).

(11)  
\[
\begin{align*}
a. & \quad \text{manao} & \quad \text{(he) wishes} & \quad \text{mananao} & \quad \text{(they) wish} \\
b. & \quad \text{matua} & \quad \text{(he) is old} & \quad \text{matutua} & \quad \text{(they) are old} \\
c. & \quad \text{malosi} & \quad \text{(he) is strong} & \quad \text{malolosi} & \quad \text{(they) are strong} \\
d. & \quad \text{punou} & \quad \text{(he) bends} & \quad \text{punonou} & \quad \text{(they) bend} \\
e. & \quad \text{savali} & \quad \text{(he) travels} & \quad \text{savali} & \quad \text{(they) travel} \\
f. & \quad \text{pese} & \quad \text{(he) sings} & \quad \text{pese} & \quad \text{(they) sing} \\
g. & \quad \text{laga} & \quad \text{(he) weaves} & \quad \text{laga} & \quad \text{(they) weave} \\
h. & \quad \text{atamai} & \quad \text{(he) is wise} & \quad \text{atamai} & \quad \text{(they) are wise} \\
i. & \quad \text{alofa} & \quad \text{(he) loves} & \quad \text{alofa} & \quad \text{(they) love} \\
j. & \quad \text{galue} & \quad \text{(he) works} & \quad \text{galu} & \quad \text{(they) work} \\
k. & \quad \text{maliu} & \quad \text{(he) dies} & \quad \text{maliu} & \quad \text{(they) die}
\end{align*}
\]

Examination of the data reveals that the next-to-last syllable is reduplicated to form the plural of these verb forms, and that it is placed within the word next to the original next-to-last syllable. This can be formalized by the rule in (12).
(12) $X \ C \ V \ (C) \ V \ ]y$

\[
1 \ 2 \ 3 \ 4 \ 5 \ 6 \rightarrow 1 \ 2 \ 3 \ 2 \ 3 \ 4 \ 5 \ 6
\]

[+plural]

Notice that, in this language, sequences of vowels count as separate syllables: there are no diphthongs. Partial reduplication also occurs in Québec French (again I am indebted to Dominique Bossé). A name can be reduced to its final (stressed) syllable, to which a reduplication of the first CV is prefixed, as in the examples of (13). Jacqueline undergoes some additional alteration. The resulting forms express a kind of affective or intimate meaning.

(13) a. Quiquine (Jacqueline)
b. Fifine (Joséphine)
c. Momone (Simone)

Other short names are made by complete reduplication of the initial CV of the full name in both standard and Québec French.

(14) a. Lolo (Lorraine)
b. Mimi (Michelle, Micheline)
c. Dodo (Doris, Dominique)
d. Jojo (Josée, Johanne)
e. Loulou (Louise)

4.5 Ablaut and Umlaut

ABLAUT is a vowel alternation that expresses morphological categories, especially as it is exhibited in many of the the Indo-European languages, particularly Greek and Germanic. For example, Old English strong verbs with $\acute{e}$ in the present tense have $\tilde{e}$ in the preterite singular 1st and 3rd persons, as shown in (15) (Moore & Knott 1962, 170).
Here -an is the infinitive marker, so that the only thing which distinguishes the present and past stems is the quality of the vowel. If we select bid- as the underlying form of the stem for ‘await,’ we need rule (16) to give the past stem.2

\[(16) \quad [\quad C \quad \tilde{r} \quad C \quad ]_{V^{-1}} \quad 1 \quad 2 \quad 3 \quad 4 \quad \rightarrow \quad 1 \quad \tilde{a} \quad 3 \quad 4 \quad [+\text{past}] \]

UMLAUT is a process that fronts a vowel under specific morphological conditions. It is well exhibited in German, where it marks numerous morphological categories, such as plural in nouns and subjunctive in verbs. In plural nouns umlaut is often accompanied by a suffix.

\[(17) \quad \text{gloss} \quad \text{Singular} \quad \text{Plural} \]

\begin{tabular}{lccc}
'father' & der Vater & die Väter & (without overt suffix) \\
'mother' & die Mutter & die Mütter & \\
'cloister' & das Kloster & die Klöster & \\
\end{tabular}

---

2 The verbs in (15) belong to the first of seven stem classes of strong verbs in Old English. The situation is actually somewhat more complicated than indicated here in that the second person singular and all three numbers of the plural use a distinct past stem, bid in the case of bidan. For some discussion of this problem in the lexical framework see Jensen and Stong-Jensen (1984); for a nonlexical treatment see Anderson (1982).
MORPHOLOGICAL PROCESSES

‘son’ der Sohn die Söhne (plural suffix -e)
‘power’ die Kraft die Kräfte
‘raft’ das Floß3 die Flöße

‘forest’ der Wald die Wälder (plural suffix -er)
‘house’ das Haus die Häuser

(1st or 3rd person singular)
past indicative past subjunctive

‘have’ hatte hättte
‘bring’ brachte brächte
‘know’ wußte wüßte
‘sit’ saß säße

Notice that a suffix -e is added if the past tense form does not already end in e.

This picture of German umlaut is complicated by the fact that umlaut sometimes accompanies certain affixes without being itself a signal of a morphological category itself. An example is the diminutive, discussed in Chapter 3. When the diminutive affixes -chen or -lein are attached to nouns with a back vowel or diphthong, the vowel or diphthong is fronted by umlaut. See example (20) in Chapter 3. But in this case it is the affix that signals diminutive, not the umlaut.

4.6 Tone Rules

TONE RULES assign or change tone morphemes in order to derive a different morphological category. The data of Problem 4-3 from Mono-Bili illustrate the process nicely.

3The letter ß in German represents [s] at the ends of words, before consonants, and between vowels if the vowel before it is long.
Problem 4-3. Mono-Bili (Congo).
(Data from Merrifield et al. 1967, 31.)

1.  àbá dá mì  Father spanked me.
2.  àbá dá mì  Father will spank me.
3.  gbòlò lú màngè  The child planted corn.
4.  gbòlò ú lù màngè  The child will plant corn.
5.  kòmbá zì gbà gà  The bird ate the peanut.
6.  kòmbá zì gbà gà  The bird will eat the peanut.
7.  kàpítà ̀ọ̀ kìndì  The chief burned the field.
8.  kàpítà ̀ọ̀ kìndì  The chief will burn the field.
9.  yàsè zì gbà gà  The woman ate the peanut.
10.  yàsè ̀i zì gbà gà  The woman will eat the peanut.
11.  múrú wó ̀še  The leopard killed him.
12.  múrú wò ̀še  The leopard will kill him.
13.  àbá dá ̀še  Father spanked him.
14.  àbá dá ̀še  Father will spank him.

We can easily isolate the noun stems and the pronouns from these data. The acute accent represents a high tone and the grave accent, a low tone. The verb stems are also easy to isolate; we can assume that the verb stems are without tone in their underlying forms. We now observe that the verb stem carries a high tone in the past tense. We can assume that this tone is assigned to the verb stem by a rule like (18).

\[
(18) \quad [ \begin{array}{l} C \ V \ y \\ 1 \ 2 \ 3 \end{array} ] \rightarrow \begin{array}{l} 1 \ 2 \ 3 \\ \text{[high tone]} \end{array} \text{[+past]}
\]

In the future, the verb stem has a low tone. An added complication occurs in the future, however. If the subject noun preceding the verb has a high pitch, there is no problem. But if the preceding noun has a low pitch, the language requires that a copy of the vowel of the verb, with a high tone, be inserted before the verb. The rule assigning low tone to the verb counts as a morphological process.
under our definition, since it derives the morphological category [+future]. However, the rule that inserts an additional vowel before the verb is a MORPHOPHONEMIC rule. It does not derive a new category, but simply assigns a phonetic realization to the existing morphological category. Therefore, we assume rule (19) to assign low tone to the verb in the future and rule (20) to insert the additional vowel where it is needed. Morphophonemic rules will be discussed at greater length in Chapter 9.

(19) \[
\begin{array}{ccc}
    1 & C & V \\
\end{array} \rightarrow \begin{array}{ccc}
    1 & 2 & 3 \\
\end{array} \\
\text{[low tone +future]}
\]

(20) \[
\begin{array}{ccc}
    1 & X & V \\
\end{array} \rightarrow \begin{array}{ccc}
    1 & 2 & 3 \\
\end{array} \\
\text{[high tone]}
\]

A somewhat different solution is possible within the framework of autosegmental phonology (Goldsmith 1976). In this framework, ‘past’ would be represented as [high tone] and future as the sequence [high tone] [low tone]. In the past tense, [high tone] would be associated with the vowel of the verb. In the future, [low tone] would be associated with the vowel of the verb and [high tone] with a preceding element. If the word before the verb has high tone inherently, the [high tone] of ‘future’ would be associated with it. If the word preceding the verb does not carry high tone, a rule, similar to our rule (20) would be required to insert a vowel in order to carry the high tone required in the future.

4.7 Selected Readings

An early paper dealing with morphemes and processes is Hockett (1954), which contrasts a pure morpheme approach (Item-and-Arrangement) with a pure process approach (Item-and-Process). Transformational grammarians have
tended to assume a process approach (e.g. Chomsky 1965; Anderson 1982); Matthews (1972, 1974) also argues for a pure process model under the name Word-and-Paradigm model.

Two papers discussing morphological infixation in considerable detail are Moravcsik (1977) and Ultan (1975). Ultan, especially, considers the possible positions for infixation and concludes that it is always after the first segment or syllable of a word, or before the last segment or syllable of a word.

Some recent papers have questioned the need for transformations in the description of processes, for example McCarthy (1981), discussed in section 4.3. In a similar vein, Marantz (1982) argues against using transformations for reduplication. These two papers are rather technical, and should not be attempted until you have some acquaintance with autosegmental phonology, the framework in which they are developed.

McCarthy and Prince (to appear) conclude that reduplication is always the repetition of a prosodic unit: syllable, foot, or phonological word.

4.8 Terms to Learn

4.1 morphophonemic processes
infixation
reduplication
ablaut
tone rules
transformation
structural description
structural change

4.2 discontinuous morpheme

4.4 complete reduplication
partial reduplication
intensification
4.9 Problems

**Problem 4-4. Zoque.**
(Data from Wonderly 1965.)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>pata</td>
<td>'mat'</td>
</tr>
<tr>
<td>2.</td>
<td>buru</td>
<td>'burro'</td>
</tr>
<tr>
<td>3.</td>
<td>faha</td>
<td>'belt'</td>
</tr>
<tr>
<td>4.</td>
<td>mula</td>
<td>'mule'</td>
</tr>
<tr>
<td>5.</td>
<td>wakas</td>
<td>'cow'</td>
</tr>
<tr>
<td>6.</td>
<td>kama</td>
<td>'cornfield'</td>
</tr>
<tr>
<td>7.</td>
<td>hayah</td>
<td>'husband'</td>
</tr>
<tr>
<td>8.</td>
<td>gayu</td>
<td>'rooster'</td>
</tr>
</tbody>
</table>

**Problem 4-5. Yidin (Australia).**
(Data from Dixon 1977.)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>buŋa</td>
<td>'woman'</td>
</tr>
<tr>
<td>2.</td>
<td>ɡalal</td>
<td>'big'</td>
</tr>
<tr>
<td>3.</td>
<td>mulari</td>
<td>'initiated man'</td>
</tr>
<tr>
<td>4.</td>
<td>djmur</td>
<td>'house'</td>
</tr>
<tr>
<td>5.</td>
<td>gindalba</td>
<td>'lizard species'</td>
</tr>
<tr>
<td>6.</td>
<td>galambaŋa</td>
<td>'march fly'</td>
</tr>
<tr>
<td>7.</td>
<td>yaburug</td>
<td>'young girl'</td>
</tr>
<tr>
<td>8.</td>
<td>daŋaman</td>
<td>'jump'</td>
</tr>
<tr>
<td>9.</td>
<td>madjandjand</td>
<td>'walk up'</td>
</tr>
</tbody>
</table>

**Problem 4-6. Finnish.**

Add the following to the data of problem 2-2.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>'I'</td>
<td>puhun</td>
<td>'speak'</td>
</tr>
<tr>
<td>'you'</td>
<td>puhut</td>
<td>'want'</td>
</tr>
<tr>
<td>'he'</td>
<td>puhuu</td>
<td>'sing'</td>
</tr>
<tr>
<td>'we'</td>
<td>puhumme</td>
<td>'keep walking up'</td>
</tr>
<tr>
<td>'you (pl.)'</td>
<td>puhutte</td>
<td>'keep walking up'</td>
</tr>
<tr>
<td>'they'</td>
<td>puhuvat</td>
<td>'keep walking up'</td>
</tr>
</tbody>
</table>
Problem 4-7. Tagalog (Philippine Islands).
(Data from Ramos 1971; Ramos & Guzman 1971; stress is not indicated.)

1. sumagot 'answer!' 17. ?uminom 'drink!'
2. sumasagot 'is answering' 18. ?umi?inom 'is drinking'
3. sasagot 'will answer' 19. ?i?inom 'will drink'
4. sinagot 'was answered' 20. ?ininom 'was drunk'
5. sagotin 'be answered' 21. ?i?inomin 'will be drunk'
6. sinasagot 'is being answered' 22. ?ini?inom 'is being drunk'
7. sasagotin 'will be answered' 23. kumanta 'sing!
8. sumagot 'answered' 24. kumakanta 'is singing'
9. binasa 'was read' 25. kakanta 'will sing'
10. babasa 'will read' 26. kinanta 'was sung'
11. bumasa 'read!' 27. kumanta 'sang'
12. binabasa 'is being read' 28. bumisita 'visited'
13. tumulor 'help!' 29. sasayaw 'will dance'
14. tinulor 'be helped' 30. pumupunit 'is tearing'
15. tutulor 'will be helped' 31. pupunitin 'will be torn'
16. tumulor 'be helped' 32. pumipindot 'is squeezing'

Problem 4-8. Arabic.
(Data from Haywood & Nahmad 1962.)

<table>
<thead>
<tr>
<th>gloss</th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
</table>
1. letter (of the alphabet) |  호텔 | חָפָר |
2. heart                  |  قُلْب | قُلْبُ |
3. sword                  |  طِبْخ | سُعُف |
4. knowledge              |  مَلِك | مَلِكُ |
5. lesson                 |  مَسْتَمْلَع | مَسْتَمْلَاع |
6. month                  |  شَهْر | شَهْرُ |
7. king                   |  مَلِك | مَلِكُ |
### Problem 4-9. Agta (Philippine Islands).
(Data from Healey 1960.)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>labaŋ</td>
<td>‘patch’</td>
<td>18.</td>
</tr>
<tr>
<td>2.</td>
<td>takki</td>
<td>‘leg’</td>
<td>19.</td>
</tr>
<tr>
<td>3.</td>
<td>ulu</td>
<td>‘head’</td>
<td>20.</td>
</tr>
<tr>
<td>4.</td>
<td>uffu</td>
<td>‘thigh’</td>
<td>21.</td>
</tr>
<tr>
<td>5.</td>
<td>abikan</td>
<td>‘near’</td>
<td>22.</td>
</tr>
<tr>
<td>6.</td>
<td>adanuk</td>
<td>‘long’</td>
<td>23.</td>
</tr>
<tr>
<td>7.</td>
<td>addu</td>
<td>‘many’</td>
<td>24.</td>
</tr>
<tr>
<td>8.</td>
<td>apisi</td>
<td>‘small’</td>
<td>25.</td>
</tr>
<tr>
<td>9.</td>
<td>wer</td>
<td>‘creek’</td>
<td>26.</td>
</tr>
<tr>
<td>10.</td>
<td>talobag</td>
<td>‘beetle’</td>
<td>27.</td>
</tr>
<tr>
<td>11.</td>
<td>bakkakat</td>
<td>‘granny’</td>
<td>28.</td>
</tr>
<tr>
<td>12.</td>
<td>bag</td>
<td>‘g-string’</td>
<td>29.</td>
</tr>
<tr>
<td>13.</td>
<td>kwak</td>
<td>‘mine’</td>
<td>30.</td>
</tr>
<tr>
<td>14.</td>
<td>pirak</td>
<td>‘money’</td>
<td>31.</td>
</tr>
<tr>
<td>15.</td>
<td>abbıŋ</td>
<td>‘child’</td>
<td>32.</td>
</tr>
<tr>
<td>16.</td>
<td>bahuy</td>
<td>‘pig’</td>
<td>33.</td>
</tr>
<tr>
<td>17.</td>
<td>pesuk</td>
<td>‘peso’</td>
<td>34.</td>
</tr>
</tbody>
</table>

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### Problem 4-10. Turkish
(Data from Lewis 1967 and Hony and Iz 1957.)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>ačık</td>
<td>‘open’</td>
<td>11.</td>
</tr>
<tr>
<td>2.</td>
<td>dolu</td>
<td>‘full’</td>
<td>12.</td>
</tr>
<tr>
<td>3.</td>
<td>kara</td>
<td>‘black’</td>
<td>13.</td>
</tr>
<tr>
<td>4.</td>
<td>kırmızı</td>
<td>‘red’</td>
<td>14.</td>
</tr>
<tr>
<td>5.</td>
<td>kizil</td>
<td>‘red’</td>
<td>15.</td>
</tr>
<tr>
<td>6.</td>
<td>kuru</td>
<td>‘dry’</td>
<td>16.</td>
</tr>
<tr>
<td>7.</td>
<td>sari</td>
<td>‘yellow’</td>
<td>17.</td>
</tr>
<tr>
<td>8.</td>
<td>taze</td>
<td>‘fresh’</td>
<td>18.</td>
</tr>
<tr>
<td>9.</td>
<td>uzun</td>
<td>‘long’</td>
<td>19.</td>
</tr>
<tr>
<td>10.</td>
<td>yeni</td>
<td>‘new’</td>
<td>20.</td>
</tr>
</tbody>
</table>
5.1 Preliminaries

Up to this point, we have been assuming that all morphological operations take place before all phonological rules. This ordering relation obtains in the example we gave of the regular English plural morpheme in Chapter 1: first the morpheme /-z/ is attached to a noun, then the phonological rules of vowel insertion or devoicing apply to produce correct phonetic forms. Such ordering of morphological and phonological processes has been assumed since the beginning of work in generative grammar.

However, there is some evidence that at least some phonological rules apply before some morphological rules. Siegel (1974) called attention to the fact that some affixes are sensitive to the phonological structure of the words they attach to, where the phonological structure itself is produced by rules. An example is the suffix -al, attached to certain verbs to give nouns. The condition is that the verb must have stress on its final syllable and may have no more than two consonants at the end, of which the last must be anterior (labial or alveolar) and the next-to-last must be a sonorant. This condition can be stated formally by the SUBCATEGORIZATION FRAME in (1).

\[(1) \quad \text{-al} \] \(N \) / \( [ \text{+syl} \] \( [ \text{+stress} \] \( [ \text{-syl} \] \( [ \text{-syl} \] \( [ \text{+ant} \] \( [ \text{+ant} \) ] ] ] ] ] ] v ___

Examples of verbs that meet this condition are given in (2).
That the final consonant must be [+anterior] can be seen from the impossibility of *begrudgeal, *rebukal, *impeachal, *encroachal, and *detachal, although the intended meaning is clear enough in each case. That the vowel in the last syllable must be stressed is seen from the impossibility of *promissal, *abandonal, *developal, and *edital. That there can be only one obstruent after the stressed vowel is shown by the impossibility of *acceptai and *resistal. Notice that not all verbs that meet the conditions of (1) allow noun-forming -al — gaps such as *derival, *conceiveal, *forceal seem to be accidental.

It may seem that burial is an exception, since bury does not have final stress. But final y is exceptional in other ways that suggest that it should not count as a syllable. For example, adjective-forming -ful, as in artful, normally attaches only to final stressed nouns, but it also attaches to penultimately stressed nouns in y, as fanciful, merciful, pitiful, plentiful, bountiful, beautiful, and dutiful. Similarly, comparative -er normally attaches only to monosyllables, as in longer, but it also attaches to penultimately stressed adjectives in y, as in rosier, wearier, daintier, prettier, thirstier, and dustier. It is plausible to assume that y is an underlying glide which becomes syllabic only by a later rule of phonology.¹

Now, stress in English is predictable in a wide range of cases, which suggests that it is assigned by a phonological rule. With few exceptions, a verb is assigned final stress if its final syllable contains a long vowel or diphthong or ends in two or more consonants. The verbs in (2) are of this form, except for acquit, which has final stress even though it ends in a short vowel followed by

1 Note that this implies that schema (1) should be revised to allow up to two sonorants after the stressed vowel. I know of no other forms that appear to make this necessary, however.
only one consonant. Therefore, the verbs in (2), and many others, are assigned final stress.

It might be objected that we needn't rely on a phonological rule of stress to determine whether or not -al can attach to verbs. Since stress is predictable on the basis of the segmental makeup of the verb, we could build these stress conditions into the subcategorization frame of -al attachment. Assuming that diphthongs are derived from underlying long vowels, we could state the subcategorization frame for -al as in (3).

\[
(3) \quad -al / \begin{cases} 
\left[ \begin{array}{c}
+\text{syll} \\
+\text{long} \\
+\text{son} \\
+\text{ant} \\
\end{array} \right] \left( \begin{array}{c}
-\text{syll} \\
-\text{son} \\
-\text{syll} \\
+\text{ant} \\
\end{array} \right) \\
\left[ +\text{syll} \right] \\
\left[ -\text{syll} \right] \\
\left[ -\text{son} \right] \\
\left[ +\text{ant} \right] \\
\end{cases} \end{array} \] 
\]

There are three problems with this analysis. First, the subcategorization frame in (3) has to state the same conditions twice: first that a long vowel may OPTIONALLY be followed by a sonorant and an anterior consonant, and second that a (short) vowel MUST be followed by exactly the same sequence of consonants in order for -al attachment to be successful. Second, frame (3) builds in some of the same conditions as the stress rule, which is needed independently to place stress correctly. Finally, this formulation has no way to handle exceptions like acquit. Such words are exceptions to the stress rules in any analysis, but in an analysis incorporating (3) they are exceptions to -al attachment also, in that -al attachment must be allowed to affect acquit even though it does not meet the requirements of (3). It is preferable to say that acquit is exceptional in having final stress, and that the conditions of -al attachment, stated as in (1) in terms of stress, applies to irregularly stressed as well as regularly stressed forms.

Accepting this result commits us to assuming a model of the lexicon that incorporates at least the levels in (4).
5.2 The Level-Ordering Hypothesis

We will now show that a somewhat more complex system is needed. Siegel (1974) shows that morphological processes are also assigned to distinct levels. One indication of this is the ordering of affixes. Given the adjective-forming suffix -ian, and the noun-forming suffix -ism, they can appear only in the order -ian-ism, as shown in (5).

