3.1 Morphology and Phonology

This chapter explores some of the many interactions that take place between morphology and phonology. We begin by looking at phonological processes such as assimilation and the effect they have on the shapes of morphemes. We then consider limitations on the phonological shape of morphological entities such as words and stems. From there we will move on to two general types of affixes that are distinguished, in part, by phonological criteria. Their phonological behavior reveals details about their underlying structure and the point at which they attach to their bases. We conclude the chapter with a look at secret languages in which morphology and phonology interact to disguise the shapes of words.

3.1.1 The distribution of allomorphs

The term allomorph was introduced in the first chapter, in two contexts. In Kujamaat Jóola, we noted that the stem /baj-/ has two possible shapes, [baj-] and [bøj-], with [bøj-] occurring in the presence of a morph with an underlyingly tense vowel, and [baj-] elsewhere. In English, we observed that the plural marker comes in several shapes, among them [s] as in lips, [z] as in balls, [əz] as in roses, [n] as in oxen, and null, as in sheep. The Kujamaat Jóola alternation is based purely on phonological context. It is the type of alternation that interests us in this chapter. In the English data, only the first three allomorphs of the plural suffix depend on phonological context. The last two, as in oxen, and sheep, are lexical, and so we will not worry about them here.

Like the English plural suffix -s, the English past tense suffix has three forms: [d], [t], and [əd]:
The distribution of the three allomorphs is predictable, and parallel to the distribution of the three allomorphs of the English plural suffix. [d] is found on verbs ending in a vowel or a voiced consonant, with the exception of coronal stop [d]. [t] is found on verbs that end with a voiceless consonant, with the exception of coronal stop [t]. In verbs that end with [t] or [d], we find [əd]. But we can formulate the distribution of the allomorphs in even simpler terms.

We can say that the English past tense suffix is /d/, period. Where we find [t], the /d/ has assimilated to the preceding segment in voicing. Where we find [əd], we can say that the [ə] has been added by an automatic phonological rule of epenthesis that is triggered by the fact that the final segment in the verb and the suffix itself agree in both place and continuancy. (Epenthesis is the linguistic term for the addition of a segment or segments.) We can call /d/ the basic form or the basic allomorph of the English past tense suffix.

Allomorphs are often the product of assimilations like the one that takes /d/ to [t] in words like jumped, baked, or kissed. In the case of the English past tense suffix, the voicelessness of the final consonant in the verb spreads forward to the suffix in what we call progressive assimilation. There are also cases of the opposite, regressive assimilation.

An example of regressive assimilation can be found in Spanish. The preposition con ‘with’ has three phonetic realizations: [kom], [kon], and [kon]. Their distribution is predictable, just like that of the English past tense suffixes. We find [kom] before labial consonants, [kon] before coronals and vowels, and [kon] before velars. Again, we can identify a basic form, in this case /kon/. We know it is basic because it occurs in two unlike environments: before certain consonants and before all vowels. The distribution of the other
two allomorphs can be explained as assimilation in place of articulation to a following segment.

(2) Castilian Spanish *con*

a. [kom]

  *commigo* ‘with me’
  *con* María ‘with Maria’
  *con* Beatríz ‘with Beatrice’

b. [kon]

  *contigo* ‘with you (sg)’
  *con* Tomás ‘with Thomas’
  *con* él ‘with him’

c. [kon]

  *con* Gabriela ‘with Gabriela’
  *con* Carlos ‘with Carlos’

Like assimilation, epenthesis is common in the world’s languages as a source of allomorphy. Frequently, for example, languages epenthesize consonants in contexts where a final vowel in one word would otherwise come up against an initial vowel in the following word, particularly when the two have a strong syntactic bond. We call this unwanted vowel-vowel contact hiatus. French is a language that doesn’t like hiatus, and it has all sorts of ways for eliminating it in certain syntactic contexts. The plural article *les* [le] ‘the’ is pronounced [lez] when it is followed by a vowel-initial word (3a); the masculine demonstrative *ce* [sə] becomes *cet* [set], which happens to be homophonous with the feminine demonstrative *cette* (3b); and the feminine genitive adjectives *ma* [ma], *ta* [ta], and *sa* [sa] are replaced by the masculine forms *mon* [mon], *ton* [ton], and *son* [son] (3c). Regarding the last three forms, it is important to note, however, that when they function as
masculine genitive adjectives, the vowel is nasalized and the final /n/ is not pronounced before a consonant. It is only pronounced before vowel-initial words—another hiatus context.

(4).

(3) a. les maisons [lemezô] ‘the houses’
    les ami(e)s [lezami] ‘the friends’

b. ce médecin [sômedse˘] ‘this doctor’
   cet âne (m) [seton] ‘this donkey’

c. ma tante [matût] ‘my aunt’
   mon analyse (f) [monanaliz] ‘my analysis’

(4) a. mon chien [mõjì˘] ‘my dog’

b. mon oncle [monõkl] ‘my uncle’

Similarly, in the Vallader dialect of Rumantsch, the pronouns da ‘from’ and a ‘to’ become dad and ad respectively before words beginning with a vowel (Lia Rumantscha 1990):

(5) a. da Zernez ‘from Zernez’
    dad Ardez ‘from Ardez’

b. a Cuoira ‘to Chur’
    ad Arosa ‘to Arosa’

An interesting case is that of Spanish, as shown by the following set of data:

(6) a. el agua ‘the water’

b. el alma ‘the soul’

c. el águila ‘the eagle’

d. el aula ‘the classroom’

e. el ave ‘the bird’

f. el hacha ‘the axe’

g. el hambre ‘hunger’
All of the Spanish nouns above are feminine, which may surprise you if you know already that *el* is the masculine definite article, and *la* is the feminine. In Spanish, *la* must be replaced by *el* before a feminine noun that begins with a stressed [a]. This does not occur before any other vowel sound, as shown by the last two examples. So the Spanish anti-hiatus rule has a very limited application. It applies only at the juncture between the feminine definite article and a stressed [a]. What’s more, it has at least two lexical exceptions: it does not apply in the case of *la a* ‘the a’ or *la hache* ‘the h’ (letters of the alphabet). As morphologists, we are used to dealing with cases like this. Unlike syntax, which tends to be very regular, morphology is full of irregularities and exceptions that only add to its charm.

