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LANGUAGE FILES

Materials for an Introduction to Language and Linguistics

Department of Linguistics

LANGUAGE FILES

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Language Files

Materials for an Introduction to Language and Linguistics

Thirteenth Edition

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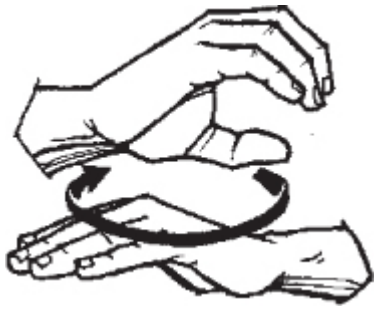


So in any signed language, a grammatical sign cannot have both hands moving unless they have the same handshape and orientation and are performing the same kind of movement. Interestingly, in Signed Mandarin (which is not a signed language, but rather a signed code for Mandarin Chinese; see File 1.5) certain signs that have been introduced by hearing (non-native signer) instructors at schools for the deaf do not follow this universal rule. This fact is yet more evidence that signed codes and signed languages differ! For example, in the Signed Mandarin sign for 'ink,' both hands are moving, so the sign should follow the symmetry constraint, but instead the hands have different orientations: the dominant hand isfacing toward the signer, and the non-dominant hand away from the signer. The hands also have different movement: the dominant hand moves in a path away from the body while the non-dominant hand moves from side to side, as well as different handshapes: the dominant hand has one finger extended while the non-dominant hand has three fingers extended. This is therefore ungrammatical as a sign for three reasons.

There has been an attempt (again by non-native signers) to introduce such signs from Signed Mandarin into Taiwan Sign Language, but the reaction among the native signers is that these signs are not possible in their language. It is exactly as though somebody told you that [kpflus] was a new word of English; you wouldn't accept it!

3.1.3 Foreign Accents

Applying the phonotactic constraints of one language while speaking another is an important source of foreign accents. A Spanish speaker, for example, may pronounce *student* as [estudent], because in Spanish, the consonant clusters [st], [sk], and [sp] are not permitted to occur at the beginning of a word without being preceded by a vowel—as in the words *estudiante* 'student,' *escuela* 'school,' and *espalda* 'back.' The speaker who says [estudent] is simply applying the phonotactic constraints of Spanish when speaking English words.

FILE 3.5

How to Solve Phonology Problems

3.5.1 Goals of Phonemic Analysis

Because phonemes are important units of linguistic structure, linguists must have a general method for identifying them in all languages. But the task of determining what a language's phonemes are and what allophones are assigned to them is not always straightforward. For one thing, the set of phonemes differs from language to language, so a separate analysis is required for each language. Moreover, phonemes are psychological units of linguistic structure and are not physically present in a stream of speech. As a result, it is not possible to identify the phonemes of a language simply by taking physical measurements on a speech sample. Nor does investigating a native speaker's intuitions necessarily help, because the minute phonetic details involved are often precisely those that speakers are not accustomed to noticing.

To get around these problems, linguists have developed an objective procedure by which the phonemes of a language can be discovered through examination of a set of words written in phonetic transcription. This procedure is based on two main observations about patterns of sounds.

First, as discussed in File 3.2, phonemes make distinctions in meaning. If two sounds are members of separate phonemes, minimal pairs can almost always be found. For example, the minimal pair *led* and *red* is evidence that [l] and [ɹ] contrast and are allophones of separate phonemes in English. But if two sounds are allophones of the same phoneme, minimal pairs differing only in those sounds will not exist. For example, [bʌʔn̩] and [bʌtʰn̩] are both possible pronunciations of the English word *button* (though [bʌtʰn̩] may sound a little stilted). This is because the sounds [ʔ] and [tʰ] are both allophones of the phoneme /t/. Thus, the meaning doesn't change.

Second, the allophones of a phoneme are not a random collection of sounds but are a set of sounds that have the same psychological function—they are the "same" sound. Accordingly, allophones of the same phoneme are systematically related to one another: they often share many phonetic properties, and because they are in

complementary distribution, it is possible to predict which allophone will appear in a word on the basis of phonological rules.