(5)  a. Mendelianism
     b. Mongolianism
     c. *Mendelismian
     d. *Mongolismian

Notice that this cannot be explained merely on the basis of the subcategorization frames of the affixes above. -ism attaches to nouns or adjectives to form nouns, while -ian attaches to nouns to form adjectives. These subcategorization frames are shown in (6).

(6)  a. -ism]N / \{N A\} ___
     b. -ian]A / N ___

Judging from the frames above, we might expect (5c, d) to be well formed. Siegel proposes that -ian is a primary suffix while -ism is a secondary suffix, and suggests a constraint that primary affixes are attached before
secondary affixes. This ensures that primary affixes (prefixes or suffixes) are always closer to the root than secondary affixes. Siegel distinguishes primary affixes by a + boundary (boundary:morpheme, e.g. +ian) and secondary affixes by a # boundary (boundary:word, e.g. #ism). We can capture the ordering facts by having at least two levels of morphology. Further results indicate that English requires three levels of morphology and phonology. We will discuss these further in section 5.5. Anticipating these results for the moment, our revised model of the grammar now looks like (7). This is called the Level-ordering Hypothesis for phonology and morphology.
I have listed three levels of both phonology and morphology in (7) although we have yet to give examples of level 3 morphology or of levels 2 and 3 phonology. We will get to these presently.

In (7), unlike (4), I show each level of morphology feeding back into the corresponding level of phonology, allowing the rules to apply cyclically. This
is because primary suffixes like +ian can have additional phonological consequences. Consider the nouns Mendel, Mongol, Parkinson, to which +ian can be added. They all have [a] in the last syllable and are stressed on the first syllable. But, when +ian is attached, the vowel is lengthened and the stress shifts to the syllable before the suffix: Mendélian, Mongólian, Parkinsónian. This shows that the stress rules must apply both before and after the attachment of primary suffixes in English, as allowed for in model (7). Notice that stress shift is not applicable to words like Mendel when secondary affixes are attached to them: Méndelism, Môngolism, Párkinsonism. This organization of the grammar was first suggested by Pesetsky (1979) and further developed by Kiparsky (1982a, 1982b). We will refer to rules that appear at one (or more) lexical levels (either phonological or morphological) as lexical rules; phonological rules that apply outside the lexicon are called postlexical rules.

Let us consider some other effects of model (7). English has several negative prefixes, including in- (level 1) and non- (level 2). Both can be added to words like legible but only in- undergoes assimilation: il-legible but nonlegible. Furthermore, they can both be prefixed, but only in one order: nonillegible, *innonlegible. This is consistent with our model if we assume that the rule assimilating n to / (and other consonants: irreversible, impossible) is a rule of level 1 phonology.

Another level 1 suffix in English is -ity, which forms nouns from adjectives, as in sane, sanity. In sanity we observe the effects of a level-1 phonological rule known as Trisyllabic Laxing, which laxes a vowel in the third syllable from the end of a word (on condition that the penultimate vowel is unstressed). This gives us a chance to observe an interesting property of lexical rules: they apply only in a derived environment. Sanity illustrates the concept of derived environment, since it is formed by combining two morphemes: sane + ity. Therefore, Trisyllabic Laxing can apply, giving sánity. But this rule does not apply to monomorphemic words, such as nightingale, Avery, Oberon. These words are not derived, since they consist of a single morpheme each. This fact blocks Trisyllabic Laxing in these cases. Furthermore, Trisyllabic Laxing does not apply in words like heedlessness, tastelessness, even though these do illustrate derived environments. The suffixes #less and #ness are both level 2 suffixes, and when they are attached, the level 1 rule of Trisyllabic Laxing has been passed and so it is inapplicable.
5.3 Zero Derivation

English also allows word formation by zero derivation, already mentioned briefly in Chapter 1. For example, from the verb *spy* we derive the noun *spy*, ‘one who spies.’ (Semantically, this direction of derivation is more plausible than the reverse, i.e. deriving *spy* ‘to act as a spy’ from *spy*.)

Interestingly, when a longer verb is turned to a noun it may shift its stress to the noun pattern. Nouns in English are stressed by the same rule as verbs except that the last syllable in polysyllabic nouns is ignored. This results in the noun having stress one syllable earlier than the corresponding verb. Therefore, from *torment*, *protest* are derived the nouns *torment*, *protest*. The second syllable does not completely lose stress in these words, but is reduced to secondary stress, showing that they were originally stressed as verbs. Two-syllable nouns not derived from verbs generally have no stress on the second syllable, as *system*.

The stress shift in nouns zero-derived from verbs shows that this morphological operation must be assigned to level 1 morphology, since the stress rules are on level 1 phonology. To illustrate, consider the derivation of *protest* in (8).

(8) underived lexical item:  
level 1 phonology: stress  
level 1 morphology:  
zero derivation of noun  
level 1 phonology: stress  

However, when verbs are zero-derived from nouns, they do not shift to a characteristic verb-stress pattern. For example from *pattern* the derived verb is *pattern*; *pattern* would be impossible. We can account for this if we assign zero derivation of verbs from nouns to level 2 morphology. Since this is after the stress rules of level 1 phonology, these zero-derived verbs escape these stress rules and are stressed as nouns.

5.4 Productivity and Blocking

This difference between the levels of zero derivation of nouns and verbs correlates with a difference in *productivity*. Broadly speaking, verbs are derived freely from nouns by zero derivation at level 2 unless there exists a level 1 form of the same meaning. Thus *pattern* can turn to a verb *to pattern*, but
we don’t get *to system because of the existence of systematize, formed by the level 1 suffixes +at+ and +ize (Kiparsky 1982b, 140). This process is known as blocking, and it is quite general. For example Aronoff (1976, 43-5) shows that adjectives in +ous do not form derivative nouns in +ity if a noun with the presumed meaning exists independently: curious gives curiosity but glorious does not give *gloriousity because of the existence of glory. However, the existence of an +ity form does not block the formation of a noun in #ness, such as curiousness. This can be explained by the difference in meaning between the two forms. Aronoff notes that “nouns of the form Xousness have the following three paraphrases” and in fact only these (1976, 38).

(9) a. The fact that Y is Xous
   His callousness surprised me.
   = The fact that he was callous surprised me.

b. The extent to which Y is Xous
   His callousness surprised me.
   = The extent to which he was callous surprised me.

c. The quality or state of being Xous
   Callousness is not a virtue.
   = The quality or state of being callous is not a virtue.

Aronoff refers to the fact that the meaning of a form Xousness is completely predictable from the meaning of Xous as semantic coherence: the suffix #ness is SEMANTICALLY COHERENT.

Nouns with the suffix +ity are less semantically coherent, in that, while they can have the meanings of (9a-c) they commonly have other meanings as well. Thus, curiosity can have meanings (9a,b) (His curiosity disturbed me), (7c) (Curiosity can be dangerous), and another, paraphrasable as ‘something strange or fascinating’ (Collins English Dictionary). Since curiousness cannot have this last meaning of curiosity, the two forms are not synonymous, and curiousness is not blocked.

In a similar vein, consider the zero-derived noun spyN, which we derived at level 1 from the verb spyV. The existence of spyN blocks the otherwise very productive level 2 rule that forms agentive nouns by suffixing #er: we don’t have *spier because it would mean the same as spyN. We can imagine spier as a neologism, however, perhaps with the meaning ‘voyeur.’ Similarly, the
existence of the nouns bore\textsubscript{N}, (dull person or activity) guide\textsubscript{N}, inhabit\textsubscript{ant} block the level 2 derivation of *bor\#er, *guid\#er, *inhabit\#er. However, blocking is inapplicable if words of different meaning are derived. Consider the examples in (10), from Kiparsky (1983).

\begin{enumerate}
\item a. drill (device) \quad \text{driller (person)}
\item b. cook (person) \quad \text{cooker (device)}
\item c. informant (in linguistics) \quad \text{informer (to the police)}
\item d. bore (cylindrical hole) \quad \text{borer (tool for boring holes, kind of insect)}
\end{enumerate}

Similarly, the existence of thief blocks *stealer, but a base-stealer is possible in baseball.

At this point, it may be worthwhile to state blocking as a formal principle, which Kiparsky (1983, 15) calls the Avoid Synonymy Principle.

(11) Avoid Synonymy Principle

The output of a lexical rule may not be synonymous with an existing lexical item.

5.5 Further Results of Level-Ordered Morphology

We have not yet given any examples of morphological rules at level 3. The rule that attaches the regular plural suffix /-z/ in English belongs here. We assume that irregular plurals are formed at level 1. This implies that irregular plurals are available for compounding, a level 2 morphological process, but that regular plurals are not. This seems to be correct, as the examples in (12) show.

\begin{enumerate}
\item teeth marks *claws marks
\item lice-infested *rats-infested
\end{enumerate}

The only time we find regular plurals inside compounds is when they are pluralia tantum (literally: plural only; the singular is plurale tantum)—words that exist only in the plural. Some examples are given in (13).
We can assume that pluralia tantum are listed in the lexicon with the regular plural suffix. The theory does not allow the underlying forms *alm, *odd, with the plural affix added at level 3, since this operation would violate (11). The consequence, that they are listed in the dictionary of morphemes, predicts that they appear in compounds only as plurals, as (13) shows.

Returning now to blocking, we notice that the plural affix /-z/ can only be added to a noun once. Given the subcategorization frame that we assumed for this affix in (13) of Chapter 2, repeated here as (14a), and the structure of the resulting form, given as (14b), you might expect multiple attachment of the plural affix.²

(14) a. /-z/ \[ +N \]  
    b. \[ N \]  
        \[ N \]  
        \[ cat \]  
        \[ z \]  

But blocking (11) prevents any further attachment of /-z/ to (12b).

The same is true of irregular pluralia tantum, such as cattle, which, because it is inherently [+plural], is not provided with a plural affix at level 3: *cattles.

² Welsh permits two plural endings to be added to a stem.

(i) a. peth 'thing'  (ii) a. esgid 'shoe'  
    b. pethau 'things'  b. esgidiau 'shoes'  
    c. petheuau 'various things'  c. esgideuau 'pair of shoes'

Blocking does not prevent (ic) (iic) since they mean something different from (ib) and (iib).
The noun *people* is similar when it serves as the irregular plural of *person* but not in its meaning of 'nationality' when it has the regular plural *peoples*.

There are two further results of having verb-to-noun zero derivation on level 1 and noun-to-verb zero derivation on level 2. First notice that most verbs ending in *Xing* or *Xink* are irregular in that they form their inflected forms by ABLAUT. Some examples are given in (15).

(15)  
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>sing</td>
<td>sang</td>
</tr>
<tr>
<td>b.</td>
<td>bring</td>
<td>brought</td>
</tr>
<tr>
<td>c.</td>
<td>ring</td>
<td>rang</td>
</tr>
<tr>
<td>d.</td>
<td>sink</td>
<td>sank</td>
</tr>
<tr>
<td>e.</td>
<td>stink</td>
<td>stank</td>
</tr>
<tr>
<td>f.</td>
<td>think</td>
<td>thought</td>
</tr>
</tbody>
</table>

The (apparent) exceptions to this exceptional behaviour (i.e. verbs in *Xing* or *Xink* that take regular inflections) are mainly those that are zero-derived from nouns. Since this derivation occurs on level 2, we predict that only regular inflections are possible with these words. This prediction is correct.

(16)  
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>ring</td>
<td>ringed</td>
</tr>
<tr>
<td>b.</td>
<td>wing</td>
<td>winged</td>
</tr>
<tr>
<td>c.</td>
<td>ink</td>
<td>inked</td>
</tr>
<tr>
<td>d.</td>
<td>link</td>
<td>linked</td>
</tr>
</tbody>
</table>

Thus we can say that the ablaut rules of level 1 that produce the irregular forms of *sing* and similar verbs are more general, since they are automatically blocked from applying to level 2 derived verbs.

The second result concerns noun-verb pairs referring to an instrument and the activity carried out with that instrument. Kiparsky (1983, 11) argues that in some such pairs the verbs are basic, with nouns derived from them at level 1, while in others the nouns are basic, with verbs derived from them at level 2. In the first class, some examples of which are listed in (17), the noun is the most typical instrument for the activity, but the activity can be carried out using other instruments, as shown in (18) (some examples are Kiparsky’s).

(17) hammer, brush, paddle, string, whistle, saw, anchor, comb, wedge
(18)  
   a. he hammered the nail with a rock.  
   b. he brushed the clothes with his hand.  
   c. I paddled the canoe with a copy of *The Financial Times*.  
   d. She strung the picture up with a wire.  
   e. Can you whistle with a blade of grass?  
   f. He had to saw the bread with the knife.  
   g. They anchored the ship with a rock.  
   h. He combed the grass with a rake.  
   i. We wedged the door open with a brick.

The sentences of (18) are possible because the verbal meaning is basic, not the noun. "Thus, *to hammer* does not mean 'to strike with a hammer' but something like 'to strike with the flat surface of a solid object'” (Kiparsky 1983, 12), or ‘to strike . . . with or as if with a hammer’ (*Collins English Dictionary*). This is what is expected if the noun is derived from the verb at level 1: a hammer is an instrument for hammering. In other seemingly similar pairs, the noun is the only possible instrument for the activity named by the verb. Typical words of this class are listed in (19); the impossibility of using another instrument is demonstrated in (20). (Some examples are Kiparsky’s.)

(19) tape, rivet, chain, button, pitchfork, bicycle, screw, staple, hacksaw, snowplow, ink

(20)  
   a. *She taped the picture to the wall with pushpins.  
   b. *He riveted the parts together with nails.  
   c. *They chained the entrance off with a rope.  
   d. *She buttoned up her dress with snaps.  
   e. *He pitchforked the manure with a shovel.  
   f. *They screwed the lamp to the ceiling with glue.  
   g. *He stapled the papers together with a paper clip.  
   h. *The artist inked his drawing with crayons.

The verbs of (19) are derived from the corresponding nouns by zero derivation at level 2; thus the meaning of the noun is an essential component of the meaning of the verb and no other instrument can be mentioned. *Tape* means ‘to furnish with tapes, to bind, measure, secure, or wrap with tape’ (*Collins English Dictionary*). Contrast this with the same dictionary’s definition of *hammer* above. Since compounds are also derived at level 2, we predict that,
for compound noun-verb pairs, the noun again is basic and the verb is zero-derived from it; therefore with compounds we get a pattern similar to (21) (Kiparsky's examples).

(21) a. *They padlocked the door with a latch.
    b. *He snowplowed the sidewalk with a shovel.
    c. *She charcoaled the drawing with ink.

Kiparsky concludes "that the level-ordered lexical framework discloses nontrivial regularities in the phonology, morphology, and semantics of English noun/verb pairs. It seems also that rather rich principles must be at work to permit the acquisition of this much structure that is not encoded by any overt affixes" (Kiparsky 1983, 13).

A key idea in lexical morphology is that internal brackets are erased at the end of each level. This is similar to the convention in generative phonology that brackets are erased at the end of each cycle in the application of the cyclic rules. This ensures that morphological rules on some level do not have access to the internal structure of words formed at earlier levels. Kiparsky (1982b, 140) states this condition as Bracket erasure (22).

(22) Bracket erasure

Internal brackets are erased at the end of a level.

Let us illustrate by returning to the example of protest. In (8) we showed the derivation of the noun protest\(_N\) at level 1. In the discussion we pointed out that this noun can in turn derive a verb at level 2, to protest. The derivation of this form is given in (23), where bracket erasure takes place between levels 1 and 2.
(23)  underived lexical item
       level 1 phonology: stress  [protest]v
       level 1 morphology: zero derivation  [[protést]v Ø]N
       level 1 phonology: stress  [[protést]v Ø]N
       bracket erasure  [protèst]N
       level 2 phonology  ——
       level 2 morphology  [[protèst]N Ø]v
       level 2 phonology  ——
       level 3 morphology and phonology  ——

Kiparsky proposes a constraint that zero suffixes cannot be added to suffixed forms (1982b, 141).

(24)  Constraint on zero derivation:  * ] X ] Ø ]

From (24) and bracket erasure it follows that nouns formed with level 1 suffixes can give zero-derived verbs (25a), but not nouns formed with level 2 suffixes (25b) (Kiparsky’s examples).

(25)  a. to pressure, to picture, to commission, to proposition, to engineer

       b. *to singer, *to beating, *to championship, *to nationalist,
          *to sisterhood

To see this, consider the derivation of to pressure in (26).

(26)  underived lexical item  [press]v
       level 1 phonology: stress  [préss]v
       level 1 morphology: -ure  [[préss]v ure]N
       level 1 phonology  ——
       bracket erasure  [préssure]N
       level 2 phonology  ——
       level 2 morphology: zero-derivation  [[préssure]N Ø]v
       level 2 phonology  ——
       bracket erasure  [préssure]v

The derivation in (27) shows why *to singer is blocked by (24).
Similarly, verbs formed with suffixes never give zero-derived nouns. If the suffix is added at level 1, zero derivation of a noun, also at level 1, is blocked by (24). Examples (Kiparsky’s 1982b, 141) are *a publicize, *a demonstrate, *a clarify. The derivation in (28) shows why.

If the suffix were added at level 2, verb-to-noun zero derivation would be impossible because it is restricted to level 1. However, there are no suffixes forming verbs at level 2, so we cannot test this claim. A final result of the ordering relations we assume here is that noun compounds can become verbs, as in (29a), but verb compounds cannot become nouns, as in (29b).

Since compounds are formed at level 2, noun compounds can undergo zero derivation to verbs at level 2, but verb compounds cannot be returned to level 1 for zero derivation to nouns, under the assumptions of the theory. Show-off and break-in are not exceptions, since they are not zero derived from verbs (show off is a verb plus particle) but are compounds. These will be discussed in Chapter 6.
5.6 Selected Readings

Lexical phonology is undergoing rapid development. In addition to the model for English discussed here, there have been several alternate proposals. Kiparsky (1985) revises his earlier system to one in which there are only two lexical levels for English, of which only the first level is subject to strict cyclicity, but where all lexical levels are subject to structure preservation. In this model, level 2 corresponds to levels 2 and 3 in the discussion in the text. A competing model is proposed in Halle and Mohanan (1985) and Mohanan (1986) which contains four lexical levels for English. The arguments for these systems are complex but worth pursuing. In addition to English, this model has been applied to a number of languages. Booij and Rubach (1987) discuss a number of issues in Polish and Dutch, Mohanan discusses Malayalam, a Dravidian language of southern India, and Pulleyblank (1986) discusses a number of African tone systems, including Yoruba. Because the theory is evolving so rapidly, it is hard to predict where it will go in the next few years. It is clear that further research is needed to determine if the number of levels is variable in different languages and which levels are cyclic.

5.7 Terms to Learn

5.2 primary (affix)
    secondary (affix)
    + boundary (morpheme boundary)
    # boundary (word boundary)
    level-ordered hypothesis
cyclically
lexical rules
postlexical rules
Trisyllabic Laxing
derived environment

5.4 productivity
    blocking
    semantic coherence
    Avoid Synonymy Principle

5.5 pluralia tantum
    bracket erasure
Problem 5-1.

In sections 5.2 and 5.4 we discussed the two English affixes \( +ity \) and \( #ness \), which we assigned to levels 1 and 2 respectively on the basis of their phonological and morphological behaviour. Find a similar pair of affixes in some other language, assigning the affixes to distinct lexical levels on the basis of the criteria we discussed for English. The affixes need not be identical in meaning, but it would be best if you could find affixes with similar meanings. On the phonological side, look for irregular morphophonemic changes, such as stress assignment, assimilations, and Trisyllabic Laxing in English, bearing in mind that the rules in your language may be quite different from these English-particular rules. On the morphological side, consider the possible ordering of affixes, the productivity of the affixes, and the semantic effects of blocking. You will need to consult such reference material as dictionaries and grammars of the language, and you should seek the assistance of native speakers of the language if you are not one yourself. Backwards dictionaries, those listing words alphabetically by their ends, are especially useful for investigating suffixes. In writing up your discussion, be sure to acknowledge all the sources you consulted, including the native speaker, if any.
6

Compounds

6.1 Types of Compounds

Two types of compounds are recognized in English: **synthetic compounds**, whose second member is derived with a verbal affix (-ing, -er, -ed) or is a past participle, such as *breath taking, watch maker, long-tailed, man made*, and **primary compounds** (Marchand (1969), Lieber (1983)), which includes all other types. We will consider primary compounds first. The first thing to notice is that compounds made of two nouns, two adjectives, or a noun and an adjective are extremely common, easily created, and freely interpreted. Compounds containing prepositions and verbs, however, are far less productive.

Another traditional distinction is between endocentric and exocentric compounds. (In fact these terms are applied to a variety of other structures as well.) **Endocentric** compounds have a **head**, in English the right member, which gives the basic meaning of the compound as a whole, such as *mailman*, a ‘man who delivers the mail.’ **Exocentric** compounds are not headed in this way. Examples are *redcap*, which is not a kind of *cap* but a porter in a railway station, and *push up*, which is a noun, although its right member is a preposition (or adverb). To begin with, we will confine our attention to endocentric compounds. The table in (1) shows some of the more common types.
Examples of the first four types in (1) are very common, especially the endocentric ones. Those which are nouns are interpreted in a great variety of ways. A **steamboat** is a boat powered by steam; an **airplane** is a plane that flies in the air; a **blackbird** is a bird with black or dark plumage; a long house is “a long communal dwelling of the Iroquois and other North American Indian peoples” *(Collins English Dictionary)*; a **strawberry** is a kind of berry that spreads by runners that vaguely resemble straw, or grows in straw; a **cranberry** is simply a kind of berry, since *cran-* means nothing on its own (it is derived from Low German *kraan* ‘crane’). The adjectives have similar properties: **knee-deep** is ‘deep enough to reach the knees of someone standing,’ **ice-cold** is ‘as cold as ice,’ and **bittersweet** is ‘bitter and sweet.’ These examples show that virtually any relation can exist between members of a compound that are nouns and adjectives. By contrast, compounds containing a verb or preposition are considerably less productive and appear to be subject to severe constraints. Nouns such as **underarm** and **drawbridge**, verbs like **spoon-feed, sweet-talk, overshoot**, and **freeze dry** are fine, but compounds like *put-box, seem-dog,*
*above-green seem completely impossible and are downright uninterpretable. Why should a difference exist between these two types?

