An Introduction to Practical Phonetics for Nigeria

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Foreword

This Introduction to Practical Phonetics is published by the European Training Programme, UK Campus and is designed to be used in conjunction with its courses and is therefore intended primarily for the benefit of those taking part in the European Training Programme. We are delighted, though, that others may also find it useful in learning phonetics.

A large number of teaching staff have contributed to this book. W. H. Chapman, who served as head of the Phonetics Department of the then British SIL School from 1961 to 1973, produced the original version of this book in 1966, entitled, "A Handbook of Practical Phonetics", and subsequently saw it through two revisions. Among the many staff involved in the changes introduced to the next editions special mention must be made of the contributions of Gunilla Andersson, Dr. Brian Bull, Philip Davison, Elizabeth Olsen and Dr. Ivan Lowe. The revised fifth edition of 1990 incorporated changes made by the International Phonetic Association in 1989. The current revision is the product of careful work by Cathy Bartram in particular, ably assisted by Heather Saunders and Hannu Sorsamo. Leoma Gilley was consulted about the features of advanced tongue root (ATR).

We expect to continue to adapt and improve the materials. All comments and suggestions are therefore warmly appreciated and will be taken into consideration in future editions of the book.

In addition to the introductory phonetics course for which the IPP has been developed, the European Training Programme offers a variety of other courses in language study and development. Similar training courses are also offered by SIL training centres in other parts of the world. Details of courses and publications are available on request.

David Morgan
European Training Programme
Director, UK Campus
August, 2009

Table of Contents

Chapter 1

Introduction

The study of **phonetics** is only one part in the study of linguistics or of any language. It is chiefly concerned with the **study of sounds found in human speech**.

In any particular language this **phonetic data** may then be analysed to determine which are the significant sounds of that language, i.e. sounds which need to be symbolised in an alphabet. Such a study is a part of **phonology**. To give a more complete picture of a language it is also necessary to examine the way in which words are formed - **morphology** - and used in the making of sentences - **syntax**. These are both dealt with in SIL's Grammar Course. A study of the meaningful concepts associated with words - **semantics** - and the total number of words which exist in a language – the **lexicon** - completes the picture.

1.1 The scope of the course

This Handbook is designed for use with a course on **articulatory** phonetics. It is not concerned with acoustic or instrumental phonetics. There are four main activities:

1. The **recognition** of speech sounds, realising that there are more sounds used in human speech than there are in any one language.
2. The **production** of speech sounds by the vocal apparatus. As all people of all races normally have a similar apparatus, all should be able to produce the same sounds, although practice will be needed for some of them.
3. The **analysis** of the way in which speech sounds are produced by the vocal apparatus. This will help both in production and also in making an accurate description of the sound.
4. The **symbolisation** of speech sounds. In studying speech sounds in languages, especially writing a language down for the first time, there is a need to be able to represent each sound with one symbol. When transcribing (putting down in written form) an unwritten language it is crucial that all phonetic distinctions are recorded.

The International Phonetic Association has invented a system where each sound has its own phonetic symbol, and diacritics (additional signs) can be added for extra accuracy. Other systems exist, but the International Phonetic Alphabet (IPA) is used at the SIL training centres. The few differences there are will be pointed out and explained as they occur.

This course will not cover every speech sound in every language. It will, however, examine the main types of speech sounds found in Nigerian and other West African languages, giving the most important examples of each type and possible modification. This will provide a phonetic framework into which the actual sounds of any language may be placed.

1.2 The phonetic symbols

It will be noticed from the above that the emphasis is on **sounds**. The way in which a language is written (the orthography) may or may not be consistent with how it is pronounced. Written English is **not** a phonetic transcription and in English there are a number of particular problems associated with the spelling. Two of the most important, from the phonetic point of view, are:

1. The fact that in the English orthography one sound may be symbolised in a variety of ways, e.g.

   the first sound in *sell* and *cell*
   the vowel sound in *I, eye, die, rye, by, bite, height*

   In a phonetic transcription, on the other hand, the same sounds will be symbolised in the same way, e.g. the 's' sound in *sell*, and the 's' sound in *cell* will both be represented by the same symbol in a phonetic transcription.

2. The fact that more than one sound may be represented by a particular letter or group of letters, e.g.

   the 's' in *this* and *these*
   the sequence 'ough' in *although, through, thought, plough, cough, enough*

   In a phonetic transcription sounds that are different will be written with different symbols. Thus the final consonant in *this* is written with an [s], but the final consonant in *these* is written with a [z].

It is therefore important from the very outset to think in terms of **sounds** rather than of traditional spelling, to remember the priority of the spoken over the written form.

From the very beginning care must be taken to use the correct printed shape of the symbols. The reason for this may not be obvious at first, but it will soon become clear that incorrect symbols may be ambiguous, e.g., if a [t] symbol is written without the right hand curl at the bottom of the upright stroke, it may be confused with a 'dark l' [ɬ], or a poorly written [m] may be confused with the voiceless approximant [ʍ]. In particular, one should remember never to use an upper case symbol when the standard symbol is a lower case. Thus for example [M] must never be written instead of [m] or [A] instead of [a]. Again, the symbols are in printed form; no hand-written forms are used.

It must be emphasised that phonetic symbols are not meant to represent an alphabet for the final written form of a language. Such an alphabet will be determined on the basis of the phonological analysis of the language, and considerations such convenience for typing and conformity to the orthographies of other languages of wider communication that are used in the same country can be very important as well.

1.3 Ideas of phonetic ability

There are those who approach a course such as this one with mistaken ideas of their own ability or inability. In actual practical language study a great deal depends on a person's ability to work hard and systematically and upon their willingness to lose their self-consciousness in making the effort to speak.

Languages do differ phonetically and care must be taken in all areas. Some of the kinds of difficulty a learner will encounter are:

1. Sounds may occur in a language which are totally unlike any sound in their own language. These are generally not so much of a problem as might be thought. This is because it is usually fairly obvious that such sounds are very different and the language student will give special attention to mastering them.
2. What usually causes a lot more difficulty are sounds in a language which are quite similar to sounds in the student's own native language, but not exactly the same, e.g. the vowel sounds in Hausa are fairly similar to some Yoruba ones. However if the Hausa vowels are used in place of the Yoruba ones, then the speaker will sound decidedly "foreign".
3. A language may make distinctions between sounds which exist in the student's own language, but which are not recognised as being different, e.g. in English there are different 't' sounds in words such as "team" and "steam", but as they are used in particular contexts an English speaker will not at first react to the fact that they are different. However, to an Ibo speaker this difference is vital as it is used to distinguish between otherwise identical words.

In the study of any language there is a need to **break the old habits of speech** acquired over a span of years, and to form new ones. One of the dangers is that students will try to make sounds which are somewhat similar to the sounds of another language but not quite the same. They may do this by using sounds which are really quite close to the model or by using an entirely different mechanism, e.g. an English speaker will sometimes try to substitute 'in' or 'ing' for the Yoruba '-in' at the end of a word, or they may not notice that the 'r' sounds in English and Hausa are pronounced quite differently. If concentration is given to careful listening to their own speech and to the speech of others, and this is coupled with an understanding of the means of production of speech sounds in general, and with lots of practice of new sounds and new sound combinations then it should be possible to arrive at a completely satisfactory production of the sounds of any unfamiliar language.

In the discussion of various sounds a number of examples from English (as well as from many other languages) will be given. These are introduced for **general guidance only**, and do not necessarily imply that the symbols given represent the exact phonetic representations of the actual sounds.

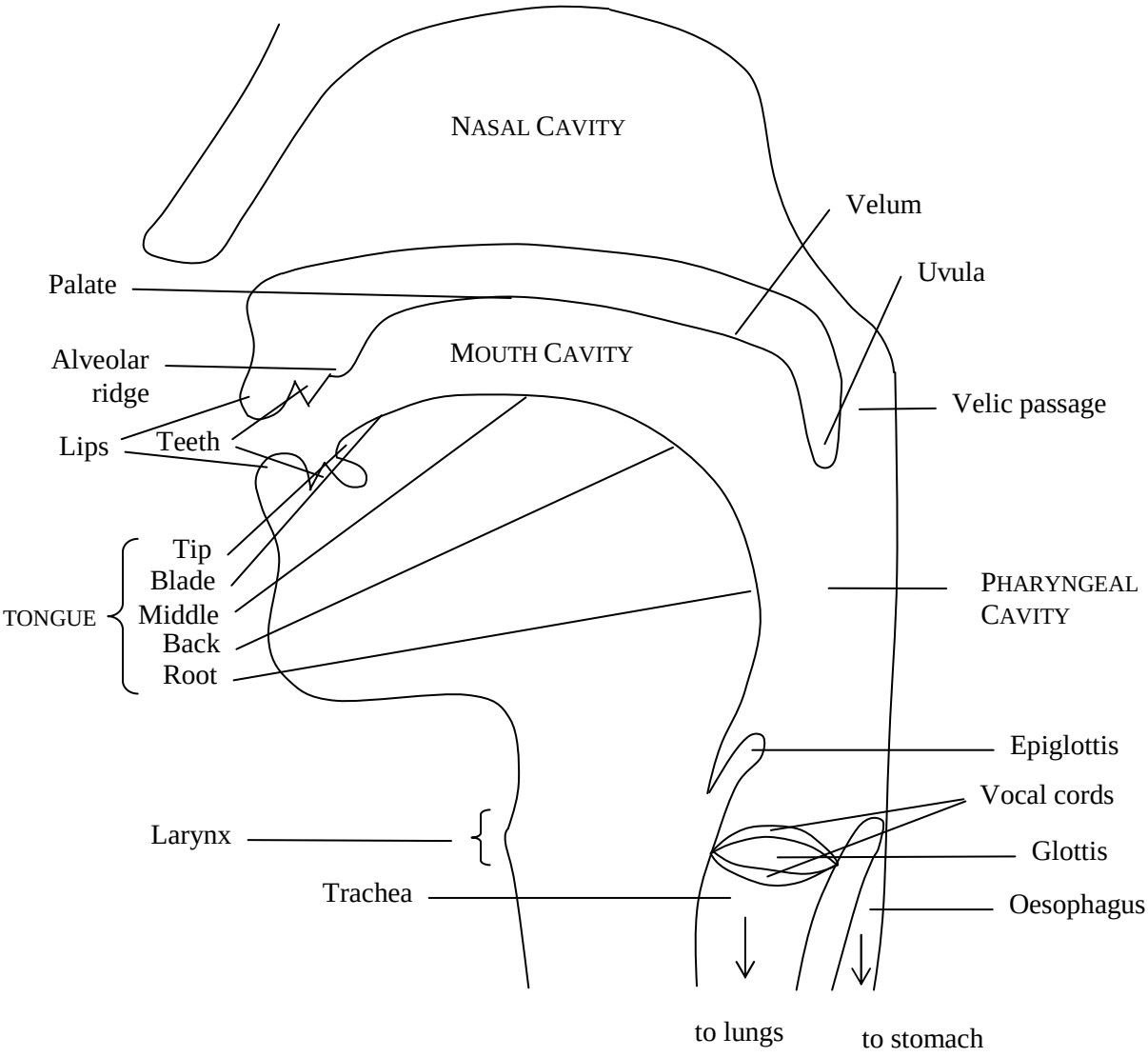


Figure 1.1 The vocal apparatus

Chapter 2

Speech Sounds

When two people speak to each other a complex series of events takes place. In its very simplest form this may be described as follows: one person forms an idea in their mind which they wish to transmit to the hearer and therefore first to the vocal organs. These organs move so as to produce vibrations in the air. The vibrations fall on the ear of the hearer who then "converts" them into a meaningful message. This Handbook treats only one part of this process, and that is the movement of the vocal organs so as to produce the vibrations called "speech sounds".

