

NOTES ON VOWELS

Note: In this chapter, the word “vowel” is considered in its phonetic (and not its orthographic) form.

In English, there are 12 vowels represented orthographically by 5 letters.

Vowels are characterized by their open articulation. **Open articulation** is the free, unobstructed flow of the airstream through the supraglottal tract.

Vowels can be simple (**monothongs**) or combinations of a vowel and a glide (**diphthongs**).

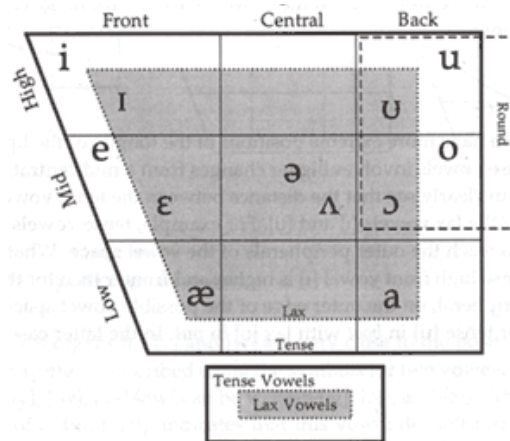
The vowels of a language are generally described using the following four parameters:

- the relative **height** of the tongue
- its **advancement** (relative frontness or backness)
- amount of **rounding** of the lips
- the **tenseness** of the lower jaw and tongue

In some languages, it is also necessary to include **nasality** (produced using the nasal cavity) and **length** (the duration in time that a vowel is pronounced). Since these two parameters are allophonic in English and Spanish, most non-linguists do not even notice them.

Vowel Trapezoid

In describing vowels, it is traditional to use the **vowel trapezoid** based on the shape of the oral cavity.



The nine sections of the vowel trapezoid are referred to by combining the adjective for the vertical position with that of the horizontal position. For example, the top right area is called high back; the exact middle area is called mid central.

Vowel Parameters

Tongue Height

The three horizontal rows of the vowel trapezoid represent the relative height of the tongue, customarily labeled as **high**, **mid**, and **low**. These labels are based in terms of how much space there is between the tongue and the roof of the mouth, which is determined by the height of the tongue. For high vowels, the tongue is higher and the jaw more closed than in the production of the low vowels.

In English, examples of high vowels are [i], [I], [u], and [U]. These are vowels with a relatively narrow space between the tongue and the roof of the mouth. Examples of low vowels are [æ] and [a]. These are vowels with a relatively wide space between the tongue and the roof of the mouth. Examples of mid vowels are [e], [ɛ], [o], and [ɔ]. These are vowels whose tongue positions are roughly between the high and low vowels.

Tongue Advancement

The vertical columns represent the relative advancement of the tongue. The columns, left to right, are called: **front**, **central**, and **back**. The left vertical line represents the limit set by the teeth; the right vertical line the limit set by the pharyngeal wall or the back of the throat. Vowels are classified in terms of how far the raised body of the tongue is from the back of the mouth, which is called the backness of the tongue.

In English, examples of front vowels are [i], [I], [e], [ɛ], and [æ]. These vowels are articulated relatively forward in the mouth. Examples of back vowels are [u], [U], [o], and [ɔ]. These vowels are articulated relatively far back in the mouth. Examples of central vowels are [a], [ə], and [ʌ]. These are vowels whose tongue positions are roughly between the front and back vowels.

Lip Rounding

Another aspect of vowel classification is the presence or absence of lip rounding. Some vowels, such as the vowels [u] and [o], are formed with a high degree of lip rounding. Such vowels are called rounded vowels. Some vowels, such as [i] and [ɛ], are formed without such rounding, and are called unrounded vowels. The rounded vowels in English and Spanish are [u], [U], [o], and [ɔ]. All others are unrounded.