By analyzing the patterns of sounds that are physically present, it is possible to draw conclusions about the psychological organization of a language, even though it is not directly observable.

3.5.2 How to Do a Phonemic Analysis

Although a phonemic analysis can be performed successfully on any language, we will begin with a problem based on English. Look over the data in (1), which are given in a fairly detailed phonetic transcription. Recall that an open circle under a segment indicates that it is voiceless.

(1)

'pray'	[pʰ̥ɹeɪ]
'gray'	[gɹeɪ]
'crab'	[kʰ̥ɹæb]
'par'	[pʰɑɹ]
'broker'	[bɹoʊkɻ]
'fresh'	[f̥ɹɛʃ]
'regain'	[ɹigeɪn]
'shriek'	[ʃ̥ɹik]
'tar'	[tʰɑɹ]

Consider the sounds [ɹ] and [ɹ̥]: are these sounds constrastive or allophones of the same phoneme? (Of course, native speakers of English may intuitively know that they are allophones of the same phoneme. However, the procedure for doing a phonemic analysis should produce the same answer without appealing to the intuitions of speakers.)

In order to answer this question, it is necessary to examine scientifically the **distribution** of sounds within these data. That is, for each sound in question we need to determine the set of phonetic environments in which it can occur. But just what do we mean by *environment*? For the time being, we can define the **phonetic environment** of a sound as the sounds that immediately precede and follow it within a word. For example, in the word [gɹeɪ], [ɹ] is in the environment [g __ eɪ]; that is, [ɹ] is preceded by [g] and followed by [eɪ]. (Remember that diphthongs like [eɪ] and [oʊ] are single sound even though they are represented by two vowel symbols together.)

The best way to begin a phonemic analysis is to look first for minimal pairs. Suppose for a moment we were interested in the sounds [pʰ] and [tʰ] in the data in (1). These sounds do appear in a minimal pair: [pʰɑɹ] and [tʰɑɹ] have different meanings and differ phonetically by only a single sound in the same position. This tells us that [pʰ] and [tʰ] are in overlapping distribution and, more specifically, that they are in contrastive distribution, because the difference between them causes a difference in meaning. Therefore, they are allophones of different phonemes. We can also look for pairs of words that differ phonetically by only a single sound in the same position but that have exactly the same meaning. If we find any, we know that the sounds are in free variation and are allophones of the same phoneme.

Returning to the status of [ɹ] vs. [ɻ̊], we see that there are no minimal pairs in the data that differ only by these two sounds. Since [ɹ] and [ɻ̊] are not in overlapping distribution in our data,[1] we can assume that they are in complementary distribution. However, we must prove that this is so by making a generalization about where [ɹ] (but not [ɻ̊]) may appear, and vice versa. In order to do so, we need to compare the phonetic environments of each of these sounds. The easiest way to do this is to make a list for each sound, as follows. (Note that "#" indicates a word boundary.)

(2)

[ɹ]	[ɻ̊]
[ɡ __ eɪ]	[pʰ __ eɪ]
[ɑ __ #]	[kʰ __ æ]
[b __ oʊ]	[f __ ɛ]
[# __ i]	[ʃ __ i]

Once you have collected the list of phonetic environments for each sound from all of the data, you can proceed as follows:

1. *Look at the environments to find natural classes.* As a beginner, you may find it helpful to begin by giving the phonetic description for each of the sounds in the environments listed. This will help you to see any generalizations. (As you become more familiar with the IPA and the features it represents, it will become easier to see generalizations just from looking at the list of sounds.) So, for example, we could look at the sounds that appear before [ɻ̊] in (2), which are [pʰ], [kʰ], [f], and [ʃ], and describe them as follows: aspirated **voiceless** bilabial stop; aspirated **voiceless** velar stop; **voiceless** labiodental fricative; **voiceless** post-alveolar fricative. This lets you see that all of these sounds share the feature of being voiceless consonants. This generalization

permits us to simplify the description of the preceding environment for [ɹ̥]; instead of listing each sound separately, it is now possible to say:

(3) [ɹ̥] appears after voiceless consonants.