The sounds are produced as a column of air moves through the vocal apparatus (or "vocal tract"). In most speech sounds this column of air is set in motion by the lungs and travels out through the throat, mouth, and sometimes the nose, into the outer air. The movement of the air stream can also be caused by an action of the throat or mouth. The air stream may flow outwards, from the body, or inwards, into the body. For each different sound that can be made, the vocal tract has a particular shape and this shape includes one point or area where the cross-section is narrowest, i.e. where an obstruction or approximation is made by the articulators. The air stream then passes through this narrowing, or stricture, and it is this stricture that makes a major contribution to the characteristics of the sound.

The characteristics of a sound, therefore, will depend on:

- the part of the vocal apparatus which causes the air stream to move (lungs, throat or mouth).
- the direction of the air stream (outwards or inwards).
- the type and place of the stricture that the air stream passes as it goes through the vocal apparatus.

2.1 The vocal apparatus (or vocal tract)

The term "vocal apparatus" is sometimes used to describe the whole of those parts of the body including the lungs, which may be used in the production of speech sounds. However, for the sake of convenience, the term will be limited to the region of the mouth, nose and throat, including the larynx or "Adam's apple". It is within this region that the narrowing of the air stream takes place.

Figure 1.1, p.9 shows a cross-section of part of the head with the main parts of the vocal tract, or apparatus, marked. It will be seen that there are three cavities: the nasal cavity (the nose), the oral cavity (the mouth), and the pharyngeal cavity (the pharynx).

2.1.1 The nasal cavity

This is mostly of bony construction and therefore of fixed shape. It can be shut off from the rest of the vocal tract by raising the velum (soft palate). This action closes the **velic passage** which leads from the pharyngeal cavity into the nasal cavity. When the vocal tract is at rest the velum hangs down and the velic passage is therefore open. During the production of most speech sounds the velum is raised and the velic passage is closed, but in the case of nasals and nasalised sounds it remains open so that the air escapes through the nasal cavity giving a distinctive nasal resonance.

2.1.2 The oral cavity (or mouth cavity)

The top of the oral cavity is formed by the bony structure of the palate and the fleshy velum. If you place the tip of your tongue against the upper **teeth** and then move it backwards along the roof of the mouth, you will notice that at a little distance behind the teeth and gums there is a clearly defined ridge, **the alveolar ridge**, and then the curve of **the (hard) palate** gives way to the **velum** or **soft palate** at the back. The velum terminates with **the uvula** which you can see hanging down when you look into your mouth wide open.

The shape of the oral cavity may be altered very considerably. The lower jaw may fall or rise, thus opening or closing the mouth, whilst the lips and tongue may adopt a great variety of shapes.

The lips may vary in shape from extreme rounding and protrusion, as when pouting, to extreme spreading as in a rather exaggerated artificial smile.

The tongue is very mobile indeed and because of this it is essential to specify which part of the tongue is used in the production of a particular sound. Names are given to different parts of the tongue. **The tip** is the very front portion, and is followed by **the blade; the middle** faces the hard palate when **the tongue** is at rest; **the back** faces the velum; **the root** faces the pharyngeal wall.

2.1.3 The pharyngeal cavity

The pharyngeal cavity extends down the throat. It is the passage through which air passes in breathing and in most speech sounds. It is also the passage through which food passes from the mouth into **the oesophagus**. The main function of the epiglottis is to form a lid which closes the **trachea** when swallowing, and directs food down the oesophagus into the stomach.

The shape of the pharyngeal cavity may be modified by a general constriction of the cavity, involving the drawing back of the tongue root towards the pharyngeal wall.

2.1.4 The larynx and vocal cords

The pharyngeal cavity terminates in **the larynx**, (popularly called **the Adam's apple)**, within which **the vocal cords** (or **folds**) are located. These are a pair of fleshy membranes whose length and shape is controlled by a number of different muscles. The space (or opening) between them is known as **the glottis**. During the production of a sound the extremely mobile vocal cords may

adopt a variety of shapes. The three most common shapes that they can take are (i) wide apart (allowing the air to flow through unhindered), (ii) close together and vibrating, or (iii) completely closed, cutting the rest of the vocal apparatus off from the lungs (see Figure 2.1, p.14).

The vocal cords are of variable length, but in a man the average length is 23 mm., in a woman 18 mm.

2.2 Air mechanism

The air stream used in the production of speech sounds may move outwards from the body into the outer air, or inwards from the outer air into the body. Sounds produced with an outward-moving or **egressive** air stream are far more common than those with an inward-moving or **ingressive** air stream.

The column of air is set in motion in one of three different ways:

2.2.1 Lung air mechanism (Pulmonic air stream mechanism)

In speaking, as in breathing, the chest muscles may contract and the diaphragm rise, forcing air out, or they may expand and the diaphragm fall, drawing air in. Speech has been referred to as "modified breathing". This lung air mechanism, using the out-going, or egressive, air stream, is the most common air mechanism in all languages of the world, and for some it is the only one used in normal speech. The in-going, or ingressive, lung air stream, on the other hand, is not part of the sound system of any language, but in some it is used in certain expression as a stylistic variant.

The actual rate of flow of air is controlled by the chest muscles. When sounds are produced with egressive lung (or pulmonic) air, the air stream begins to move in the lungs, and continues upwards through the trachea and glottis into the pharyngeal cavity. From there it may move out through the mouth or nose or both, depending on whether there is some stoppage in the mouth or not and whether the velic passage is open or closed.

2.2.2 Pharynx air mechanism

When this mechanism is being used, the glottis is closed, and the whole larynx may move up and down in the trachea like the piston in the barrel of a pump. When it rises it forces air out and when it falls it draws air in. This gives rise to an egressive or ingressive pharynx air stream. This egressive mechanism may be used to start blowing up difficult toy balloons. More pressure can be exerted this way than with egressive lung air.

2.2.3 Mouth air mechanism

When this mechanism is being used the tongue makes **two simultaneous closures**, one with the back of the tongue placed against the velum, and the other one further forward. The tongue is then drawn down and backwards, thus sucking air into the space between the two closures.

This will produce an **ingressive mouth air stream**. (Sounds with **egressive** mouth air are not reported in speech except in certain paralinguistic expressions.)

Sounds produced with the pharynx and mouth air mechanisms will be discussed in greater detail in Chapter 18 and Chapter 19; otherwise all the sounds introduced in this book will be produced with the egressive lung air mechanism.

2.3 Voice

When an air stream passes through the glottis the vocal cords are most commonly either far apart and at rest, or close together and vibrating. Sounds produced with the vocal cords at rest are said to be **voiceless**, while those with vocal cords vibrating are said to be **voiced**. Considerable force is needed to cause this vibration. This action of the moving air stream on the vocal cords is similar to that of a bow on a violin string.

In the English word “sip” the vocal cords are at rest during the production of the first sound, ‘s’, but they begin to vibrate as soon as the vowel is produced. In the word “zip” they are vibrating, both when the ‘z’ is being produced and when the ‘i’ is. Thus the only difference between these two words is that of the voicing of the first sound: [s] is voiceless and [z] is voiced. In every other way the two words are identical; in other words the two sounds [s] and [z] are identical except for the voicing.

The fact of voicing may be felt quite easily in oneself. If the fingers are placed in the ears whilst saying [zszszszs] a “buzzing” going on and off inside the head will be heard as the vocal cords vibrate and relax. Alternatively, if a finger is placed lightly on the Adam's apple or a hand is placed flat on the top of the head whilst saying [zzzzzz] a vibration will be felt. A further observation is that one can sing on a voiced sound such as [z], but not a voiceless one such as [s].

The speed of vibration of the vocal cords may be altered by tensing or relaxing them by muscular action. The faster the vibration the higher the pitch. In a man the usual range of vibrations in a normal speaking voice is from 100 to 150 cycles per second, whilst in a woman it is 200 to 325 cycles per second. Chapter 21 deals with pitch variations in languages.

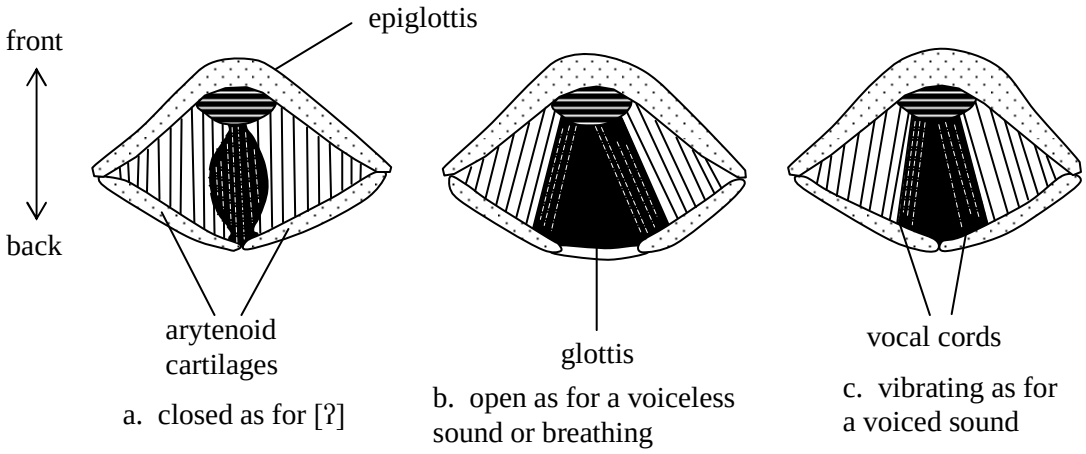


Figure 2.1 Vocal cords positions

Figure 2.1 illustrates some positions of the vocal cords and glottis as they would appear if seen from the inside of the back of the mouth. (This may be done with the aid of a small mirror mounted on a rod.) The vocal cords are fixed at their front end but moveable at their back end by means of the arytenoid cartilages.