6.2 Argument Structure and Feature Percolation

Lieber (1983) has provided an elegant account of these facts. In order to understand her system, we will have to introduce some terminology. First, let us consider the argument structure of words. This concept is most easily understood in connection with verbs. The verb *run* is intransitive, and it takes a single argument, the agent of the running. The verb *hit* is transitive, and takes two arguments, the agent of the hitting and the patient. A verb like *put* takes three arguments, an agent, a theme (the thing being put), and a goal. At most one argument of a verb can be an external argument, which, if present, functions as its subject; all other arguments of a verb are called internal arguments. An example of a verb with no external argument is *seem*. In a sentence like (2a), the overt subject *it* is not an argument, but merely a dummy, as in (2b), since English sentences require an overt subject (except in the imperative). In (2c), John is not the logical subject of *seem* but the logical subject of *is smart*.

(2)  

a. It seems that John is smart.

b. It is snowing.

c. John seems to be smart.

Prepositions have only an internal argument. Nouns and adjectives usually have no obligatory internal arguments. Adjectives characteristically have an external theme (3a), but some adjectives have an internal theme, such as *fond* (3b, c) and *desirous* (3d, e).

(3)  

a. The car is green.

b. *John is fond.

c. John is fond of sherry.

d. *John is desirous.

e. John is desirous of a new coat.

A second key idea in the analysis of compounds is Lieber’s concept of feature percolation, by which features of the morphemes that make up a word are interpreted as features of the word as a whole. In Chapter 3, section 3.11,
we gave the essential content of these conventions. I will give Lieber’s version in full here, somewhat paraphrased. The first three conventions are universal; the fourth is specific to English.

(4) a. Convention I

All features of a stem morpheme, including category features, percolate to the first non-branching node dominating that morpheme.

For example, the category features that specify that *derive* is a verb are placed on its immediately dominating node as shown.

```
N
 \  \\
 V /  \\
 /  \\
[[derive]V] ation]N
```

b. Convention II

All features of an affix morpheme, including category features, percolate to the first branching node dominating that morpheme.

For example the fact that -*ation* makes a noun out of the stem it is attached to is shown thus:

```
N
 \  \\
 V /  \\
 /  \\
[[derive]V] ation]N
```
c. Convention III

If a branching node fails to obtain features by Convention II, features from the next lowest labelled node percolate up to the unlabelled branching node.

For example, the prefix *counter-* in English has no category features of its own. If attached to a verb, the result is a verb, as *counterattack*. If attached to a noun, the result is a noun, as *counterexample*. If attached to an adjective, the result is an adjective, as *counterproductive*. Therefore, the category features of the stem percolate, since the prefix lacks specification for these features, as shown.

\[
\begin{array}{c}
\text{N} \\
\text{N} \\
[\text{counter}]_{\text{N}} \\
[\text{example}]_{\text{N}} \\
\end{array}
\]

d. Convention IV

If two stems form a compound, features from the right-hand stem percolate up to the branching node dominating the stems. For example:

\[
\begin{array}{c}
\text{A} \\
\text{N} \\
\text{A} \\
[[\text{knee}]_{\text{N}} \\
[\text{deep}]_{\text{A}} \\
\end{array}
\]

Reduced to the essentials, Conventions I through III mean that all features percolate, with features of affixes taking precedence over those of stems where there is a conflict. Convention IV is language-specific, since other languages
may percolate features from the left-hand stem in compounds. Lieber (1980) argues that this is the case in Vietnamese.

Lieber (1983, 257) proposes the Argument-linking Principle to govern compounds. Freely paraphrased, this principle states the following.

(5) Argument-linking Principle

a. An element of a compound must be able to LINK all its obligatory internal arguments.

b. A compounded stem not linked by an argument-taking stem compounded with it must be interpretable as a restrictive modifier of that stem, i.e. as a locative, manner, instrumental, or benefactive.

A stem can link its obligatory internal arguments in two ways. If features of the stem percolate to the compound as a whole, then it must link its arguments outside the compound because among the features percolated are those indicating the stem’s argument structure. In a compound like hand weave, for example, the argument structure of weave becomes the argument structure of the compound by feature percolation Convention IV (4d). Weave has a single internal argument, a patient, i.e. the thing being woven. This argument must be satisfied outside the compound by (5a), as in (6).

(6) We handweave all our own cloth.

Now, by (5b), the compounded stem hand, which is not linked by weave, must be interpreted as a restrictive modifier of the verb weave, normally as an instrumental ‘by hand.’

When a verb or preposition appears as the left member of a compound in English, its features do not percolate to the compound, and thus its argument structure must be satisfied within the compound. This is the case of drawbridge and underarm, for example. A drawbridge is a ‘bridge which one draws,’ the head is bridge and the compound is a noun. Bridge has no obligatory argument structure, so no arguments must appear outside the compound. Draw has an obligatory internal argument, the THEME (that which is drawn). This argument must be found within the compound, as it is in drawbridge, drawstring, and so on. Although the productivity of this type has been questioned (Bauer 1983,
punchcard seems to be a relatively recent formation; others cited by Marchand (1969, 74) are draw curtain, drop curtain, push-cart, showplace, treadmill, knitwear. In French, this type of compound is particularly productive: consider porte-bagages, porte-étiquette, portefeuille, portemanteau, porte-monnaie, pousse-café (liqueur), gagne-pain, gagne-petit, etc.

Compounds with a preposition as first member are underworld, overdraft, and in French après-midi, contrepoison, etc. Lieber’s principle predicts that these are possible as long as the noun can satisfy the argument structure of the preposition. Since adjectives cannot satisfy the argument structure of prepositions, we also predict the absence of PA compounds: Lieber gives the hypothetical nonoccurring forms *during-warm, *above-green, and *among-legal. One compound of this form appears to be down-right, an exception for Lieber. Intransitive verbs compound freely with adjectives (in the order VA), since intransitive verbs have no obligatory internal arguments. Lieber gives these examples: be-good, play-dead, appear-productive, the last of which may appear odd until put into a syntactic context such as (7).

(7) Moe’s appear-productive attitude didn’t fool anyone.

Lieber regards endocentric compounds whose second member is a preposition as impossible on the grounds that prepositions constitute a closed set which can acquire no new members. Compounds in which the second element is a verb are entirely possible; they are verbs if endocentric and a noun or adjective in first position is interpreted as a restrictive modifier in accordance with (5b). As examples with nouns, Lieber cites (8a); (8b) illustrates AV compounds.

(8) a. NV: hand-make, spoon-feed, hand-wash
b. AV: dry-farm, double-coat, sweet-talk

There are occasional compounds of the form NV where the N satisfies the internal argument of the verb, such as carol-sing, flower-arrange. Lieber finds these peculiar, but they are attested (Hall 1956). Interestingly, such compounds are only possible when used intransitively. Lieber (1983, 263) speculates that “some English speakers seem to allow a compounding strategy in which a second stem verb which requires an internal argument but which cannot link it syntactically will incorporate its first stem within the compound…” This is a common type of compound structure in Eskimo. For example, illu-xa-vunga
(house-have-I) ‘I have a house’ is a word of this type. The principles of argument structure appear to vary somewhat in different types of languages. In Swahili, this type can yield transitive verbs (Darlene La Charite, personal communication). For example, the verb *kupaka* ‘to paint’ can be compounded with the noun *rangi* ‘colour’ to yield the transitive verb *kupaka rangi* ‘to paint’ as in *kupaka rangi nyumba* ‘to paint the house’ (*nyumba* ‘house’).

Compounds of preposition or verb plus verb are rather rare. By Lieber’s Argument-linking Principle, the first element of such a compound would have to satisfy its argument structure within the compound, and a verb cannot satisfy the argument structure of a verb or preposition. This predicts the impossibility of (9).

(9) a. *during-run* *above-arrive* (PV)  
  b. *give-hit* *hit-elapse* (VV)

If the first stem has no obligatory internal arguments, then the second stem must be interpretable as a restrictive modifier by (5b). Lieber claims, however, that if the second stem is a verb, and thus incapable of being so interpreted, it is unrestricted, making such compounds as (10) possible. I myself, however, find these forms rather dubious, except for *overshoot*.

(10) a. oncome, upcome, overshoot (PV)  
  b. fly-drive, slip-slide, fall-float (VV)

Existing VV compounds, such as those in (11), are rather different from those in (10b).

(11) freeze-dry, drop-kick, stir-fry, push-start.

Lieber interprets these as having two transitive verbs, both of which can somehow satisfy their internal argument structure outside the compound, although this is contrary to her Argument-linking Principle (5). Another possible interpretation, which seems more plausible to me, is to regard the first stem as constituting a restrictive modifier of the second: *dry by freezing, fry while stirring, start by pushing.*
6.3 Synthetic Compounds

Synthetic compounds are a bit more complex, but operate according to the same principle in Lieber’s analysis. For example, agentive \(-er\) is analyzed as follows. It has a lexical representation that includes at least the information in (12).

\[
\begin{array}{c}
-er]_N / ]_V \quad (\text{subcategoryization}) \\
\quad \text{argument structure: none} \\
\quad \text{semantic representation: agentive}
\end{array}
\]

A word like \textit{driver} is derived simply by attaching \(-er\) to the verb \textit{drive}. This noun, in turn, can be compounded with another noun, say \textit{Sunday}, to form the synthetic compound \textit{Sunday driver}. Its structure is shown in (13).

(13)

\[
\begin{array}{c}
N \\
\quad N \\
\quad \quad N \quad V \\
\quad \quad \quad \text{Sunday} \quad \text{drive} \quad \text{er}
\end{array}
\]

Because the verb \textit{drive} here is not part of a compound, it is not required to satisfy its argument structure. Furthermore, the argument structure of the verb does not percolate to the noun node dominating \textit{V-er}, since the argument structure of the verb is incompatible with the noun node. Since the noun \textit{Sunday} is not linked by an argument-taking stem, (5b) requires it to be interpreted as a restrictive modifier; so (13) can mean 'someone who drives (as if) only on Sunday.' Clearly (13) cannot be the structure of \textit{truck driver}, where \textit{truck} is (most naturally) interpreted as an internal argument of \textit{drive}. However, another structure is possible for this synthetic compound, shown in (14).
(14)

Truck-drive is not a possible compound by itself. In Lieber’s terms, this is accounted for by the fact that the argument structure of drive percolates to the V node dominating truck-drive, so the argument structure of drive should be satisfied outside the compound, rather than inside. (Truck-drive might be an acceptable compound if truck were interpreted as a restrictive modifier of drive.) But this (nonexistent) compound certainly satisfies the subcategorization frame of -er (12), and so (14) can be produced. In (14) the argument structure of drive percolates no further than the branching V node over truck drive; this implies that this argument structure must be satisfied within the compound here, and it can be satisfied by truck.

6.4 Gerundive Compounds

Synthetic compounds in -ing are similar, but more varied, since -ing can form verbs, adjectives, or nouns. Verbal -ing, regardless of whether it is inserted into a frame like (13) or (14), percolates its features (including argument structure) up to the top node, and hence satisfies its argument structure outside the compound. As a result, synthetic compounds whose first member is interpretable as a restrictive modifier would be acceptable with -ing on the second member (such as Lieber’s quick-considering or an existing example such as deep-fry(ing)), but not compounds whose first member is interpreted as an internal argument (Lieber’s *proposal-considering). I find both types a bit strange, although I must admit that quick-considering sounds better in context than *proposal-considering.
(15)  a. They are quick-considering the proposal.
     b. *They are proposal-considering the offer.

     Furthermore, if quick-considering is a verb, as in (15a), it belongs to an
anomalous class of verbs in English that are defective\(^1\) in having only a present
participle.

(16)  *They quick-considered the proposal yesterday.

While this property of such compound verbs is predicted by Lieber’s proposal,
it is certainly strange that such defective verbs do not exist elsewhere in
English.

When -ing is nonverbal, that is, either an adjective or a noun, the features of
the verb to which it is attached cannot percolate further up than the verb itself.
Such compounds are interpreted as ordinary primary compounds, if their
structure is as in (13).

(17)  prize drawing ‘drawing that won a prize’

Otherwise, in a structure analogous to (14), the first compounded element is
interpreted as an internal argument of the verb, as in (18).

(18)  a. The proposal-considering went on for a week.
     b. The air-conditioning in this building is faulty.
     c. This compound contains an argument-taking verb.

I find Lieber’s example (18a) a bit strange, but examples like (18 b,c) amply
exemplify this type. Given Lieber’s Argument-linking Principle, the three types
(15a), (17), and (18) exhaust the possibilities for synthetic compounds in -ing.

6.5 Participial Compounds

Synthetic compounds containing passive participles are exemplified in (19),
where once again we have two possible structures for a form such as hand-
picked.

\(^1\) Defective paradigms are considered in section 7.2.
(19) a. \[ V \quad b. \quad V \]

\[ N \quad V \quad N \quad V \]

\[ \text{hand} \quad \text{pick} \quad \text{ed} \quad \text{hand} \quad \text{pick} \quad \text{ed} \]

In both cases, the argument structure of the verb percolates to the top node, and this argument structure must be satisfied outside the compound, as in (20).

(20) They have hand-picked the strawberries yesterday.

The noun stem *hand* must be a restrictive modifier, most naturally an instrumental phrase.

Verbs whose passive participle is an irregular allomorph (e.g. *written, held*) can only have structure (19a) when they participate in synthetic compounds (21). As before, the internal argument is satisfied outside the compound and the first element is interpreted as a restrictive modifier.

(21) They have hand-written all the cards.

In addition to their use as verbs, passive participles are used as adjectives, as in (22).

(22) a. A hand-written letter.

b. Hand-picked strawberries.

Lieber regards these as derived from the corresponding verbs by zero affixation, as in (23 a, b, c). A fourth possible structure, not given by Lieber, is (23d).
In all four structures of (23) the argument structure of the verb percolates up to the highest V node, but no further. This implies that the argument structure of the verb must be satisfied within the compound. But plainly *hand* functions as a restrictive modifier in (22), not as an internal argument of *pick*. I have departed from Lieber's analysis of the argument structure of passive participles on this point. We have seen that adjectives characteristically have an external theme (section 6.2). It seems that derived adjectives, including adjectives created by zero derivation, always have an external theme. Under this interpretation, *hand* cannot be interpreted as an internal theme of *pick* in (23) and so must be taken as a restrictive modifier. Notice that this problem is avoided in structure (23d) where *hand* is not compounded with *pick*.

A structure like (23d) also seems to be responsible for 'unpassive' words like *unpicked*, *unwritten* etc.
6.6 Exocentric Compounds

As we stated earlier, an exocentric compound is one whose rightmost member is not its head: a mailman is a kind of man, but a redcap is not a kind of cap. Interestingly, all the exocentric compounds listed in the right column of (1) are nouns, regardless of the category membership of their right components. Kiparsky (1982a, 10; 1982b, 139) argues that such compounds are derived by the suffixation of $\emptyset$, and that this $\emptyset$ functions as the head of the compound. For example, pushup will have the structure (25a), and redcap that of (25b).

(25) a. \begin{tikzpicture}[level distance=1.5cm, sibling distance=1cm,]  \node (N) [level 1] {N}  \node (P) [level 2] {\textit{P}}  \node (V) [level 3] {\textit{V}} \edge from (N) to (P) \edge from (P) to (V) \node (push) at (V) {push} \node (up) at (V) {up} \end{tikzpicture} b. \begin{tikzpicture}[level distance=1.5cm, sibling distance=1cm,]  \node (N) [level 1] {N}  \node (A) [level 2] {\textit{A}} \node (N) [level 3] {\textit{N}} \edge from (N) to (A) \edge from (A) to (N) \node (red) at (A) {red} \node (cap) at (A) {cap} \node (Ø) at (N) {$\emptyset$} \end{tikzpicture}

Like the zero affix that derives adjectival participles, this zero affix allows the category of the whole compound to differ from that of its rightmost (overt) member, and it allows it to be interpreted freely. This structure for such compounds interacts in an interesting way with the Level-ordering Hypothesis discussed in Chapter 5.

First, notice that forms inflected at level 1 do not undergo affixation at level 2. For example, *menly is impossible. Nothing in the theory predicts this;
Kiparsky has to assume an ad hoc constraint to block it; he notes, however, that "this constraint does not apply to inherent plurals, cf. to people, to dice, dicey, sudsy, woodsy" (1982b, 174 (footnote 3)). As we noted, level 1 plurals are available for compounding on level 2, as in teeth marks, lice infested. Now consider the distinction between milk teeth 'temporary teeth of young mammal' and sabre teeth 'kind of tiger.' Milk teeth is an endocentric compound, with a simple NN structure. Sabre tooth is exocentric, since it means a kind of tiger, and so has a structure like (25b). Given that level 1 plurals cannot receive level 2 affixes, including the Ø suffix used to derive exocentric compounds, we cannot create sabre teeth to mean 'sabre-tooth tigers,' although this form is fine in the meaning 'teeth shaped like sabres.'

6.7 Terms to Learn

6.1 synthetic compounds
primary compounds
endocentric
head
exocentric

6.2 argument structure
intransitive
agent
transitive
patient
theme
goal
external argument
internal argument
Argument-linking Principle
link
restrictive modifier

6.5 zero affixation
6.8 Problems

Problem 6-1.

Consider the process of compounding in a language other than English. What types of compounds exist? To what extent are Lieber’s constraints on argument structure adequate to deal with these types of compounds? Are any modifications to her system necessary to account for compounds? You may restrict your discussion to a single type of compound, such as primary endocentric compounds, or exocentric compounds, or discuss the full range of compounds that you find. As in problem 5-1, you will need to consult a variety of reference sources in this problem; see that question for further information.
7 Inflections and Paradigms

7.1 Inflections and Derivations

Defining the precise distinction between inflection and derivation has long been a problem. A recent attempt to define inflection (already noted in section 1.6) is given by Anderson (1982, 587), which we give as (1).

\[(1) \text{ Inflectional morphology is what is relevant to the syntax.}\]

However, this definition is not entirely adequate. For example, declension and conjugation classes in Latin while generally considered part of the inflectional system, are not syntactically relevant, since no syntactic rules depend on these factors.\(^1\) Syntactic relevance includes such factors as **agreement** and **government**. Two items are in agreement if they must be marked with the same value of certain morphological features (cf. Chapter 3). Thus, an adjective in Latin agrees with the noun it modifies in case, number, and gender. Likewise, a verb agrees with its subject in person and number. In government, a lexical item requires certain morphological features on another item. Generally the **head** of a phrase governs the other elements of the phrase, as a verb or preposition governs its objects. In Latin, most verbs govern accusative objects, but some verbs are lexically specified as governing some other case. The features involved in these cases of agreement and government are all inflectional features, both in traditional usage and by Anderson’s definition. It might be thought at this point that we could make a list of inflectional features, such as

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\(^1\) Baldi (1978) provides a number of interesting cases in which syntactic rules depend on possible homophonies within the nominal paradigm, but this is not a case of syntactic interaction with declensional class per se.
the ones just discussed, and be done with the matter. But things are not quite so simple. Anderson provides evidence that the same feature can be inflectional in one language and derivational in another. For example, diminutives are derivational in English and most other Indo-European languages, but inflectional in Fula, a West Atlantic language; conversely, plural is inflectional in Indo-European languages but derivational in Kwakwala, a Wakashan language spoken on Vancouver Island and the adjacent mainland of British Columbia. Furthermore, the same feature can be derivational and inflectional in the same language. Because it features in agreement rules, gender is normally considered inflectional in Latin, yet it functions derivationally in such pairs as *cervus* (masculine) 'stag,' *cerva* (feminine) ' doe.'

### 7.2 Paradigms

A **PARADIGM** is a set of all the inflectionally related forms of a single lexeme. The number of forms in a paradigm is generally constant for each syntactic class (noun, verb, etc.) in a given language and the paradigm is defined by a relatively small number of morphological features. For example, in Latin, a noun is defined in terms of six cases (with one other marginal one in some instances), and this pattern remains constant for all the nouns in the language. Paradigms in English are quite short. A noun generally has only two forms, the singular and the plural. An adjective usually has three forms, the **positive**, the **comparative**, and the **superlative**. A verb has a maximum of eight forms, exemplified by the single item *be*, but for other verbs only five, counting the past tense and the past participle as distinct forms. Some sample paradigms of English are given in (2).

---

2 Sometimes the possessive singular and plural are added to this, making for a total of four forms. However, the possessive seems to be rather different from the plural, in that the possessive morpheme is added not to nouns but to noun phrases.

(i)    [The King of England]NP's hat.

This suggests that the possessive morpheme is a syntactic clitic in modern English rather than an inflectional affix.
More highly inflected languages have more complicated paradigms. A regular verb in French has 48 forms, not counting PERIPHRASTIC FORMS, which contain two or more words, as in (vous) avez donné. The complete paradigm of a verb in Classical Greek has 294 forms, periphrastic forms not included. While paradigms can be irregular in various ways, it is clear that they must have some principles of organization. It would be unreasonable to expect a language learner to memorize such a mass of forms for every verb in the language. The principles organizing the verb paradigms of Latin is the subject of Chapter 8.

Paradigms can be **defective** in that they lack one or more forms. Examples in English are such PLURALIA TANTUM as scissors, pants, trousers. Similar nouns in French are annales, ciseaux (singular ciseau has a different meaning), dépens. More highly inflected languages have greater possibilities for defective paradigms. Halle (1973) notes that, in Russian, there are about one hundred verbs, all of the second conjugation, which lack the first person singular of the present tense. He gives the examples of (3).

---

3 They are never all formally distinct, however.
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(3) a. *lážu    ‘I climb’
b. *pobežú (or pobeždú)    ‘I conquer’
c. *deržú    ‘I talk rudely’
d. *mučú    ‘I stir up’
e. *erunžú    ‘I behave foolishly’

Halle discusses a possible explanation of these data, but rejects it. Cases (3a, b, c) happen to be homophonous with the first person singular present of other verbs, but there are other cases where this presents no difficulty, e.g. vožú ‘I lead’ or ‘I cart.’ A more promising explanation may lie in the semantics of these forms. Ross (1970) notes a similar problem with certain verbs in English, such as lurk.

(4) *I am lurking in a culvert.

It may be that speakers find the meanings of (3) odd or that no opportunity arises where they would be used. Presumably the forms of (3) could be used and would be understood in a context where these meanings were required.