### 3.1.2 Phonotactic constraints

Another phenomenon at the boundary of morphology and phonology is the existence of phonotactic constraints, that is, constraints on the phonological shape of stems and words. These phonotactic constraints are often addressed in the phonological literature, and in some cases have been instrumental in the development of particular approaches to phonology.

At their most basic, phonotactic constraints determine the minimum length of content words in particular languages. For example, in Mohawk, each content word contains at least two syllables (Michelson 1988, cited by Hayes 1995: 47). Other languages require that content words consist of at least a heavy syllable, where heavy means that the syllable contains a long vowel, diphthong, or a vowel and a weight-bearing (moraic) consonant. Many
languages do not have minimal word constraints. Romanian, Hungarian, and Icelandic are all examples (Hayes 1995: 88-9).

What about English? Does it have a minimal word constraint? One oft-cited set of data that suggests that it does is nicknames. Let’s make a list of some English first names and their corresponding short forms, or nicknames:

(7) **English nicknames**

a. Alexander --> Alex
    Caroline --> Carrie
    Katherine --> Cathy, Kitty

b. Josephine --> Jo
    Louisa, Louis --> Lou
    Susan, Suzanne --> Sue
    Tyler --> Ty

c. Beverly --> Bev
    Christopher --> Chris
    Robert --> Rob, Bob
    Stephanie --> Steph

Even if we were to keep going, we would find that any nickname we can think of falls into one of these three sets. They are either polysyllabic (7a) (in this case, bisyllabic) names or monosyllabic names (7b-c) that either have a diphthong, a coda, or both. No native English nicknames consist of a single, light syllable. From this data, it seems that English falls in with the set of languages that have a minimal word constraint. Even the shortest of names, nicknames, must consist minimally of a heavy syllable or two light syllables. And it is difficult, if not impossible, to find an English content word that contradicts this conclusion.
We also find that languages have restrictions on the possible shapes of roots. Nida (1965: 66) reports that in the Mayan languages, roots are predominantly of the shape CVC and in Bantu they are generally CVCV. In Hebrew, Arabic, and other Semitic languages, roots generally consist of three consonants: CCC. To form words, vowels are superimposed on this template. We can call this type of morphology root-and-pattern, because the vowels in a given inflectional or derivational paradigm fall into a fixed prosodic pattern which can be described in terms of syllable types, complete with information about vowel and consonant length. Interestingly, this feature of the language is reflected in the writing systems of Hebrew and Arabic, which use the primary symbols to represent consonants and diacritics to represent vowels.

While there are no exceptions to minimal word constraints, by definition, we do sometimes find exceptions to generalizations about possible root shapes. In the Semitic languages, for example, we find roots consisting of two consonants (CC) and four (CCCC). But these are rare compared to triconsonantal roots.

3.1.3 Primary and secondary affixes

Over the years, our knowledge of morphological structure has been enhanced by work in phonology. We can learn a lot by observing the phonological processes that take place or do not take place within particular sets of morphologically-complex words.

One distinction that has come out of work that pairs morphology and phonology is that between primary and secondary affixes, also known as class 1 and class 2 affixes. Below are some examples, from Kiparsky (1983), of words bearing –(i)an, a primary affix (8), and ones bearing –ism, a secondary affix (9):

(8)   a. Mendel → Mendelian
      b. Mongol → Mongolian
If you read the words in (8) and (9) to yourself, you will hear an important difference. Words with –(i)an have a stress shift. The stress in Mendel is on the first syllable, while in Mendelian, it is on the second. Likewise, Parkinson is stressed on the first syllable, but Parkinsonian is stressed on the third. We can generalize by saying that in all words with –(i)an, stress is on the antepenultimate, or second-to-last, syllable. Stems suffixed with –ism, on the other hand, are stressed on the same syllable as their unaffixed counterparts. Nationalism is stressed on the first syllable, just like national. This is the first and most famous difference between primary and secondary affixes. Primary affixes cause a stress shift, while secondary affixes do not.

If primary and secondary affixes both occur in the same word, we can make a second prediction. The primary affix will always occur closer to the stem than the secondary affix. Therefore, Parkinsonianism is a possible word, but *Parkinsonismian is not.

Now consider the words reparable and repairable. What is the difference between them? Both have repair as their stem, but it is slightly disguised in the first. Semantically, both mean ‘capable of being repaired’, but only the second would be used to describe a broken appliance. The first is better suited to abstract repairs. We could ask, for example, if a broken peace accord is reparable. These words show that the suffix –able in English is
actually two suffixes. One is primary, and the other is secondary. Traditional usage among
morphologists is to use the symbol ‘+’ to mark the juncture between a stem and a primary
affix and to use ‘#’ to mark the juncture between a stem and a secondary affix. To avoid
confusion, we’ll use these symbols to differentiate between the two types of –able here.

Other word pairs that show the opposition between +able and #able are preferable
[préfərəbl] vs. preferable [prəfərəbl] and comparable [kʌmpərəbl] vs. comparable
[kəmpərəbl]. Phonologically, the stem in the first undergoes a stress change, as is typical of
primary affixes. In addition, in each case, the semantics of the first are less direct, or less
compositional, than the semantics of the second. The semantics of the second are so
predictable that most complex forms with #able are not even listed in dictionaries. For
example, if we say two models are not comparable, we mean that they are unlike. If we say
that they are not comparable, we mean that it is not possible, in a very literal sense, to
compare them.

If we look for other +able vs. #able pairs, we discover other types of phonological
changes that are characteristic of primary affixation. Consider the following words:

(10)  

<table>
<thead>
<tr>
<th>+able</th>
<th>#able</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. defensible</td>
<td>defendable</td>
</tr>
<tr>
<td>b. perceptible</td>
<td>perceivable</td>
</tr>
<tr>
<td>c. divisible</td>
<td>dividable</td>
</tr>
</tbody>
</table>

Forms with +able in (10) exhibit allomorphy in the stem. They use a form that is recognizable
from nouns, namely defense, perception, and division, instead of the citation form of the
lexeme: defend, perceive, and divide. The fact that +able can be spelled ible is unimportant.
Its pronunciation is what counts. Sometimes stem allomorphy is due to truncation, as seen in
the following examples. Truncation is the shortening of a morph by lopping off one end and
leaving the rest intact; thus, from cultivate we get cultiv-: \(^{1}\)
The untruncated stem appears in words with #able. In fact, in any word of the form $X_{able}$, if $X$ is not a free form, then the word is of the form $X_{+able}$ and not of the form $X_{#able}$.

