

Lecture 03 :Phonology

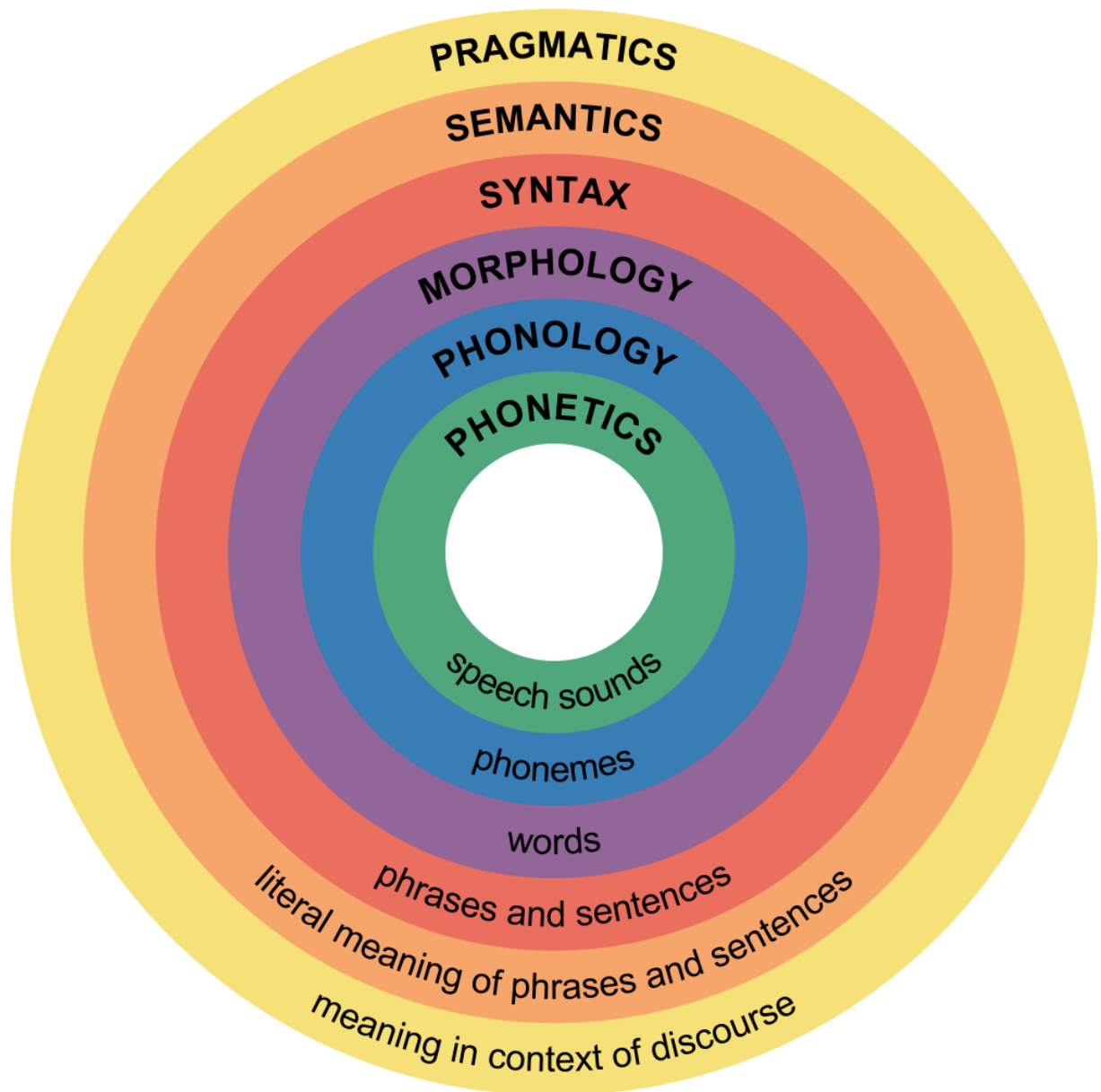


Figure 01. Branches of Micro Linguistics

What is phonology?