Some Latin verbs are defective. The verb āiō ‘I say’ occurs in the present indicative only in the singular and third person plural, in the present subjunctive only in the first person singular and the third person singular and plural, and in the imperative only in the second person singular. It has a present participle and an imperfect indicative with all six forms, but no other forms; in all there are only fifteen forms (out of a possible 72). Here there is obviously no problem with the semantics of the missing forms, but this verb is restricted to formulaic expressions, and there are other verbs for more productive uses of ‘say,’ such as diciō. Latin also has defective nouns. Fors ‘chance’ has only the nominative singular fors and the ablative singular forte (used adverbially: ‘by chance’); in other cases cāsus must be used. A group of nouns of the third declension lack the genitive plural, such as lūx ‘light,’ pāx ‘peace,’ sōl ‘sun,’ and cor ‘heart.’ Various other combinations are listed in Latin grammars. In the case of the genitive plurals there is no obvious semantic restriction, excepting possibly lūx and pāx, nor are there more common synonyms to supply the missing form, such as we saw with diciō. But it may simply be that the genitive plurals of these
nouns was never needed, even in the vast corpus of Latin literature that survives, and that they were available in principle. When Carruthers (1964) translated Alice in Wonderland into Latin, he needed a term for the Knave of Hearts, among other things. He translated this as Bāro Cordium, using the supposedly nonexistent genitive plural of cor. As long as inflectional systems are highly productive, and governed by regular principles of formation, it is possible to extend defective paradigms to include previously unknown forms, as long as these forms make sense semantically.

Certain verbs in French are defective, such as clore, which lacks the passé simple and the first and second persons plural of the present. Gésir lacks all tenses but the present and imperfect indicative, and lacks the first and second persons singular of the present. Again, close synonyms exist to supply the missing forms, such as fermer and se coucher. In English, the modal verbs, such as must, can, may, lack the infinitive (*to must), the present participle (*he is musting go) and the past participle (*he has must(ed) go). This may be simply because modals are syntactically generated in AUX position while have and be are generated to the right of AUX and so participial forms of modals have no chance to occur to the right of have and be when they would be required; infinitive to seems to occur syntactically in modal position and thus the two are mutually exclusive. Paraphrases are available for these functions (to have to, to be able to, etc.).

Zwicky (1969) has noticed that certain irregular plurals cannot have possessive 's attached to them: *geese's, *mice's. But possessives are not part of the paradigm of nouns in English, since possessive 's also attaches to phrases, like the King of England's hat (cf. footnote 2). Zwicky notes also that possessive 's does not attach to phrases whose heads are plural (*the queens of England's hats), so it seems that these curious restrictions (and others that he mentions) are syntactic in nature, and not defective paradigms.

In spite of defective paradigms, inflections are generally more PRODUCTIVE than derivations. Virtually all English nouns can have a plural in /-z/, excepting only those that have an irregular (level 1) plural, as discussed in section 1.7. Derivations are another matter. Some verbs can be nominalized with -al, as arrive, arrival, others are nominalized with -ation, as derive, derivation. There is virtually no pressure to expand the range of these affixes, producing *derival, *arrivalation, for example. As we have seen, there is some pressure to fill in defective paradigms when the need arises. Furthermore, inflectional forms are SEMANTICALLY COHERENT in a way that derivations often are not. In section 1.8 we mentioned that carriage and marriage, derived by suffixing -age to the
verbs *carry* and *marry* respectively, have quite distinct meaning relations to their bases. Plurals in */-z*/, on the contrary, have a constant meaning relation to their corresponding singulars.

In section 6.4 of Chapter 6 we noted the (apparent) existence of a class of defective verbs having only a single form—the present participle, derived as synthetic compounds from adjective and verb, such as Lieber's *quick-considering*. Although such forms conform to Lieber's constraint on argument structure, they seem odd, perhaps because of this very restrictedness of their paradigms.

Given the lack of agreement on the difference between inflection and derivation, we might ask whether it is really necessary to define the difference at all. The answer depends crucially on the model of grammar that one assumes. In the lexical model of morphology that is assumed in this book, both inflection and derivation are in the lexicon, along with compounding, and all three types of word formation are governed by common principles, such as feature percolation (see sections 3.11 and 6.2). In this model, then, there is no need to have a formal distinction between inflection and derivation, although the terms are useful for informal descriptions. In an interpretive model, on the other hand, it is crucial to define the distinction formally, since this model puts derivational morphology and compounding in the lexicon but does inflection as part of the phonological interpretation of surface structures (see section 1.8 for a discussion of lexical and interpretive morphology and for a diagram of the grammatical model we are assuming). A language learner would have to learn which morphological processes are which, in the interpretive model, in order to know where in the grammar to put each new process he encounters, in addition to learning which features are manipulated by syntactic rules. In the view of the impossibility of characterizing inflections universally, this would be a non-trivial task. In the lexical theory, the learner must learn which features are manipulated by syntactic rules, but need not learn where to place each new process in the grammar—surely a significant advantage of the lexical theory.

### 7.3 Suppletions and Stem Classes

Inflectional systems frequently exhibit **suppletion**: two allomorphs with identical meaning (and not related by phonological rules) that appear in distinct contexts. We examined one example of this in the irregular allomorphs of the English plural discussed in section 1.7. In Latin, there are three allomorphs meaning 'first person singular' ([+I, -II -pl] in the feature system developed in
Chapter 3): -ō, -ē and -m. The forms in (5) show their appearance with various stem classes (conjugation classes, abbreviated CC).

(5)  present   future   perfect   imperfect

1CC  'love'  am-ō    am-ā-b-ō    am-āv-ī    am-ā-ba-m
2CC  'warn'  mon-e-ō  mon-ē-b-ō  mon-u-ī    mon-ē-ba-m
3CC  'read'  leg-ō    leg-a-m    leg-ī     leg-ē-ba-m
4CC  'seize' cap-i-ō  cap-i-a-m  cēp-ī    cap-i-ē-ba-m
5CC  'hear'  aud-i-ō  aud-i-a-m  aud-īv-ī  aud-i-ē-ba-m

From (5) it is apparent that -ō appears throughout the present and in the future of the first two conjugation classes, -ē appears throughout the perfect, and -m appears in all other cases. See Chapter 8 for a more complete analysis. The data in (5) also illustrate suppletion in the perfect: -āv- appears after am- but -u- appears after mon- and -īv- appears after aud-. In the first two conjugation classes, the future is indicated by -b- but in the rest it is indicated by -a-.

Stems, as well as affixes, may illustrate suppletion. The English verb go has the suppletive past tense form went. The French verb aller has the suppletive future stem ir- and four suppletive forms in the present indicative: vais, vas, va, and vont, and the imperative va(s). The Latin verb ferō 'I carry' has the suppletive perfect stem tul- as in tuli 'I carried.' These suppletive stems are best represented as separate allomorphs at the stem level. It would be perverse to try to derive one from the other by a morphological process, of the type discussed in Chapter 3. Such a rule would be no more instructive than listing the forms, since it would encode all the same information. We represent the two stems of ferō as in (6).

(6) a. V-1  b. V-1
    |                 |
    fer-            tul-
    [-perfect]      [+perfect]
**Stem classes** represent an arbitrary division of the lexicon into those items that require different allomorphs or different processes to realize the same inflectional category. The Latin conjugation classes that appear in (5) are one example; a somewhat more complex example comes from problem 7-1.

**Problem 7-1. Oaxaca Chontal**
(Data from Waterhouse 1962, 95-97 and Merrifield et al. 1967, 15; acute accent indicates stress.)

<table>
<thead>
<tr>
<th>gloss</th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. bed</td>
<td>kanagá</td>
<td>kanagá?</td>
</tr>
<tr>
<td>2. firefly</td>
<td>ummá</td>
<td>ummá?</td>
</tr>
<tr>
<td>3. butterfly</td>
<td>paapaló</td>
<td>paapaló?</td>
</tr>
<tr>
<td>4. wall</td>
<td>aptyáŋ</td>
<td>aptyáŋ?</td>
</tr>
<tr>
<td>5. squash</td>
<td>?awá?</td>
<td>?awá?</td>
</tr>
<tr>
<td>6. tortilla</td>
<td>askúť</td>
<td>askúť?</td>
</tr>
<tr>
<td>7. mocking bird</td>
<td>futuyá</td>
<td>futuyá?</td>
</tr>
<tr>
<td>8. wasp</td>
<td>nanará</td>
<td>nanará?</td>
</tr>
<tr>
<td>9. plantain</td>
<td>wáywé?</td>
<td>wáywé?</td>
</tr>
<tr>
<td>10. ear of green corn</td>
<td>milyó</td>
<td>milyó?</td>
</tr>
<tr>
<td>11. monkey</td>
<td>mačín</td>
<td>mačín?</td>
</tr>
<tr>
<td>12. lizard</td>
<td>kwepóʔ</td>
<td>kwepóʔ</td>
</tr>
<tr>
<td>13. grandchild</td>
<td>koñńíʔ</td>
<td>koñńíʔ</td>
</tr>
<tr>
<td>14. woman</td>
<td>akanńóʔ</td>
<td>akanńóʔ</td>
</tr>
<tr>
<td>15. word</td>
<td>atáygi?</td>
<td>ataygi?</td>
</tr>
<tr>
<td>16. basket</td>
<td>ańčúpiʔ</td>
<td>ańčúpiʔ</td>
</tr>
<tr>
<td>17. turkey</td>
<td>apúmpúʔ</td>
<td>apúmpúʔ</td>
</tr>
<tr>
<td>18. year</td>
<td>amác?</td>
<td>amác?</td>
</tr>
<tr>
<td>19. hunchback</td>
<td>ámućé</td>
<td>ámućé</td>
</tr>
</tbody>
</table>

An inspection of the data reveals five stem classes. Forms 1 and 2 form their plural by suffixing -?y?. Forms 3 through 11 suffix -? for the plural. Forms 12 to 14 form the plural by infixing -?—the process involved is given as (1) in Chapter 4. In forms 15 to 17, the plural is formed by a process that shifts stress to the word-final syllable, a process which can be described by rule (7).
The final stem class forms plurals by lengthening the second vowel, a process that can be symbolized as in (8).

For additional practice in identifying stem classes and suppletive affixes, work out solutions for problems 7-3 to 7-6. In 7-6 you will find that stems that are grouped together for some affixes are not so grouped for others.

7.4 Syncretism

SYNCRETISM occurs when a single form expresses two or more meanings that form a NATURAL CLASS in terms of morphological features. Thus, syncretism can be thought of as the NEUTRALIZATION of one or more inflectional features. As an example, consider the present and imperfect of the indicative active of the Greek verb lúō ‘I loose’.
In the present, the second and third persons dual are represented by the same form, *lúeton*. This represents a syncretism, since the second and third persons form a natural class, the [-I] persons of our feature system (refer to (1) in Chapter 3). These persons are not always neutralized in the dual, as the distinct forms of the imperfect *elúeton* and *eluétēn* show. (You will have noticed the lack of first person dual forms in these paradigms. This is not a defective paradigm, since the first person dual is systematically missing from the conjugation of the Greek verb, aside from a few relic forms.)

In the imperfect, the first person singular and the third person plural are also represented by the single form *éluon*. This is NOT a case of syncretism, for, although the form is the same, the first person singular and the third person plural do not form a natural class. As in phonology, a natural class is defined as one which is characterized by fewer features than any one of its members. To express a class in which some feature is neutralized, we omit any specification for that feature. So, we can express the class of ‘second and third persons’ by a single feature, [-I], while we need two features to express ‘second person’ alone, i.e. [-I, +II]. Second and third persons together therefore form a natural class. On the other hand, ‘first person singular,’ represented by the feature complex (10a), and ‘third person plural,’ represented in (10b), do not form a natural class. They have in common only the features [-II, -dual], so we need a feature disjunction to represent them as a class, as in (10c).

\[
\begin{align*}
(10) & \quad \text{a.} \quad \begin{bmatrix} +I \\ -II \\ -dual \\ -pl \end{bmatrix} \quad \text{b.} \quad \begin{bmatrix} -I \\ -II \\ -dual \\ +pl \end{bmatrix} \quad \text{c.} \quad \begin{bmatrix} -II \\ -dual \\ -pl \\ I \end{bmatrix} \\
& \quad \begin{array}{c}
\text{‘1st singular’} \\
\text{‘3rd plural’}
\end{array}
\end{align*}
\]

Since it takes more features to represent the class of ‘first person singular’ and ‘third person plural’ than it takes to represent either of these alone, these two do not constitute a natural class. Consequently, we do not count the identity of these forms in the imperfect in Greek a syncretism.

The declension of the demonstrative *dieser* in German provides another example of syncretism and natural classes. The complete declension was given
in Chapter 3, and is repeated here as (11), with boxes drawn around the syncretisms (based on Bierwisch 1967).

(11)

<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>masculine</strong></td>
<td>dieser</td>
<td>dieser</td>
</tr>
<tr>
<td><strong>neuter</strong></td>
<td>diesen</td>
<td>diesen</td>
</tr>
<tr>
<td><strong>feminine</strong></td>
<td>diese</td>
<td>diese</td>
</tr>
<tr>
<td>(all genders)</td>
<td>diese</td>
<td>diese</td>
</tr>
</tbody>
</table>

The arrangement is Bierwisch’s, and differs from the usual textbook order of the paradigm. It is designed to allow systematic recognition of the syncretisms; otherwise, the physical arrangement is arbitrary. Additional boxing could have been done if the only criterion had been identity of form, and in fact Bierwisch unites the feminine nominative and accusative with the plural of these cases, and he joins the genitive plural with the feminine dative and genitive. However, since these do not count as natural classes by our definition, we have left them unboxed. Given these facts, and the features of Chapter 3, we can give feature representation for the syncretisms in (11). We show this in (12). Of the case features, only [oblique] and [theme] are used, since these suffice to distinguish the four cases of German.

(12) a. \( \text{dieses} \), neuter singular, nominative and accusative

```
[-animate]
[-feminine]
[-plural]
[-oblique]
```
b. *diesem*, dative singular, masculine and neuter

  - feminine
  - plural
  + oblique
  + theme


c. *diesen*, genitive singular, masculine and neuter

  - feminine
  - plural
  + oblique
  - theme


d. *diese*, feminine singular, nominative and accusative

  + animate
  + feminine
  - plural
  - oblique


e. *dieser*, feminine singular, genitive and dative

  + animate
  + feminine
  - plural
  + oblique


f. *diese*, nominative and accusative plural, all genders.

  + plural
  - oblique
Any attempt to unite the forms of (11) further into larger groups results in unnatural classes. For example, *dieser* 'genitive plural', with the features [+plural, +oblique, -theme], has only [+oblique] in common with (12e); their union is thus not a natural class, and so not a syncretism. Attempting to unite (12d) with (12f) results in (13) which has AS MANY features as (12d), but this is still not a natural class, which must have fewer features than ANY of its members. (And, of course, (13) has MORE features than (12f)).

\[
(13) \begin{array}{c}
\text{-oblique} \\
\{ \begin{array}{c}
\text{+feminine} \\
\text{+animate} \\
[+\text{plural}] \\
\end{array} \}
\end{array}
\]

This concludes our survey of inflectional systems, paradigms, suppletions, stem classes, and syncretism. In the next chapter we will examine a single inflectional system in detail, that of Latin verb paradigms.

7.5 Terms to Learn

7.1 agreement
   government
   head (of a phrase)

7.2 positive
   comparative
   superlative
   periphrastic forms
   defective (paradigm)

7.3 suppletion
   stem class(es)
7.6 Problems

Problem 7-2. Swahili.

(Data from Perrott 1950; orthographic; j = [j] sh = [ʃ].)

1. kisu 'knife' visu 'knives'
2. kiti 'chair' viti 'chairs'
3. kitabu 'book' vitabu 'books'
4. kisu kidogo 'small knife'
5. kisu kikubwa 'large knife'
6. visu vidogo 'small knives'
7. visu vikubwa 'large knives'
8. kisu kidogo kimoja 'one small knife'
9. viti vidogo viwili 'two small chairs'
10. vitabu vikubwa viwili 'two large books'
11. kisu kimoja kilitosha 'one knife was enough'
12. visu vitatu vinatosha 'three knives are enough'
13. visu vidogo vitatosha 'the small knives will be enough'
**Problem 7-3. Arabic.**  
(Data from Haywood and Nahmad 1962.)

<table>
<thead>
<tr>
<th>gloss</th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. teacher</td>
<td>mu'allim</td>
<td>mu'allimūna</td>
</tr>
<tr>
<td>2. tailor</td>
<td>xayyāt</td>
<td>xayyāţūna</td>
</tr>
<tr>
<td>3. good</td>
<td>ḥasan</td>
<td>ḥasanūna</td>
</tr>
<tr>
<td>4. much, many</td>
<td>kaēr</td>
<td>kaērūna</td>
</tr>
<tr>
<td>5. baker</td>
<td>xabbāz</td>
<td>xabbāţūna</td>
</tr>
<tr>
<td>6. heart</td>
<td>qalb</td>
<td>qulūb</td>
</tr>
<tr>
<td>7. lesson</td>
<td>dars</td>
<td>durūs</td>
</tr>
<tr>
<td>8. month</td>
<td>ᵊahr</td>
<td>ᵊuhūr</td>
</tr>
<tr>
<td>9. king</td>
<td>malik</td>
<td>mulik</td>
</tr>
<tr>
<td>10. dog</td>
<td>kālb</td>
<td>kīlāb</td>
</tr>
<tr>
<td>11. man</td>
<td>raĵul</td>
<td>riţāl</td>
</tr>
<tr>
<td>12. mountain</td>
<td>ḫabal</td>
<td>ḫibāl</td>
</tr>
<tr>
<td>13. big</td>
<td>kābīr</td>
<td>kībār</td>
</tr>
<tr>
<td>14. book</td>
<td>kitāb</td>
<td>kutub</td>
</tr>
<tr>
<td>15. new</td>
<td>jadīd</td>
<td>ḫudud</td>
</tr>
<tr>
<td>16. river</td>
<td>nahr</td>
<td>ḥanhr</td>
</tr>
<tr>
<td>17. foot</td>
<td>rīj ī</td>
<td>ḫarjūl</td>
</tr>
</tbody>
</table>

**Problem 7-4. Czech**  
(Data from Lee and Lee 1959; ' = vowel length.)

Add the following to the data of Problem 2-5.

<table>
<thead>
<tr>
<th>'knit'</th>
<th>'carry'</th>
<th>'lead'</th>
<th>'grow'</th>
<th>'steal'</th>
<th>'read'</th>
</tr>
</thead>
<tbody>
<tr>
<td>'I' pletu nesu vedu rostu kratu čtu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'you' pleteš neseš vedeš rosteš kradeš čteš</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'he' plete nese vede roste krade čte</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'we' pleteše neseše vedeše rosteme kradem ďtešeme</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'you (pl.)' pletete nesete vede tete rostete kradete čtete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'they' pletou nesou vedou rostou kradou čtou</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Problem 7-5. Huichol.
(Data from Grimes 1964. ‘ = high tone, VV = long vowel or diphthong.)

<table>
<thead>
<tr>
<th>gloss</th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. pot</td>
<td>záari</td>
<td>záarite</td>
</tr>
<tr>
<td>2. mango</td>
<td>máakuu</td>
<td>máakuute</td>
</tr>
<tr>
<td>3. leg</td>
<td>?akáa</td>
<td>?akáate</td>
</tr>
<tr>
<td>4. tree</td>
<td>káyée</td>
<td>káyéete</td>
</tr>
<tr>
<td>5. heron</td>
<td>qázú</td>
<td>qázúri</td>
</tr>
<tr>
<td>6. pig</td>
<td>tuizú</td>
<td>tuizúri</td>
</tr>
<tr>
<td>7. skunk</td>
<td>?áapá</td>
<td>?áapári</td>
</tr>
<tr>
<td>8. raccoon</td>
<td>meetá</td>
<td>meetári</td>
</tr>
<tr>
<td>9. grey squirrel</td>
<td>tekáA</td>
<td>tekáAri</td>
</tr>
<tr>
<td>10. duck</td>
<td>paatú</td>
<td>paatúri</td>
</tr>
<tr>
<td>11. chicken</td>
<td>waakána</td>
<td>waakánari</td>
</tr>
<tr>
<td>12. donkey</td>
<td>puuzúu</td>
<td>puuzúuri</td>
</tr>
<tr>
<td>13. mountain lion</td>
<td>máayé</td>
<td>máayéci</td>
</tr>
<tr>
<td>14. fox</td>
<td>káuzai</td>
<td>káuzaici</td>
</tr>
<tr>
<td>15. deer</td>
<td>mázá</td>
<td>mázáci</td>
</tr>
<tr>
<td>16. mouse</td>
<td>naiká</td>
<td>naikáci</td>
</tr>
<tr>
<td>17. louse</td>
<td>?aatée</td>
<td>?aatéeci</td>
</tr>
<tr>
<td>18. rattlesnake</td>
<td>záyé</td>
<td>záyéci</td>
</tr>
<tr>
<td>19. jaguar</td>
<td>táwée</td>
<td>táwéezi</td>
</tr>
<tr>
<td>20. coyote</td>
<td>yaawi</td>
<td>yaawizi</td>
</tr>
<tr>
<td>21. turkey</td>
<td>?árúu</td>
<td>?árúuzi</td>
</tr>
<tr>
<td>22. bird</td>
<td>wiikíi</td>
<td>wiikíizi</td>
</tr>
</tbody>
</table>
Problem 7-6. Swahili
(Data from Perrott 1950; orthographic; j = [j], sh = [ʂ].)