2.4 Types of speech sound

Speech sounds are normally divided into two main groups, vowels and consonants. Various criteria are suggested for making this division (see Appendix I, p.103), but in phonetics the terms are defined on the basis of the method of the production of the sounds.

Phonetic **vowels** may be formally defined in terms of the fact that as the air passes through the vocal tract it goes over the centre of the tongue **with no friction or stoppage in the mouth** and that some of the air, if not all, goes out through the mouth. **Consonants** comprise all other speech sounds.

SECTION 1 - CONSONANTS

Chapter 3

General Features of Consonants

3.1 Definition

Consonants are those sounds during whose production there is either total stoppage or some other restriction of the air stream. Because of this it is easier to feel the movement of the various vocal organs and their positions relative to each other during the production of a consonant than it is during the production of a vowel.

The stoppage or restriction of the air stream is caused chiefly by the relative positions of the lips, teeth, tongue and palate. These organs that make the constriction are called **articulators**. Every sound needs two articulators, usually a lower one, e.g. part of the tongue, and an upper one, e.g. the palate, to articulate against each other. Often, one of the articulators is movable (**active**), the other fixed (**passive**).

The place at which the main constriction occurs is known as the **place of articulation** (= **where** the sound is produced), and the manner in which the air stream is constricted is known as the **manner of articulation** (= **how** the sound is produced).

3.2 Classification of consonants

In describing the sounds of a language it is not adequate to say that "this consonant is like the English 's' sound", or "that vowel is like the vowel in the English word 'bath'", or to make some such comment. Such a description would be inexact, particularly in describing vowels, because it would depend on the reader's knowledge of English and on what dialect of English he/she spoke. And it would obviously be totally inadequate for describing sounds not found in English.

Rather, if we are to describe a consonant (or any sound) accurately, we need first to understand how the sound is made, or more specifically how the vocal organs are placed and shaped to make the sound. In order to do this the following four categories must be considered:

- the **place** of articulation
- the **manner** of articulation
- the **voicing** (whether present or absent)
- the **air mechanism**

The consonant chart on p.104 will show that this system simply identifies the box on the chart which the sound fills.

3.3 Place of articulation

This defines both the place at which the main interference to the air stream takes place, and also the articulators which cause it. In naming the articulators involved it is assumed that some part of the tongue is one of the articulators, unless two other parts of the vocal apparatus are mentioned. An example of the latter is "labiodental" which names both the lips ("labio"), and the teeth ("dental"). The first part of the term usually refers to the lower articulator, the second to the upper.

Figure 3.1 on p.19 shows the vocal tract with lines to indicate the way in which either the lips or the different parts of the tongue move towards the various places of articulation.

The various places of articulation are as follows:

3.3.1 Bilabial

The lower lip approaches the upper lip with various degrees of closeness, from only a slight approach to a complete firm closure. The general shape of the lips may be either spread wide (unrounded) or rounded. If there is no closure this means that if the lips are unrounded, air can escape over the whole width of the lips, at the sides as well as at the centre, whilst if they are rounded the air escapes only at the centre. The tongue is in a neutral position.

Example: the 'p' in *paper*

3.3.2 Labiodental

The lower lip articulates with the upper teeth.

Example: the 'f' and 'v' in *five*

Sometimes it is convenient to group the bilabials and labiodentals together under the term **labial**. This is a term used to cover sounds made in the same general area of the mouth and does not specify the exact place of articulation.

3.3.3 Dental

The tongue tip articulates with the edge or back of the upper teeth. The air passes between the upper surface of the tongue tip and the upper teeth. A wide range of sounds may be produced at this point.

Example: the 'th' in English *thin*, or 'th' in English *this*
the 't' in Isoko *othu* ("louse")

Sounds produced with the tongue tip actually between the teeth are really **interdental**. Most linguists, however, do not make a distinction between the interdental and dental place of articulation, but call them both dental. In this case the term "dental" is not meant to specify the exact place of articulation, but is a term used to refer to a group of sounds which are produced in the same general region of the mouth. In this Phonetics course, however, the term **dental** is not used in this wide sense, but refers specifically to sounds produced at the dental place of articulation.

In some languages, however, it is important to know the exact place of articulation, especially if accuracy in reproduction is to be gained. It is therefore useful to know about the distinction even if the IPA does not make one.

In some languages there are dental and alveolar consonants in contrast with each other. In others some dental sounds occur but not the corresponding alveolar ones. In English, comparing the pairs of words

ten and *tenth*
eight and *eighth*
well and *wealth*

it will be seen that whereas the final consonants in the first member of each pair are alveolar, i.e. [n], [t] and [l^{y}], in the second member of each pair these same consonants are dental in anticipation of the final dental fricative [θ].

3.3.4 Alveolar

The tongue tip or blade articulates with the alveolar ridge. A wide range of sounds may be produced at this point as the tongue shape may vary considerably.

Example: the 't' in *team*, for a sound with the tongue tip (apical), and
the 's' in French *six* ("six"), for a sound using the tongue blade (laminal).

The 't' in *team* (English) may in fact be either apical or laminal. There is variation from one speaker to another, and there is very little difference in sound. In a new language it may be necessary to adjust the articulation for an alveolar sound slightly.

3.3.5 Postalveolar

The tongue tip or blade articulates with the back part of the alveolar ridge.

Example: the 'sh' in *ship*

This grooved fricative sound is in English usually pronounced with the tongue blade.

3.3.6 Alveolopalatal

Grooved fricatives can also be produced at other places of articulation, e.g. alveolopalatal (or alveopalatal). Then the tongue middle articulates against the alveolopalatal (alveopalatal) area. (The term means that the sound is **mainly** palatal.) These sounds are common in Slavic languages. It is important to note the contrast between these sounds and the **palatalised** ones discussed in Chapter 12.

Example: the 'ś' in Polish *śmiać się* ("to laugh")

3.3.7 Retroflex

The tongue tip is curled up and back so that the tip or underside of the tongue makes contact with the roof of the mouth. The point of contact may be just behind the alveolar ridge or further back, sometimes right at the back of the palate. The important factor is not the exact point of

contact but the fact of the retroflexed, or curled back, tongue tip. There is a noticeable effect on the adjacent vowels, particularly the one preceding the retroflex consonant.

Example: the 'r' in Hausa *rawa* ("dance")

3.3.8 Palatal

The tongue middle articulates with the hard palate. There appears to be some variation as to tongue tip position in different languages. It is easiest to place the tongue tip well down behind the lower teeth, thus ensuring that the tongue **middle** is articulating with the palate.

Example: The 'n' in Fula *nyaaku* ("bee")

3.3.9 Velar

The tongue back articulates with the velum (or soft palate). It should be remembered that the tongue back faces the velum directly so that in order to make a velar articulation the tongue back needs only to be raised, **not** drawn backwards. To ensure that this is done, it is best to let the tongue and jaw relax and then raise the jaw gently until contact or near contact is made.

Example: the 'c' in English *car*

3.3.10 Uvular

The tongue back articulates with the uvula, the very back of the soft palate. For these sounds the tongue back has to be drawn backwards as well as being raised slightly. In this way they contrast with the velar sounds.

Example:

3.3.11 Pharyngeal

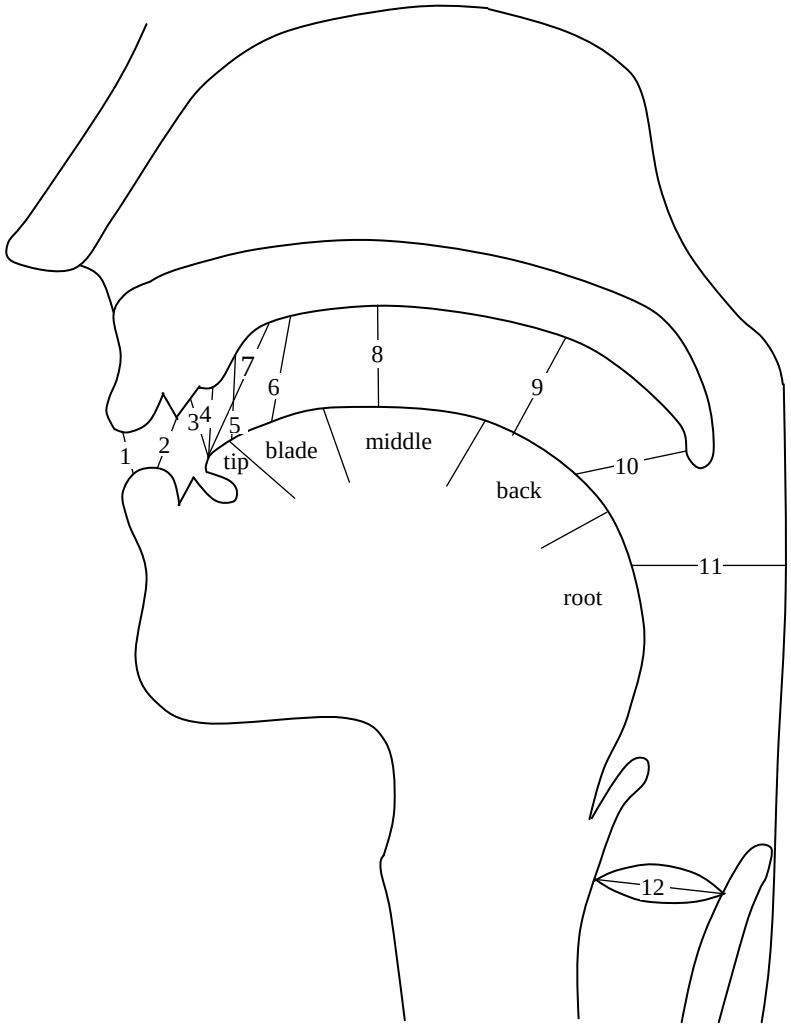
The tongue root articulates with the back of the pharyngeal wall, often with a simultaneous general constriction of the whole pharynx. Sounds made at this point have a distinctly "swallowed" effect.