Examples include possible, vulnerable, horrible, capable, and susceptible.

Another difference between +able and #able is that in words of the form $X_{#able}$, $X$ must be a transitive verb. In (11), cultivate, educate, irrigate, navigate, and demonstrate are all transitive. +able, on the other hand, can attach to stems that are not transitive verbs, such as possible (from Latin posse ‘to be able’) or risible (from Latin ride:re ‘to laugh’).

In talking about the distinction between primary and secondary affixes, we have focused on suffixes. Prefixes can be primary or secondary as well. An example of a primary prefix is in+, and an example of a secondary one is un#. Both mean ‘not’. Phonologically, in+ has allomorphs. It surfaces as ir-, im-, in-, and il- in words like irreplacable, immortal, inoperable, and illegal. Un# does not have any allomorphs.

in+, like +able, attaches to allomorphic, and sometimes truncated stems:

(12)  

<table>
<thead>
<tr>
<th></th>
<th>in+</th>
<th>un#</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>irregulable</td>
<td>unregulatable</td>
</tr>
<tr>
<td>b.</td>
<td>inviolable</td>
<td>unviolatable</td>
</tr>
<tr>
<td>c.</td>
<td>imperceptible</td>
<td>unperceivable</td>
</tr>
<tr>
<td>d.</td>
<td>indivisible</td>
<td>undividable</td>
</tr>
</tbody>
</table>

The stems it attaches to are characterized by a stress change:
in+ and un#

a. irréparable unrepáirable (cf. repárir)
b. irrévocable unrevókable (cf. revóke)

And in+ attaches to non-lexical stems, while un# does not.

(14) a. impossible *unpossible
b. impalpable *unpalpable
c. inept *unept
d. inert *unert

Compare well-formed words prefixed with un# such as ungodly, unhinge, unlike, unsteady. Godly, hinge, like, and steady are all lexical stems. An exception to this general observation is unkempt. There is no lexical stem kempr. But as usual, this morphological fact about English finds an explanation when we look to the history of the word. Indeed, kempt used to exist. It was the past participle of the Old English word cemban ‘to comb’.

If you are observant, you have observed a final and very important difference between in+ and un#. The former has a special relationship with +able, and the latter with #able. Words with +able are prefixed with in+ and not un#, while words with #able are prefixed with un#.

We have included our discussion of primary and secondary affixes in a chapter that deals with the interaction between phonology and morphology because that is the context in which this distinction has most often been treated and because it led to important work in phonology. Under the heading Lexical Phonology, phonologists have used the distinction between the two types of affixes to explore the possibility that different phonological rules apply at different levels of a morphological derivation (for a detailed overview, see Kenstowicz 1994). But as we have seen, primary and secondary affixes have semantic
consequences as well. In particular, the semantics of primary affixes are less likely to be compositional.

3.1.4 Linguistic exaptation, leveling, and analogy

Rudes (1980) and Lass (1990) have both raised the question of what to do with “linguistic left-overs” (Rudes’ term) or “linguistic junk” (Lass’ term). In both cases, it has to do with morphemes that lose their semantic content or morphosyntactic function as a result of language change, and are left as contentless, functionless strings of phonemes floating around in the system. Rudes’ and Lass’ investigations on this question cover a variety of cases. They show that languages are in general intolerant of useless elements, and speakers reanalyze them as having a new role. Lass calls this process linguistic exaptation, extending a term originally coined by Stephen Jay Gould and Elizabeth Vrba in the context of evolutionary biology to the study of language change. In evolutionary biology, exaptation occurs when a structure of feature takes on a function different from that which it developed for through natural selection.

Carstairs-McCarthy (1994) and Cameron-Faulkner and Carstairs-McCarthy (2000), in their work on inflectional classes and gender, and stem alternation, respectively, suggest that linguistic exaptation is pervasive. Carstairs-McCarthy views the ingenuity that speakers show in assigning new roles to inflectional contrasts whose original purpose has been lost as being related to Clark’s (1987: 2) Principle of Contrast, “Every two forms contrast in meaning.” Linguistic exaptation is therefore a natural consequence of a core psycholinguistic mechanism that makes it easier for speakers to master complex inflectional systems or to learn the meanings of new vocabulary items, and we expect to find it playing an important role in the evolution of inflectional systems cross-linguistically.
One place that linguistic exaptation has occurred is Germanic (Lass 1990: 83-87). There, Indo-European ablaut, or vowel alternations within verbal paradigms, came to encode tense, i.e., the present/preterit distinction (e.g., English write, wrote). It had originally been used to encode aspeotual distinctions. (There will be more on ablaut in the next chapter.)

The case that we are going to focus on here, however, is the one discussed by Rudes: the development of the verbal suffix –esc in Romance.

Our story begins with Latin, where the suffix –sc (sometimes considered an infix) attached to sequences of verb stem plus theme vowel to form the inchoative aspect. Two terms here merit definition. A theme vowel, in the morphology of Latin, was a vowel that attached to the verb stem and can be seen as determining its inflection class. For example, one Latin verb class was identified by the theme vowel /a/. Inchoative aspect refers to the fact that some verbs identify actions that are just beginning. Thus, amō in Latin means ‘I love’, while amasco means ‘I am beginning to love’, and florere is ‘to flower’ while florescēre is ‘to begin to flower’ (examples from Rudes 1980).

As Latin developed into the modern Romance languages, this inchoative suffix declined in productivity and eventually ceased to be productive at all. But while the semantic function of the affix eroded, the phonological material survived into various Romance languages, including Italian, Romanian, and dialects of Rhaeto-Romance. It was altered in one significant way: the theme vowel ceased to be identifiable as a theme vowel, and came to be segmented along with the affix. In both Romanian and Rhaeto-Romance, the suffix was reanalyzed as –esc. In Italian, it was reanalyzed as –isc. At this stage, we had what Lass calls “linguistic junk,” phonemes without a function. Within Lass’ model, there were three possibilities regarding the future development of the suffix –esc/-isc:

(15) a. It could disappear entirely.
b. It could be kept as “marginal garbage,” i.e., meaningless idiosyncrasies of the verbs already bearing it.

c. It could be kept, but instead of being relegated to the marginal role of (b), it could be used for something new, taking on a new meaning or function.

What happened was (15c). It became productive once again, and is a distinctive feature of the verbal morphology of certain Romance languages. The question is, why?