<table>
<thead>
<tr>
<th>gloss</th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. thing</td>
<td>kitu</td>
<td>vitu</td>
</tr>
<tr>
<td>2. knife</td>
<td>kisu</td>
<td>visu</td>
</tr>
<tr>
<td>3. chair</td>
<td>kiti</td>
<td>viti</td>
</tr>
<tr>
<td>4. book</td>
<td>kitabu</td>
<td>vitabu</td>
</tr>
<tr>
<td>5. shoe</td>
<td>kiatu</td>
<td>viatu</td>
</tr>
<tr>
<td>6. tree</td>
<td>mti</td>
<td>miti</td>
</tr>
<tr>
<td>7. town</td>
<td>mji</td>
<td>miji</td>
</tr>
<tr>
<td>8. leg</td>
<td>mguu</td>
<td>miguu</td>
</tr>
<tr>
<td>9. arm</td>
<td>mkono</td>
<td>mikono</td>
</tr>
<tr>
<td>10. man</td>
<td>mtu</td>
<td>watu</td>
</tr>
<tr>
<td>11. child</td>
<td>mtoto</td>
<td>watoto</td>
</tr>
<tr>
<td>12. stranger</td>
<td>mgeni</td>
<td>wageni</td>
</tr>
<tr>
<td>13. old man</td>
<td>mzee</td>
<td>wazee</td>
</tr>
<tr>
<td>14. animal</td>
<td>mnyama</td>
<td>wanyama</td>
</tr>
<tr>
<td>15. insect</td>
<td>mdudu</td>
<td>wadudu</td>
</tr>
<tr>
<td>16. bird</td>
<td>ndege</td>
<td>ndege</td>
</tr>
<tr>
<td>17. banana</td>
<td>ndizi</td>
<td>ndizi</td>
</tr>
<tr>
<td>18. drum</td>
<td>ngoma</td>
<td>ngoma</td>
</tr>
<tr>
<td>19. road</td>
<td>njia</td>
<td>njia</td>
</tr>
<tr>
<td>20. locust</td>
<td>nzige</td>
<td>nzige</td>
</tr>
<tr>
<td>21. plan</td>
<td>shauri</td>
<td>mashauri</td>
</tr>
<tr>
<td>22. cultivated field</td>
<td>shamba</td>
<td>mashamba</td>
</tr>
<tr>
<td>23. answer</td>
<td>jibu</td>
<td>majibu</td>
</tr>
<tr>
<td>24. egg</td>
<td>yai</td>
<td>mayai</td>
</tr>
<tr>
<td>25. flower</td>
<td>ua</td>
<td>maua</td>
</tr>
<tr>
<td>26. disease</td>
<td>ugonjwa</td>
<td>magonjwa</td>
</tr>
<tr>
<td>27. quarrel</td>
<td>ugomvi</td>
<td>magomvi</td>
</tr>
</tbody>
</table>
8 An Inflectional System in Detail: The Latin Verb

8.1 Background

In Chapter 1 we briefly introduced two approaches to inflectional morphology. One is the INTERPRETIVE approach, described in Matthews (1972, 1974), Anderson (1982), and defended in Chomsky (1965). According to this system, inflectional rules operate on the output of syntactic rules that specify the required feature composition of all the nodes in a syntactic representation, and assign appropriate phonological form to the words in accordance with their feature composition. However, this model also relegates unproductive, irregular forms to the lexicon, such as the irregular plurals discussed in Chapter 1 (foot, feet, etc.), and the suppletive stems in Latin (fer-[+perfect], tul[+perfect]) discussed in Chapter 7. In this chapter, we develop the alternative LEXICAL approach, described by Kiparsky (1982a, 1982b), Mohanan (1982), Lieber (1980), Williams (1981) and others, according to which all inflectional morphology takes place in the lexicon. There are three advantages to this approach. First, it allows all of morphology to be unified in a single component of the grammar, the lexicon. Second, it permits certain derivational and compounding processes to have access to inflectional forms. For example, English has adjectives formed from past participles. Participles are inflected forms of verbs, and adjective formation is clearly derivational, since it results in a change of category. In French, the infinitive of certain verbs can be used as nouns, as le parler. Third, since we regard lexical and inflectional morphology as being governed by identical principles, such as feature percolation, there is no need for a formal distinction between these two types of morphology, as
there is in any approach that places them in distinct components. The advantage of this lies in the fact that the distinction between inflections and derivation varies widely across languages, as Anderson emphasizes. The interpretive model therefore imposes additional learning difficulties in determining which processes are inflectional and which derivational, which do not arise on the lexical model. Some of Matthews' arguments are limited to showing that an analysis of Latin verb morphology in lexical terms is literally not possible. However, with the formal mechanism we have developed so far, it is possible to give a complete description of a complex inflectional system, as we will now demonstrate.

Table 1 gives the complete conjugation of the Latin verb moneō ‘warn’. Each cell in the table is defined by MORPHOLOGICAL FEATURES heading the rows and columns. Within each cell (on the first page of the table) the forms are listed in the traditional textbook order of persons and numbers: first, second, and third persons singular, then the same in the plural. In the last column of this page of the table, the left column of forms are participles which vary by gender and are listed in the order masculine, feminine, neuter (singular) and the same order in the plural. Any of the singular participle forms can be used with any of the singular forms of the verb sum ‘to be’ given in the second column there, and likewise in the plural. For some of the categories we have simply given the traditional name instead of a feature designation, since no features were introduced for these categories in Chapter 3.

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1 Latin verbs are traditionally cited in the first person singular of the present indicative active, and we follow this practice here. No confusion should arise with the citation of the same form to represent the whole paradigm and as the form itself.
Conjugation of the Latin verb *moneō*

<table>
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<th>[+passive]</th>
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<td>monitum est</td>
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<td>monēberis</td>
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<td>monēbitur</td>
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<table>
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Table 1
### Imperative

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<td>monētōte</td>
<td>monētor</td>
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<td>monentor</td>
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<tr>
<td>-I</td>
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<tr>
<td>-II</td>
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### Infinitive

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<td>monitum īrī</td>
<td>monitum fore</td>
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</tr>
<tr>
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<td>monitus esse</td>
<td></td>
</tr>
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<tr>
<td>-future</td>
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Table 1 (continued)
8.2 Inflectional Structures

In analyzing data of this sort, Lieber (1980) assumed that structures were provided as binary branching unlabelled trees. Jensen (1980) argued that a slightly richer system is required, in which lexical structure rules (analogous to phrase-structure rules in syntax) provide partially labelled structures, using an extended X-bar system, in which a lexical node is represented as the category (e.g. V for verb) with no bars, and the verb stem, one level lower than the lexical node, is represented by $V^{-1}$ (verb with minus one bar). Another level lower is the root, which we represent as $V^{-2}$ (minus two bars). In addition, the branching can be greater than binary. For example, in (29) of Chapter 2, we analyzed a verb form in Swahili in this system. We repeat this analysis here in (1), expanding it by giving the features for each morpheme and for the verb as a whole, in accordance with the system developed in
Chapter 3. We assumed a multiply-branching V node, since there is no evidence that the form has any further internal structure.

\[ \text{(1)} \]

To describe the structure of the Swahili verb forms presented in problem 2-1 of Chapter 2, we can write the lexical structure rule (2).

\[ \text{(2)} \]

This rule states that the verb consists of three affixes plus a verb stem, in that order. The first affix is marked with person-number features of subject, in the outer layer of nesting, using the nested bracket convention introduced in Chapter 3. The Ø before each feature value is Lieber’s way of showing that the morpheme must have some value for the feature in question. The second affix is similarly marked for tense (and aspect), the third for direct object, in the inner layer of nesting. Lieber’s feature percolation conventions (sections 3.11 and 6.2) apply to assign the correct features to the V node—notice that the person-number features retain their original layer of nesting in percolation.

### 8.3 Latin

The situation in Latin is somewhat more complex. First, it is necessary to assume that stems themselves have internal structure, consisting of a root (V-2),
and an affix, which in [-perfect] forms is known as a theme vowel; otherwise it is a [+perfect] suffix. Second, the affix positions do not always represent a constant contribution to the meaning. The final suffix always represents the person and number, but the affix between the stem and the person-number suffix can represent tense or mood or both. We assume the lexical structure rules of (3).

\[(3) \quad \text{a. } V \rightarrow V^1 \quad \text{(af) af} \]
\[\text{b. } V^1 \rightarrow V^2 \quad \text{af} \]

Since the node \(af\) is not provided with any features, it is really only a placeholder for a position where an affix can be inserted. The first \(af\) in (3a) is optional, so that the final structure may have two or three affixes. The full expansion of (3a, b) is the structure (4).

\[(4) \]

8.4 The Perfect Tense

Let us start with the simplest verb tense: the perfect. The perfect stem of \(moneo\), \(monu-\), is derived from the root \(mon-\) by affixing the [+perfect] suffix \(-u\). Latin verbs are divided into eight stem classes on the basis of the formation of the perfect stem, and so roots have to be provided with a diacritic to show which stem class they belong to. The person-number suffixes for perfect forms are given in (5), each with its feature composition.
In order to ensure that they occur only in the perfect, immediately following the stem, these suffixes are SUBCATEGORIZED for occurrence in this position, as in (6).

(6) \[-f, -ist-\text{-i} \quad \text{/} \quad ]v^{-1} \quad ___ \quad ]v

\[-imus, -istis, \text{-ērunt} \quad [+\text{perfect}]\]

Morphemes are subcategorized for particular environments just as lexical items are in syntax. Normally, only affixes have morphological subcategorization frames, stems having syntactic frames. A perfect form such as monu\text{"i} \text{"I warned’} has the structure of (7).

(7)

\[\text{V} \quad [+\text{perfect}, \text{-past}, \text{-future}, \text{-passive}, \text{-subjunctive}, +I, -II, -pl]\]

\[\text{V}^{-1} \quad [+\text{perfect}]\]

\[\text{V}^{-2}
\]

\[\text{mon} \quad u \quad \text{\text{-i}} \quad [+\text{perfect}] \quad [+I, -II, -pl]\]

The feature [+perfect] percolates from the suffix \text{-u-} to the V\text{-1} node, thereby ensuring that the subcategorization requirements of the person-number suffix \text{-f} are satisfied. The features of both affixes percolate to the V node, as shown. The features percolated to the V node in (7) are not a complete feature specification for this form. Every verb form in Latin must be specified for all
these features: [perfect], [past], [future], [passive], [subjunctive], [I], [II], and [plural]. The form in (7) is not specified for [past], [future], [passive], or [subjunctive] by percolation, since no morpheme there carries a specification for these features. Significantly, this form is sometimes called the ‘present perfect,’ i.e. [-past, -future], and it is also clearly [-passive, -subjunctive]. In Chapter 3 we gave evidence to support the view that minus is universally the unmarked value of morphological features. Jensen (1983) suggested the natural principle to deal with this situation, called the Unmarking Principle.

(8) Unmarking Principle

If a form fails to receive a specification for any feature relevant to it, it is assigned the unmarked (minus) value of that feature.

Principle (8) correctly fills in the remaining feature values in (7) as [-past, -future, -passive, -subjunctive]. Given this principle, it suffices to give -t the feature [+I], as [-II, -pl] can also be supplied by (8).

8.5 Present and Future

Other person-number suffixes are used in the active nonperfect ([-passive, -perfect]) forms—those listed in (9).

(9)  -ō, -m  [+I, -II, -pl]
    -s  [-I, +II, -pl]
    -t  [-I, -II, -pl]
    -mus  [+I, -II, +pl]
    -tis  [-I, +II, +pl]
    -unt  [-I, -II, +pl]

The [-perfect] forms are based on the [-perfect] stem, formed by suffixing the THEME VOWEL, a meaningless morpheme with six allomorphs that again depend on a division of verbs into stem classes, but not the same stem classes that determine the form of the perfect suffix. The verb moneō belongs to the stem class that requires -ē- as a theme vowel. To the [-perfect] stem monē- we add the person numbers affixes of (9) to form the present tense, such as monēs 'you warn'.
Feature percolation and the Unmarking Principle operate as before, giving (10) the complete specification shown.

The person-number suffix -s of (10) is simply subcategorized to occur in verb-final position; this applies also to the other suffixes in (9) except for the special form -5 [+I, -II, -p1]. The subcategorization is given in (11).

(11) \[-m, -s, -t, -mus, -tis, -unt / __ \]

Given this subcategorization, it might seem that the forms of (11) could appear in perfect forms as well as the forms of subcategorization frame (6), which is certainly not the case. Notice, however, that the subcategorization frame (6) properly includes that of (11), in that (6) has all the specifications of (11) plus additional material. The ELSEWHERE CONDITION, introduced in Chapter 2, deals appropriately with this situation. We repeat the definition given there as (12).

(12) Elsewhere Condition

If two or more morphemes can be attached to a third form, the morpheme with the more specific subcategorization frame takes precedence and blocks the attachment of the other morpheme. A subcategorization frame, A, is more specific than another, B, if A specifies everything that B specifies and more.
Now we are in a position to generate the present tense paradigm. Three of the forms, however, are phonetically incorrect as they stand. Four phonological rules are required to give the correct forms (based on Redenbarger 1976).

(13)  

a. \( u \rightarrow \emptyset / \begin{bmatrix} +\text{syl} \\ -\text{hi} \\ -\text{rd} \end{bmatrix} \)  

b. \( V \rightarrow [-\text{long}] / \quad V \)  

c. \( V \rightarrow [-\text{long}] / \quad \begin{bmatrix} +\text{cons} \\ -\text{strid} \end{bmatrix} \)  

d. \( V \rightarrow [-\text{long}] / \quad \text{nt} \)

These rules apply to the morphological forms in (14) to yield the phonetic forms.²

(14)  
morphological form  

<table>
<thead>
<tr>
<th></th>
<th>mon-( \varepsilon )-( \ddot{o} )</th>
<th>mon-( \varepsilon )-t</th>
<th>mon-( \varepsilon )-unt</th>
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</thead>
<tbody>
<tr>
<td>(13a)</td>
<td>_______</td>
<td>_______</td>
<td>( \emptyset )</td>
</tr>
<tr>
<td>(13b)</td>
<td>( \varepsilon )</td>
<td>_______</td>
<td>_______</td>
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<tr>
<td>(13c)</td>
<td>_______</td>
<td>( \varepsilon )</td>
<td>_______</td>
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<tr>
<td>(13d)</td>
<td>_______</td>
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<td>( \varepsilon )</td>
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phonetic form  

|    | mon\( \varepsilon \ddot{o} \) | mon\( \varepsilon t \) | mon\( \varepsilon nt \) |

The subcategorization of -\( \ddot{o} \) ‘first person singular’ is more complex than that for the other suffixes of (11). We state it as (15).

² Monent could also be derived from mon-\( \varepsilon \)-unt by (13b) \( \rightarrow \) mon-\( \varepsilon \)-unt and (13a) \( \rightarrow \) monent. We assume (13d) applies in this derivation, since it is needed independently for participles like mon\( \varepsilon \ddot{n}is \), mon\( \varepsilon \ddot{n}nis \) (genitive).
Because of (15), -\(\delta\) is selected for the present tense mon-\(e\)-\(\delta\), since here -\(\delta\) comes directly after a nonperfect stem in verb-final position. It also appears immediately after a future morpheme, e.g. -by-. The future indicative of moned has the structure of (16), with features as assigned by percolation and unmarking, except for person and number, which depends on the final suffix.\(^3\)

We follow Lieber (1980, 76) in giving the future morpheme the underlying form -by-. Redenbarger (1976) assumes an underlying -b-, with i-Epenthesis between consonants at a morpheme boundary. This analysis encounters difficulties in certain past participles, such as cap-t-us ‘seized’, where i-Epenthesis would be expected between p and t. Considering the irregularity in participle forms, Redenbarger proposes that capt- be analyzed as a monomorphemic adjective stem. But this is difficult to maintain, since it gives

\(^3\) The future is formed with -by- only in the first and second conjugations (stem classes). Other morphemes are used in the remaining conjugations, but we will not discuss them here.
no way of showing that capt- is derived from the verb root cap- ‘seize’ or that -t- is one of several suffixes that convert verb stems (or roots) to adjective stems. The future could not be -bi-, with i-Deletion before vowel, such as first person singular -ū, since there are many forms containing the phonetic sequence iū across a morpheme boundary, such as cap-īū ‘I seize,’ aud-īū ‘I hear.’ With -by- as the underlying form we need two rules, given in (17), one to delete y before a vowel (17a), the other to convert y to i between consonants (17b).

\[(17) \quad a. \quad y \rightarrow \emptyset / \begin{array}{c} \text{[syl]} \\ \text{[+cons]} \end{array} V \\
\]

\[b. \quad y \rightarrow i / C \text{___} C \]

8.6 Imperfect

The imperfect indicative is formed by inserting the [+past] suffix -bā after the theme vowel and before the person-number suffixes; the structure, given as (18), is similar to the future.

\[(18) \quad V \quad [-\text{perfect}, +\text{past}, -\text{future}, -\text{passive},
\quad -\text{subjunctive} \quad \text{(plus features for}
\quad \text{person and number percolated}
\quad \text{from the word-final suffix)}] \]

\[
\begin{array}{c}
\text{V-1} \\
\text{V-2} \\
\quad \text{bā} \\
\quad \text{[+past]} \\
\end{array}
\begin{array}{c}
\text{m} \quad (\text{monēbam}) \\
\text{s} \quad (\text{monēbās}) \\
\text{t} \quad (\text{monēbat}) \\
\text{mus} \quad (\text{monēbāmus}) \\
\text{tis} \quad (\text{monēbātis}) \\
\text{unt} \quad (\text{monēbānt})
\end{array}
\]
The most general first person singular suffix, -m, is selected here because the more specific subcategorization frames for -ō and -ē are not satisfied. The vowel of -bā is shortened in monoēbam, monoēbat, and monoēbant by rules (13c) and (13d).

8.7 Other Perfect Tenses

The future perfect (monuerō) and past perfect (monueram) are formed on the perfect stem by attaching special [+future] and [+past] suffixes respectively. The underlying forms of these suffixes are -ery- and -erā- with the subcategorization frames of (19a) and (19b), respectively.

(19) a. -ery- / [+future] | ___ af |V
      [V-1] [+perfect]

b. -erā- / [+past] | ___ af |V
      [V-1] [+perfect]

In the future morpheme -ery- we again see that mysterious (abstract) y whose phonetic form is determined by the rules of (17). In (20) we have the structure of future perfect forms. Since -ery- is a future morpheme, -ō is selected for first person singular. A complication arises here in the third person plurals in that the correct form is monuerint, not *monuerunt, as predicted by our rules so far.
To handle this case, Lieber (1980) posited two allomorphs of the third person: -unt and -nt. But notice that this case is somewhat different from that of the first person singular allomorphs -ō, -ē and -m, which cannot be related phonologically. We already accounted for the appearance of -nt instead of -unt in the present monent and the past perfect monuerant (see below) by the means of the phonological rule (13a). To account for -nt here, I propose a rule of allomorphy, as developed by Aronoff (1976). This is a rule that operates on a morpheme in a morphemic context. The rule is given in (21).

(21) -unt → -nt /

This rule also operates in the perfect subjunctive, to which we return below.

The past perfect is similar; its structure is that in (22). Here, the allomorph of 'first person singular' is -m, the phonological rules operate as expected, and no allomorphy is involved.
8.8 Subjunctive

The subjunctive has only four tenses: present, imperfect, perfect, and past perfect. Another way to state this is as follows: the features [+future] and [+subjunctive] are mutually exclusive. The present subjunctive morpheme for all conjugations except the first is -ā-, subcategorized as in (23).

\[
(23) \quad -\text{ā-} / \quad \text{v}^{-1} \quad \text{af} \quad \text{v} \\
\quad \text{[+subjunctive]}
\]

The structure is given in (24). Again -m is chosen for first person singular and the phonology operates as expected.
The imperfect subjunctive uses the [+past, +subjunctive] suffix \(-rē-\), which appears in all conjugations, subcategorized as in (25).

\[(25)\quad -rē- / [v-1 ___ af ]v\]

\[
\begin{array}{l}
\quad +past \\
\quad +subjunctive
\end{array}
\]

Two additional subjunctive morphemes appear with perfect stems. To form the perfect subjunctive, \(-erē-\) is attached to the perfect stem; the allomorphy rule (20) applies in the third person plural. The past perfect subjunctive suffix is \(-issē-\), also attached to the perfect stem. They are subcategorized as in (26).

\[(26)\]

\[\begin{array}{l}
\text{a. } \quad -erē- / [v-1 ___ af ]v \\
\quad [+subjunctive] \\
\quad [-perfect]
\end{array}\]

\[\begin{array}{l}
\text{b. } \quad -issē- / [v-1 ___ af ]v \\
\quad [+subjunctive] \\
\quad [+past]
\end{array}\]
For these subjunctive forms, the reader should verify that the correct forms are given by the phonological rules developed so far.

8.9 Passive

Passive nonperfect forms are formed with special person-number affixes, listed in (27). Perfect passive forms are periphrastic and will be discussed in Section 8.10.

(27) -or, -r     [+passive, +I, -II, -pl]
  -ris      [+passive, -I, +II, -pl]
  -tur      [+passive, -I, -II, -pl]
  -mur      [+passive, +I, -II, +pl]
  -minf     [+passive, -I, +II, +pl]
  -untur    [+passive, -I, -II, +pl]

The principles governing the distribution of the allomorphs -or and -r of the first person singular exactly parallel those given for the distribution of the active allomorphs, -ơ and -m. The subcategorization of the passive suffixes (27) restricts them to nonperfect forms, shown in (28) for -ris.

(28) -ris / ___ ]
    [ +passive ]
    [ -I ]
    [ +II ]
    [ -pl ]

The subcategorization for -or parallels that for -ơ, with the verb specified [-perfect].

(29) -or / ___ ]
    [ +passive ]
    [ +I ]
    [ -II ]
    [ -plural ]

V

V-1

[-future]

[-perfect]
The third person plural passive suffix -untur loses its initial vowel after a nonhigh nonround vowel by rule (13a). The structure of the passive nonperfect paradigms parallels that of the corresponding active forms, with only the person-number affixes changed. You can check the subcategorizations and phonological rules to verify this. One more phonological rule is needed for the second person singular of the future passive. The morphological structure is (30).

\[
\text{(30) } \quad \text{(V) \quad \text{[-perfect, -past, +future, +passive,}}
\]
\[
\quad \text{ -subjunctive, -I, +II, -pl]}
\]

\[
\quad \text{\text{V} \quad \text{[-future]}}
\]

\[
\quad \text{\text{V-1} \quad \text{[-passive]}}
\]

\[
\quad \text{\text{V-2} \quad \text{-I}}
\]

\[
\quad \text{\text{by} \quad \text{+II}}
\]

\[
\quad \text{\text{ris} \quad \text{-plural}}
\]

The y of the future morpheme must be changed to e rather than to i as before. Some basic is must also be changed to e before r or word-finally, e.g. /cap-i-ris/ \rightarrow caperis 'you are seized', /cap-i/ \rightarrow cape 'seize!' This rule also applies to back vowels, as in /corpur-i/ \rightarrow corporf 'body (dative singular)’. The rule given in (31) is based on Redenbarger (1976).

\[
\text{(31) } \quad \begin{bmatrix} \text{-cons} \\ \text{-long} \end{bmatrix} \quad \rightarrow \quad \text{[-high]} \quad \begin{bmatrix} \text{r} \\ \# \end{bmatrix}
\]

8.10 Perfect Passive

The perfect passive forms are all PERIPHRASTIC, consisting of two words. One of these is the perfect passive participle, which is inflected for number and gender like other participles; in this respect it behaves like an adjective. The
other word is a form of the irregular verb *sum* 'to be,' appropriately inflected for person, number, and tense. Let us consider the participle alone first. The participle is derived from the imperfect stem by the addition of a suffix, here -\(t\)-that forms an adjective stem, which then adds adjectival suffixes for number, gender, and case. In the case of *moneō* an allomorph of the theme vowel, -\(i\)-, is used to form the participle. Because we regard the participle stem as an adjective stem derived from a verb stem, we can give the following structure to *monitus*.

\[
\begin{align*}
& \text{A} \\
& \quad \text{A-1} \\
& \quad \quad \text{V-1} \\
& \quad \quad \quad \text{V-2} \\
& \quad \quad \quad \quad \text{mon} \\
& \quad \quad \quad \quad \quad \text{i} \\
& \quad \quad \quad \quad \quad \quad \text{t} \\
& \quad \quad \quad \quad \quad \quad \quad \text{us} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \text{+perfect} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \text{+passive} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \text{+N} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \text{+V} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \quad \text{-plural} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \quad \text{+animate} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \quad \text{-feminine} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \quad \text{-oblique} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \quad \text{-theme} \\
& \quad \quad \quad \quad \quad \quad \quad \quad \quad \text{-source}
\end{align*}
\]

A perfect passive form such as *monitus sum* 'I have been warned' is a periphrastic form consisting of a participle and the verb *sum* joined into a phrase at the one-bar level, as in (33).
The interpretation of these periphrastic forms is somewhat idiosyncratic. English has many examples, such as put up with, whose interpretation is quite divergent from the meanings of the parts. The interpretation of the structure in (33) is only slightly idiosyncratic. It must be interpreted as a perfect passive (from the features of monitus) rather than as an imperfect active (as the features of the verb sum would have it). Since periphrastic forms are formed at the phrasal level, analogous to such phrases as bonus sum 'I am good,' we leave this interpretation to the semantic component.