Example: the Arabic letter "'ain" (voiced pharyngeal fricative)

3.3.12 Glottal

The vocal cords articulate with each other.

Example: the ' in Hausa *sa'a* ("good luck")



1. bilabial
2. labiodental
3. dental
4. alveolar
5. postalveolar
6. alveolopalatal
7. retroflex
8. palatal
9. velar
10. uvular
11. pharyngeal
12. glottal

Figure 3.1 The various places of articulation

3.4 Manner of articulation

At the beginning of the chapter it was mentioned that a consonant is a sound where there is some restriction to the air stream, this restriction being caused by the articulators. The placing and movement of the articulators result in different kinds of interference to the air stream. This produces different kinds of sounds, different **manners of articulation**.

One way of grouping sounds is to do it depending on the degree of stricture or narrowing between the articulators. When there is complete closure or a very small gap, we have one subclass called **obstruents**; when the gap is opened wider so that the sound has great sonority we have **sonorants**. We describe these two subclasses in turn.

3.4.1 Obstruents

Obstruents involve a major obstruction to the air stream. They are themselves subdivided into plosives and fricatives.

3.4.1.1 Plosive articulation

In the production of a plosive, the articulators are completely and firmly closed so that the air stream is completely stopped and cannot escape through the mouth. Air pressure builds up behind the closure, and is then released.

Example: the 'p' in English *pull*

3.4.1.2 Fricative articulation

In the production of a fricative, the articulators make a loose contact, but not a firm closure, so that the air stream can pass through the narrow gap only by producing considerable friction and hence turbulence. It is this turbulence that gives the roughness, rather like hissing, which characterises all fricatives.

Example: the 'f' in English *full*

When the tongue is one of the articulators in the production of a fricative, the air stream can either pass through a gap at the centre of the tongue, giving us **central** fricatives, or it can pass through gaps over the sides of the tongue, giving us **lateral** fricatives.

Thus the term OBSTRUENT is an inclusive term meaning either a plosive or a fricative. It comes from the same root as 'obstruct' and thus an obstruent is a sound in which the air stream has been obstructed, either completely (as for plosives) or enough to produce friction (as for fricatives).

3.4.2 Sonority and sonorants

When you listen to an obstruent (i.e. to either a plosive or a fricative), you notice that the sound does not resonate - in other words, it has low sonority.

Compare the obstruents with such sounds as vowels (e.g. [α], [o]) or vibrants (e.g. [r]), or nasals (e.g. [m], [n]). These latter sounds have a lot more sonority, in other words, they resonate

more than the plosives, like [t], [d], or the fricatives, like [s], [z]. Thus we have a new class of sounds which are called **sonorants**. Sonorants are sounds which have little or no impedance to the air stream which thus passes through the vocal tract with no friction so that the sound can resonate. Sonorants are sounds with greater sonority than the obstruents.

There are various ways in which we can change the manner of articulation so as to get more sonority. In order to see what kinds of change we need, it is useful to think about why obstruents do not have sonority.

When we produce obstruents, either we stop the air stream completely so that the vocal cords soon stop vibrating, or we make enough friction and turbulence at the place of articulation so that the sound loses its sonority. So in order to get more sonority we must open up the gap wide enough to prevent any friction and turbulence, while continuing to keep the air stream flowing. Characteristically sonorant sounds are voiced, but voiceless vowels and approximants are also included as sonorants in most classifications because of the large gap between the articulators, causing little or no obstruction to the air stream.

There are three ways of avoiding loss of sonority. The **first** way of producing sonorants is by **opening the gap more** between the articulators to change the stricture. Thus, we can get:

3.4.2.1 Approximant articulation

We can open the gap **slightly**, just wide enough so that there is no friction, in which case we get approximant articulation. In other words, one articulator approaches another, but not close enough to produce friction. Again we can have both central and lateral approximants, just as we had both central and lateral fricatives.

Example: the ‘y’ in English *yell*

3.4.2.2 Vowel articulation

The gap can also be **opened still wider** (than for approximants), in which case we get vowel articulation. Thus, in the production of vowel sounds, the passage of the air stream is relatively unobstructed over the central line of the tongue and the articulators do not approach very closely at all. Note that in neither approximant nor in vowel articulation is there any build up of air pressure behind the place of articulation.

Example: the ‘i’ in English *ill*

The following deals with the **second** way of producing sonorants:

3.4.2.3 Vibrant articulation

We can allow the articulators to form a **complete closure for such a short time** that there is no chance of either any effective stopping of the air stream or of any friction. Here too, we have two alternatives:

Either we can cut off the air stream momentarily with one quick tap of one articulator against the other, or we can cut off the air stream repeatedly with a series of such quick

momentary taps. In either case, the total time of closure is so small that the air pressure behind the place of articulation does not build up, and so we have sonorants.

Examples: the 'r' in Ngizim (Yobe) *rama* ("speech")

the 'rr' in Ngizim *rrama* ("feeling better")

3.4.2.4 Nasal consonant articulation

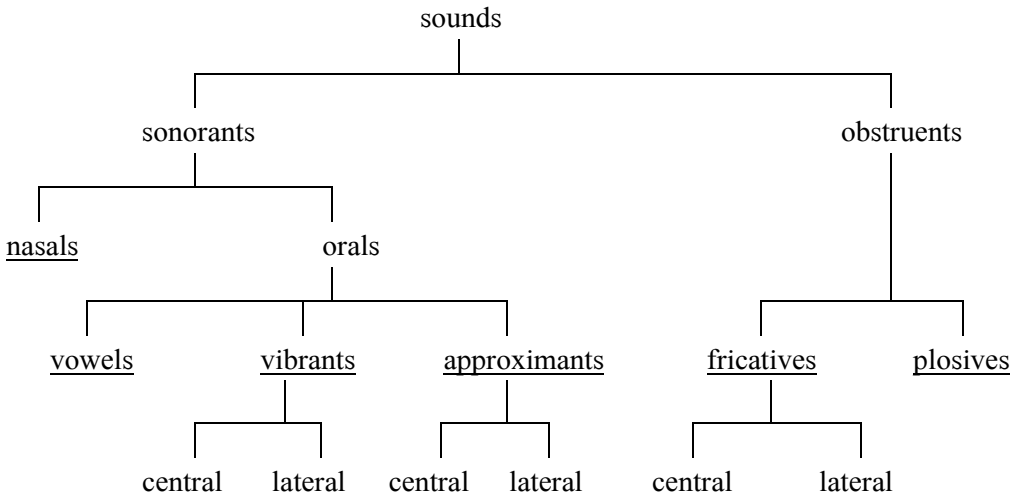
The third way of avoiding the loss of sonority that we get in obstruents is to lower the velum and so open the velic closure but leave the organs of articulation in the oral tract as for plosives. This now allows the air stream to escape into the open air outside the mouth via the nasal cavity and so we avoid both the build up of air pressure and the local friction which are the two things that lead to loss of sonority. With the velic passage open, then, we have nasal consonants (which are sonorants).

Example: the 'n' in English *no*

3.4.3 Summary of manner of articulation

Figure 3.2

A Classification of Sounds in terms of manners of articulation



In Figure 3.2 we find a classification of sounds according to the manner of articulation. Note that as we proceed from left to right, the opening between the articulators gets progressively narrower. Specifically, the opening gets progressively narrower as we go from vowels to approximants to fricatives to plosives. (Vibrants are rather a special case as they are the only sounds that do not have a constant-sized opening, but they become sonorant because the closure is so momentary or so intermittent that there is no significant build-up of air pressure behind the constriction.)

The perceptive reader will regard the categories plosive, fricative, approximant, vowel as points along a continuous scale rather than each as a watertight category that never overlaps with any of the others. This is especially important for the distinction between fricative and

approximant. If you have a certain stricture, let's call it fricative, between articulators, then the amount of friction you get (and the amount of turbulence you generate) depends on how much pressure there is behind the air stream. The higher the pressure, the greater the friction.

Note also that the two-way option of central versus lateral applies equally to fricatives, approximants and vibrants. That is to say, we have

both central and lateral fricatives,
both central and lateral approximants,
both central and lateral vibrants.

Restating this in physical terms, it means that we can have fricatives in which the air goes down the centre or round the side of the tongue, and the same applies to approximants and vibrants as well.

For plosives, however, the air stream is completely stopped and the articulators are completely closed, so the question of where the air stream escapes just does not arise. Therefore, there cannot be any central versus lateral distinction for plosives. And for vowels, the air stream is never diverted round the sides of the tongue by an obstruction in the centre because the articulators are very wide apart. So, again there is no central versus lateral distinction for vowels. Note that some linguists define a vowel as a central oral resonant, reflecting the fact that in making vowels the air stream does in fact pass down the centre of the tongue.

3.5 Voicing

If the vocal cords are vibrating during the time of production of the consonant, then it is voiced. If the vocal cords are at rest, then the sound is voiceless.

3.6 Air mechanism

This specifies both the **direction** of the air stream, normally egressive, but may be ingressive, and also the **initiator** of the air stream, whether the lungs, the pharynx or the mouth (see 2.2).

All sounds introduced in this book except those in Chapter 18 and Chapter 19, will be produced with egressive lung air.

3.7 Technical Description of Consonants

We are now in a position to approach the technical description of consonants. In such a description we need to include the information on how the sounds are made. However, it has been the convention to present that information in the following order:

- the voicing: whether the sound is voiced or voiceless
- the place of articulation
- the manner of articulation
- the air mechanism

Here are some sample descriptions showing how it is done:

	Voice	Place of articulation	Manner of articulation	Air mechanism
[p]	voiceless	bilabial	plosive	with egressive lung air
[g]	voiced	velar	plosive	with egressive lung air
[ɲ]	voiced	palatal	nasal	with egressive lung air
[x]	voiceless	velar	fricative	with egressive lung air
[f]	voiceless	labiodental	fricative	with egressive lung air

If the articulation is "modified" in any way (i.e. if any other activity of the vocal apparatus is contributing to the sound) then this is specified just before the manner of articulation. Modifications are dealt with in Chapter 12.

Notice that the order in which the information is presented in the technical description of a sound is quite different from the order in which we have described the articulatory processes which made the sound. The articulatory processes were described in the order which made it easiest to see how the vocal apparatus worked and how to distinguish the various sounds from each other.