The classical conception of morpheme is a pairing between sound and meaning, although we have defined it as the smallest grammatically-significant unit in a word. What makes the development of –esc in the Romance languages distinctive is that its function was phonological, rather than syntactic or semantic. It is meaningless. We can exemplify this by looking at the paradigm of a verb that contains this morpheme. As seen below, the suffix occurs in the first, second, and third person singular and third person plural of the present indicative of the verbs that have it (so-called fourth conjugation verbs) in Romanian, illustrated here by *a citi* ‘to read’ (Rudes 1980: 333). (It also occurs in these persons in the present subjunctive and imperative.) But verbs obviously do not mean different things depending on what the subject is:

(16) 1sg citésc

2sg citéști

3sg citéște

1pl citím

2pl citiți

3pl citésc

We can describe the new-found role of the –esc suffix in (16) as that of a stem-extender. The addition of –esc in the singular persons and in the third person plural had an effect on word stress. If not for the presence of the suffix, verbs like *a citi*, above, would be stressed on the
root in the 1-3sg and 3pl forms, and on the suffix in the 1-2pl forms. Since the diachronic, or historic, development of vowels in Romanian and other languages varies depending on stress, this would have had the effect of creating two stems for many verbs. In other words, the renewed productivity of the suffix –esc long after its original meaning of inchoative aspect was lost is due to its regularizing effect on the stress of non-past verb forms. This is reflective of a larger tendency cross-linguistically. As languages evolve over time, they often show a preference for regularity within paradigms.

The story of the evolution of the Latin inchoative affix has another twist. Recall from above that one of the languages where it is productive and phonologically conditioned (appearing where stress would otherwise fall on the stem) is Italian. There, it is realized as [isk] or [iʃ], depending on the following vowel. From Italian, it was borrowed into Maltese.

Maltese is a Semitic language. Semitic is known for root-and-pattern morphology, as we saw in section 3.1.2 above. Over the course of time, however, the productive verbal morphology of Maltese has become affixal, with only relics of the original root-and-pattern type remaining (Hoberman and Aronoff, to appear). One consequence of this change is that Maltese easily borrows verbs intact from other languages—especially Romance. This is not so straightforward in other Semitic languages like Hebrew and Arabic. For example, as noted by Hoberman and Aronoff, Hebrew borrows nouns intact (e.g., telefon), but “verbs must follow the patterns dictated by the morphological patterns of the language’s verbal morphology.” Thus, one form of the verb ‘to telephone’ is tilfen.

When Maltese borrows Italian verbs containing the <-isc-> augment, it borrows the augment as well, which always takes the shape [iʃ], written <ixx>. This augment appears under the same conditions as in Italian: when stress would otherwise fall on the stem. But since the stress patterns of Maltese verbs differ from those of Italian verbs, these conditions are met in different tense, person, and number forms. This is shown in Table 6.1. Following
Hoberman and Aronoff, we have indicated stress, though the orthographies of neither language do so:

Table 6.1. Italian and Maltese verb paradigms (Hoberman and Aronoff, to appear)

<table>
<thead>
<tr>
<th></th>
<th>Italian</th>
<th>Maltese</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perfect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sg 1</td>
<td>suggerisco</td>
<td>issuggeri</td>
</tr>
<tr>
<td>sg 2</td>
<td>suggeristi</td>
<td>issuggeri</td>
</tr>
<tr>
<td>sg 3m</td>
<td>suggeri</td>
<td>issuggerixx</td>
</tr>
<tr>
<td>sg 3f</td>
<td>---</td>
<td>issuggeriet</td>
</tr>
<tr>
<td>pl 1</td>
<td>suggerimmo</td>
<td>issuggeréjna</td>
</tr>
<tr>
<td>pl 2</td>
<td>suggeriste</td>
<td>issuggerétu</td>
</tr>
<tr>
<td>pl 3</td>
<td>suggerirono</td>
<td>issuggeréw [-éww]</td>
</tr>
<tr>
<td><strong>Imperfect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sg 1</td>
<td>suggerísco</td>
<td>nissuggerixx</td>
</tr>
<tr>
<td>sg 2</td>
<td>suggerísici</td>
<td>tissuggerixx</td>
</tr>
<tr>
<td>sg 3m</td>
<td>suggerísce</td>
<td>jissuggerixx</td>
</tr>
<tr>
<td>sg 3f</td>
<td>---</td>
<td>tissuggerixx</td>
</tr>
<tr>
<td>pl 1</td>
<td>suggeriámo</td>
<td>nissuggerixxu</td>
</tr>
<tr>
<td>pl 2</td>
<td>suggerite</td>
<td>tissuggerixxu</td>
</tr>
<tr>
<td>pl 3</td>
<td>suggeríscono</td>
<td>jissuggerixxu</td>
</tr>
<tr>
<td><strong>Imperative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sg</td>
<td>suggerísci</td>
<td>suggeríxxi</td>
</tr>
<tr>
<td>pl</td>
<td>suggerite</td>
<td>suggeríxxu</td>
</tr>
</tbody>
</table>

In some cases, the augment appears in parallel forms in both languages, but in other cases, it doesn’t. Maltese has borrowed a morpheme and the rule that governs its distribution, but not the verb forms themselves.

The tendency for languages to prefer regular paradigms over irregular ones explored above leads to what we call **leveling**. In other words, morphophonemic alternations that do
not signal important differences in meaning tend to be eliminated. A classic example of leveling comes from Latin. In Prehistoric Latin, the stems of words like *coloːs* ‘color’ and *honoːs* ‘worth’ ended in –s throughout the nominal paradigm:\(^2\)

\[
\begin{array}{ll}
\text{Prehistoric Latin} \\
\text{Nominative} & \text{coloːs} \\
\text{Genitive} & *\text{coloːs-es} \\
\text{Dative} & *\text{coloːs-ei} \\
\text{Accusative} & *\text{coloːs-em} \\
\text{Ablative} & *\text{coloːs-i}
\end{array}
\]

Through regular sound change, intervocalic /s/ became /t/, a process called rhotacism:

\[
\begin{array}{ll}
\text{Old Latin} \\
\text{Nominative} & \text{coloːs} \\
\text{Genitive} & \text{coloːr-is} \\
\text{Dative} & \text{coloːr-ei/-eː} \\
\text{Accusative} & \text{coloːr-em} \\
\text{Ablative} & \text{coloːr-e}
\end{array}
\]

At this point, the paradigm was characterized by two stems, one ending in /s/ (the nominative form) and one ending in /t/ (the oblique forms). Eventually, the final /s/ of the nominative form was replaced by /t/ in order to conform with the stem of the oblique forms. Note also that the /o/ preceding the /t/ of the nominative form shortened:\(^3\)

\[
\begin{array}{ll}
\text{Classical Latin} \\
\text{Nominative} & \text{color} \\
\text{Genitive} & \text{coloːr-is} \\
\text{Dative} & \text{coloːr-iː} \\
\text{Accusative} & \text{coloːr-em}
\end{array}
\]
We refer to the process by which members of a paradigm come to conform in shape as leveling.