Although in English and Spanish rounded and unrounded vowels are not found in contrast, there are other languages where they are. For example, French and German have front vowels which are both unrounded and rounded, and Russian has a high back unrounded vowel that contrasts with [u].

Tense vs. Lax

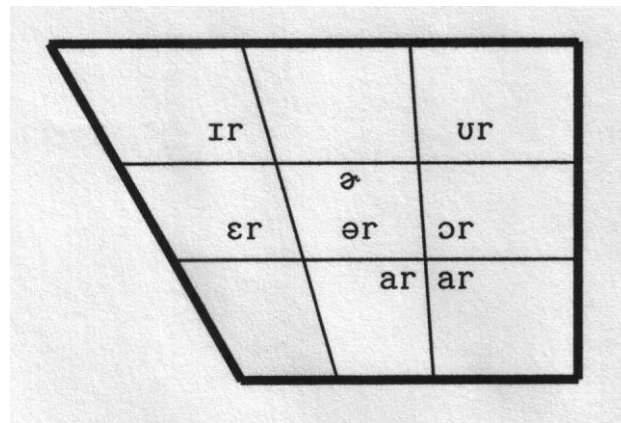
Another aspect of vowel classification is commonly characterized in terms of the tenseness or laxness of the articulators. In English, the vowels [i], [e],[u], and [o] are formed with a high degree of tenseness. Such vowels are called tense vowels. All other vowels are formed without a high degree of tenseness, and are called lax vowels.

The tense vowels are produced with a slightly higher tongue position than the lax counterparts, and for this reason they are written higher in the appropriate section of the vowel trapezoid. The lax vowel is written lower and closer to the center of the diagram. The tense/lax

feature is used to distinguish only the high/front [i] [I], mid/front [e] [E], high/back [u] [U] and mid/back [o] [ɔ] vowels of English. In Spanish, tenseness is not used to distinguish vowel phonemes; all Spanish vowels are tense.

Post-vocalic retroflexion and R-coloring

An aspect of vowel pronunciation is the post-vocalic pronunciation or [r]. **Retroflexion** is the curling back of the tongue. Three things should be noted about this term: 1) the amount of post-vocalic retroflexion heard will vary depending on the preceding vowel, 2) post-vocalic retroflexion changes the quality of vowels that precede it; and 3) not only does post-vocalic retroflexion change the quality of preceding vowels; it eliminates some of the differences between the vowels we recorded in the original trapezoid.



Broad Transcription Conventions for V + r

The r-colored vowels of General American English can be written with vowel-r digraphs:

Stressed [ɜː]: *hearse, assert, mirth, work, turkey, myrtle*

Unstressed [ɜ̞]: *standard, dinner, Lincolnshire, editor, measure, martyr*

Stressed [ɑː]: *start, car*

Stressed [ɔː]: *north, war*

Symmetry

Languages tend to have **symmetrical phonetic inventories**. That is, for every phone with feature X, there is usually a phone with the opposing feature. For example, if a language has a high front vowel /i/, it probably has a high back vowel /u/ as well. The majority of American English speakers have no high central nor low central vowel, so the American English vowel system is not perfectly symmetric in terms of the number and positions of vowels in the high, mid and low central categories. It is symmetrical with regard to the number and position of vowels in the front and back categories and the pairs of tense and lax vowels in the high front, high back, mid front and mid back positions. The Spanish vowel system is symmetrical with respect to high and mid front and back vowels. No language has a perfectly symmetrical phonetic inventory. However, the tendency toward symmetry is strong enough that if a phonetician discovers a pair of phones which are opposed on a particular feature, like tongue height, other similar pairs are likely to be present in the language.