Chapter 4

Plosives

In the production of a plosive there are three phases:

- the **closure**, the phase during which an articulator approaches another to produce a complete closure.
- the **compression**, or **hold**, the phase during which the air builds up behind the closure. It can be of shorter or longer duration within limits. With a voiced plosive the voicing continues throughout this phase, and so it cannot be prolonged indefinitely, for as soon as the pressure of air above the glottis equals the pressure below, then the flow of air over the vocal cords ceases, and so the voicing also ceases.
- the **release**, which is the final phase. The articulators separate, one from the other, allowing the accumulated air to escape. Apart from affrication (see p.52) there are two ways of achieving this. The plosive may be cleanly released into the following sound, and in this case it is said to be **unaspirated**. Alternatively, there may be a sharp flow of (voiceless) air through the glottis before the following sound is articulated. In this case it is said to be **aspirated**.

The third phase, the release, need not be **audibly** present in every plosive, e.g. the 'p' in "captain" is released, but not audibly.

In phonetic transcription, aspiration is written as a raised 'h', [^{h}] e.g. [p^{h}] [t^{h}], and an unaspirated plosive is written as e.g. [p].

e.g.	[p^{h}] as in	English	[p^{h}æt]	-	"pat"
		Igbo	[ip^{h}a]	-	"press out"
	[p] as in	French	[pɔm]	-	"apple"
		Igbo	[ipa]	-	"carry in hand"

For transcription of lightly aspirated plosives and unreleased plosives see 11.1.1 and 11.4.1 respectively.

Figure 4.1 shows the voice onset time for a voiceless unaspirated and aspirated plosive. The voiceless aspirated plosive can be said to have a period of voicelessness before the following vowel is articulated. This is also called "delayed voice onset time".

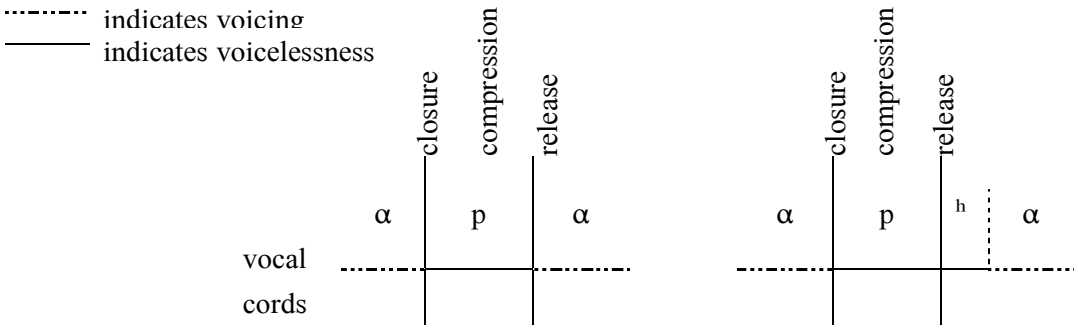


Figure 4.1

Voice onset time for an unaspirated and an aspirated plosive

The closure of a plosive may be made at a variety of places of articulation.

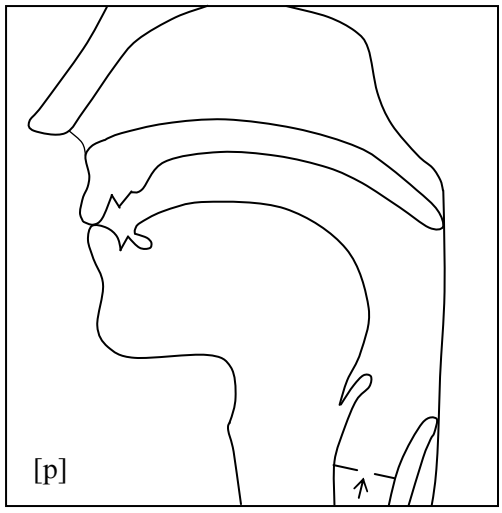


Figure 4.2

4.1 Bilabial plosives

The closure is made by the two lips making a complete closure.

[p] voiceless unaspirated bilabial plosive with egressive lung air

[p^h] voiceless aspirated bilabial plosive with egressive lung air

e.g. [p] in English [spɪn] - "spin"
[p^h] in English [p^hɪn] - "pin"

[b] voiced unaspirated bilabial plosive with egressive lung air

[b^h] voiced aspirated bilabial plosive with egressive lung air

e.g. [b] in Igbo [ibe] - "to cry"
[b^h] in Igbo [ib^he] - "to slice, cut small"

(voiced asp. see p.51)

4.2 Dental plosives

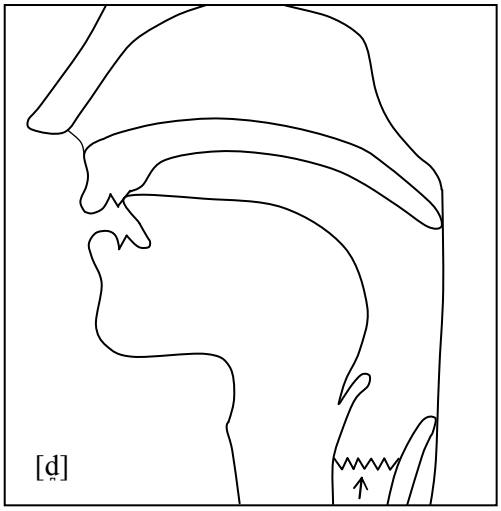
The tongue tip touches the back of the upper teeth and gum to produce a complete closure.

[t̪] voiceless dental plosive with egressive lung air

e.g. English [ɛˈt̪θ] - "eighth"
Isoko [ot̪u] - "louse"

[d̪] voiced dental plosive with egressive lung air

e.g. English [wɪd̪ð̪] - "width"
Isoko [ud̪u] - "farm"



4.3 Alveolar plosives

The tip or blade of the tongue makes a closure at the alveolar ridge.

[t] voiceless alveolar plosive with egressive lung air

e.g. Isoko [uti] - "sugar cane"

[d] voiced alveolar plosive with egressive lung air

e.g. Isoko [udi] - "drink"

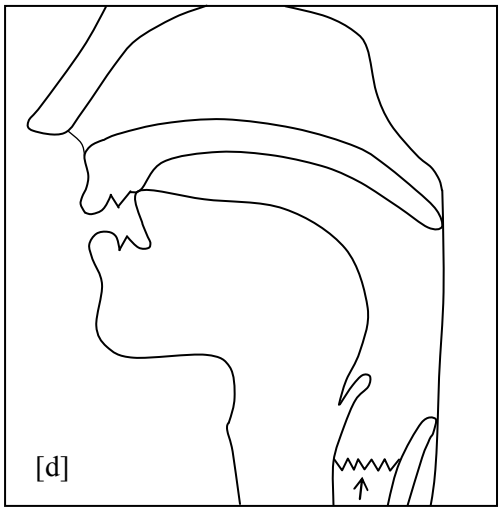


Figure 4.4

4.4 Retroflex plosives

The tongue tip is curled up and back so that the underside of the tongue makes contact with the palate; the exact position varies.

[ʈ] voiceless unaspirated retroflex plosive with egressive lung air

e.g. Herero [ʈɑ] - "to fit"

[ɖ] voiced unaspirated retroflex plosive with egressive lung air

e.g. Ewe: [ɖe] - "to take away"

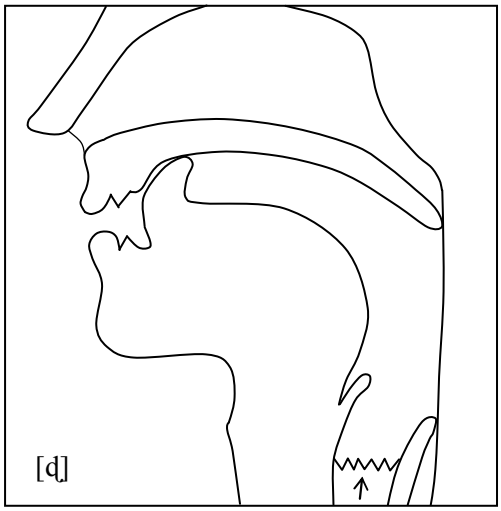


Figure 4.5

4.5 Palatal plosives

The middle of the tongue makes contact with the hard palate. The tip is usually held down.

[c] voiceless palatal plosive with egressive lung air

e.g. Peul (W. Africa): [comci] - "clothing"

[ɟ] voiced palatal plosive with egressive lung air

e.g. Peul: [ɟɔɟᵊ] - "five"

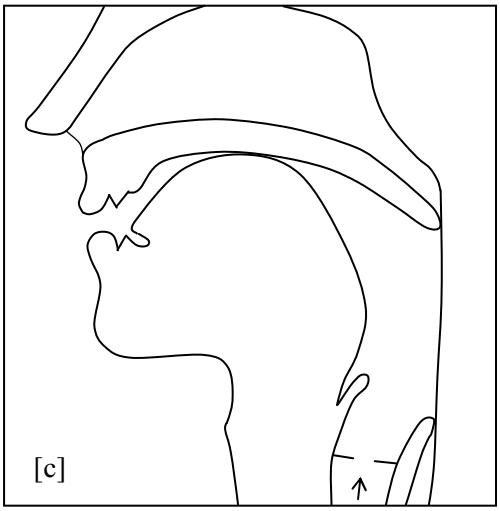


Figure 4.6

As the palate covers a large area, the closure can occur at the front, in the centre, or at the back of the palate. Also slightly different parts of the tongue may be used. These plosives often sound affricated (see p 52).

4.6 Velar plosives

The tongue back is raised to make a closure at the velum.

[k] voiceless velar plosive with egressive lung air

e.g. English: [skɪn] - "skin"

Wolof [buki] "hyena

[g] voiced velar plosive with egressive lung air

e.g. English: [ˈfɪgə] - "figure"

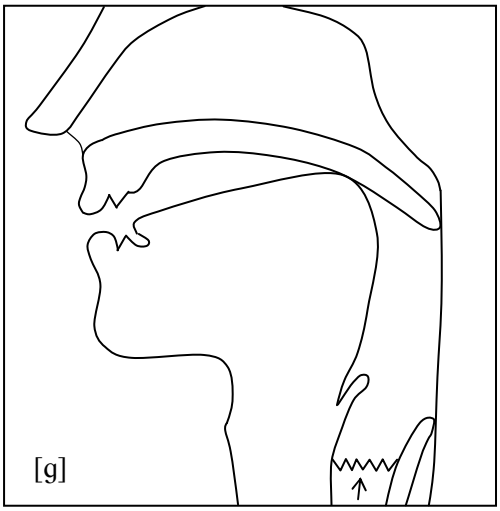


Figure 4.7

4.7 Uvular plosives

The tongue back is drawn upwards and backwards to make contact with the uvula.