A second example of leveling comes from the history of Spanish. Latin, from which Spanish developed, had a class of verbs that was characterized by a nasal infix in the present stem. The nasal infix was present in many forms of the verb, but was absent from others:

\[(20)\]
\[\begin{align*}
\text{a. } & \text{ rumpō ‘I break’ but rūpī ‘I broke} \\
\text{b. } & \text{ vincō ‘I defeat’ but vići ‘I defeated’}
\end{align*}\]

In the history of Spanish, the /n/ infix has been generalized to all forms of the verbs that once had it. Hence we have the Modern Spanish forms romper ‘to break’, rompo ‘I break’, rompi ‘I broke’ and vencer ‘to defeat’, venzo ‘I defeat’, venci ‘I defeated’.

When talking about leveling, we often use the term analogy. The nasal infix was generalized within the paradigms of verbs that had it on analogy with verbs that did not have such a morphophonemic alternation at all and instead had a single form of the stem. Using Modern Spanish forms for simplicity, the equation would be as follows, where conocer ‘to know’ is chosen randomly as a representative of verbs that did not have the nasal infix:

\[(21)\]
\[\begin{align*}
\text{concer : conocí} \\
\text{vencer : } X = \text{venci}
\end{align*}\]

More broadly, four-part analogy is used to describe the generalization or extension of a morphological pattern across (as opposed to within) paradigms (Hock 1991: 168). Through it, whole classes of words come to behave more similarly. Hock gives the example of English plurals. It is because of four-part analogy that the plural of cow is cows and not the earlier form kine. The new plural cows generalizes the plural formation familiar from other words, such as stone, stones:
(22) stone : stone-s
    cow : X = cow-s

Again, we have chosen to use modern forms for simplicity’s sake.

Leveling and analogy are powerful forces in the development of languages over time. They are driven by an innate preference in speakers for phonological and morphological similarity between members of a paradigm or a class of words.

3.1.5 Secret languages

We would like to conclude this chapter by looking at a couple of secret languages, both of which are permutations of existing languages. They are only two examples of a phenomenon that is found around the world. Secret languages have been attested in English, French, Spanish, Dutch, Thai, Cuna (Sherzer 1970), and Haitian Creole, to name a few. What is the place of these languages in a book on morphology? In the examples that we present, speakers go from the existing language to the secret language through the regular application of phonological rules in what might be considered a morphological derivation.

One secret language you may already be familiar with is Pig Latin. In one variation, words that start with vowels are simply suffixed with \textit{way} [wej]. Words that begin with a consonant or consonant cluster shift the entire onset sequence to the end, and then are suffixed with \textit{ay} [ej]:

(23) igpay atinlay  ‘Pig Latin’
    eefray ormfay  ‘free form’
    inflectionway ‘inflection’

For speakers to manipulate words in this fashion, they have to have subconscious knowledge of linguistic notions such as onset and nucleus. Language games are therefore an interesting union of phonology and morphology.
Another secret language is *verlan* [vɛʁlɑ̃], which is based on French. The word *verlan* is derived by reversing the syllables of *l’envers* [lœ̃vɛʁ] ‘the other way around’. Verlan works best with words of two syllables, because in these the two syllables can simply be reversed:

(24)  
<table>
<thead>
<tr>
<th>Standard French</th>
<th>Verlan</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. pourri [puki]</td>
<td>ripou [kipu]</td>
</tr>
<tr>
<td>b. branché [bʁœ̃sɛ]</td>
<td>chébran [ʃebʁɑ̃]</td>
</tr>
<tr>
<td>c. pétard [petaʁ]</td>
<td>tarpé [tœ̃pe]</td>
</tr>
<tr>
<td>d. bagnole [baŋol]</td>
<td>gnolba [ŋolba]</td>
</tr>
</tbody>
</table>

Monosyllables are verlanized differently depending on whether they are open or closed. In open monosyllables, such as *pue* [py] ‘stinks’, the order of consonant and vowel is reversed, yielding forms like [yp]. Closed monosyllables, such as *femme* [fam] ‘woman’, are treated as if they end in a schwa (Bullock 1996: 185), and therefore as if they are underlyingly bisyllabic. The syllables are reversed, and the final vowel is dropped: *[fam] --> [fa.m] --> [mœ̃f]*. Note that the schwa is realized as [œ]; this is because schwa cannot be in stressed position in French. Trisyllabic words are put into verlan by changing the order of the syllables, but there are no fixed rules on how. For simplicity’s sake, we are not going to deal with these forms here.

For Bullock (1996), the interesting question is how the phonology of secret languages like verlan compares to the phonology of the language they are based on. We see with verlan that it respects the basic syllable structure of French. Speakers of verlan, as with speakers of Pig Latin, are conscious on some level of prosodic entities such as onset, nucleus, coda, and syllable. On the other hand, Bullock and her predecessors who have looked at French secret languages note that the phonology of verlan is not the same as that of the standard language. We see in (24d) that [p] is a licit onset in verlan. It is not in standard French. Furthermore, in
verlan, only the liquids [l] and [ʁ] are permitted in the codas of polysyllabic words. Bullock presents the example of bifton, syllabified in standard French as bif.ton. In verlan, it would become fton.bi [ftó.bi], because [f] cannot form the coda of a polysyllabic word. This example deviates from standard French phonology in another way: [ft] is not a possible onset in French. Finally, it is significant that we formulated the constraint on codas by referring to “polysyllabic words.” In verlan monosyllables, consonants other than [l] and [ʁ] are welcome in word codas:

(25) **Standard French**  **Verlan**

a. disque [disk]  skeud [skød]  ‘CD, record’

b. mec [mek]  keum [køm]  ‘man’

In natural languages we would not expect to find a coda constraint that holds in polysyllabic words but not monosyllables. It is intimately related to the fact that no verlan form is native, and no verlan speaker is monolingual. All of verlan is based on standard French, and speakers of verlan invariably speak French, if not natively, then under more natural conditions. According to Bullock, the ‘rules’ of verlan are artificial vis à vis those of the standard—and natural—language.