Now look at the environments in which [ɹ] appears. Do the sounds that appear before it make up a natural class? Yes and no. Certainly [b] and [g] are voiced consonants, and [ɑ] is also voiced, but the set that includes [b], [g], [ɑ], and the beginnings of words does not form a natural class. Thus, the critical observation to make here is that there is no single natural class of environments that [ɹ] follows.

We have looked at the sounds preceding [ɹ] and [ɹ̥], but what about the sounds that follow them? As you can see, only [ɹ] may occur word-finally, but either [ɹ] or [ɹ̥] can occur before a vowel. Because the environment that follows either [ɹ] or [ɹ̥] can be the same (for example, [eɪ]), this alone can't tell us about when you get [ɹ] vs. [ɹ̥]. Thus, the environments that condition the appearance of [ɹ] or [ɹ̥], i.e., the conditioning environments of these particular allophones, are their immediately preceding sounds.

It is important to keep in mind that the relevant part of the environment will differ based on the particular phonological rule involved. Sometimes the conditioning environment is the preceding environment, sometimes it is the following environment, and sometimes it is a combination of the two (think back to the environment for the flapping rule in English). It is also the case that some of the natural classes involved will be quite broad (e.g., "voiceless consonants," "vowels") and some will be more narrow (e.g., "alveolar stops," "front high and mid vowels").

2. *Look for complementary gaps in the environments.* So far, we have shown that [ɹ̥] appears after voiceless consonants, while [ɹ] appears in an apparently random set of environments. Yet, it is possible to make one more critical observation by comparing the two sets of environments. [ɹ] does not appear in the environments in which [ɹ̥] appears, namely, after voiceless consonants. Moreover, [ɹ̥] does not appear where [ɹ] does; there is no [ɹ̥] after voiced consonants or at the beginnings or ends of words. Since the environments of [ɹ] and [ɹ̥] have systematic and complementary gaps, we say that [ɹ] and [ɹ̥] are in complementary distribution. We can predict, based on the preceding sound, which one will occur. Therefore, they are allophones of the same phoneme. Note that any kind of complementary gap—any environment where one sound can occur but not the other—results in predictability.

3. *State a generalization about the distribution of each of these sounds.* In other words, write a rule that will make predictions about where each of the sounds can occur. Actually, we've done the hard part of this already by observing that [ɹ̥] occurs following voiceless consonants. How should we state the distribution of [ɹ]? We could try formulating our rule as follows:

(4) [ɹ̥] appears following voiceless consonants;
[ɹ] appears following voiced consonants or vowels, or at the beginning or end of a word.

However, that's not a very succinct formulation of the rule. To simplify it, recall that wherever [ɹ̥] occurs, [ɹ] can't, because their possible environments form complementary sets. Therefore, we can revise our rule this way:

(5) [ɹ̥] appears following voiceless consonants;
[ɹ] appears elsewhere.

4. *Determine the identity of the phoneme and its allophones.* This next step in writing the rule involves deciding how to label the phoneme these sounds belong to. In order to do so, we need to decide which of the allophones is the **basic allophone** and which is the **restricted allophone.** We have determined that the conditioning environment for [ɹ̥] consists of a single natural class of sounds. [ɹ̥] is restricted to occurring after these sounds, whereas [ɹ] may appear anywhere else. Therefore, we can identify [ɹ̥] as the restricted allophone and [ɹ] as the basic one.

It makes sense to name the phoneme after the basic allophone, since it is the one that can show up in a wider variety of contexts. Furthermore, the basic allophone is assumed to be the closest approximation of the mental "sound" that speakers store in memory. In choosing a name for the phoneme, we have made the leap from observable phonetic reality to unobservable psychological reality. (It is not always possible to choose one allophone as basic, however. In that case the phonology exercise's instructions will not tell you to do so, and any of the allophones would serve equally well as the name of the phoneme.)