According to Loreto Todd “Phonology is the study of sounds and sound combinations in a particular language”. Whereas phonetics is chiefly concerned with the physical nature of speech sounds, and hence is not strictly a part of linguistics, phonology deals with the ways in which sounds behave in language, and it is a central part of linguistics. The central concept in the phonological approach is the phoneme principle which allows linguists to understand the sounds of a language. Although phonology is considered to involve two studies; the study of

production, transmission and reception of speech sounds which again is the study of phonetics, and the study of the sounds and their patterns in language which is the discipline known as phonemics, linguists tend to use phonology interchangeably with phonemics. (see the figure 01)

Languages are written in alphabets, and many use the Latin alphabet. It turns out that not only is the Latin alphabet not always suitable for other languages, orthographies are often not a reliable source for pronunciation. English is a case in point. The sounds of a language change slowly over time. If we could hear a tape recording of English spoken, say, one or two hundred years ago in one and the same region, we would surely notice a difference. The orthography however tends to be conservative. The good side about a stable writing system is that we can (in principle) read older texts even if we do not know how to pronounce them. Second, languages with strong dialectal variation often fix writing according to one of the dialects. Once again this means that documents are understood across dialects, even though they are read out differently. I should point out here that there is no unique pronunciation of any letter in a language. More often than not it has quite distinct values. For example, the letter /p/ sounds quite different in /photo/ as it does in /plus/. In fact, the sound described by /ph/ is the same as the one normally described by /f/ (for example in /flood/). The situation is that we nevertheless ascribe a 'normal' value to a letter (which we use when pronouncing the letter in isolation or in reciting the alphabet). This connection is learned in school and is part of the writing system, by which I mean more than just the rendering of words into sequences of letters.

What is phonetics?

"The study of speech sounds is called Phonetics". Phoneticians investigate such topics as the anatomical, physiological and neurological basis of speech (physiological phonetics), the actions of the speech organs in producing speech sounds (articulatory phonetics), the acoustic nature of the sound waves which transmit speech (acoustics phonetics), and the manners in which the ears and brain interpret speech (auditory and perceptual phonetics). Human beings are capable of producing an infinite number of sounds but no language uses more than a small proportion of this infinite set and no two human languages make use of exactly the same set of sounds. When we speak, unlike writing, we put no spaces between words. For someone who does not know the language spoken, it would seem as an uninterrupted stream of sounds. Phonetics slows down the process and studies it.

Phonology, phonetics, and phonology

. We begin with phonology and phonetics. It is important to understand the difference between phonetics and phonology. Phonetics is the study of actual sounds of human languages, their production and their perception. It is relevant to linguistics for the simple reason that the sounds are the primary physical manifestation of language. Phonology on the other hand is the study of sound systems. The difference is roughly speaking this. There are countless different sounds we can make, but only some count as sounds of a language, say English. Moreover, as far as English is concerned, many perceptibly distinct sounds are not considered 'different'. The letter /p/, for example, can be pronounced in many different ways, with more emphasis, with more loudness, with different voice onset time, and so on. From a

phonetic point of view, these are all different sounds; from a phonological point of view there is only one (English) sound, or phoneme: [p]. The difference is very important though often enough it is not evident whether a phenomenon is phonetic in nature or phonological. English, for example, has a basic sound [t]. While from a phonological point of view there is only one phoneme [t], there are infinitely many actual sounds that realize this phoneme.

The organs of speech

Figure 2 shows the main organs of speech : the jaw, the lips, the teeth, the teeth ridge (usually called the alveolar ridge), the tongue, the hard palate, the soft palate (the velum), the uvula, thepharynx, the larynx and the vocal cords. The mobile organs are the lower jaw, the lips, the tongue, the velum, the uvula, the pharynx and the vocal cords. The tongue is very important in the production of speech sounds, therefore, it has been divided into four main areas. (see figure 03)

Sounds couldn't occur without air. Air comes mostly from lungs and passes through the larynx. Inside the larynx are two folds of ligament and tissue which makes up the vocal cords. Vocal cords can be in five positions, from wide open to closed. These positions determine the production of silent and voiced sounds.