Returning to Pig Latin, in the version presented here, words that start with a consonant cluster postpone the entire cluster, then add the suffix –ay. But another version of the secret language simply postpones the first letter. Any rule that operates on letters rather than on phonological entities such as onsets is unnatural. Languages are first and foremost oral, and orthographies are simply systems imposed on them by people. Because of characteristics like these, secret languages must be looked upon as somewhat artificial, and should not on their own be used to make conclusions about the workings of natural languages.
3.2 Kujamaat Jóola Vowel Harmony

We now turn to Kujamaat Jóola and the most salient feature of its phonology, vowel harmony. Vowel harmony is the agreement among vowels in a word with respect to a given feature, such as height, rounding, or backness. In Finnish, for example, vowels harmonize for backness. All the vowels in a given word must be either front or back. The vowel of a suffix therefore changes, depending on whether the vowels of the unsuffixed word are front or back, as shown by the partial nominal declension paradigms in (1):

\[(1) \quad \text{‘house’} \quad \text{‘forest’} \]

\[ \begin{array}{ll}
\text{nominative} & \text{talo} \quad \text{metsä} \\
\text{partitive} & \text{talo-a} \quad \text{metsä-ä} \\
\text{ablati ve} & \text{talo-lta} \quad \text{metsä-itä} \\
\text{inessive} & \text{talo-ssa} \quad \text{metsä-ssä} \\
\text{elative} & \text{talo-sta} \quad \text{metsä-stä}
\end{array} \]

The /a/ vowel of the case-endings may be realized as back [ɑ] or front [æ] (orthographic <ä>) depending on the backness of the preceding vowel.

In Kujamaat Jóola, there are two sets of vowels, tense and lax:

\[(2) \quad \begin{array}{cccc}
\text{\small Tense} & \text{\small Lax} \\
\text{i} & \text{u} & \text{i} & \text{u} \\
\text{e} & \text{o} & \text{e} & \text{o} \\
\text{æ} & \text{e} & \text{æ} & \text{e} \\
\text{a} & \end{array} \]
It may seem strange that schwa is classified as a tense vowel, but as explained by Sapir (1975: 3), the tense/lax distinction in West African languages is typically different from that of European languages. In West African languages, like Kujamaat Jóola, tense vowels are relatively higher and closer to center than lax vowels. This explains why schwa, which is higher and more central than /a/, is considered its tense counterpart. The difference between high tense and lax vowels is hard to perceive for foreigners, but the same is not true for the lower vowels, where distinctions are readily apparent.

All vowels in a word must be either tense or lax. Since tense vowels are dominant, whenever any tense vowel is found in a morphologically complex word, vowels that are otherwise lax become tense.\(^4\) Harmony spreads out both ways from a tense vowel:

\[
\begin{array}{ll}
\text{Lax stem} & \text{Tense stem} \\
\text{baj} & \text{jitum} \\
\text{bajen} & \text{jitumen} \\
\text{nibajenu} & \text{nijitumenunu} \\
\text{bojul} & \text{jitumul} \\
\text{nibojulu} & \text{nijitumulu}
\end{array}
\]

As we see in (3), the process of vowel harmony leads to the existence of two allomorphs, or variants, for all morphs with lax vowels that can occur together in a word with morphs containing tense vowels. The stem /baj-/ ‘have’, for instance, may be realized as [baj-] or [bɔj-]. The causative marker /-en/ also occurs as [-en], and the subject prefixes /ni-/ ‘I’ and /u-/ ‘you (sg.)’ as [nɪ-] and [u-]. Morphs containing tense vowels, by contrast, never alternate, because tense vowels always win. The stem /jitum/
‘bring’ always appears with the same shape, because its vowels are underlyingly tense. Likewise, the directional marker /-ul/ has an underlyingly tense vowel. Both /jitum/ and /-ul/ trigger vowel harmony, but are never affected by it. We can tell whether a morph’s vowels are basically tense or lax by whether it alternates; alternating morphs whose vowels are sometimes lax and sometimes tense are basically lax, while non-alternating morphs whose vowels are always tense are basically tense.

The importance of the tense-lax distinction in Kujamaat Jóola goes well beyond phonology and morphology. In a 1975 article, Sapir explores the social role played by tense and lax vowel harmony. It turns out that vowel harmony is not absolute. Some speakers make relatively more use of it, and their speech is considered to be kɔlo ‘big’ by other Kujamaat Jóola speakers. Those who make relatively less use of it have speech that is called mis ‘thin’. Big and thin are always relative terms. There are no speakers who have only tense vowels or only lax vowels. It is a “quantitative tendency . . . to favor lax or tense pronunciation” (Sapir 1975: 5; emphasis his) that determines whether someone’s speech is ‘big’ or ‘thin’.

As Sapir relates, he first became aware of the big-thin distinction while working with three Kujamaat Jóola speakers, AB (thin), KB (intermediate), and AK (big) on a dictionary project. The big-thin distinction came across in three general areas. Of highest importance was variation in the application of vowel harmony. While vowel harmony is obligatory in the language, the extent and degree of vowel harmony is not fixed. A tense morpheme might affect all of the vowels of a base, or only an adjacent vowel (Sapir 1975: 6):
(4) \( \text{pan} + a + \text{kan} + \text{do} \) ‘he will put it within’

*Full harmony:* \( \text{panak\öndo} \)

*Partial harmony:* \( \text{panak\öndo} \)

Likewise, vowels affected by vowel harmony “may only partially tense, that is, they may become tainted with tenseness, not completely tense.” This fact is particularly interesting, because it shows that the phonological feature [tense] is not an all-or-nothing matter.