We can improve on our rule once more by writing it to show the process of going from the phoneme to each of the allophones, as in (6). This notation was introduced in Section 3.3.1. The arrows in the rule in (6) mean 'is pronounced as.' We use slashes around symbols that represent phonemes, square brackets around symbols that represent

phonetic realizations, and a single slash indicates the beginning of the environment specification.

(6) /ɹ/ → [ɻ̊] / after voiceless consonants;
/ɹ/ → [ɹ] / elsewhere.

Now that we have formulated the necessary phonological rule, we can see which phonological process it involves (see File 3.3). In this rule a voiced phoneme changes into a voiceless sound when it follows another voiceless sound. In other words, /ɹ/ becomes more like a preceding sound with respect to the feature of voicelessness. Therefore, we can conclude that the process of assimilation is involved in this phonological rule.

3.5.3 Some Potential Trouble Spots

The procedure outlined in the previous section will work for any language for which reliable phonetic transcriptions exist. However, beginners are often confused by certain questions.

For instance, if you discover that no minimal pairs exist for two sounds, is it possible to automatically conclude that they are allophones of the same phoneme? No. It is still necessary to show that the sounds are in complementary distribution, since allophones are predictable variant pronunciations of the same phoneme.

Consider what happens if you make a decision too soon. Using the data presented in (1) at the beginning of the previous section, suppose you wanted to know whether [g] and [ʃ] are allophones of the same phoneme. Since there are no minimal pairs differentiated by these sounds in the data set, it might seem reasonable to conclude that they are. (Of course, a speaker of English should have no trouble thinking of a minimal pair involving these two sounds, for example, *gag* and *gash.* The exercises, however, are designed to be self-contained; that is, in all of the problems in this book, you will be given enough data **within** the problem set to solve the problem. This means that you should not rely on outside knowledge you may have of the language you are analyzing to answer the question.) But a careful examination of the data reveals that this is the wrong conclusion. Listing the data and the relevant environments, you find what is shown in (7).

(7) [g] appears in *gray* [gɹeɪ], *regain* [ɹigeɪn]
generalization: [g] appears between vowels or at the beginning of a word;

[ʃ] appears in *fresh* [fr̥ɛʃ], *shriek* [ʃr̥ik]
generalization: [ʃ] appears at the beginning or end of a word.

As these data illustrate, [g] and [ʃ] are not in complementary distribution because their distributions overlap: either may occur at the beginning of a word. Furthermore, either may be followed by the phoneme /ɹ/. As a result, no phonological rule can be responsible for their distribution. In general, when no generalization can be made about where sounds can occur, it is possible to conclude that they are contrastive and are allophones of separate phonemes. A conclusion based on such a demonstration is just as valid as showing that minimal pairs exist. This alternative way of showing that sounds are members of separate phonemes is useful because it's not always possible to find minimal pairs for all distinctive sounds. For example, there are no minimal pairs involving [ŋ] and [h] in English, and [h] never appears in a syllable coda while [ŋ] only appears in a syllable coda. But it is reasonable to assume that they belong to separate phonemes because they share few phonetic properties, and no phonological rule determines where they can occur.

The range of tests for identifying phonemes can be broadened somewhat by the use of **near-minimal pairs.** Recall that a minimal pair is a pair of words differing in meaning but phonetically identical except for one sound in the same position in each word. Near-minimal pairs are similar, except that the words are **almost** identical except for the one sound. For example, *heard* [hɻd] and *Bert* [bɻt] form a near-minimal pair involving [h] and [b]. It is important to note that the immediately adjacent environments of the sounds in question are still identical, and this should generally hold true for near-minimal pairs. We are thus justified in saying that [h] and [b] are allophones of separate phonemes because no conceivable phonological rule would permit only [h] at the beginnings of words ending in [d], and only [b] at the beginnings of words ending in [t]. (This conclusion is partly based on extensive study of how phonological rules work: experience does play a role in being able to do phonological analysis.)