[q] voiceless unaspirated uvular plosive with egressive lung air

e.g. Wolof (Senegal): [buqi] - "stare"

Arabic [saqala "asked"

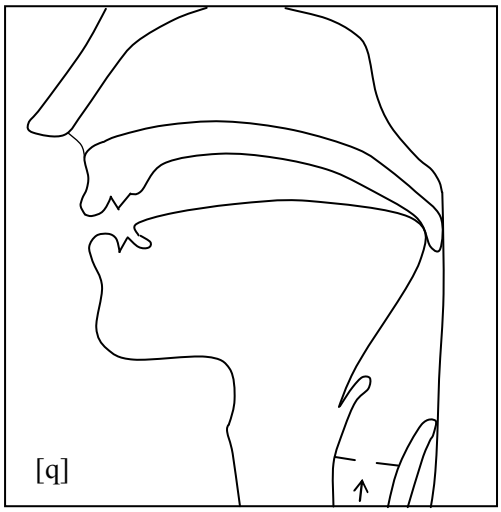


Figure 4.8

[ɢ] voiced unaspirated uvular plosive with egressive lung air

e.g. Tlingit (Alaska): [eɢeː] - "spoon"

4.8 Glottal plosive

The vocal cords come together to form a complete closure. By the very definition it means that the vocal cords cannot vibrate so that only a voiceless sound is produced.

[ʔ] glottal plosive with egressive lung air

e.g. Hausa [ˈsɑwɛʔ] - "companion"

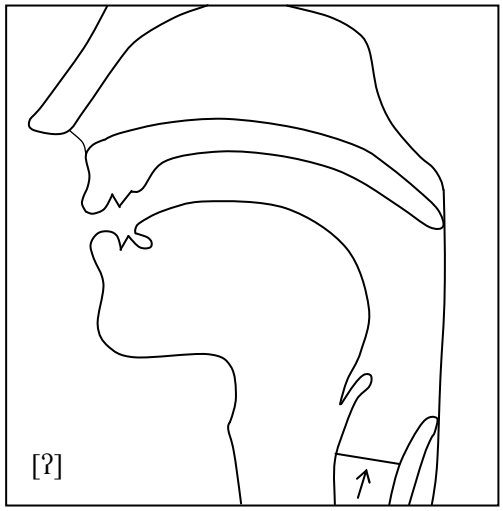


Figure 4.9

Up to now in this chapter we have only considered plosives made at a single place of articulation. It is, however, possible to make plosives at **two places of articulation simultaneously**, thus giving us **double plosives**:

4.9 Labial-velar and labial-alveolar plosives

The voiceless and voiced double plosives have **two closures made simultaneously** and then **released simultaneously**. The two closures are bilabial and velar/alveolar.

Although the releases are made simultaneously, the hearer tends to be more aware of the bilabial release than of the velar, especially since the lips are often visibly "thrust forward".

In some languages one can hear a slight "popping" noise at the lips as the sound is released. This results from air being sucked into the mouth as the velar closure is being released by a downward and backward movement of the tongue. At the same time there is still an egressive lung air stream.

When practising production it may help to start with the labial-velar double nasal [ŋ͡m] (see 10.9), which can be held for a while. First make the velar closure for [ŋ], then, while maintaining that, bring the lips together as for [m]. Then release them at the same time. When the 'feel' of the sound is familiar the closure should also be made at the same time. After this the plosives [k͡p] and [g͡b] are more easily controlled.

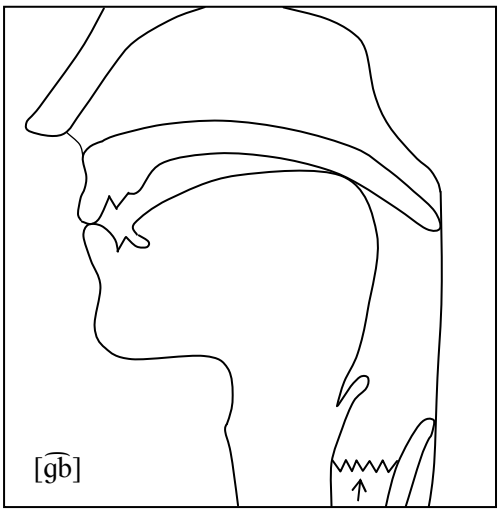


Figure 4.10

N.B. The ligature [‿] shows simultaneous articulation.

[k͡p] voiceless labial-velar plosive with egressive lung air

e.g. Agatu (Benue): [àk͡pātʰā] "should"

[g͡b] voiced labial-velar plosive with egressive lung air

e.g. Agatu (Benue): [àdāg͡bá] "elephant"

[pt] voiceless labial-alveolar plosive with egressive lung air

e.g. Bura [pta] "animal"

[bd] voiced labial-velar plosive with egressive lung air

e.g. Bura [bda] "chew"

Chapter 5

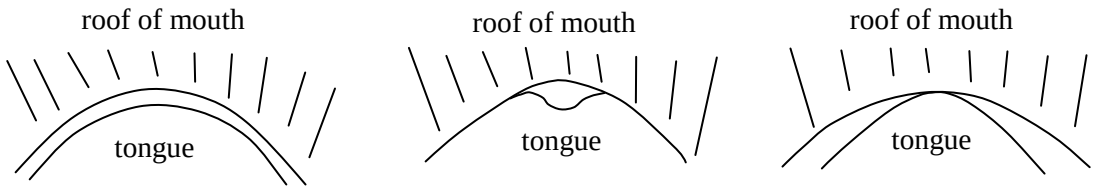
Central Fricatives

Fricatives are produced by a restriction of the air passage caused by the articulators coming close together. The articulators are not sufficiently near to produce a closure, but are close enough to cause noticeable friction. Another term often used for fricatives is "spirants". Fricatives can be produced with varying degrees of friction.

It is necessary to distinguish:

- the **central** fricatives in which the air comes over the **centre** of the tongue. These need to be further subdivided into:
    - **flat** fricatives in which the **tongue or other articulator remains flat** across its width to form a **wide channel**, and,
    - **grooved** fricatives in which the **tongue is grooved** to create a **tubular channel**. These are sometimes referred to as "**sibilants**" (see footnote 1).

    Figure 5.1 (below) shows the difference in tongue shape between a flat, a grooved and a lateral fricative,
- the **lateral** fricatives in which the air stream passes over the **sides** of the tongue.



a. Flat fricative b. Grooved fricative c. Lateral fricative

Figure 5.1

Shape of the tongue (cross-section) for fricatives, showing the roof of the mouth as well.

N.B. Some flat fricatives do not have the tongue as an articulator, e.g. a bilabial fricative, but the definition above still holds true.

In the discussion of the fricatives and in their technical names it will be assumed that the fricative is flat unless it is specified otherwise.

In this chapter we discuss the central fricatives, leaving the lateral fricatives till Chapter 8.

Where face diagrams do not occur in this chapter students may refer back to the face diagram for the corresponding plosive. However, **the diagram for a fricative will have a small gap between the articulators** at the place of articulation, to show that although slight contact can be felt, there must still be a gap as air is allowed to escape.

5.1 Flat fricatives

5.1.1 Bilabial fricatives

The two lips approach each other so as to produce a long, very narrow slit. The air escapes over the whole length of the lips rather than at some particular place.

Bilabial fricatives are similar in sound to the labiodental fricatives, and there may initially be a problem in production as well as in differentiation. Attempting to blow hair out of the eyes will help to overcome the tendency to produce the more familiar labiodentals. This is really an over-correction but it is useful in the early stages. A strong air stream will be required to produce friction, especially with the voiced sound.

[ɸ] voiceless bilabial fricative with egressive lung air

e.g. Ewe (Togo): [ɸu] - "bone"

[β] voiced bilabial fricative with egressive lung air

e.g. Ewe: [βu] - "boat"

5.1.2 Labiodental fricatives

The lower lip lightly touches the upper teeth, which can usually be seen between the lips. The air escapes through friction between these two articulators.

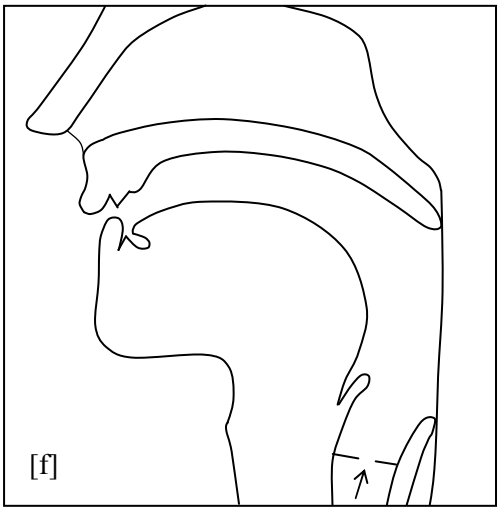


Figure 5.2

[f] voiceless labiodental fricative with egressive lung air

e.g. Ewe: [fu] - "feather"

[v] voiced labiodental fricative with egressive lung air

e.g. Ewe: [vu] - "to tear"

5.1.3 Dental fricatives

The tongue remains flat whilst the tip articulates against the edge or back of the top teeth, or even between the teeth. The air escapes through friction between the tongue tip and the upper teeth.

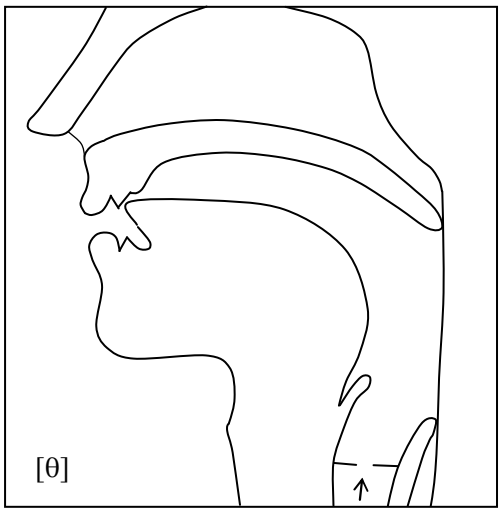


Figure 5.3

[θ] voiceless dental fricative with egressive lung air

e.g. English: [θɪn] - "thin"

[ð] voiced dental fricative with egressive lung air

e.g. English: [ðɪs] - "this"

5.1.4 Alveolar flat fricatives

The tongue remains flat as it approaches the alveolar ridge. These sounds are used in certain cases for the English ‘r’ consonant (when it follows a ‘t’ or a ‘d’), although these ‘r’ sounds are otherwise considered to be produced a little further back than the alveolar sounds previously considered, and may be termed “post-alveolar”. The symbol is the same as for the corresponding approximant, but with an added diacritic (extra sign) showing that the articulators are closer together.