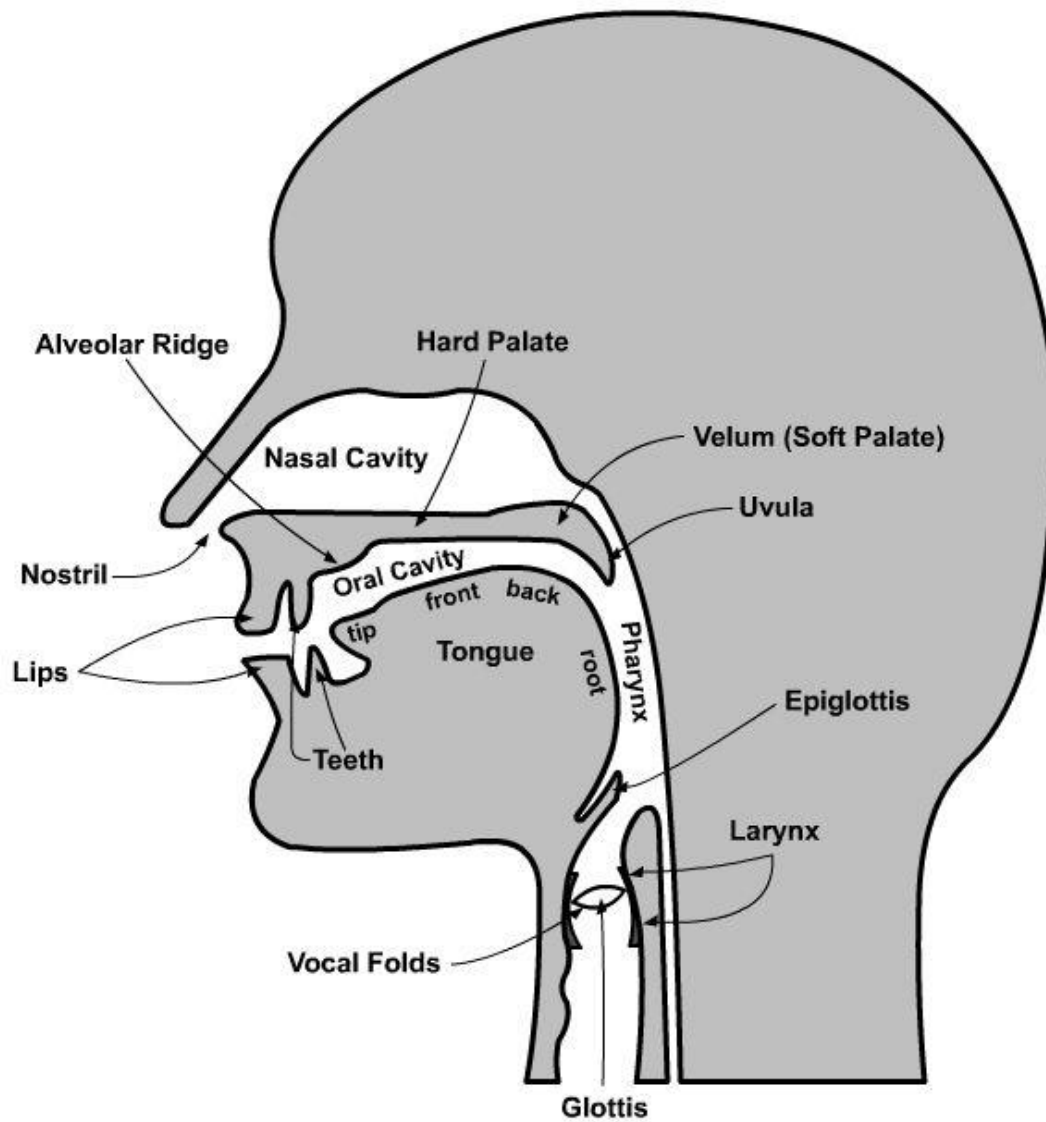
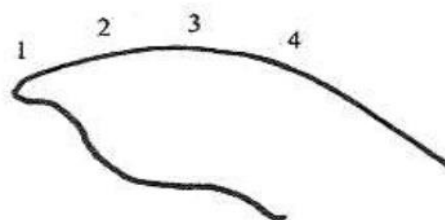


Figure 02. The organs of speech



Subdivisions of the Tongue

1. Tip (*apex*) ⇔ apikal
2. Blade (*lamina/laminum*) ⇔ laminal
3. Middle (*medium*) ⇔ medial
4. Back (*dorsum*) ⇔ dorsal

Figure 03. Subdivisions of the tongue.

Languages are written in alphabets, and many use the Latin alphabet. It turns out that not only is the Latin alphabet not always suitable for other languages, orthographies are often not a reliable source for pronunciation. English is a case in point. To illustrate the problems, let us look at the following tables [Coulmas, 2003]. The values of the letter /x/ in different languages: As one can see, the correspondence between letters and sounds is not at all uniform. On the other hand, even in one and the same language the correspondence can be nonuniform. One sound is represented by many vowels, or a single vowel can have different sounds that can also represent other vowels. This mismatch has various reasons, a particular one being language change and dialectal difference. The sounds of a language change slowly over time. If we could hear a tape recording of English spoken, say, one or two hundred years ago in one and the same region, we would surely notice a difference. The orthography however tends to be conservative. The good side about a stable writing system is that we can (in principle) read older texts even if we do not know how to pronounce them. Second, languages with strong dialectal variation often fix writing according to one of the dialects. Once again this means that documents are understood across dialects, even though they are read out differently.