The remaining forms of the perfect passive are analogous, as you should verify for yourself. The forms of the verb used are eram [+past], erō [+future], sim [-past, -future, +subjunctive], and essem [+past, +subjunctive], with additional forms in other persons and numbers.
8.11 Other Verb Forms

The imperative forms are based on the present stem plus appropriate imperative suffixes. The present active singular imperative *mone* ‘warn!’ has a zero affix.\(^4\) The passive plural *monēmini* syncretizes with the indicative.

The infinitives are formed either from the appropriate stem plus a suffix or are periphrastic combinations of a participle and an infinitive form of *sum* (irregularly, the future passive infinitive is a periphrastic combination of the accusative supine and *īrī*, the passive infinitive of *eō* ‘go’). The participles are fully declined adjectives, derived from appropriate stems of the verb. The gerund is a defective noun, lacking the plural and the nominative singular, whose place is taken by the infinitive. The supine is a highly defective noun, having only the accusative and ablative singular.

We could easily extend this description to other verb classes, by adding some morphemes and phonological rules, but we will not do that here, since our purpose is to show how the analysis of a complex inflectional system is carried out in terms of morphemes in the lexicon. A complete analysis requires six stem classes for the imperfect stem and eight stem classes for the perfect stem, which cross-classify, although not all 48 possibilities are actually realized. A number of verbs are irregular. The verb ‘to be’ has irregular forms in the present indicative (*sum, es, est, sumus, estis, sunt*), which will be separately listed, each with its appropriate set of features. Also listed is its perfect stem *fu-* , although here the regular perfect person-number suffixes are added.

This concludes our survey of the inflectional system of Latin verbs. Latin is one of the best-studied languages of all time, and descriptions are available in many frameworks. We will mention a few in the Selected Readings.

8.12 Terms to Learn

8.2 lexical structure rules
8.3 theme vowel
8.4 Unmarking Principle

\(^4\) Alternatively, we could have a special semantic rule that interprets bare stems as imperatives. This type of formation occurs in many languages, including Swahili: *jibu* ‘answer!’ (This stem occurred in problem 2-1.)
8.5 properly includes
8.7 rule of allomorphy

8.13 Selected Readings

Any traditional Latin grammar will acquaint you with the full range of verb forms. Allen & Greenough (1901), Hale & Buck (1903), Lane (1903), Harkness (1881), and Bennett (1918, 1907) are all good. The lexical analysis presented here owes much to Lieber (1980) and Redenbarger (1976). Matthews (1972) develops an interpretive analysis of this material, criticizing the Item-and-Arrangement analysis into morphemes; however his critique is weakened by the attempt to isolate morphemes for each element of meaning, e.g. a ‘passive’ morpheme -r, which of course is impossible. Other complex inflectional systems are analyzed in the interpretive tradition by Anderson (1982); for a critique and lexical reanalysis of his data see Jensen and Stong-Jensen (1984)
9 Morphophonemics

9.1 Preliminaries

MORPHOPHONEMICS is a general term referring to processes affecting the phonological shape of morphemes and sequences of morphemes. The type of processes involved range from purely phonetic rules (POSTLEXICAL RULES in the terminology of Chapter 5) to genuine suppletive allomorphs with nothing phonological in common (such as the Latin stems fer-, perfect tul- discussed in Chapter 7). How many types to distinguish along this scale, and where to draw the lines between them, has been a matter of much discussion and dispute in twentieth-century linguistics. Some structural linguists, such as Hockett (1958), exclude all processes from phonology except those concerned with the distribution of nondistinctive allophones, such as the aspirated [pʰ] of pin versus the unaspirated [p] of spin. For them, all other alternations were irregular morphological allomorphs, regardless of their phonological relationship. Generative phonology showed that many such alternations could also be subsumed under general phonological rules, if the rules were allowed to operate with wider scope (Cf. Chomsky 1964). As an example, consider the data of problem 9-1.
Problem 9-1 Russian.
(Based on Koutsoudas 1966, 89; raised ь following a consonant indicates palatalization.)

<table>
<thead>
<tr>
<th>singular</th>
<th>plural</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. luk</td>
<td>luká</td>
<td>'onion'</td>
</tr>
<tr>
<td>2. snék</td>
<td>sńyigá</td>
<td>'snow'</td>
</tr>
<tr>
<td>3. л́́с</td>
<td>л́ísá</td>
<td>'forest'</td>
</tr>
<tr>
<td>4. glás</td>
<td>glazá</td>
<td>'eye'</td>
</tr>
<tr>
<td>5. górat</td>
<td>garadá</td>
<td>'town'</td>
</tr>
<tr>
<td>6. óstraf</td>
<td>astravá</td>
<td>'island'</td>
</tr>
<tr>
<td>7. pógŕ́ýp</td>
<td>pagŕibá</td>
<td>'cellar'</td>
</tr>
<tr>
<td>8. luk</td>
<td>lugá</td>
<td>'meadow'</td>
</tr>
</tbody>
</table>

We can immediately isolate the plural morpheme -á. The singulars are all stressed on the initial (or only) syllable in these examples. We can say that a syllable is destressed if a stress follows later in a word. (This description of stress is adequate for these data but not for Russian generally.) For the stems we have only one form for ‘onion’ (лук) but two forms for each of the others: sńek, sńyig- for ‘snow’, etc. Do we need to list two allomorphs for each stem? No, for it turns out that there are two simple phonological rules responsible for the variation observed. These rules are known as NEUTRALIZATION rules, because they collapse distinct underlying representations. First, obstruents are devoiced in word-final position, a rule that can be given as (1).

(1) [-sonorant] → [-voiced] / ___ #

Second, certain vowels are reduced1 when they are unstressed, namely е becomes i and o becomes a. This can be expressed as (2a, b), which can be collapsed as (2c) in the notational conventions of generative phonology.

---

1 VOWEL REDUCTION results in a smaller set of vowels in unstressed syllables than in stressed syllables. In Russian, only i, a, u occur in unstressed syllables, while, in addition to these, е and о occur in stressed syllables. See section 9.2.8 for more discussion of this type of rule.
In order to derive the correct forms, we clearly have to select underlying forms that permit the greatest degree of predictability; in this case, we select underlying forms that contain unreduced vowels where a reduced vowel alternates with an unreduced one, and that contains a voiced obstruent if there is an alternation in voicing. The underlying form of 'onion' is /luk/, since no alternations are involved. The underlying form of 'forest' is /lyes/, since the vowel alternates between e when stressed and i when unstressed (by 2a). The underlying form of 'eye' is /glaz/, since the final consonant is z before a vowel but s at word end (by 1). The underlying form of 'snow' is /sn\veg/, since both the vowel and the consonant show alternation. Notice that this underlying form is not identical to either of the surface phonetic forms that are observed in the original data. The remaining underlying forms can be determined by similar reasoning. Notice also that the description becomes enormously more complicated if we try to derive the unneutralized variants from the neutralized ones. For example, we might try the initial hypothesis that the singular always represented the underlying form; we would then have to state a voicing rule that would operate on t, f, and p when these occur between vowels, on k between a front vowel and another vowel, and on s between a back vowel and another vowel. While the singular is unmarked with respect to the plural, it does not

---

2 Given only these data, the underlying form of 'island' could be either /ostrav/ or /ostrov/, since the second-syllable vowel is always reduced in these data. A general principle selects the form /ostrav/ as underlying. This principle, called the Naturalness Condition (Postal 1968), requires that non-alternating forms have their phonetic form (except for the effects of postlexical rules) as the underlying form.
necessarily follow that this form is morphologically more basic. Attention must be paid to the phonological patterns of the language. This Russian example illustrates two fairly common natural phonological changes: obstruent devoicing in word-final position and vowel neutralization in unstressed syllables. As a rule of thumb, look for such natural changes in the problems, although this cannot be a strict procedure, since unnatural changes also occur.

9.2 Types of Morphophonemic Rules

Linguists have given special names to some of the most common morphophonemic changes, at least to the more natural ones. In this section we discuss some of the most frequent ones.

9.2.1 Assimilation

Assimilation means that sounds become more alike. The word is derived from Latin ad- ‘to’ and similis ‘similar’. Notice that this word provides an example illustrating itself, since the d of ad- becomes s by assimilation to the s of similis. Other examples are sonorants in English, which are devoiced after voiceless obstruents as in lay [ley] vs play [pley], and the regular plural affix which we discussed in Chapter 1: dogs [dɔgz] vs cats [kæts].

9.2.2 Dissimilation

The opposite of assimilation is dissimilation, that is, sounds becoming less alike. This is illustrated by such popular pronunciations as [fiːt] for fifth, where the second fricative becomes a stop by dissimilation to the preceding fricative. A similar example is the common pronunciation [ˈdɪpθɔŋ] for diphthong, where the first fricative becomes a stop before another fricative. The term dissimilation does not illustrate itself. Linguists use the term autodescriptive for linguistic terms that illustrate themselves. Linguistic terms can often be made autodescriptive by slight distortions, for example, in this case, [ˌduθʌməˈleɪʃən] for dissimilation. While such distortions have their origin in humour, their introduction may help you to remember the terms. For a more complete list of autodescriptive terms, refer to Ernst and Smith (1978).
9.2.3 Insertion

A third type of morphophonemic process is **insertion**. When a vowel is inserted, this is usually called **epenthesis** (autodescriptive: [ˌɛpəˈneθəsɪs]) from the Greek term, or **svarabhakti** (autodescriptive: [ˌsavəˈbrahəkəti]) from the Sanskrit term. This occurs in certain English dialects that say [tələm] for *film*. Another example is rule (5a) of Chapter 1, where we proposed a rule to insert [u] in plural nouns if the stem ends in a strident coranal. This is sometimes called **anaptyxis** if a short vowel is inserted. If insertion occurs at the beginning of a word, it is called **prothesis**. This occurred in some Romance languages when *e* was prefixed to Latin words that begin with *s* plus a consonant, so that Latin *schola* became Spanish *escuela* (with diphthongization of the stressed vowel) and French *école* (with loss of *s*). Insertion of a consonant can be called epenthesis also, or else **excrescence** (autodescriptive: [ˌɛksˈkrɛskəns]). Many speakers do not distinguish *prints* from *prince* because of an excrescent [t] in the latter: [prɪnts]. Historically, *thimble* is a diminutive of *thumb*: Old English *pūma*3 plus the diminutive -el gives *pymel* (with umlaut of the stem vowel) which became *thymbyl* in Middle English by the excrescence of *b*.

9.2.4 Deletion

**Deletion** is the opposite of insertion. Deletion of an initial sound is called **aph(a)eresis** (autodescriptive: *'pheresis*) as in *'round* for *around*. Deletion of a medial sound is called **sycope** (autodescriptive: *sync’pe*). The Latin word *calidus* 'hot' became Italian *caldo* by sycope of the middle vowel, and this form in turn became French *chaud* by a series of further changes. Similarly, some Greek nouns show sycope in certain forms, such as the genitive *pater’s* compared to the nominative *patēr* 'father'. **Apocope** (apocop’) is deletion of a final sound, as in *chile* for *child* or the development of French *chaud* [ʃo] from *caldo* by deletion of both [o] and [d], plus the further development of [o] from [al] (compare this to *au* 'to the (masculine)’ from *à + l(e)*). (See section 1.7.)

---

3 The *p* is an Old English letter representing phonetic [θ]. Also, *y* represents [ʊ].
9.2.5 Haplology

Haplology is the deletion of a sound or syllable which is similar to an adjacent sound or syllable (autodescriptive: haplogy). Turu, a language of Tanganyika (data from Nida 1949, 40-41) has complex verb forms consisting of a subject marker, tense, optional object marker, and verb stem, such as n-a-hé:ya ‘I take away,’ n-a-ge-hé:ya ‘I take it away’ go-a-ge-hé:ya ‘we take it away’ and o-go-mo-hé:ya ‘he will take him away.’ When the prefix -go:- ‘we’ comes before the prefix -go:- ‘future’, we get a haplology, so that we have the form gó:-mo-hé:ya ‘we will take him away’ rather than *go-gó:-mo-hé:ya.

9.2.6 Metathesis

The interchange of two sounds is a metathesis (autodescriptive: [mεθætθæs]). This occurs in English when prescription, for example, is pronounced [prəsɪkrɪʃən], or conversely, when perception is pronounced [prəŋkʃən]. In Québec French, regarder may be pronounced [ərgarde] and aéroport may be pronounced [ærəpɔʁ]. This change occurs in Hungarian in such noun paradigms as teher ‘burden,’ whose accusative is terhet. Another illustration is provided by problem 9-2.

Problem 9-2. Hanunoo (Philippine Islands).
(Data from Gleason 1955, 30.)

1. ?usa ‘one’ kas?a ‘once’ ?usahi ‘make it one!’
2. duwa ‘two’ kadwa ‘twice’ duwahi ‘make it two!’
3. tulu ‘three’ katlu ‘three times’ tuluhi ‘make it three!’
4. ?upat ‘four’ kap?at ‘four times’ ?upati ‘make it four!’
5. lima ‘five’ kalima ‘five times’ limahi ‘make it five!’
7. pitu ‘seven’ kapitu ‘seven times’ pituhi ‘make it seven!’

The most transparent forms in the data are the forms for ‘five’ and ‘seven,’ from which we can isolate the stems lima ‘five’ and pitu ‘seven’ and two affixes: ka- ‘times’ and -hi ‘make it!’ The variation in the remaining stems is best described by taking /s?a/, for example, as the underlying form of ‘one,’ and by assuming the three phonological rules of (3), where (3a) must apply before (3b); rule (3c) is not crucially ordered.
Rule (3a) is given in the transformational format introduced in Chapter 4. It interchanges a consonant and a following glottal stop at the beginning of a word. Rule (3b) inserts $u$ between two consonants in word-initial position. We can derive the forms for `one` by applying the rules in order, as shown in (4).

(4) underlying /s?a/ /ka-s?a/ /s?a-hi/
(3a) ?sa ___ ?sa-hi
(3b) ?usa ___ ?usa-hi
output [?usa] [kas?a] [?usahi]

Rule (3c) applies in the derivations of $\mathit{topati}$ and $\mathit{unumi}$, deleting the $h$ after a consonant.

### 9.2.7 Vowel Harmony

Many languages exhibit vowel harmony (autodescriptive: vowol harmonu), where the vowels in a word are required to agree in some phonological feature. Hungarian exhibits front-back harmony, a very common type. (Acute accent represents a long vowel, double acute accent indicates a long front rounded vowel; examples are given in standard orthography.)

(5) a. Front-vowel words

<table>
<thead>
<tr>
<th>‘to’</th>
<th>‘from’</th>
</tr>
</thead>
<tbody>
<tr>
<td>öröm</td>
<td>‘joy’</td>
</tr>
<tr>
<td>idő</td>
<td>‘time’</td>
</tr>
<tr>
<td>tömeg</td>
<td>‘crowd’</td>
</tr>
</tbody>
</table>
b. Back-vowel words

<table>
<thead>
<tr>
<th>Word</th>
<th>'house'</th>
<th>'city'</th>
<th>'squirrel'</th>
</tr>
</thead>
<tbody>
<tr>
<td>ház</td>
<td>ház-nak</td>
<td>ház-tól</td>
<td></td>
</tr>
<tr>
<td>város</td>
<td>város-nak</td>
<td>város-tól</td>
<td></td>
</tr>
<tr>
<td>mókus</td>
<td>mókus-nak</td>
<td>mókus-tól</td>
<td></td>
</tr>
</tbody>
</table>

### 9.2.8 Vowel Reduction

The example of section 9.1 (problem 9-1) illustrated **vowel reduction** in Russian. This type of process is also illustrated in English, where completely unstressed syllables can have only the vowels [ɪ, ə], or in some dialects, only [ə], except in word-final position, where a special lengthening rule applies. Consider the second syllable of *proclamation*, which contains [ə], compared to the second syllable of *proclaim*, which contains the full vowel [ey]. Once this syllable has been destressed, it can no longer contain a full vowel. A comparable example appears in the triplet *telegraph*, *telegraphy*, *telegraphic*, which have vowel reductions in different syllables, as shown in the phonetic transcriptions ['təlɪˌɡræf], [təˈlɛɡræfi], [ˌtɛlɪˈɡræfɪk]. The underlying form is /telɪˈɡræf/, from which all the phonetic forms are predictable, once suffixes are added and the stress rules have applied.

### 9.2.9 Tone Rules

A further type of morphophonemic rule is **tone rules**, of which problem 9-3 provides an example. (These are distinct from the morphological tone rules discussed in Chapter 4, Section 4.6.)

#### Problem 9-3. Efik (Nigeria).
(Data from Gleason 1955, 37.)

<table>
<thead>
<tr>
<th>Case</th>
<th>'buy'</th>
<th>'live'</th>
<th>'think'</th>
<th>'put'</th>
<th>'go'</th>
<th>'run'</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am buying</td>
<td>ñdèp</td>
<td>ñdù</td>
<td>ńkèrè</td>
<td>ńdòrì</td>
<td>ńkà</td>
<td>mìfièhè</td>
</tr>
<tr>
<td>you are buying</td>
<td>èdèp</td>
<td>òdù</td>
<td>èkèrè</td>
<td>èdòrì</td>
<td>èkà</td>
<td>èfèhè</td>
</tr>
<tr>
<td>he is buying</td>
<td>èdèp</td>
<td>òdù</td>
<td>èkèrè</td>
<td>èdòrì</td>
<td>èkà</td>
<td>èfèhè</td>
</tr>
<tr>
<td>we are buying</td>
<td>ídèp</td>
<td>ídù</td>
<td>íkèrè</td>
<td>ídòrì</td>
<td>íkà</td>
<td>ífèhè</td>
</tr>
<tr>
<td>you (pl.) are buying</td>
<td>èdèp</td>
<td>èdù</td>
<td>èkèrè</td>
<td>èdòrì</td>
<td>èkà</td>
<td>èfèhè</td>
</tr>
<tr>
<td>they are buying</td>
<td>ídèp</td>
<td>ídù</td>
<td>íkèrè</td>
<td>ídòrì</td>
<td>íkà</td>
<td>ífèhè</td>
</tr>
</tbody>
</table>
Each of the verb stems illustrated has a characteristic tone on each syllable, which can be observed in the past and future forms. In the present, however, the tones are obligatorily neutralized to low tone. There are several other interesting processes illustrated in these data as well. A phonological process assimilates ń- ‘I’ in point of articulation to a following consonant: ńdèp ‘I buy,’
‘kèrè ‘I think,’ ğıwût ‘I show,’ mífège ‘I run’. The morphemes meaning ‘you,’ ‘he,’ and ‘past’ have a phonologically unspecified vowel (however, with a specified tone). The articulation of the vowel is determined by the following vowel. We can symbolize these morphemes as in (6).

(6) a. V ‘you’  
    b. V ‘he’  
    c. kV ‘past’  

(V indicates a vowel unspecified for articulation.)

We now need a phonological rule to assimilate the vowel to the following vowel.

(7) \[
\begin{array}{c}
V \\
\alpha \text{back} \\
\beta \text{round} \\
\gamma \text{ense} \\
\delta \text{low} \\
\end{array} \rightarrow \begin{array}{c}
\alpha \text{back} \\
\beta \text{round} \\
\gamma \text{ense} \\
\delta \text{low} \\
\end{array} \]

Rule (7) gives a V the articulatory features of the following vowel, but does not affect its tone. Notice also the neutralization of the tone in the stem of the present to low. The past and the future show the underlying form of the stem with its underlying tone.

9.2.10 Morpheme Sequence Rules

Rules that alter the sequence of morphemes in a word appear occasionally in languages. An example is provided by Problem 9-4 (Choctaw); the data are somewhat regularized.
Problem 9-4  Choctaw.
(Data from Merrifield et al. 1967, 9.)

1. pǐsalitok  ‘I saw’
2. išsapīsǎčć  ‘you will see me’
3. čipīsali  ‘I see you’
4. išsaso  ‘you hit me (present)’
5. čisoli  ‘I hit you (present)’
6. išsotok  ‘you hit (past)’
7. soličć  ‘I will hit’
8. išpayatok  ‘you called’
9. čipayaličć  ‘I will call you’
10. išsapaya  ‘you call me’
11. čakmāneličć  ‘I will like’
12. čičakmānelitok  ‘I liked you’
13. išsačakmāne  ‘you like me’
14. išpǐsa  ‘you see’

The regular order of morphemes is: subject, object, verb stem, tense. But if the subject is first person singular, it appears immediately after the verb stem. If we assume that words are generated with morphemes in the normal order, we need a transformation to produce the correct order in these cases. This rule is given in (8).

\[(8) \quad \begin{array}{c|c|c|c} 
\text{li} & \text{object} & V & \text{Øpast} \\
\hline
\text{+I} \\
\text{-pl} \\
\text{Ø} & 2 & 3 & 4 \\
\end{array} \quad \rightarrow \quad 1 \quad 2 \quad 3 + 1 \quad 4
\]

This rule states that -li- ‘1st person singular subject’ is obligatorily repositioned after the verb stem (V-1) but before the tense, if any. You should have no difficulty identifying the remaining morphemes in the problem.

9.3 An Illustrative Example

We can illustrate a variety of types of morphophonemic processes by considering problem 9-5.
### Problem 9-5. Isthmus Zapotec.
(Data from Merrifield et al. 1967, 40; Tone is not indicated.)