[ɹ̟̊] voiceless alveolar (or postalveolar) fricative with egressive lung air

e.g. English [tɹ̟̊ɛˈn] - “train”

[ɹ̟] voiced alveolar (or postalveolar) fricative with egressive lung air

e.g. English [dɹ̟ɛˈn] - “drain”

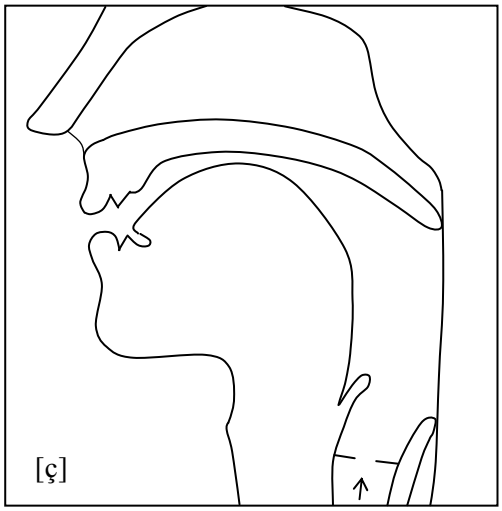


Figure 5.4

5.1.5 Palatal fricatives

The tongue middle rises towards the palate. The tongue shape approximates to the shape of the palate so that there is an even flow of air over the whole surface area. This makes the fricative **flat**. As the tongue tip is not used in the articulation, it may be held out of the way behind the bottom teeth.

English speakers use this sound word initially, e.g. in “huge” and “Hugh”. English speakers can practice producing this sound in isolation, and then before and after various vowels until it comes at will.

[ç] voiceless palatal fricative with egressive lung air

e.g. Glavda (Borno) çəva - “sickle”

[j̊] voiced palatal fricative with egressive lung air

e.g. Glavda (Borno) aj̊uŋw a - “donkey”

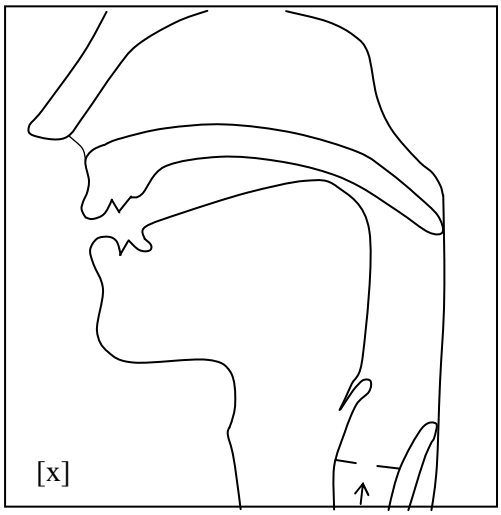


Figure 5.5

5.1.6 Velar fricatives

The tongue back rises towards the velum, not making a closure, but near enough to cause friction.

[x] voiceless velar fricative with egressive lung air

e.g. Glavda [xara] - “sleep

[ɣ] voiced velar fricative egressive lung air

e.g. Glavda [ɣaɣa] - “hawk”

5.1.7 Uvular fricatives

The tongue back is drawn upwards and backwards towards the uvula, causing friction. These sounds are used in Parisian French for the ‘r’ sound, voiceless in consonant clusters and voiced elsewhere.

[χ] voiceless uvular fricative with egressive lung air

e.g. Wolof (Senegal [baːχ - “good

[ʁ] voiced uvular fricative with egressive lung air

e.g. Parisian French: [ɑˈʁɛ] - “stop”

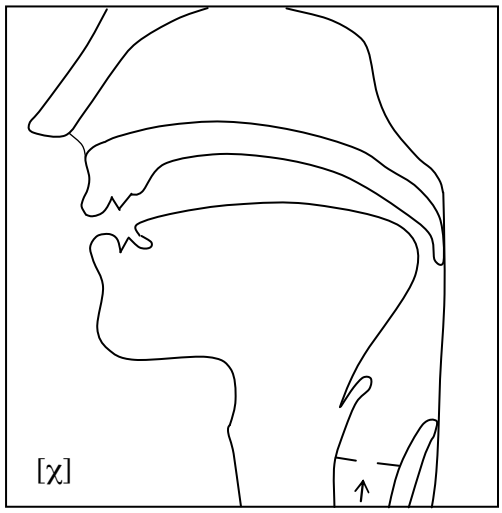


Figure 5.6

5.1.8 Pharyngeal fricatives

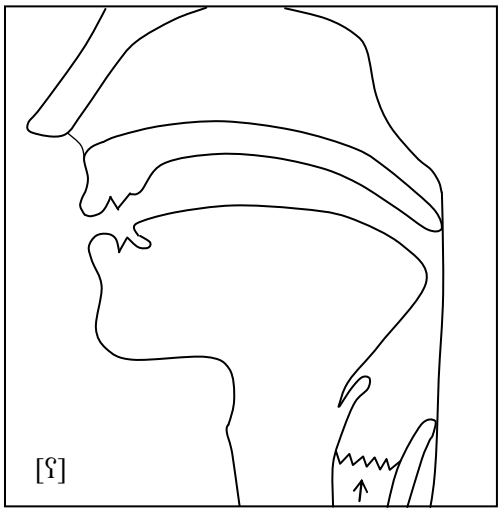


Figure 5.7

There is a general constriction of the pharynx, involving a drawing back of the tongue root towards the pharyngeal wall and a lateral constriction of the pharynx from the left and right, thus producing a "throaty-sounding" friction.

In producing these sounds, try to constrict the pharynx and also flatten the tongue to draw the root back towards the pharynx wall. It helps to hold the tongue tip behind the bottom teeth. It can also sometimes help to try panting like a dog.

[ħ] voiceless pharyngeal fricative with egressive lung air

e.g. Iraqw (Tanzania) [ɑˈħɑ] - "to hate"

Arabic ħuruːb "wars"

[ʕ] voiced pharyngeal fricative with egressive lung air

e.g. Somali [ʕɛl] "well"

These sounds are common in Semitic languages. In some dialects of Arabic, the sound which is traditionally called a voiced pharyngeal fricative has lost its friction and is therefore, in fact, an approximant. There is no symbol to distinguish between them, however.

5.1.9 Glottal fricatives

A strong airflow through the partially opened glottis sets up friction there.

As in the English 'h' sound, the mouth is ready for the pronunciation of a voiced vowel, and so the 'h' is often thought of as a voiceless vowel with some cavity friction in the mouth and also some glottal friction. However, because of the glottal friction and because it is non-syllabic, the 'h' can also be thought of as a glottal fricative.

The voiced counterpart, "voiced h", in English it is sometimes heard instead of [h] between vowels, e.g. "behold", "perhaps" and "aha".

[h] voiceless glottal fricative with egressive lung air

e.g. English [hɛd] - "head"

[ɦ] voiced glottal fricative with egressive lung air

e.g. English [əˈɦɛd] - "ahead"

5.2 Grooved fricatives

5.2.1 Dental grooved fricatives

The tongue is grooved throughout its length, with the tip forming a tubular outlet against the upper teeth. The friction produced is of a higher pitch than for the alveolar grooved fricative (see 5.2.2).

[s̪] voiceless dental grooved fricative with egressive lung air

e.g. French [s̪is̪] - "six"

[z̪] voiced dental grooved fricative with egressive lung air

e.g. French [duz̪] - "twelve"

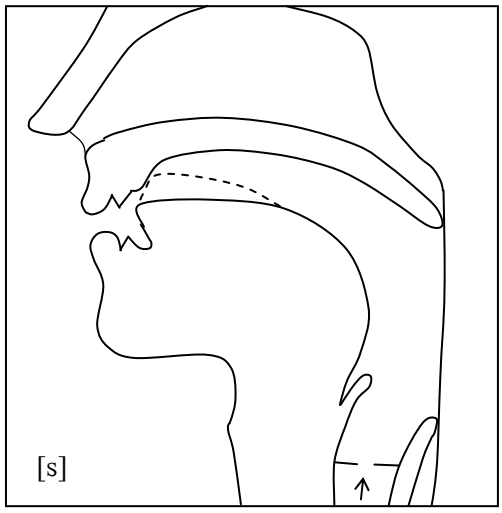


Figure 5.8

5.2.2 Alveolar grooved fricatives

The tongue is deeply grooved, with the back, as shown in X-ray photographs, falling away steeply. Thus, a funnel-shaped cavity is formed with the curve of the palate at the top and the groove of the tongue at the bottom. The air escapes through the narrow opening between the alveolar ridge and tongue tip, with the air stream being directed against the upper teeth. This causes a high-pitched hissing sound (see footnote 2).

N.B.
Solid line ———— = centre of tongue
Broken line ---------- = sides of tongue

[s] voiceless alveolar grooved fricative with egressive lung air

e.g. English: [sɪp] - "sip"

[z] voiced alveolar grooved fricative with egressive lung air

e.g. English: [zɪp] - "zip"

The sound can be either apical or laminal.

5.2.3 Postalveolar grooved fricatives

The term "postalveolar" indicates that the main place of articulation is the back of the alveolar ridge. The tip or blade of the tongue is raised towards the postalveolar area towards the palate and grooved to form a longish tube. If the tongue tip is used the sound

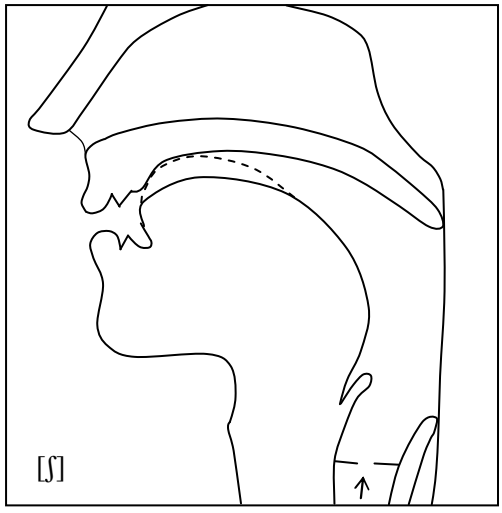


Figure 5.9

is "apico-postalveolar", if the blade is used it is "lamino-postalveolar". The pitch is lower than in the alveolar grooved fricative, and gives the effect of fluid flowing through a tube. The tongue has a "**domed**" shape.