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The disadvantage for the linguist is that the standard orthographies have to be learned (if you study many different languages this can be a big impediment) and second they do not reveal what is nevertheless important: the sound quality. For that reason one has agreed on a special alphabet, the so-called **International Phonetic Alphabet (IPA)**. In principle this alphabet is designed to give an accurate written transcription of sounds, one that is uniform for all languages. Since the IPA is an international standard, it is vital that one understands how it works (and can read or write using it). The complete set of symbols is rather complex, but luckily one does not have to know all of it.

The Analysis of Speech Sounds

First of all, the continuum of speech is broken up into a sequence of discrete units, which we referred to as sounds. Thus we are analysing language utterances as sequences of sounds. Right away we mention that there is an exception. Intonation and stress are exceptions to this. The sentences below are distinct only in intonation (falling pitch versus falling and rising pitch).

You spoke with the manager.

You spoke with the manager?

Also, the word /protest/ has two different pronunciations; when it is a noun the stress is on the first syllable, when it is a verb it is on the second. Stress and intonation obviously affect the way in which the sounds are produced (changing loudness and / or pitch), but in terms of decomposition of an utterance into segments intonation and stress have to be taken apart. We shall return to stress later. Suffice it to say that in **IPA** stress is marked not on the vowel but on the syllable (by a [ˈ] before the stressed syllable), since it is thought to be a property of the syllable. **Tone** is considered to be a suprasegmental feature, too. It does not play a role in European languages, but for example in languages of South East Asia (including Chinese and Vietnamese), in languages of Africa and Native American languages. We shall not deal with tone.

Sounds are produced in the vocal tract. Air is flowing through the mouth and nose and the characteristics of the sounds are manipulated by several so-called **articulators**. A rough picture is that the mouth aperture is changed by moving the jaw, and that the shape of the cavity can be manipulated by the tongue in many ways. The parts of the body that are involved in shaping the sound, **the articulators**, can be **active** (in which case they move) or **passive**. The articulators are as follows: **oral cavity, upper lip, lower lip, upper teeth, alveolar ridge** (the section of the mouth just behind the upper teeth stretching to the ‘corner’), **tongue tip, tongue blade** (the flexible part of the tongue), **tongue body, tongue root, epiglottis** (the leaf-like appendage to the tongue in the pharynx), **pharynx** (the back vertical space of the vocal tract, between uvula and larynx), **hard palate** (upper part of the mouth just above the tongue body in normal position), **soft palate or velum** (the soft part of the mouth above the tongue, just behind the hard palate), **uvula** (the hanging part of the soft palate), and **larynx** (the part housing the vocal chords). For most articulators it is clear whether they can be active or passive, so this should not need further comment.

It is evident that the **vocal chords** play a major role in sounds (they are responsible for the distinction between **voiced and unvoiced**), and the sides of the tongue are also used (in sounds known as **laterals**). Table 1 gives some definitions of phonetic features in terms of articulators for consonants. Column labels here refer to what defines the **place of articulation** as opposed to the **manner of articulation**. **The degree of constriction** is roughly the distance of the active articulator to the passive articulator. The degree of constriction plays less of a role in consonants, though it does vary, say, between full contact [d] and ‘close encounter’ [z], and it certainly varies during the articulation (for example in affricates [dz] where the tongue retreats in a slower fashion than with [d]). **The manner of articulation** combines the degree of constriction together with the way it changes in time. Table 2 gives an overview of the main terms used in the IPA and Table 1 identifies the row labels of the IPA chart. Vowels differ from consonants in that there is no constriction of air flow. The notions of active and passive articulator apply. Here we find at least four degrees of constriction (**close, close-mid, open-mid and open**), corresponding to the height of the tongue body (plus degree of mouth aperture). There is a second dimension for the horizontal position of the tongue body. The

combination of these two parameters is often given in the form of a two dimensional trapezoid, which shows with more accuracy the position of the tongue. There is a third dimension, which defines the rounding (**round** versus **unrounded**, which is usually not marked). We add a fourth dimension, **nasal** versus **nonnasal**, depending on whether the air flows partly through the nose or only through the mouth.