<table>
<thead>
<tr>
<th>2nd singular</th>
<th>3rd singular</th>
<th>1st singular</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. glean</td>
<td>ribágulu?</td>
<td>ribágube</td>
</tr>
<tr>
<td>2. put in</td>
<td>rigůlu?</td>
<td>rigůbe</td>
</tr>
<tr>
<td>3. sell</td>
<td>rutőio?</td>
<td>rutőbe</td>
</tr>
<tr>
<td>4. sleep</td>
<td>rásílu?</td>
<td>rásibe</td>
</tr>
<tr>
<td>5. sit</td>
<td>ribílu?</td>
<td>ribíbe</td>
</tr>
<tr>
<td>6. scrape</td>
<td>rurálu?</td>
<td>rurábe</td>
</tr>
<tr>
<td>7. fall</td>
<td>riábalu?</td>
<td>riábabe</td>
</tr>
<tr>
<td>8. cover</td>
<td>ručůlu?</td>
<td>ručůbe</td>
</tr>
<tr>
<td>9. get fat</td>
<td>rirőlo?</td>
<td>rirőbe</td>
</tr>
<tr>
<td>10. bathe</td>
<td>rázelu?</td>
<td>rázebe</td>
</tr>
<tr>
<td>11. pinch</td>
<td>rigiélu?</td>
<td>rigiébe</td>
</tr>
<tr>
<td>12. walk</td>
<td>rizálu?</td>
<td>rizábe</td>
</tr>
<tr>
<td>13. put on</td>
<td>rákulu?</td>
<td>rákube</td>
</tr>
<tr>
<td>14. err</td>
<td>ručělu?</td>
<td>ručěbe</td>
</tr>
<tr>
<td>15. get old</td>
<td>riššolo?</td>
<td>riššobe</td>
</tr>
<tr>
<td>16. cough</td>
<td>ruřůlu?</td>
<td>ruřůbe</td>
</tr>
<tr>
<td>17. enter</td>
<td>riůlu?</td>
<td>riůbe</td>
</tr>
<tr>
<td>18. take out</td>
<td>ribélu?</td>
<td>ribébe</td>
</tr>
<tr>
<td>19. say</td>
<td>răblu?</td>
<td>răbíbe</td>
</tr>
<tr>
<td>20. get up</td>
<td>riásalu?</td>
<td>riásabe</td>
</tr>
<tr>
<td>21. give</td>
<td>rudůlu?</td>
<td>rudőbe</td>
</tr>
<tr>
<td>22. faint</td>
<td>rięgulu?</td>
<td>rięgube</td>
</tr>
<tr>
<td>23. suppose</td>
<td>ruzulůlu?</td>
<td>ruzulůbe</td>
</tr>
<tr>
<td>24. hunt</td>
<td>rukuągulu?</td>
<td>rukuągube</td>
</tr>
<tr>
<td>25. save</td>
<td>rulálu?</td>
<td>rulábe</td>
</tr>
</tbody>
</table>

All the forms of problem 9-5 are in the habitual aspect, indicated by the suppletive prefix *ri-, ru-,* or *r-*, whose appearance depends on three stem
classes. Vowel symbols with a superior glottal stop, as \( \tilde{u} \), are laryngeal and stressed. The first two verbs allow us to isolate the stems \( \tilde{b}\acute{a}g\acute{u} \) 'glean' and \( \tilde{g}u \) 'put in,' and the suffixes \(-lu? [+II], -be [-I, -II], \) and \(-a? [+I]. \) In the third row, we observe that the vowel \( u \) of \(-lu? \) turns to \( o \) if the immediately preceding vowel is \( o. \) This is Vowel Harmony, as discussed in section 9.2.7. The data are insufficient to determine how general this process is. Conservatively, we can assume a rule along the lines of (9).

\[(9) \quad u \rightarrow o / o \ C \quad \text{(Vowel Harmony)}\]

This third verb form also illustrates the first of several processes dealing with vowel sequences. When a stressed vowel is followed by a vowel of a different articulation, the stress (and laryngealization, if present) is shifted to the second vowel. We can give this rule as in (10).

\[(10) \quad \begin{bmatrix} \text{V}_{i} \\ +\text{stress} \\ <+\text{constricted}> \end{bmatrix} \quad \begin{bmatrix} \text{V}_{j} \end{bmatrix} \quad \text{(Stress Shift)} \]

\[1 \quad 2 \rightarrow 1 \quad 2\]

\[(\text{where } \text{V}_{i} \text{ differs from } \text{V}_{j} \text{ in articularatory features})\]

In addition the final \( o \) of the stem \( \tilde{t}d\acute{o} \) 'sell' becomes \( u \) before \( a \) by rule (11).

\[(11) \quad o \rightarrow u / \_ \ a \quad \text{(o-Raising)}\]

This rule is a relatively unnatural dissimilation rule. Again, we don't know whether (11) applies generally or just before the first person singular suffix \(-a\),\) but we will assume the general form of (11), to be confirmed or disconfirmed by further data. Rules (10) and (11) do not have to be ordered; in the order (10) followed by (11) they apply as in (12).
(12) Underlying form /ru + to + a/? ‘I sell’
(10) ru + to + ə?
(11) [ru+tu + ə?]

‘Sell’ belongs to verb class 2, requiring the allomorph ru- of the habitual morpheme. We can establish that allomorphy is involved rather than phonological conditioning by comparing forms of similar phonetic shape that belong in distinct classes, e.g. rō ‘get fat’ (verb class 1, habitual in ri-) versus rā ‘scrape’ (verb class 2, habitual in ru-). The next verb stem ási ‘sleep’ belongs to stem class 3, with habitual in r-. Although all the stems in these data that belong to class 3 begin with stressed á, there are stems of this shape in stem class 1 (habitual in ri-), namely ába ‘fall’ and ása ‘get up’. The first person suffix -a? undergoes a change to -e? in this form. We cannot simply give a rule to raise a to e when preceded by i, since we have the sequence iə (at a morpheme boundary) in riábalu? ‘you fall’ and riásalu ‘you get up’. This rule (which also applies after e, to which we return) is restricted to forms where this vowel sequence is followed by ?, as in (13).

(13) a → e / \ V --- ? (a-Raising)
- back
- lo (i, e)

While the partial assimilation of á raising to e is fairly natural in the context of a high vowel, the restriction to environments with a following glottal stop make this rule less natural. A rule is now required to delete i to get the final form ráse?.

(14) i → Ø / --- + e (i-Deletion)

[-stress]

The first person form of ‘scrape,’ rurā?, illustrates the rule of a-Deletion, which deletes a before another a. The underlying form /ru-rā-a/? first
undergoes Stress Shift (10) to become /ru-ra-áʔ/ and then a-deletion, (15), to become ruráʔ.

(15)  a → Ø / ____ a  (a-Deletion)

However, a form like rizáʔyaʔ ‘I walk’ appears to contradict (15). Its underlying form, /ri-zá+aʔ/, does not undergo Stress Shift (10), since the vowels are the same. We propose a rule of y-Insertion (16) for these cases.

(16)  Ø → y / ĕi _____ Vi  (y-Insertion)

(Insert y between two vowels of identical articulation if the first is stressed (but not laryngeal) and the second is unstressed)

If rule (16) is ordered before (15), a bleeding order, the right effect is achieved, as shown in (17).

(17)  underlying form /ri- zá - aʔ/  
y-Insertion (10) /ri- zá - yaʔ/  
a-Deletion (9) _____  
final form [ri- zá - yaʔ]

One last rule completes the description. This is a rule to delete e when it precedes e (a relatively natural rule of vowel elision).

(18)  e → Ø / ____ +e  (e-Deletion)

The operation of (18) is illustrated in the derivations of (19). The derivation of ‘I bathe’ also illustrates the effect of a-Raising after e.
The rules vary widely in naturalness. A-Raising is a relatively unnatural rule, as we have already noted. Deletion of a vowel and insertion of a glide are fairly natural ways of dealing with HIATUS, the clash of two adjacent vowels, but a clash of two a is resolved either by y-Insertion (if the first is stressed) or by deletion (otherwise). The interaction of a-Raising with i-Deletion is such that i, which serves to condition the raising, is subsequently dropped. The resulting form is opaque, since a change has occurred whose conditioning environment is not visible in phonetic forms. Similarly, the interaction of Stress Shift, a-Raising, and e-Deletion (see the derivation in 19c) results in a final stressed e that represents not the final stressed e of the stem but of the affix, originally unstressed -a?.

Even more unnatural changes appear in problem 9-6.
Problem 9-6. Xavante.

(Regularized; data from Merrifield, et al. 1967, 32.)

<table>
<thead>
<tr>
<th></th>
<th>3rd. sg.</th>
<th>2nd sg.</th>
<th>3rd sg. neg.</th>
<th>2nd sg. neg.</th>
<th>imperative</th>
</tr>
</thead>
</table>

The data in the second column show that the second syllable of the stem is deleted after the second singular prefix if no suffix follows and the form is not imperative. Since this is stated in terms of morphological categories, it is a lexical rule. Further criteria for distinguishing lexical from postlexical phonological rules are presented in the next section.

9.4 Criteria for Lexical and Postlexical Rules

In terms of the lexical model of morphology developed in Chapter 5, morphological rules and phonological rules that depend on morphological categories apply in the lexicon, while phonological rules that do not depend on morphological categories apply postlexically. Table 1 summarizes the main differences between lexical rules and postlexical rules (adapted from Kiparsky 1983, 5-6).
Let us illustrate each of these concepts using the English rule of TRISYLLABIC LAXING as an example of a (cyclic) lexical rule and Flapping and Aspiration as examples of postlexical rules. Trisyllabic Laxing can be formulated as in (21).

(21) \( V \rightarrow [-\text{tense}] / \) \( \_ \_ \_ C_o \_ V \_ C_o \_ V \_ C_o \) 

\([-\text{stress}]\)

Aspiration affects voiceless stops at the beginning of words or before stressed vowels (for example potato \( [p^{h\text{\textipa{a}}t\text{\textipa{eyro}}}] \). Flapping affects \( t \) and \( d \) in roughly the complement of the environment for Aspiration, i.e. in word-internal syllables before unstressed vowels and word finally before a vowel-initial word (for example the \( t \) before the final \( o \) in potato).

Trisyllabic Laxing is clearly word bounded: it applies in profundity (from profound) but not in the phrase count on it, for example. In fact, as we saw in Chapter 5, it applies only to words derived with level 1 suffixes, so that heedlessness, for example, is unaffected. Flapping and Aspiration are not word bounded; they apply to phrases. In the phrase at a glance the first \( t \) is flapped in
North American English as it is also in the phrase *at all*. In British English, this last phrase is pronounced with an aspirated *t*, since this *t* is resyllabified with the following vowel. Such cyclic rules as stress in English refer to word-internal structure, as we saw in Chapter 5, where we saw that stress applies differently to nouns and verbs. Postcyclic rules cannot refer to word-internal structure by virtue of bracket erasure ((22) in Chapter 5), but they can refer to phrase structure.

The cyclicity of Trisyllabic Laxing can be shown by the contrast between *hypo-cris-y* and *hypo-thesis*. A cyclic rule applies after each morphological operation in the lexicon (attachment of an affix or operation of a morphological rule) and can apply only to an environment that is derived on that cycle (i.e. not to a monomorphemic item or to an environment derived on an earlier cycle). In *hypothesis*, there is only one cycle, that on which the prefix *hypo-* is attached to the stem *thesis*. *Hypocrisy* undergoes two cycles, as shown in the derivations of (22), where ' indicates stress, x indicates destressing, - indicates long, " indicates short, and / indicates that the rule is blocked in that position.

(22) 

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>underived lexical items</td>
<td>*/thesis/</td>
</tr>
<tr>
<td>level 1 phonology: Stress</td>
<td>'</td>
</tr>
<tr>
<td>level 1 morphology</td>
<td><em>/hypo+thesis/</em></td>
</tr>
<tr>
<td>level 1 phonology: Stress</td>
<td>'</td>
</tr>
<tr>
<td>Post-stress Destressing</td>
<td>x</td>
</tr>
<tr>
<td>Trisyllabic Laxing</td>
<td>/</td>
</tr>
<tr>
<td>level 1 morphology</td>
<td>[<em>/hypo+crit</em>]+i]</td>
</tr>
<tr>
<td>level 1 phonology: Stress</td>
<td>'</td>
</tr>
<tr>
<td>Trisyllabic Laxing</td>
<td>-</td>
</tr>
<tr>
<td>other rules and output</td>
<td>[h'pəθəsɪs]</td>
</tr>
</tbody>
</table>

If Trisyllabic Laxing were postlexical, it would incorrectly be blocked from applying to the first syllable of *hypocrisy* by the stress on the second syllable. This application is possible on the cyclic account because it applies to *hypocrit* on the cycle preceding that on which stress is assigned to the second syllable. Postlexical rules do not depend on such cyclic structure for their operation but apply wherever they are applicable.

Lexical rules apply only in derived environments. Trisyllabic Laxing applies to *sanity*, which is derived from *sane* at level 1 by attaching the suffix -*ity*, but
does not apply to monomorphemic items like nightingale, Avery, Oberon. Postlexical rules do not have access to word-internal structure, and apply equally to derived and nonderived environments. Compare tepid+ity, with initial t and p aspirated and d and last t flapped, with potato considered earlier.4

Lexical rules are structure preserving, in the sense that they do not introduce new segments or structures that do not occur in underived lexical items. Trisyllabic Laxing produces short vowels (as [æ] in sanity which also occurs in simple words like cat). Flapping produces the flap [ɾ] which does not occur in the underlying form of English words, and Aspiration produces aspirated segments [pʰ, tʰ, kʰ] which again are not part of underlying representations of English words. So postlexical rules need not be structure preserving.

Finally, lexical rules can have exceptions. Exceptions to Trisyllabic Laxing include obese (obes+ity) and note as in denotative (vs compar+ative). Postlexical rules do not have exceptions; they are automatic, in the sense that, if the conditions for the rule appear in phonetic forms, the rule necessarily applies.

9.5 Morphological Rules and Phonological Rules

We distinguish morphological rules from phonological rules by the criterion that morphological rules derive a new meaning, and are in that respect like affixation. (See Chapter 4.) Lexical phonological rules effect a phonological change on words derived morphologically in the lexicon. They may refer to morphological categories, but they do not change in themselves change the meaning.

In Chapter 1, section 1.7, we referred briefly to an historical process whereby productive (postlexical) phonological rules become lexical phonological or morphological rules. Our example there was the rule of fricative voicing between vowels in Old English, which has become a morphologically conditioned lexical phonological rule of modern English. Klausenberger (1979) refers to this process generally as MORPHOLOGIZATION, although the majority of his examples involve postlexical phonological rules becoming lexical phonological rules in historical change. A fairly straightforward example of both types occurs in the history the Germanic languages. Old High German

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4 The question of cyclicity and the restriction of cyclic rules to derived environments has become somewhat controversial. Kiparsky (1985) has claimed that only the first lexical level in English (and perhaps universally) is cyclic. Our example still holds because Trisyllabic Laxing is a rule of level 1.
(OHG) has a postlexical rule of UMLAUT that fronts vowels if the next syllable contained a high front nonround vowel or glide. This rule can be stated as in (23).

\[
(23) \quad V \rightarrow [-\text{back}] / \quad \text{C}_o \quad \left[ \begin{array}{c} -\text{cons} \\ \text{+hi} \\ -\text{back} \\ -\text{round} \end{array} \right] \quad \text{(Umlaut)}
\]

In Old English, the conditioning environment was lost as a result of other phonological changes. The prehistoric Old English /mann+i/ ‘men,’ which becomes [mænni] by (17), loses its final -i (a plural suffix). The word appears as menn in historical Old English, with its vowel raised to e by another rule. The rule is now a morphological one, deriving a new morphological category ([+plural]) by means of a vowel change. In OHG, the plural suffix -i still appears in such forms as gast+i ‘guests’. In modern German, the conditioning environment is retained in a reduced form [ə] that is phonetically unlikely to cause vowel fronting. Rather than becoming a morphological rule, the rule has become a lexical phonological rule with morphological conditions. In German, umlauted vowels generally occur in conjunction with some overt marker of a morphological category, as in the examples of (24).

\[
(24) \quad \begin{array}{ll}
\text{Singular} & \text{Plural} \\
a. \quad \text{Mann} & \text{Männ+er} \\
b. \quad \text{Kuh} & \text{Küh+e} \\
c. \quad \text{Fuchs} & \text{Füchs+e} \\
\end{array}
\]

\[
\begin{array}{ll}
\text{Past Indicative} & \text{Past Subjunctive} \\
d. \quad \text{saß} & \text{säß+e} \\
e. \quad \text{maß} & \text{mäß+e} \\
\end{array}
\]
Derivational affix

f. Holz 'wood' hölz+ern 'wooden, awkward'
g. gut 'good' Güte 'quality'

In some cases, however, umlaut seems to be the only marker of a morphological category, as shown in (25).

(25)  

<table>
<thead>
<tr>
<th></th>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Mutter</td>
<td>Mütter</td>
</tr>
<tr>
<td>b.</td>
<td>Hammer</td>
<td>Hämmer</td>
</tr>
</tbody>
</table>

Past Indicative  
Past Subjunctive

c. hatte  'had' hätте
d. wußte  'knew' wüßte

Derivational affix

e. Sturz  'fall' stürz- 'fall' (verb stem)

The noun plurals in (25a, b) have been plausibly argued to have the plural marker -e that also appears in (24b, c) (Wurzel 1970, Kloeke 1982). The past subjunctives in (25c, d) may also involve a suffix -e (cf. 24d, e) and a kind of haplology (section 9.2.5), where one of two adjacent identical (or similar) segments or sequences is deleted. This (perhaps) leaves only the derivation of verb stem from noun cited in (25e) as the only unambiguous example of umlaut as the only overt marker of a morphological operation, where a truly morphological rule is involved.

A rule may be lexicalized without acquiring a morphological environment. It is sometimes said that Trisyllabic Laxing in English is morphologized, since it takes place only when certain suffixes are added, namely those listed in (26) (Kiparsky 1982a, 38).
(26) -ous ômen òminous
-ate sèmen insèminate
-ar líne línear
-al nátion nátional
-ty pénal pénalty
-ison compâre compárison
-(it)ive compète compétitive
-(i)fy vile vilify
-ent réféer référent

But such a list is entirely redundant, as Kiparsky points out, since it includes all the level 1 suffixes that create the phonological conditions under which Trisyllabic Laxing (21) takes place. A level 1 suffix which does not condition Trisyllabic Laxing is noun-forming -al, but this is added only to verbs with final stress (recall the discussion in Chapter 5, section 5.1). Suppose that we consider a morphological formulation of Trisyllabic Laxing that says that laxing takes place before the affixes in (26). But such a formulation would treat the forms in (27) as exceptional, in as much as they contain a tense vowel before the suffixes of (26). Clearly, the phonological formulation (21), which requires that the vowel to be shortened be three or more syllables from the end of the word, is preferable.

(27) heinous
 sôlar
 fôcal
 evâsive
 sônant

We conclude that Trisyllabic Laxing is correctly formulated as a phonological rule (21), but also that it is a lexical rule, since it has superficial exceptions, such as those given in (28).
The forms in (28a) retain their long vowel because they are lexical items, and lexical rules cannot change features in lexical items (i.e. they apply only in derived environments). The forms in (28b) are derived, but at level 2, and so they too escape the level 1 rule of Trisyllabic Laxing.

It seems desirable to restrict the term MORPHOLOGIZATION to the case where a rule actually derives new morphological categories. We can use the term lexicalization to describe a postlexical rule becoming a lexical rule, with or without an added morphological environment.

9.6 Rule Inversion

It sometimes happens that a rule that becomes lexicalized becomes INVERTED as well, in some or all of the environments where it applies. A rule (29a) is inverted if its input and output are interchanged and the environment is changed by putting the complement environment for the original environment, as in (29b).

\[
(29) \quad \begin{align*}
\text{a. original rule:} & \quad A \rightarrow B / C \\
\text{b. inverted rule} & \quad B \rightarrow A / C
\end{align*}
\]

(where \(C\) indicates the class complement of \(C\))

An example is again provided by German umlaut. The stem \textit{senden} 'send' forms its past tense by changing \(e\) to \(a\): \textit{sand+te}. Originally this verb had the stem vowel \(a\) which underwent umlaut to \(e\) in the present because of a \([y]\) now lost, in the following syllable. However, the group of verbs that show this
particular alternation contains only eight verbs, and umlauted forms do not otherwise appear in the present indicative. In this case the umlauted form send- has become the lexical stem form, and the past in a is derived by a morphological rule. We say that the lexical form has been **restructured** from /sand/ to /send/. The morphological rule that derives the past here is the reverse of the historical umlaut rule, hence the term **rule inversion**.

Old English has taken this process one stage further, in that the literary form sendan has the stem vowel e in all its forms. The inverted morphological rule has been lost.

Rule inversion can also take place without lexicalization. Certain English dialects, most notably standard Southern British RP, underwent a sound change by which r was dropped in syllable codas. A word like park was presumably restructured as /pa:k/ soon after the change, since there was no circumstance under which r would be pronounced in this word. A word like car, however, retains its r before a following vowel, presumably by resyllabification.

(30) a. [ðə kər ɪz] the car is...
b. [ðə ka: əz] the car was...

However, in RP, pronunciations with word-final r before vowel occur in words that do not have r etymologically.

(31) a. [ði ɛdɪər ɪz] the idea is...
b. [ði ɛdɪə əz] the idea was...

Evidently the historical r-Drop rule has been inverted to a rule that inserts r at a word boundary between vowels.

(32) Ø → r / V ____ #V

This could not be a lexical rule since it is not word bounded. Nevertheless, it is an inverted rule.

### 9.7 Truncation

Isačenko (1969) introduced a type of morphological operation that does not result in new categories which he called **truncation**. This is the deletion of a morpheme under morphological conditions. Aronoff (1976) discusses a number
of cases in English. One is the deletion of adverb-forming -ly before the comparative -er. An adverb like quickly, derived from the adjective quick, has quicker as its comparative (the same as the comparative of the adjective) rather than *quicklier, as might be expected. Aronoff proposes that -er be permitted to attach to adverbs in -ly, and that -ly is subsequently deleted by a rule of truncation. Kiparsky (1983) proposes instead that -er is prevented from attaching to adverbs in -ly, and that comparatives are interpretable either as adjectives or as adverbs. He points out that this has to be true in any case, since suppletive comparatives such as better, worse are both adjectives and adverbs, yet are monomorphemic and certainly not derived via truncation.

Another of Aronoff's examples is the truncation of verb-forming -ate before suffixes like -ee, -ant, and -able. He cites examples like those in (33).