One final point about minimal pairs: notice that we have not defined them as pairs of words that rhyme. It is not necessary for two words to rhyme in order to form a minimal pair. Consider the English minimal pairs *state* [steɪt] and *steak* [steɪk], for example, or *boat* [boʊt] and *beat* [bit]. Nor is rhyming sufficient to qualify a pair of words as a minimal pair: *gray* [gɹeɪ] and pray [pʰr̥eɪ] from the list of data above rhyme, but differ in two sounds. And to take another example, *glitter* and *litter* rhyme but do not form a minimal pair because they do not contain the same number of sounds.

Another question that often troubles beginners is this: when describing the environment in which a sound appears, how do you know where to look? In the problem we solved in the previous section, we focused on the sounds that preceded [ɹ] and [ɻ̊]. But as we noted above, this is certainly not the only possibility. In fact, identifying conditioning environments is the most challenging part of doing a phonemic analysis.

Recall that in many cases, the relevant conditioning environment consists of the sounds immediately surrounding the sound in question. However, it is sometimes necessary to look beyond the sound's immediate environment. As we saw for Finnish vowels in Section 3.3.3, if you are examining the distribution of a vowel allophone, the conditioning environment might involve a vowel in an adjacent syllable, even though consonants may intervene. It may also be necessary to consider preceding or following sounds even when they belong to a separate word that is adjacent in the stream of speech. However, it is best to start by examining the immediate environment of an allophone when you are trying to determine its conditioning environment.

Since there are many logically possible environments to consider, the task is made easier by eliminating all of those except the most plausible. This can be accomplished by using strategies like the following:

a. *Formulate hypotheses about the allophones.* Investigation of the world's languages has revealed that some sounds are more common than others (see File 3.4 for a relevant discussion). For example:

- Voiced nasals and liquids are more common than voiceless ones.
- Oral vowels are more common than nasal vowels.
- Short consonants are more common than long consonants.
- "Plain" consonants are more common than those with secondary articulations like velarization or palatalization.

On the basis of these generalizations, it is possible to speculate that if a less common sound appears in a language, it is likely to be a restricted allophone. But these tendencies should be used only as a guide for forming hypotheses, not as a basis for jumping to conclusions, since some languages exhibit exceptions. For example, French has both nasal and oral vowel phonemes.