A second area in which the big-thin distinction is apparent is suffixes. Three Kujamaat Jöola suffixes have regional variants that differ in part in containing tense versus lax vowels. AB, Sapir’s ‘thin’ consultant, used the lax variants of the three suffixes. KB, the intermediate consultant, used the lax variants of two, but the tense variant of the third. AK, Sapir’s ‘big’ consultant, used the tense variants of two suffixes. The tense and lax variants of the third suffix were in free variation (Sapir 1975: 5):

(5)  

<table>
<thead>
<tr>
<th></th>
<th>( AB, ) thin</th>
<th>( KB, ) intermediate</th>
<th>( AK, ) big</th>
</tr>
</thead>
<tbody>
<tr>
<td>negative infinitive</td>
<td>-( \text{ati} )</td>
<td>-( \text{atì} )</td>
<td>-( \text{atì} )</td>
</tr>
<tr>
<td>‘never’</td>
<td>-( \text{erit} )</td>
<td>-( \text{erit} )</td>
<td>-( \text{urit} )</td>
</tr>
<tr>
<td>‘1pl exclusive’</td>
<td>-( \text{uli} )</td>
<td>-( \text{uli} )</td>
<td>-( \text{oli} ) -( \text{oli} )</td>
</tr>
</tbody>
</table>

The final area in which the big-thin distinction showed up was vocabulary. There is quite a bit of lexical variation between the Kujamaat Jöola speakers of different villages. Sometimes lexical items are completely distinct. Sometimes, however, dialectal forms are only slightly different and are due in part or in full to the tense-lax distinction. Here are a few examples (Sapir 1975: 5):
As seen in (6), the intermediate speaker shares the lax variant of ‘shinny up a tree’ with the thin speaker, but shares the tense variants of the other three forms with the ‘big’ speaker. For more detail on this and the other two areas that contribute to the big-thin distinction (harmony, variation in the form of suffixes), we refer the reader to Sapir (1975).

Moving away from morphology now and into the realm of sociolinguistics, the big-thin distinction, as mentioned above, is not absolute, but instead must be seen as falling out along a continuum. A Kujamaat Jóola speaker will be able to place another’s speech as being bigger or thinner than his or her own. Regional dialects differ in terms of their relative bigness or thinness, and Jóola speakers even refer to other languages as being various degrees of big. The fundamental role of the big-thin distinction in Kujamaat Jóola society is identification of someone else as being similar or different. The closer in speech a person is to another, the more likely that that person is “reliable and trustworthy, or at least predictable” (Sapir 1975: 10).

Below is part of Sapir’s description of a conversation that he had with a Kujamaat Jóola woman, who characterized the speech of Sindian, the village of KB, Sapir’s intermediate consultant, as being “heavy” and “hard to understand” (1975: 10). Sapir explains that to his knowledge, speakers of the woman’s dialect didn’t have any difficulty
at all in understanding Sindian speech. It was more that Sindian speech was simply different:

Although Sindian speech was heavy it was not nearly so heavy as Kasa, a different dialect where there are some real difficulties. In turn Kasa was not as heavy as Wolof, the dominant language of Sénégal, nor was Wolof as heavy as French. English, my speech and the official language of the neighboring ex-colony of Gambia, was to this woman unquestionably the heaviest speech imaginable, just \textit{k\k\k\k\k\k} like so many pied crows.

One of the most interesting aspects of the big-thin distinction is how speakers are placed in one category or another. Recall that Sapir had three consultants. One talked ‘big’ (AK) and one ‘thin’ (AB), and the third fell between them. As Sapir notes, there was nothing in the speech of the third individual that placed it closer to the ‘thin’ or the ‘big’ speaker. But this individual, KB, called his speech ‘big’, and the other two agreed. The reason for this had nothing to do with the tense-lax distinction. It was social. KB and AK, the ‘big’ speaker, were both Muslims, younger, and from outlying villages. Furthermore, they had worked with Sapir previously. AB, the ‘thin’ speaker, was Catholic, older, and from the administrative center. He was also fairly new to the project. Thus, KB’s decision to call himself ‘big’ had more to do with his perceived similarities to AK than to the tenseness of his speech.

Because the decision to classify someone as ‘big’ or ‘thin’ is based in part on social factors, Kujamaat Jóola people can disagree about whether someone talks ‘big’ or
‘thin’. Sapir gives another example, where two of his consultants disagreed over whether the speech of Kagnaru, a village, was ‘big’ or ‘thin’. KB, who considered his speech ‘big’, classified Kagnaru’s dialect as ‘thin’. It was true, the people of Kagnaru spoke ‘thinner’ than KB. But they did not speak as ‘thin’ as AB. KB’s labelling of their speech as ‘thin’ came more from the difficult relationship between his village and theirs. AB disagreed with KB. For him, the speech of Kagnaru was ‘big’:

Although he admitted that Kagnaru might speak ‘thinner’ than [KB’s village] they were both ‘bigger’ speakers than himself and he saw no reason why he should be grouped with them. And socially, didn’t the Kagnaru people intermarry with [KB’s village] and quarrel with villages connected to his own family? And weren’t they for the most part Muslims? (Sapir 1975: 13)

This passage highlights sociolinguistic aspect of the big-thin distinction nicely.

This short excursion into vowel harmony and the metalinguistic role of the tense-lax distinction should convince the reader that a morphologist must also be a bit of a phonologist. An understanding of Kujamaat Jóola vowel harmony is essential if we are to identify the morphological building blocks of the language — the smallest grammatically significant pieces. We need to recognize, for example, that although the first singular subject prefix may be realized as [ni-] or [ni-], in both cases we are dealing with the same underlying form, /ni-/.

What’s more, if we were out in the field working with Jóola consultants, it would be essential to realize that variation in vowel harmony plays not a
morphological role, but a social one. What we started off considering as a phenomenon at
the intersection of Kujamaat Jóola phonology and morphology turned out to be a
tripartite issue that brings together phonology, morphology, and sociolinguistics.
1. Classical Greek (adapted from Nida 1965: 27)

Compare the nominative (subject) forms with the corresponding genitive forms. Determine the assimilations and reductions that are exhibited in the nominative series, and express them by referring to phonological features. (You should ignore changes in the position of stress.) Finally, determine the best underlying representation of each root.

   a) aitʰiops  ‘Ethiopian’   aitʰiopos  ‘of an Ethiopian’
   b) pʰléps  ‘vein’   pʰlebós  ‘of a vein’
   c) pʰúlaks  ‘watchman’   pʰúlakos  ‘of a watchman’
   d) aiks  ‘goat’   aigós  ‘of a goat’
   e) tʰEʰs  ‘serf’   tʰetós  ‘of a serf’
   f) elpís  ‘hope’   elpídos  ‘of hope’
   g) órnis  ‘bird’   órnitʰos  ‘of a bird’
   h) gígas  ‘giant’   gígantos  ‘of a giant’
   i) hrís  ‘nose’   hrinós  ‘of a nose’

2. Huave (Mexico) (Nida 1965: 17)

Identify the morpheme that has allomorphs and describe their phonologically-defined distribution.

   nahimb  ‘broom’   -hta  ‘female’
   nahndot  ‘dust’   -ʃei  ‘male’
3. Answer the following questions about three English morphs.