Table 1: IPA consonant column labels

| Articulators involved | |
|------------------------------|--|
| Bilabial | -the two lips, both active and passive |
| Labiodentals | -active lower lip to passive upper teeth |
| Dental | -active tongue tip/blade to passive upper teeth |
| Alveolar | -active tongue tip/blade to passive front part of alveolar ridge |
| Postalveolar | - active tongue blade to passive behind alveolar |
| Retroflex | -active tongue tip raised or curled to passive postalveolar (difference between postalveolar and retroflex: blade vs. tip) |
| Palatal | -tongue blade/body to hard palate behind entire alveolar ridge |
| Velar | -active body of tongue to passive soft palate (sometimes to back of soft palate) |
| Uvular | -active body of tongue to passive (or active) uvula |
| Pharyngeal | -active body/root of tongue to passive pharynx |
| Glottal | -both vocal chords, both active and passive |

Table 2: Constriction degrees for consonants

| | |
|-----------|---|
| Stop | active and passive articulators touch and hold-to-seal (permitting no flow of air out of the mouth) |
| Trill | active articulator vibrates as air flows around it |
| tap/flap | active and passive articulators touch but don't hold (includes quick touch and fast sliding) |
| fricative | active and passive articulators form a small constriction, creating a narrow gap causing noise as air passes through it |

| | |
|-------------|--|
| approximant | active and passive articulators form a large constriction, allowing almost free flow of air through the vocal tract. |
|-------------|--|

Naming the Sounds

The way to name a sound is by stringing together its attributes. However, there is a distinction between naming vowels and consonants. First we describe the names of consonants. For example, [p] is described as a voiceless, bilabial stop, [m] is called a (voiced) bilabial nasal. The rules are as follows:

Voicing place manner

Sometimes other features are added. If we want to describe [ph] we say that it is a voiceless bilabial aspirated stop. The additional specification ‘aspirated’ is a manner attribute, so it is put after the place description (but before the attribute ‘stop’, since the latter is a noun). For example, the sequence ‘voiced retroflex fricative’ refers to [ɹ̃], as can be seen from the IPA chart.

Vowels on the other hand are always described as ‘vowels’, and all the other features are attributes. We have for example the description of [y] as ‘high front rounded vowel’. This shows that the sequence is

Height place lip-attitude [nasality] vowel

Nasality is optional. If nothing is said, the vowel is not nasal.

Table 3: IPA consonant row labels

| | |
|---------------------|---|
| Plosive | a pulmonic-egressive, oral stop |
| Nasal | a pulmonic-egressive stop with a nasal flow; not a plosive, because not oral. |
| Fricative | a sound with fricative constriction degree; implies that airflow is central |
| Lateral fricative | a fricative in which the airflow is lateral |
| Approximant | a sound with approximant constriction degree; implies that the airflow is central |
| lateral approximant | an approximant in which the airflow is lateral |

Table 4: IPA vowel row and column labels

| | |
|---------------------|---|
| Close | compared with other vowels, overall height of tongue is greatest; tongue is closest to roof of mouth (also: high) |
| Open | compared with other vowels, overall height of mouth is least; mouth is most open (also: low) |
| Close-mid, open-mid | intermediate positions (also: mid / uppermid / lowermid) |
| Front | compared with other vowels, tongue is overall forward |
| Central | intermediate position |
| Back | compared with other vowels, tongue is overall back (near pharynx) |
| Rounded lips | are constricted inward and protruded forward |

On Strict Transcription

Since IPA tries to symbolize a sound with precision, there is a tension between accuracy and usefulness. As we shall see later, the way a phoneme is realized changes from environment to environment. Some of these changes are so small that one needs a trained ear to even hear them. The question is whether we want the difference to show up in the notation. At first glance the answer seems to be negative. But two problems arise: (a) linguists sometimes do want to represent the difference and there should be a way to do that, and (b) a contrast that speakers of one language do not even hear might turn out to be distinctive and relevant in another. (An example is the difference between English [d] (alveolar) and a sound where the tongue is put between the teeth (dental). Some languages in India distinguish these sounds, though I hardly hear a difference.) Thus, on the one hand we need an alphabet that is highly flexible on the other we do not want to use it always in full glory. This motivates using various systems of notation, which differ mainly in accuracy. Table 5 gives you a list of English speech sounds and a phonetic symbol that is exact insofar that knowing the IPA would tell an English speaker exactly what sound is meant by what symbol. (I draw attention however to the sound [a], which according to the IPA is not used in American English; instead, we find [A].) This is called broad transcription. The dangers of broad transcription are that a symbol like [p] does not reveal exact details of which sounds fall under it, it merely tells us that we have a voiceless bilabial stop. Since French broad transcription might use the same symbol [p] for that we might be tempted to conclude that they are the same. But they are not.