Diphthongs

Diphthong

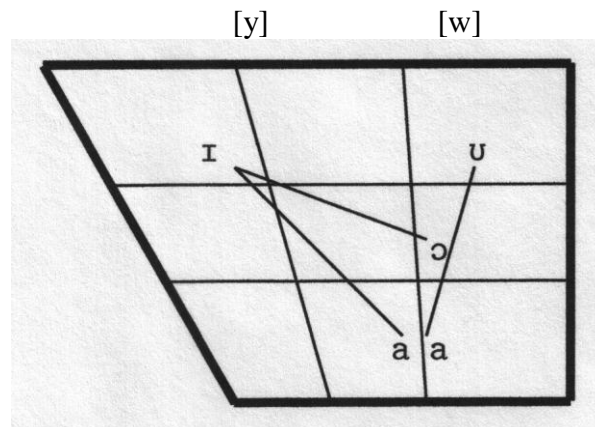
A **diphthong** is a glide from one vowel position toward another, for example from [a] toward [I] or from [a] toward [U]. Diphthong symbols are digraphs; they begin with a vowel symbol which represents where the diphthong starts on the vowel trapezoid and end with another vowel symbol (or /y/ and /w/; see below) to show where the glide ends. For example, the symbol /aU/ shows that the diphthong starts at /a/ and glides toward /U/. The diphthong /ɔI/ starts at /ɔ/ and glides toward /I/. The diphthong /aI/ occurs in the English word *night* and the Spanish word *hay*. The diphthong /aU/ occurs in the English word *out* and the Spanish word *auto*. The diphthong /ɔI/ occurs in the English word *boy* and the Spanish word *voy*. Note that we are using slash bars to indicate that both languages have these diphthong phonemes, however, their exact pronunciation is not identical. For example, /ɔI/ in English is usually closer to [ɔI] whereas in Spanish it is usually closer to [oI].

Although diphthongs are represented with digraphs, they are considered single phonemes because the nucleus to glide sequence is enunciated so quickly that they are not normally heard as two distinct vowels. In both English and Spanish, diphthongs are different from two contiguous vowels which belong to different syllables.

Some linguists prefer to use the glide symbols [y] and [w] to represent the direction of the glide to avoid the possible misinterpretation of a diphthong symbol as adjacent vowels.

American English Diphthongs

Linguists agree that English has three true diphthong phonemes, glides from one vowel position toward that of another: /aI/ , /aU/ and /ɔI/



Direction of English Diphthongs

Some linguists argue that English has seven diphthongs because they perceive tongue movement, a glide, in the articulation of the tense vowels [i], [e], [o], and [u]. The glide is more noticeable in the cases of [e] and [o] than in the cases of [i] and [u]. Native speakers of Spanish may prefer the seven diphthong classification because they perceive the [i], [e], [o], and [u] of English as diphthongs in comparison to the short, crisp equivalent sounds of Spanish. In either the three or seven diphthong system, all English diphthongs end with a glide toward a high tongue position.

As with all other vowels, diphthongs vary quite a bit, both with respect to where the diphthong begins and where it ends. For example, in a narrow transcription, phoneticians will note variations in the pronunciation of /aI/ in various dialects. In some dialects, the glide ends quite low and we hear [aI], in others the glide ends higher and we hear [ai]. The nucleus also varies from dialect to dialect. Some people say *height* [haIt] as [hæIt].

Spanish Diphthongs

Spanish has more diphthongs than English; in fact, it has all possibilities for a five vowel system. Spanish orthography, like English, uses the letters *i* and *y* to represent glides toward the high/front area of the oral cavity. It uses only the letter *u* to represent a glide toward the high/back area.

Symbol	Examples
/ai/	<u>h</u> ay, va <u>i</u> na, ba <u>i</u> le
/ei/	l <u>e</u> y, ve <u>i</u> nte, re <u>i</u> na
/oi/	so <u>y</u> , vo <u>y</u> , ho <u>y</u>
/au/	<u>a</u> uto, ca <u>u</u> sa, <u>a</u> utor
/eu/	de <u>e</u> uda, Ce <u>e</u> uta, eu <u>e</u> fonia
/ou/	bo <u>u</u> (extremely rare)

Spanish Diphthongs Ending in a Glide

Classifying Syllables

A **syllable** is usually defined as a vowel and its connected consonants. As a general rule, a word has as many syllables as it has vowels. For this reason, vowels are the nuclei of most syllables.

When talking about syllable structure, linguists refer to a consonant or consonants that precede the nucleus as the **onset** of the syllable and any that follow as the **coda**.

The difficulty in determining the structure of syllables is in assigning consonants to nuclei when they occur between vowels because they could be analyzed as the coda of the preceding syllable or the onset of the following syllable. For example, the syllables in the word *rider* could be [raɪ.dəɹ] CV.CVC, where C = consonant and V = vowel, or [raɪd.əɹ] CVC.VC.

In determining the phonological syllables of words two types of criteria are used: 1) preferences for syllable structure across the world's languages and 2) language specific preferences.

Across the world's languages, there is a strong preference for CV or CVC patterns, and consonant clusters are rare. Probably, this reflects the fact that, physiologically, CV and CVC are easier sounds to produce than consonant clusters. These facts lead to the following two basic rules of phonological syllabification:

- 1) Assign single consonants to the nucleus to the right unless there is a language specific reason to do otherwise.
- 2) Assign the first of two consonants that occur between nuclei to the preceding and the second to the following unless there is a language specific reason to do otherwise.

Since **consonant clusters** or groups are not common in the world's languages, two consonants occurring together between nuclei usually belong to different syllables.

The two rules above handle the syllabification of words in many languages. However, a few languages, among them English, permit a wide variety of consonant clusters, and the picture is more complicated. In such cases the **phonotactic rules** of the specific language, rules that explain what sequences of sound are permissible in a syllable and in what position, must be taken in to consideration.

For example, English permits syllables to begin and end with a rather large variety of consonant clusters, e.g. CCV *play*, CCVCC *plank*, and CCCVC *strong*. Consonant clusters in the onset or coda of a syllable are not problematic; once again it is those that come between two vowels that are. In such cases we have to decide whether or where to split the cluster. Take the words *linguistics* [lɪŋ.gwɪs.tɪks] and *instrumental* [ɪn.strə.mɛn.tl̩] as examples of how specific phonotactic patterns of English are used to determine the syllables of English words. Assigning the [g] in *linguistics* to the second syllable involves knowing that there are no cases in English where syllables end in the consonant group [ŋg], and there are a few other syllables which begin [gw] as in *guava* and *Guam*. The consonant group [str] is assigned to the second syllable of *instrumental* [ɪn.strə.mɛn.tl̩] because there are many other examples of [str] occurring before vowels as in *string*, *stretch* and *strong*. Furthermore although there are single morpheme syllables that end [Vns], for example *rinse*, *tense*, *dance*, *dunce*, most syllables that end [Vns] involve two morphemes, the lexical morpheme and the noun plural or third person singular verb morpheme, as in *hints*, *rents*, *pants*, *hunts*, and *fonts*.

One other type of language specific information, the way a native speaker pronounces individual sounds in a word, gives linguists a clue as to how to assign consonants to nuclei.

Classifying Syllables

Any adequate description of a language will describe not only its sounds but how the sounds are organized into syllables. Linguists find it useful to classify syllables in three different ways:

- a) open syllable vs. closed syllable
- b) simple syllable vs. complex syllable
- c) stressed syllable vs. unstressed syllable

Using these three dimensions, linguists can make meaningful statements about the patterning of sounds in the language (**phonotactics**) and also meaningful comparisons between languages. (Phonotactics is a branch of phonology that deals with restrictions in a language on the permissible combinations of phonemes. Phonotactics defines permissible syllable structure, consonant clusters, and vowel sequences by means of phonotactical constraints).

Open vs. Closed Syllables

A **closed syllable** ends with a consonant, an **open syllable** with a vowel. The words *bed* [bɛd] and *thank* [θæŋk] are closed syllables; the words *we* [wi] and *day* [de] are open syllables. Standard American English has 24 consonant phonemes or distinctive categories of sound. Only three of these cannot occur at the end of a syllable, /h/, /y/ and /w/. The PR dialect of Spanish has 15 consonant phonemes and only four of them, /n/, /l/, /s/ and /r/ can occur at the end of a syllable. Clearly, English has far more closed syllables than Spanish.

Simple vs. Complex Syllables

A **simple syllable** has from none to a maximum of two consonants. The two consonants must surround the vowel; they may not be contiguous. Simple syllables will thus follow one of these patterns: V, CV, VC, or CVC (where C = consonant and V = vowel). A **complex syllable** has at least one **consonant cluster**, that is, at least two consonants preceding and/or following the vowel nucleus. CCV, VCC, CCVC, and CCVCC are some examples of complex syllables. English and Spanish have both simple and complex syllables, but English has far more complex syllables than Spanish, for a number of reasons. English has initial consonant clusters like [spr], [str], [skw], [sm], [sn] and [sp] which Spanish does not, and English has a lot of final consonant clusters like [nd] or [lt], and [mpt] which do not occur in Spanish

Stressed vs. Unstressed Syllables

Syllables can also be categorized according to the degree of stress, or emphasis they carry. In the literature, the most common names used are stressed and unstressed, though the terms **strong** or **weak** syllables are also seen.

Three distinct levels of word stress are necessary to describe English words in **citation form**, that is when they are pronounced alone. All three can be heard in the word *neighborhood*. The syllable *neigh-* has the most stress, *-bor-* has the least stress, and *-hood* has medium stress; it is stressed more than *-bor-* but less than *neigh-*. Syllables with the highest level stress are called primary or tonic syllables and marked with [`]. Syllables with medium stress are called secondary syllables and are marked with [']. Primary and secondary syllables are considered **stressed syllables**. Syllables with the lowest level stress are unstressed syllables and are left unmarked.

In English, syllable stress is particularly important because it affects the pronunciation of the vowel in the syllable. Notice that the *o* written in the syllable *bor* represents two different

sounds in the words *border* and *neighborhood*. In the former, *bor* receives the highest stress and has the vowel [o] or [ɔ], but the unstressed syllable *bor* has [ə] with added retroflexion.

There are only two levels of stress in Spanish words, stressed and unstressed left unmarked. Unlike English, the level of stress does not affect the quality of the vowel significantly. The sound [a], for example, is pronounced the same in stressed or unstressed syllables.

Syllabic Consonants

In some dialects of English the peak of sonority in some weak syllables occurs on a consonant. These consonants which function both as consonant and nucleus of a weak syllable are called **syllabic consonants**. The consonants most frequently heard as syllabic are [l], [n], [m]. They occur most frequently after homorganic stop consonants at the end of words. Syllabic consonants are symbolized by a straight vertical line below the phone. Syllabic consonants are more frequent in informal, rapid speech than in careful, formal speech.

Syllabic l occurs frequently after oral stops as in *apple*, *table*, *battle*, *ladle*, *fickle*, and *wiggle*. Standard American English has an alveolar flap [R] variation of /t/ and /d/ so the *t* and *d* in *battle* and *ladle* will be pronounced [R].

Syllabic n occurs most frequently after [t] and [d] as in *Latin* and *sudden*. Not all speakers of English use syllabic consonants and speakers who use them have eliminated a weak vowel in the syllable so the consonant is functioning as both syllable nucleus and consonant.

Syllabic m is heard almost exclusively in informal, rapid speech across word boundaries. For example, when speaking fast, people will say [hElpm] for *help them*. In rapid speech, a syllabic n is sometimes heard, in sequences such as [aIkngo] (*I can go*). The more careful pronunciations do not sound unnatural to the native speaker. Syllabic consonants are sometimes heard after other sounds, for example after [s] as in *pencil* [pɛnsl] rather than [pɛnsəl].