(i) What are the allomorphs of the English plural suffix that we write as -s? Determine their phonologically-defined distribution and give examples.

(ii) What are the allomorphs of the English possessive suffix that we write as ’s? Determine their phonologically-defined distribution and give examples.

(iii) What are the allomorphs of the English past tense suffix that we generally write as -ed? Determine their phonologically-defined distribution and give examples.

(iv) What are the distributional similarities between the three sets of allomorphs?

4. Zoque (Nida 1965: 21)

Describe the phonological environment of all allomorphs in the following set of data.

What accounts for their appearance?

a) ?os mpama ‘my clothes’ pama ‘clothes’
b) ?os ηkayu ‘my horse’ kayu ‘horse’
c) ?os ntuwi ‘my dog’ tuwi ‘dog’
d) ?os mpoco ‘my younger sibling’ poco ‘younger sibling’
e) ?os ηkose ‘my older sister’ kose ‘older sister’
f) ?os ncin ‘my pine’ cin ‘pine’
5. Tarahumara (Mexico) (Nida 1965: 22)

Describe the phonological environment of all allomorphs and then describe the type of assimilation that determines their distribution.

mitʃiru ‘to make shavings’    reme ‘to make tortillas’
sikwitiʃi ‘anthill’    remeke ‘tortillas’
sikwiki ‘ant’    patʃi ‘to grow ears of corn’
mitʃiruku ‘shavings’    patʃiki ‘an ear of corn’
ritu ‘to be icy’    opatʃa ‘to be dressed’
rituku ‘ice’    opatʃaka ‘garment’

6. Tsotsil (Mexico) (Nida 1965: 23)

(i) Identify all morphemes.

(ii) List the morphemes that have allomorphs.

(iii) Describe the phonological distribution of these allomorphs.

a) -k'ufi ‘to put a wedge in’    -k'uf ‘wedge’
b) -fik'u ‘to put a prop under’    -fik' ‘prop used beneath an object’
c) -foni ‘to put a prop against’    -fon ‘prop used against an object’
d) -vovi ‘to go crazy’    vov ‘crazy’
e) -t'ufi ‘to become wet’    t'uf ‘wet’
f) -sakub ‘to become white’    sak ‘white’
g) -lekub ‘to become good’    lek ‘good’
h) -?ik'ub ‘to become black’    ?ik' ‘black’
Supplementary information: For this problem, it is preferable to consider that there are two different verbalizing suffixes, one consisting of the structure –V and the other of –VC.

7. The following words are all suffixed with a primary affix. What are the changes to the stem triggered by the affix? Be as thorough as possible. Refer to the basic form of the stem in formulating your answer.
   a) diplomacy
   b) publicize
   c) differential
   d) sanity
   e) electricity
   f) pollution

8. Determine whether the following English suffixes are primary or secondary. Give arguments for your decision and support them with several examples.
   a) -ness (e.g., loneliness)
   b) -ive (e.g., permissive)
   c) -ous (e.g., glorious)
   d) -ship (e.g., partisanship)
9. English (adapted from Nida 1965: 30)

First, rewrite the following forms phonetically. Next, break the morphologically complex forms in column two into their constituent parts. Finally, determine the best underlying representation of the stems.

a) hymn          hymnal
b) solemn        solemnize
c) condemn       condemnation
d) damn          damnation
e) autumn        autuminal

10. The forms in column B are drawn from a secret language based on French. The basic French forms are given in column A. Identify the morphological process that leads from the forms in column A to those in column B. Next, determine what inconsistency, if any, there is in the application of the rule. (Data from Bullock 1996: 186, citing Plénat 1983: 98-101.)

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>fois [fwa]</td>
<td>favwa</td>
<td>‘time’</td>
</tr>
<tr>
<td>poignet [pwane]</td>
<td>pwavapave</td>
<td>‘fist’</td>
</tr>
<tr>
<td>atelier [atole]</td>
<td>avatavlovje</td>
<td>‘studio’</td>
</tr>
<tr>
<td>choir [jwaβ]</td>
<td>Javwαβ</td>
<td>‘fall’ (v)</td>
</tr>
<tr>
<td>vieux [vjø]</td>
<td>vavjø</td>
<td>‘old’</td>
</tr>
<tr>
<td>derrière [dekiβ]</td>
<td>daverjavα</td>
<td>‘behind’</td>
</tr>
<tr>
<td>poursuivait [pukswive]</td>
<td>pavuβsqavivave</td>
<td>‘was pursuing’</td>
</tr>
<tr>
<td>French Word</td>
<td>Latin Form</td>
<td>Meaning</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>pointe</td>
<td>pavve∅tav∅</td>
<td>‘point’</td>
</tr>
<tr>
<td>bien</td>
<td>bavje∅</td>
<td>‘well’</td>
</tr>
<tr>
<td>ses yeux</td>
<td>savezavj∅</td>
<td>‘his/her eyes’</td>
</tr>
<tr>
<td>point</td>
<td>pavvē</td>
<td>‘point’</td>
</tr>
<tr>
<td>variable</td>
<td>vavarjavav∅</td>
<td>‘variable’</td>
</tr>
<tr>
<td>client</td>
<td>klavijavā</td>
<td>‘client’</td>
</tr>
</tbody>
</table>

1. If we don’t want to consider the forms in the first column as having undergone truncation, we can say that the stems of these verbs are bound, and that the infinitive forms (e.g., cultivate) arise through affixation of –ate.

2. We thank Alan Nussbaum for help with the Latin data presented in this section.

3. In the case of both color and honor, the older nominative forms colo:s and hono:s hung around for a long time. We use color here because it has the advantage of attesting the old nominative colo:s while still showing the new nominative color at a relatively early date. Relic forms are relatively common when it comes to analogical change. Unlike regular sound changes, which can be accounted for in purely phonetic terms (cf. Latin rhotacism), analogy is sensitive to morphologic, syntactic, and semantic factors.

4. The picture is complicated by sociolinguistic factors, as we will see later in this section.