Thus in addition to broad transcription there exists strict or narrow transcription, which consists in adding more information (say, whether [p] is pronounced with aspiration or not). Clearly, the precision of the IPA is limited. Moreover, the more primitive symbols it has the harder it is to memorize. Therefore, IPA is based on a set of a hundred or so primitive symbols, and a number of diacritics by which the characteristics of the sound can be narrowed down.

the international phonetic alphabet (2005)

| consonants (pulmonic) | LABIAL | | CORONAL | | | | DORSAL | | | | RADICAL | | LARYNGEAL |
|--------------------------|----------|--------------|---------|----------|-----------------|-----------|-----------------|---------|-------|--------|------------|-------------|-----------|
| | Bilabial | Labio-dental | Dental | Alveolar | Palato-alveolar | Retroflex | Alveolo-palatal | Palatal | Velar | Uvular | Pharyngeal | Epi-glottal | Glottal |
| Nasal | m | ɱ | n | | | ɳ | ɲ | | ŋ | ɴ | | | |
| Plosive | p b | | t d | | | ʈ ɖ | ç ʝ | | k ɡ | q ɢ | ʔ | | ʔ |
| Fricative | ɸ β | f v | θ ð | s z | ʃ ʒ | ʂ ʐ | ç ʝ | x ɣ | χ ʁ | ħ ʕ | ħ ʕ | h ɦ | |
| Approximant | | ʋ | ɹ | | | ɻ | j | | ɰ | | | | |
| Tap, flap | | ⱱ | ɾ | | | ɽ | | | | | | | |
| Trill | ʙ | | r | | | | | | | ʀ | | | ʀ |
| Lateral fricative | | | ɬ ɮ | | | ɮ | ɬ | | ɮ | | | | |
| Lateral approximant | | | l | | | ɭ | ʎ | | ʟ | | | | |
| Lateral flap | | | ɺ | | | ɻ | | | | | | | |

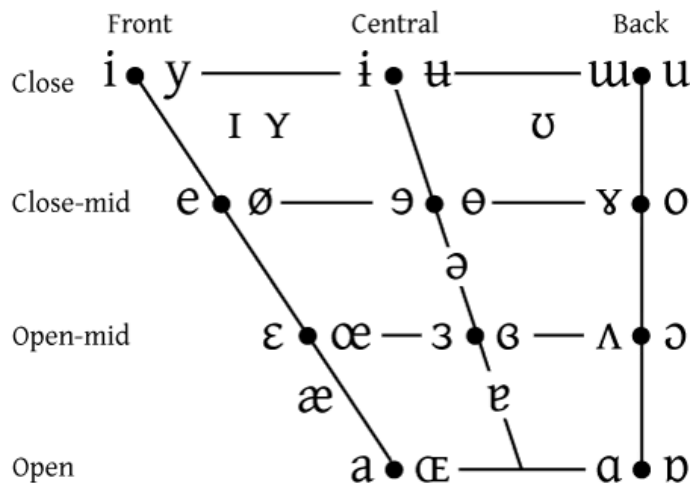
Where symbols appear in pairs, the one to the right represents a modally voiced consonant, except for murmured ʃ. Shaded areas denote articulations judged to be impossible. Light grey letters are unofficial extensions of the IPA.

Table 05: The Sounds of English

| | | | | | | | |
|------|---------|-------|-------|--------|-------|--|--------|
| ɪ | ɪ | ʊ | u: | ɪə | eɪ | John & Sarah Free Materials 1996 | |
| READ | SIT | BOOK | TOO | HERE | DAY | | |
| e | ə | ɜ: | ɔ: | ʊə | ɔɪ | əʊ | |
| MEN | AMERICA | WORD | SHORT | TOUR | BOY | GO | |
| æ | ʌ | ɑ: | ɒ | eə | aɪ | ɑʊ | |
| CAT | BUT | PART | NOT | WEAR | MY | HOW | |
| p | b | t | d | tʃ | dʒ | k | g |
| FIG | BED | TIME | DO | CHURCH | JUDGE | KILO | GO |
| f | v | θ | ð | s | z | ʃ | ʒ |
| FIVE | VERY | THINK | THE | SIX | ZOO | SHORT | CASUAL |
| m | n | ŋ | h | l | r | w | j |
| MILK | NO | SING | HELLO | LIVE | READ | WINDOW | YES |

Figure 04: Vowels chart

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel