Articulations
Vowels and Vowel-Like
Cardinal Vowels

In order to continue with these same-size steps, the back vowels and front vowels (a) and (e) are defined as vowels that contain elements of both the back and front positions. These vowels are located in the back part of the mouth, with the tongue raised in the high back position and lowered in the low back position. The front vowels (a) and (e) are defined as vowels that contain elements of both the front and back positions. These vowels are located in the front part of the mouth, with the tongue lowered in the high front position and raised in the low front position. The back vowels and front vowels are defined as vowels that contain elements of both the back and front positions. These vowels are located in the back part of the mouth, with the tongue raised in the high back position and lowered in the low back position. The front vowels (a) and (e) are defined as vowels that contain elements of both the front and back positions. These vowels are located in the front part of the mouth, with the tongue lowered in the high front position and raised in the low front position.

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Cardinal vowels are depicted in Figure 9.2, showing the relative position of the highest point of the tongue. Figure 9.3 illustrates the position of the highest point of the tongue in relation to the cardinal vowels. These positions are important in the formation of various vowel sounds.

The relative positions of the highest point of the tongue are shown in Figure 9.2. The diagram highlights the cardinal vowels, which are the most natural in their articulation and pronunciation.

Figure 9.3 provides a comparison of the tongue positions for the cardinal vowels. The diagram shows the tongue in various positions for the cardinal vowels, demonstrating how the tongue moves to produce these sounds.

Another factor to consider when analyzing vowel sounds is the shape of the palate. The shape of the palate affects the way vowels are produced, influencing the quality and pronunciation of these sounds.
Secondary Cardinal Vowels

### Figure 9.5

The symbols for some secondary cardinal vowels and some central vowels.

### Figure 9.4

A three-dimensional representation of some of the vowel space showing the central vowel in the space.

**Secondary Cardinal Vowels**

These are vowels that are not classified as primary or central vowels. They are called secondary because they are not located at the front, back, or center of the mouth. Secondary vowels are typically associated with specific features of the tongue, such as the position of the tongue tip, the rounding of the lips, or the position of the velum. They are often used in languages with complex vowel systems.

In the context of vowel systems, the central vowel is the vowel with the least characteristic features. Secondary vowels are vowels that are not as neutral as the central vowel, and they have additional features that distinguish them from the central vowel. These features can include tongue height, tongue position, and lip rounding.

To further explore the characteristics of secondary vowels, it is important to understand the relationship between these features and the overall vowel space. The vowel space is a three-dimensional space that represents the possible positions of the tongue and lips in producing vowels. Each vowel is represented by a point in this space, and the distance between points can be used to measure the degree of similarity or difference between vowels.

By examining the positions of secondary vowels in the vowel space, we can gain insights into the phonetic and phonological properties of these vowels and how they are used in different languages. This knowledge is crucial for understanding the structure of vowel systems and the ways in which they contribute to the overall sound system of a language.
The accent of American English represents in Figure 9.1 is partly conversational.

There is an important distinction between the three broad vowels (a, e, i) in American English. The three vowels are used to mark stress and intonation patterns in conversational speech. The accent pattern of American English often includes a greater degree of tongue rounding than in British English. This is especially noticeable in the pronunciation of words like "eyes" (i) and "easy" (a).

A similar pattern is found in other English varieties, such as Australian and New Zealand English, but with some differences in the degree of rounding and in the specific words used to illustrate the pattern.

In conclusion, the pronunciation of vowels in American English is characterized by a greater degree of tongue rounding than in British English. This difference is important for understanding the variation in the pronunciation of vowels in different English varieties and for interpreting the meaning of words with different vowels in context.

**Figure 9.6**

A plot of the first two components of the vowels of a group of English speakers.
The vowels of Spanish, Japanese, and Dutch show rounded and back vowels.

**Figure 9.7** A plot of the first two forms of the vowels of BGC English.

**Figure 9.8** A plot of the first two forms of the vowels of BGC English.

**Figure 9.9** A plot of the first two forms of the vowels of BGC English.

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**VOWELS IN OTHER LANGUAGES**

Next we will consider the vowels of other languages, which are:
ADVANCED TONGUE ROOT (ATR)

Particularly common among the native languages of the world, ATR tongue roots are distinct from the short vowels that we are all familiar with. In this way, the ATR tongue roots are not as common. For instance, the ATR tongue root /a/ is described in terms of variations in vowel height and backness.

Differences in vowel quality can easily be described in terms of variations in vowel height and backness.

| Table 9.1: Vowels and Vowel-Like Articulations |
|---------------------|---------------------|
| Vowels and Vowel-Like Articulations | |
| front | back | central |
| vowel | vowel | vowel |
| front | vowel | central |
| back | vowel | central |
| central | vowel | central |

Vowels without front, back, or central are very similar to the short vowels that we are all familiar with. For instance, the ATR tongue root /a/ is described in terms of variations in vowel height and backness.
Photoacoustic vowels are a combination of the physical properties and the acoustic properties of a vowel sound. They are produced by combining a high-frequency acoustic signal with a low-frequency acoustic signal, typically using a loudspeaker and a microphone. The resulting wave is then analyzed to extract information about the vocal tract configuration. This information can be used to infer the positions of the vocal cords, the tongue, and the lips, which can help to identify the specific vowel being produced.
Summary of Vowel Quality

Table 9.2 summarises the discussion of vowels. There are two features of vowel quality, nasalisation and articulation.

<table>
<thead>
<tr>
<th>Articulation</th>
<th>Nasalisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place of Articulation</td>
<td>Quality</td>
</tr>
<tr>
<td>Frontal</td>
<td>High</td>
</tr>
<tr>
<td>Palatal</td>
<td>Mid</td>
</tr>
<tr>
<td>Back</td>
<td>Low</td>
</tr>
<tr>
<td>Rounded</td>
<td>Nasal</td>
</tr>
<tr>
<td>Unrounded</td>
<td>Unnasal</td>
</tr>
</tbody>
</table>

Semi-vowels

Semi-vowels differ from other forms of vowels. They are syllable-like vowels. The feature of nasalisation affects the feature of vowel quality.

Nasalisation affects different forms of vowels. If the vowel is nasalised, the nasal consonant is voiced. If the vowel is not nasalised, the nasal consonant is voiceless. This property can be found in words like 'kangaroo'.

Articulation affects the feature of vowel quality. If the vowel is articulated, the vowel can be heard. If the vowel is not articulated, the vowel cannot be heard. This property can be found in words like 'kangaroo'.

In all vowels, we have been considering this chapter so far, the soft palate is raised, and the soft palate is lowered at the end of the vowel. This property can be found in words like 'kangaroo'.
TABLE 9.4: The Corresponding postalveolar affricate and pre-retroflex approximant in American English. The pronunciation of the postalveolar affricate and the pre-retroflex approximant are identical in American English.

*American English.*