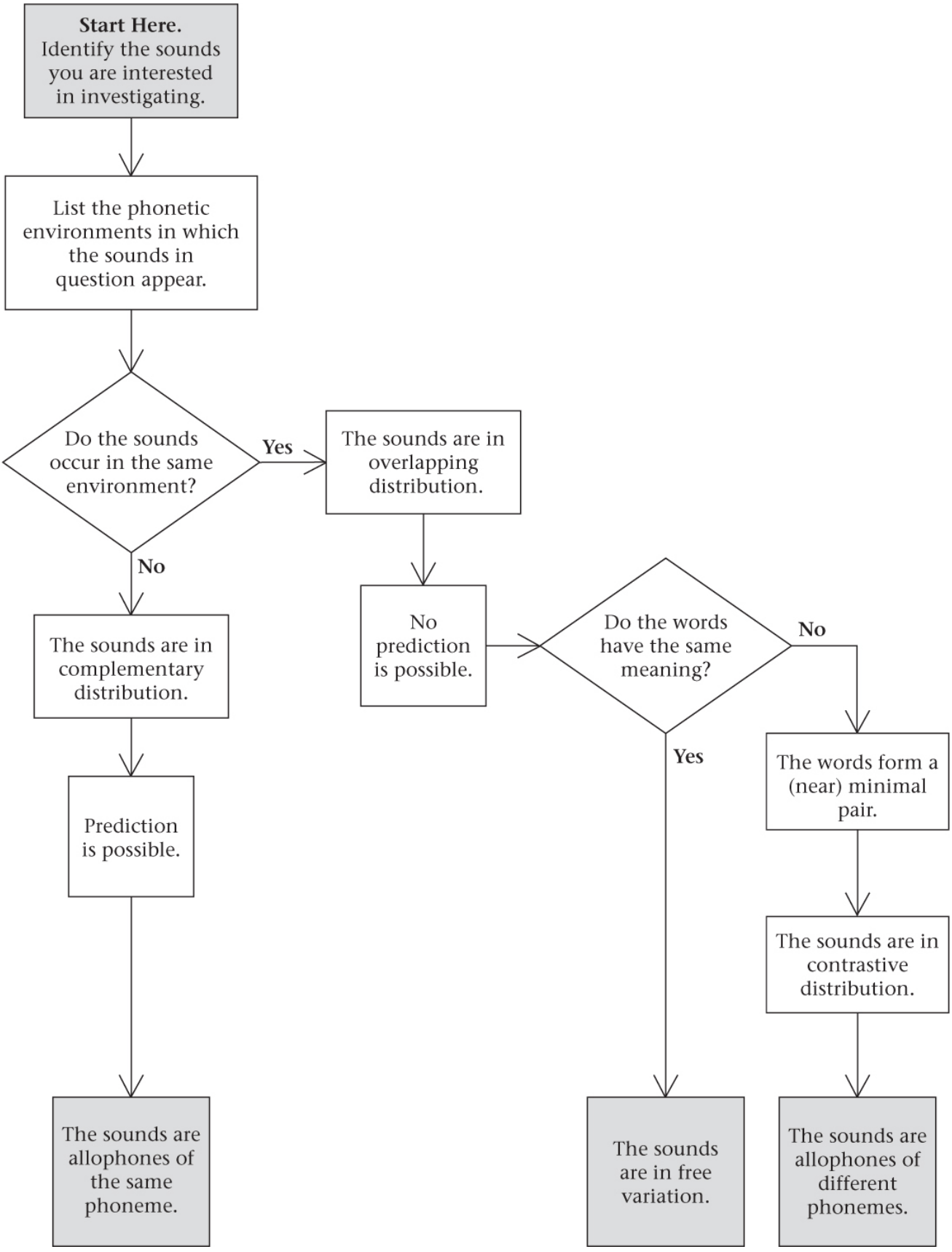
b. *Keep in mind that allophonic variation results from the application of phonological rules.* Also remember that rules usually involve some phonological process, such as assimilation or deletion. It is thus often helpful to compare the

allophones themselves to get an idea of what kind of phonological process may be involved and then check the environments in which they appear for evidence. For example, if the sounds differ only in voicing, as with [ɹ] and [ɻ̥] above, a reasonable guess would be that voicing assimilation is involved, so you will want to look for voiced and voiceless sounds in the relevant environments, as we did. Similarly, if one of the allophones is a palatal or post-alveolar consonant, and the other is alveolar or velar, a palatalization process may be involved, so you would look for front high and mid vowels and/or the palatal glide in the environments following the palatal allophone. The more familiar you are with the phonological processes in Section 3.3.3, the easier this task will be. Even if it is not obvious that a phonological process has been at work, you should be able to write a phonological rule and, thus, state a generalization about where the allophones of the phoneme occur.

3.5.4 Flowchart for Discovering the Distribution of Sounds

The flowchart in (8) should help you to identify the type of distribution two (or more) sounds in a language have. The rectangular boxes ask you to do something or give you some information that your working through the flowchart has revealed. The diamond-shaped boxes pose a question. Try reading through the flowchart before you attempt to analyze the languages in the next file (File 3.6, “Practice”); it may help you to understand the relationships among the different types of distributions of sounds in a language.

(8) A flowchart for identifying the distribution of sounds



Long Description

[1]You can always assume that the data you are given are representative of the language pattern you are being asked to analyze for the purposes of solving phonology problems in this book. Sometimes we have selected a particular subset of the data from a language to illustrate a particular analytical point; this should not be taken as a sign that every word in the language will follow exactly the same pattern. However, the patterns we present are representative of basic phonological distributions.