(33) a. nominate nominee
b. evacuate evacuee, evacuant
c. negotiate negotiant, negotiable
d. lubricate lubricant

Kiparsky's alternative is to derive both the verbs and nouns from bound stems: nomin-, (e)vacu-, negoti-, lubric-. He points out that these stems must be available for other level 1 derivatives such as nominal, vacuous and vacuity, where truncation cannot be motivated. And the suffixes -able, -ee, and -ant are added to other stems in forms such as those in (34).

(34) a. memorable lessee tenant
    innumerable conferee deodorant
    unconscionable obstruent sonorant

Again, truncation could not be invoked for these words, since there are no words *memorate, etc. If we allow these suffixes to attach to both verbs and stems (for readable and memorable, respectively), we need some way to block *nominatee and similar formations. The Avoid Synonymy Principle (Chapter 5, (11)) is not alone sufficient, since attachment of -able, -ee, and -ant takes place at level 1, whether it is to stems or verbs. If we stipulate that attachment of a given affix to stems takes precedence over attachment to words at level 1, the correct results follow. The subcategorization of -able, for example, can be given as (35).
Actually, Aronoff provides evidence that (in our terms) -able attaches both at level 1 and at level 2. We can observe this in terms of the criteria for these two levels of affixes discussed in Chapter 5.

1. Level 1 +able causes stress to shift in its base; level 2 #able doesn’t.

2. Level 1 +able may condition allomorphy of the base, while level 2 #able never does.

3. Level 1 +able may add to stems or to verbs; level 2 #able adds only to verbs. (More generally, we can note that attachment of affixes to stems (X\textsuperscript{-1}) is restricted to level 1.)
(38)  +able  
    tolerable
    negotiable
    demonstrable  demonstratable
    educable  educatable
    regulable  regulatable
    operable  operatable
    possible
    vulnerable
    horrible

4.  Level 2 #able is semantically more coherent than level 1 +able. X#able means roughly ‘capable of being X#ed.’
    X+able often has this meaning, but it usually (also) has an
    idiosyncratic meaning not directly related to the meaning of
    X.

(39)  a.  compárrable  ‘capable of being compared’
    cómparable  ‘capable of being compared, (roughly) equivalent’

    The two models are simply not  
    \[ \{ \text{cómparable.} \} \]
    \[ \{ \text{compárable.} \} \]

    This is the \{ cómparable  \} model in our line.
    \{ *compárable \}

b.  toleratable  ‘capable of being tolerated’
    tolerable  ‘capable of being tolerated, moderately good, fair’

    We had a \{ tolerable \} lunch today.
    \{ *toleratable \}
c. *appreciatable* ‘capable of being appreciated’
   *appreciable* ‘substantial’

   An \{ appreciable \} majority favoured the plan.
   \*appreciatable

   d. *perceivable* ‘capable of being perceived’
   *perceptible* ‘large enough to matter’
   *unperceivable* ‘incapable of being perceived’
   *imperceptible* ‘insignificant’

   There is a flaw in the gem, but it’s \{ imperceptible. \}
   \*unperceivable.

9.8 Back Formation

We introduced back formation briefly in Chapter 1, where we observed that this process results in new words by deleting material from existing words. For example, *pea* is a new singular derived from (originally monomorphemic) *pease* by perceiving the final [z] as the plural morpheme. Other words produced in this manner are listed in (40) (Kiparsky 1982a, 22).

(40) a. peddle < pedlar
   b. mix < mixt < L. *mixtus* (*miscēre* ‘mix’)
   c. injure < injury < L. *iniōria*
   d. sulk < sulky
   e. edit < editor
   f. eavesdrop < eavesdropper
   g. partake < partaker (part taker)

Linguistically naive speakers are unaware of the historical source of these words, and often express surprise when these facts are pointed out. Back formation, in Marchand’s (1969, 391) terms, “has diachronic relevance only.” It is not a part of synchronic grammars. Evidently, back formation takes place when speakers reanalyze or restructure the underlying forms, as shown in (41).
(41) a. [pease] (collective) reanalyzed as [[pea] + -s ] [+plural]
b. [beggar] reanalyzed as [[beg] + -er ] (agentive)
c. [mixt] reanalyzed as [[mix] + -ed] Ø [+N, +V]
d. [injury] reanalyzed as [[injur] + -y ] [+N, -V]

The formation of air-conditioning could also be analyzed as a back formation from air conditionerN. A number of such cases are discussed in Allen (1978), who argues that a compound verb is possible only in case the synthetic compound noun to which it is related has an idiosyncratic meaning. Consider some of her examples in (42).

(42) **Compound Verb** | **Lexicalized compound**
--- | ---
to air-condition | air conditioner (N)
*to water-condition

to typewrite | typewriter (N)
*to pen-write

to spoon-feed | spoon-fed (A)
*to knife-feed

to water ski | water skiing
*to ocean ski

Notice that a compound such as water conditioner is a possible compound, but Allen argues that it is not a LEXICALIZED COMPOUND, i.e. with an idiosyncratic meaning. On the other hand, an air-conditioner is a specific device, not any object that 'conditions air' but a refrigeration device with a blower designed for cooling, and this compound is lexicalized with this meaning, and can have a verb back formed from it. Non-lexical compounds like
water-conditioner are created by speakers for use on particular occasions; they are **nonce words** in Marchand’s terminology. Because they are not in the lexicon, they are not available for back formation. Hence the lack of such backformed verbs as *to water-condition*.

Traditional accounts of back formation, such as that of Marchand (1969), assume that the structure of *air conditioner*, for example, is that of (43a). Allen proposes that this can be reanalyzed as (43b), whence the verb *air-condition* (43c) comes directly, as in traditional account.

(43)  

```
(43)  

a.  

```

```
N
  |
  N
  |
  N
  |  V
  |  |
  air  condition  er

b.  

```

```
N
  |
  V
  |
  N
  |  V
  |  |
  air  condition  er

c.  

```

```
V
  |
  N
  |  V
  |  |
  air  condition

```

However, this does not explain why *air-condition* can be formed while *water-condition* cannot. Allen suggests simply that back formation is limited to lexicalized compounds. This proposal encounters difficulties in terms of the level-ordered theory of morphology discussed in Chapter 5. If *air-condition*
(V) is back formed from a compound noun, the back formation cannot take place before level 2, since this is where compounds are formed. But compound verbs whose right member has irregular inflection retain this irregularity: the past of spoon-feed is spoon-fed, not *spoon-feeded. Furthermore, a form such as spoon-fed (A) cannot be reanalyzed as in (43b), since it consists of only two morphemes (plus Ø), as in (44) (cf. the corresponding structure (23c) in Chapter 6.

(44)

Therefore, there is no way to derive spoon-feed on Allen's account.

The fact that some compound verbs with irregular right members get regular inflection does not help Allen's account. The verb grandstand 'behave ostentatiously' has the past grandstanded not *grandstood. But this receives a natural explanation on the assumptions of the level-ordered theory of Chapter 5. The derivation is given in (45).

(45) underived lexical items 
level 1 morphology: 
V→N Ø Derivation 
[stand]N 
level 2 morphology: 
compounding 
N→V Ø Derivation 
level 3 morphology 
[[grandstand]V ed]V 

Level 1 Zero Derivation of [stand]N uses stand, not stood, since stood is marked [+past] in the lexicon and any noun derived from it would be marked
[+past] by the feature percolation convention (4d) in Chapter 6. But nouns cannot be marked with tense features in English, compounded or not.5

(46) a. chicken-feed/*chicken fed  
    b. he took the lead/*led  
    c. to fight the good fight/*fought

These are formed at level 2, and are then turned into verbs by Zero Derivation. At this point, level 1 inflections are unavailable, and the result gets level 3 (regular) inflection. In contrast, both spoon feed and *spoon feeded are derived by compounding at level 2, and *spoon feeded is blocked at level 3 by the Avoid Synonymy Principle ((11) in Chapter 5).

Kiparsky’s solution is to derive the compound verb air condition directly on level 2. By Lieber’s ARGUMENT-LINKING PRINCIPLE (Chapter 6, section 6.2), the verb must satisfy its argument structure outside the compound, as in (47).

(47) They’ll have to air-condition the room.

The noun air must be interpreted as a restrictive modifier, something like 'condition the room with respect to the air.'

9.9 Terms to Learn

9.1 Naturalness Condition  
    obstruent devoicing  
    vowel neutralization  

9.2 assimilation  
    dissimilation  
    autodescriptive (term)  
    insertion  
    epenthesis  
    svarabhakti  
    anaptyxis  
    prothesis

5 The only clear counterexample I know is thought, which contrasts in meaning with the noun think (to have a thought is ‘to have a single idea’; to have a think is ‘to think about something for a while’). The noun drunk in to go on a drunk ‘binge’ is probably derived from the adjective drunk from the past participle of drink.
excrescence
deletion
aph(a)eresis
syncope
apocope
haplology
metathesis
vowel harmony
vowel reduction
tone rules (morphophonemic)

9.3 hiatus
opaque

9.4 Trisyllabic Laxing
Flapping
Aspiration

9.5 lexicalization

9.6 restructuring
rule inversion

9.7 truncation

9.8 nonce words

9.10 Problems

In solving the problems in this chapter, it is necessary to distinguish morphological rules from phonological rules, where the latter may be assumed to be lexical if they include a morphological environment. In these cases you don’t have enough information to assign rules to distinct levels, or in most cases, to distinguish lexical phonological rules from postlexical rules.

Add the following to the data of problem 4-6.

<table>
<thead>
<tr>
<th>'eat'</th>
<th>'go'</th>
<th>'take'</th>
<th>'sleep'</th>
<th>'cover'</th>
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<td>syön</td>
<td>menen</td>
<td>otan</td>
<td>nukun</td>
<td>peitän</td>
</tr>
<tr>
<td>syöt</td>
<td>menet</td>
<td>otat</td>
<td>nukut</td>
<td>peitäť</td>
</tr>
<tr>
<td>syö</td>
<td>menee</td>
<td>ottaa</td>
<td>nukuu</td>
<td>peittää</td>
</tr>
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<td>menemme</td>
<td>otamme</td>
<td>nukamme</td>
<td>peitätme</td>
</tr>
<tr>
<td>syötte</td>
<td>menette</td>
<td>otatte</td>
<td>nukutte</td>
<td>peitätte</td>
</tr>
<tr>
<td>syövät</td>
<td>menevät</td>
<td>ottavat</td>
<td>nukkavat</td>
<td>peittävät</td>
</tr>
</tbody>
</table>

(Data from Corbridge-Patkaniońska 1964.)

<table>
<thead>
<tr>
<th>gloss</th>
<th>singular</th>
<th>plural</th>
<th>gloss</th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. bridge</td>
<td>most</td>
<td>most</td>
<td>21. key</td>
<td>kluč</td>
<td>klučε</td>
</tr>
<tr>
<td>2. cat</td>
<td>kot</td>
<td>koti</td>
<td>22. elephant</td>
<td>swoń</td>
<td>swońε</td>
</tr>
<tr>
<td>3. cloud</td>
<td>xmüra</td>
<td>xmuři</td>
<td>23. shadow</td>
<td>čen</td>
<td>čenε</td>
</tr>
<tr>
<td>4. cow</td>
<td>krova</td>
<td>krovi</td>
<td>24. overcoat</td>
<td>plašč</td>
<td>plaščε</td>
</tr>
<tr>
<td>5. school</td>
<td>škowa</td>
<td>škowi</td>
<td>25. hat</td>
<td>kapeluš</td>
<td>kapelušε</td>
</tr>
<tr>
<td>6. forest</td>
<td>las</td>
<td>lasť</td>
<td>26. pear tree</td>
<td>gruša</td>
<td>grušε</td>
</tr>
<tr>
<td>7. letter</td>
<td>list</td>
<td>listi</td>
<td>27. bread</td>
<td>xľep</td>
<td>xľepť</td>
</tr>
<tr>
<td>8. goat</td>
<td>koza</td>
<td>kozi</td>
<td>28. dinner</td>
<td>ožat</td>
<td>ožadi</td>
</tr>
<tr>
<td>9. night</td>
<td>noc</td>
<td>nocť</td>
<td>29. picture</td>
<td>obras</td>
<td>obrasť</td>
</tr>
<tr>
<td>10. shop</td>
<td>skleś</td>
<td>sklešt</td>
<td>30. government</td>
<td>žont</td>
<td>žondť</td>
</tr>
<tr>
<td>11. soup</td>
<td>zupa</td>
<td>zupi</td>
<td>31. departure</td>
<td>viyast</td>
<td>viyaddť</td>
</tr>
<tr>
<td>12. language</td>
<td>yžežik</td>
<td>yžežiki</td>
<td>32. train</td>
<td>potówk</td>
<td>potówgi</td>
</tr>
<tr>
<td>13. grandmother</td>
<td>babka</td>
<td>babki</td>
<td>33. debt</td>
<td>dwuk</td>
<td>dwugi</td>
</tr>
<tr>
<td>14. mother</td>
<td>matka</td>
<td>matki</td>
<td>34. shore</td>
<td>bžežk</td>
<td>bžežgi</td>
</tr>
<tr>
<td>15. road</td>
<td>droga</td>
<td>drogi</td>
<td>35. collar</td>
<td>kowňeš</td>
<td>kowňešε</td>
</tr>
<tr>
<td>16. road</td>
<td>źełka</td>
<td>źełki</td>
<td>36. garage</td>
<td>garaš</td>
<td>garažε</td>
</tr>
<tr>
<td>17. bird</td>
<td>ptak</td>
<td>ptaki</td>
<td>37. journey</td>
<td>podruš</td>
<td>podružε</td>
</tr>
<tr>
<td>18. beetroot</td>
<td>burak</td>
<td>buraki</td>
<td>38. doctor</td>
<td>lekaš</td>
<td>lekažε</td>
</tr>
<tr>
<td>19. horse</td>
<td>koň</td>
<td>koňe</td>
<td>39. bear</td>
<td>ňedźyet</td>
<td>ňedźyetε</td>
</tr>
<tr>
<td>20. kitchen</td>
<td>kuxňa</td>
<td>kuxňe</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Problem 9-9. Turkish.
(Data from Lewis 1967, Hony & İz 1957.)

1. geldi  
   ‘he came’
2. geldim  
   ‘I came’
3. geliyor  
   ‘he is coming’
4. geliyorum  
   ‘I am coming’
5. geliyordu  
   ‘he was coming’
6. gelmedi  
   ‘he didn’t come’
7. gelmedim  
   ‘I didn’t come’
8. gelmeliyim  
   ‘I should have come’
9. gelmemişti  
   ‘he has not come’
10. sattı  
    ‘he sold it’
11. satıyor  
    ‘I am selling it’
12. sattım  
    ‘I sold it’
13. satmadi  
    ‘he didn’t sell it’
14. tuttu  
    ‘he held it’
15. tuttum  
    ‘I held it’
16. tutuyor  
    ‘he is holding it’
17. tutuldu  
    ‘it was held’
18. tutulmuştu  
    ‘it has been held’
19. tutulmadi  
    ‘it was not held’
20. tutumamalıyım  
    ‘I should not hold it’
21. tutumamalı  
    ‘he should not hold it’
22. tutuyordu  
    ‘he was holding it’
23. içti  
    ‘he drank’
24. içtim  
    ‘I drank’
25. içmedi  
    ‘he didn’t drink’
26. gördü  
    ‘he saw’
27. gördüm  
    ‘I saw’
28. görüyorum  
    ‘I am seeing’
29. görmemiş  
    ‘he didn’t see’
30. görmemedi  
    ‘I didn’t see’
31. görüldüm  
    ‘I was seen’
32. görülmüyorum  
    ‘I am not being seen’
Problem 9-10  Swahili.
(Data from Perrott 1950.)

<table>
<thead>
<tr>
<th>gloss</th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 'hair of the beard'</td>
<td>udevu</td>
<td>ndevu</td>
</tr>
<tr>
<td>2. 'plank'</td>
<td>ubao</td>
<td>mbao</td>
</tr>
<tr>
<td>3. 'rib'</td>
<td>ubavu</td>
<td>mbavu</td>
</tr>
<tr>
<td>4. 'wing'</td>
<td>ubawa</td>
<td>mbawa</td>
</tr>
<tr>
<td>5. 'sky'</td>
<td>uwiŋgu</td>
<td>mbiŋgu</td>
</tr>
<tr>
<td>6. 'tongue'</td>
<td>ulimi</td>
<td>ndimi</td>
</tr>
<tr>
<td>7. 'broom'</td>
<td>ufagio</td>
<td>fagio</td>
</tr>
<tr>
<td>8. 'wall'</td>
<td>ukuta</td>
<td>kuta</td>
</tr>
<tr>
<td>9. 'wind'</td>
<td>upepo</td>
<td>pepo</td>
</tr>
<tr>
<td>10. 'song'</td>
<td>wimbo</td>
<td>ŋimbo</td>
</tr>
<tr>
<td>11. 'razor'</td>
<td>wembe</td>
<td>ŋembe</td>
</tr>
<tr>
<td>12. 'net'</td>
<td>wavu</td>
<td>ŋavu</td>
</tr>
<tr>
<td>13. 'time'</td>
<td>wakati</td>
<td>ŋakati</td>
</tr>
</tbody>
</table>

Problem 9.11.  Zoque.
(Data from Wonderly 1965.)

Add the following to the data of problem 4-4.

1. mbata   ‘my mat’
2. mburu    ‘my burro’
3. faha     ‘my belt’
4. mula     ‘my mule’
5. nwakas   ‘my cow’
6. ṭgama    ‘my cornfield’
7. nhayah   ‘my husband’
8. ṭgayu    ‘my rooster’

<table>
<thead>
<tr>
<th>gloss</th>
<th>noun</th>
<th>'his'</th>
<th>'my'</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. 'older brother'</td>
<td>ḡaci</td>
<td>ḡyaci</td>
<td>ḡaci</td>
</tr>
<tr>
<td>10. 'father'</td>
<td>ṭatah</td>
<td>ŋataka</td>
<td>ndata</td>
</tr>
<tr>
<td>11. 'beans'</td>
<td>ŋak</td>
<td>ŋak</td>
<td>ŋak</td>
</tr>
</tbody>
</table>
Problem 9-12. Tonkawa (Texas, extinct).
(Data from Kenstowicz and Kisseberth 1979, 65-66.)

1. picno? 'he cuts it' picnano? 'he is cutting it'
   wepceno? 'he cuts them' wepcenano? 'he is cutting them'
   kepceono? 'he cuts me' kepceenano? 'he is cutting me'
   picen 'castrated one, steer'

2. notxo? 'he hoes it' notxono? 'he is hoeing it'
   wentoxo? 'he hoes them' wentoxono? 'he is hoeing them'
   kentoxo? 'he hoes me' kentoxono? 'he is hoeing me'
   notox 'hoe'

3. netlo? 'he licks it' netleno? 'he is licking it'
   wentalo? 'he licks them' wentalenon? 'he is licking them'
   kentalo? 'he licks me' kentalono? 'he is licking me'

4. naxco? 'he makes it a fire' naxceno? 'he is making it a fire'
   wenxaco? 'he makes them a fire' wenxaceno? 'he is making them a fire'
   kenxaco? 'he makes me a fire' kenxaceno? 'he is making me a fire'
# Appendix - Phonetic Symbols

## Consonants

<table>
<thead>
<tr>
<th></th>
<th>Bilabial</th>
<th>Labiodental</th>
<th>Interdental</th>
<th>Dental and alveolar</th>
<th>Retroflex</th>
<th>Palatoalveolar</th>
<th>Alveopalatal</th>
<th>Palatal</th>
<th>Velar</th>
<th>Uvular</th>
<th>Pharyngeal</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stops</strong></td>
<td>p, b</td>
<td>t, d</td>
<td>t, d</td>
<td>s, z</td>
<td>š, ž</td>
<td>k, g</td>
<td>q, g</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td><strong>Affricates</strong></td>
<td>c, dz</td>
<td>c, j</td>
<td>x, dz</td>
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<tr>
<td><strong>Fricatives</strong></td>
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<td>f, v</td>
<td>θ, δ</td>
<td>s, z</td>
<td>š, ž</td>
<td>x, y</td>
<td>h, ʕ</td>
<td>h</td>
<td></td>
<td></td>
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<tr>
<td><strong>Lateral fricative</strong></td>
<td>Ʉ</td>
<td></td>
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<tr>
<td><strong>Lateral</strong></td>
<td>l</td>
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<td></td>
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<tr>
<td><strong>Nasals</strong></td>
<td>m, m̃</td>
<td>n</td>
<td>n̄</td>
<td>ñ</td>
<td>n̄</td>
<td>n</td>
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<tr>
<td><strong>Glides</strong></td>
<td>w</td>
<td>r</td>
<td></td>
<td>y</td>
<td></td>
<td>(w)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flap</strong></td>
<td>r, ɾ</td>
<td></td>
<td></td>
<td></td>
<td></td>
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Vowels

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<th></th>
<th>-back</th>
<th>+back</th>
<th>+tense</th>
<th>-tense</th>
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<tr>
<td>+high</td>
<td>ɪ</td>
<td>ʊ</td>
<td>ɪ</td>
<td>ʊ</td>
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<tr>
<td>-high</td>
<td>ɛ</td>
<td>ơ</td>
<td>ʌ</td>
<td>ɔ</td>
</tr>
<tr>
<td>-low</td>
<td>ɛ̃</td>
<td>ɔ̃</td>
<td>ɔ</td>
<td>ɔ</td>
</tr>
<tr>
<td>+low</td>
<td>æ̃</td>
<td>æ̃</td>
<td>æ̃</td>
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</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

Where two symbols appear in a single cell of the consonant chart, the first is voiceless and the second is voiced. The glottal stop, glottal fricative and lateral fricative are voiceless. The sonorants (laterals, nasals, glides, and flaps) are generally voiced. A dot under a consonant letter indicates pharyngealization. A circle under a sonorant consonant indicates devoicing. Palatalized consonants are indicated with the symbol, as ɓ, ʋ. The symbol [a] is used for a low nonround vowel when it is not necessary to distinguish between [a] and [æ]. Long vowels are marked [aː] or [ã] or by a double vowel symbol; [a''] indicates half length. Nasal vowels are marked [ã]. A glottalized vowel is indicated with a glottal stop above: [á]. The acute accent (') indicates either primary stress or high tone; the context usually makes it clear which is meant. Primary stress is sometimes indicated by ' preceding the stressed syllable. The grave accent indicates either secondary stress or low tone. Secondary stress is sometimes indicated by , preceding the stressed syllable. Other symbols not explained in this appendix are sometimes used; they are explained where they occur.
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