[ʃ] voiceless postalveolar grooved fricative with egressive lung air

e.g. English: [ʃɪn] - "shin"

[ʒ] voiced postalveolar grooved fricative with egressive lung air

e.g. French: [ʒɑ̃] - "people"

5.2.4 Retroflex grooved fricatives

The tongue tip is curled over and grooved, or only pulled back and sticking up. The rim of the tongue touches the gums around the alveolar ridge with a slit opening formed between the front of the palate and the grooved tongue.

[ʂ] voiceless retroflex grooved fricative with egressive lung air

e.g. Vietnamese: [ʂɔ^{i}] - "to boil"

[ʐ] voiced retroflex grooved fricative with egressive lung air

e.g. Mandarin Chinese: [ʐū] - "pig"

5.2.5 Alveolopalatal grooved fricatives

The term "alveolopalatal" indicates that the basic area of articulation is palatal, but that it extends towards the alveolar ridge. The tongue tip can be held down behind the lower teeth and the blade and/or middle of the tongue is raised towards the front part of the palate and grooved. The rim of the tongue touches the back teeth. A narrow slit opening is produced at the front of the palate.

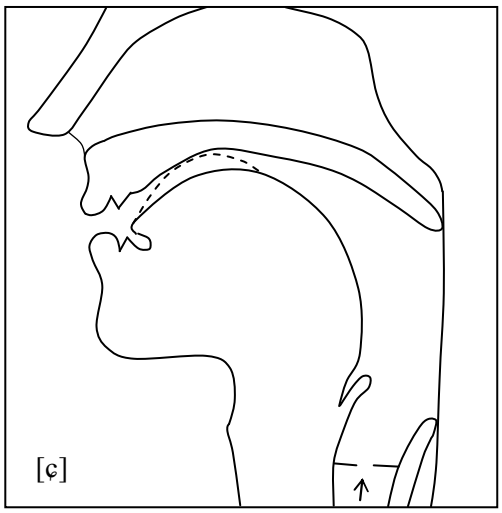


Figure 5.10

The airstream is directed downwards. The pitch is high. The general effect is like that of steam escaping from a kettle.

[ɕ] voiceless alveolopalatal grooved fricative with egressive lung air

e.g.	Mossi (W Africa)	[moɕe]	-	name of language

One must not confuse these **alveolopalatal grooved fricatives** with the **palatal flat fricatives** (5.1.5). In the former the tongue centre is grooved, not flat, and the place of articulation is more to the front of the palate.

Footnotes

1. The term **sibilant** means “a hissing sound”. In fact, what causes the grooved fricatives to have that hissing sound is that the air stream, after coming down the groove, hits the top front teeth. So it is not only the fact that the fricative is grooved that makes it a sibilant, but also that the air stream hits an edge. (Notice the peculiar sound that results when people without top front teeth make an ‘s’ sound. They’ve got the groove, but not the teeth against which the air stream wants to hit!)

2. The main types of grooved fricatives have been described, but it should be remembered that there are many different varieties. These depend upon the depth of the groove in the tongue, the exact part of the tongue used in the articulation, the length and exact position of the tube or slit opening, and the position of the other parts of the tongue not used in the main articulation.

For example the English 's' uses mainly the tongue tip near to the alveolar ridge, whilst the Swedish 's' uses the tongue blade near the alveolar ridge with the tongue tip held down. Students are encouraged to experiment with the sounds in their own speech to determine just how they are made.

Chapter 6

Central Approximants Corresponding to Fricatives

Approximants are sounds made with the articulators close together but not close enough to hinder the air stream and produce local friction and turbulence of the air stream. Thus the articulators are a little further apart than they would be for fricatives (which do have local friction) but closer together than they would be for making most of the vowels.

This chapter considers some of the central approximants. Each approximant in this chapter can be seen to correspond roughly to a central fricative at the same place of articulation. It should be noted that although an approximant is normally considered to be produced without local friction, as mentioned above, the voiceless approximants tend to have a little local friction. Otherwise they would not be heard.

(For other approximants see Chapter 17.)

6.1 Bilabial approximant

In this sound, the lips approach each other but not as closely as for [β], so the air escapes without audible friction. This approximant sounds like [w] but in its production the tongue back is not raised, and the lips are not rounded. The IPA. does not have a special symbol.

[β̞] voiced bilabial approximant with egressive lung air

e.g. Isoko: [iβ̞ɛ] *ibhe* "sacrifice"

N.B. In the technical names for approximants it is assumed that unless specified otherwise the approximant is central.

6.2 Labiodental approximant

In this sound the lower lip and upper teeth approach each other, but not enough to create friction. It could be considered to be a frictionless [v].

[ʋ] voiced labiodental approximant with egressive lung air

e.g. Dutch: [ʋɜt̪^{h}] - "what"

6.3 Alveolar approximant

To make this sound, the tongue body is held flat with the tip slightly raised, with the sides almost in contact with the side teeth, rather as for the alveolar flat fricatives (5.1.4), but the central opening is wide enough so there is no friction. Like the alveolar flat fricatives, these sounds may sometimes be referred to as "postalveolar".

[ɹ] voiced alveolar approximant with egressive lung air

e.g. English: [ɹɛˈn] - “rain”

6.4 Uvular approximant

The uvula and the back of the tongue are the articulators for this sound. The back of the tongue is grooved and raised and its sides make contact with the roof of the mouth. The uvula hangs over the tongue back (and may make slight contact with it). The air stream passes between the uvula and the tongue back through a gap which is wide enough to avoid friction.

[ʁ̞] voiced uvular approximant with egressive lung air

e.g. some French pronunciations of: [pɑˈʁ̞i] - “Paris”

The sound is simply a [ʁ] said without friction. The diacritic [˕] means that the articulators are further apart than the symbol on its own would otherwise indicate.

Chapter 7

Lateral Approximants

7.1 Lateral sounds

All the lateral sounds to be described have part of the tongue as one articulator, and the gap that the air stream must pass through is around the **sides** of the tongue. (Note the dictionary definition of "lateral" as "to, of, or from the side".) Compare this with the fricatives studied in Chapter 5, where the gap that the air stream passed through is either over the whole width of the tongue (flat fricatives) or with the sides of the tongue in contact with the roof of the mouth so the air can pass through the groove in the middle (grooved fricatives).

When we make a **lateral** sound, the centre of the tongue tip, tongue blade or tongue middle touches the roof of the mouth, while at the same time the sides of the tongue are lowered. Thus, the air stream is directed round the sides of the tongue and stopped from going down the centre.

In laterals, just as in other sounds, we can vary the width of the gap. With a small opening between the articulators, we get friction, and therefore **lateral fricatives** (see Chapter 8). With a wider opening, there will be no friction, and we get **lateral approximants**.

This chapter is about lateral approximants. There are various kinds of lateral approximant depending on where the actual closure is, i.e. where it is that the tip or body of the tongue makes contact with the roof of the mouth.

Often in technical descriptions, lateral approximants are simply described as laterals, and the word approximant is omitted. In such a mode of description, it has been assumed that a lateral is an approximant unless it has been explicitly stated that it is a lateral fricative.

7.2 Dental lateral approximants

The tip of the tongue is in contact with the upper teeth and gums, whilst the sides are lowered to allow a passage of air without friction.

[l̪] voiced dental lateral approximant with egressive lung air

e.g. Hausa [kʷʾάūːl̪í] - "bright, clear"

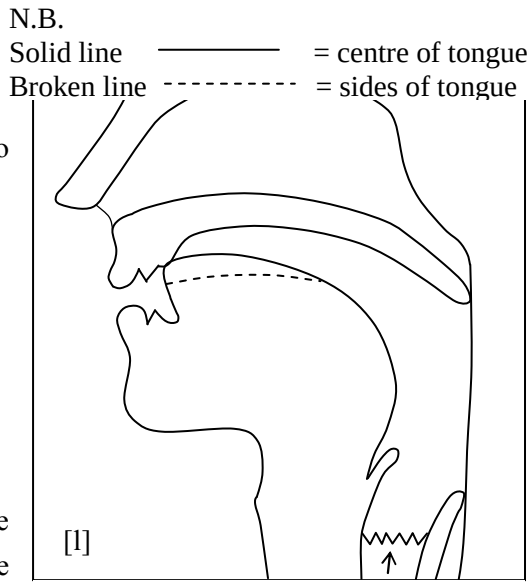


Figure 7.1

7.3 Alveolar lateral approximants

The tip of the tongue makes contact with the alveolar ridge, whilst the sides or rim of the tongue are lowered. Acoustically there is not much

difference between these and the dental lateral approximants.

[l] voiced alveolar lateral approximant with egressive lung air

e.g. English: [li:v] - "leave

In both the dental and alveolar lateral approximants, it is only the tongue tip that is used in the main articulation. The middle and the back of the tongue may take up a variety of positions. In the English word "legal" the first lateral approximant tends to have the back of the tongue lowered, whilst the second tends to have the back of the tongue raised. These are referred to as "clear" and "dark" lateral approximants. The latter is really **velarised** and will be dealt with in 12.2.3, but a face diagram is included here as well, for ease of comparison.

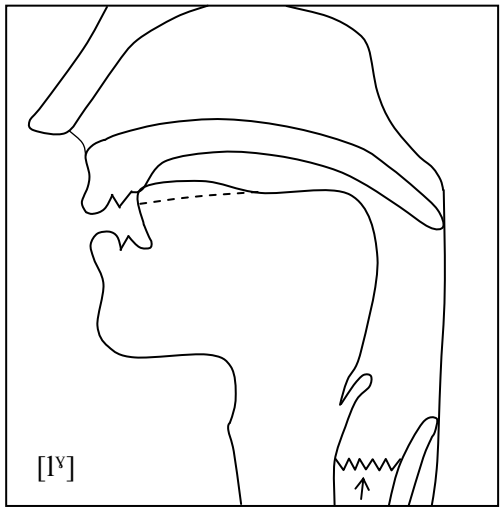


Figure 7.2

7.4 Retroflex lateral approximant

The tongue tip is curled over and makes contact with the area behind the alveolar ridge. This affects the previous sound. The sides of tongue are lowered to let air pass through without friction.

[ɭ] voiced retroflex lateral approximant with egressive lung air

e.g. Tamil (India/Sri Lanka): [vɛɭi] - "star"

7.5 Palatal lateral approximants

The tongue tip is held down behind the lower teeth, whilst the tongue middle raises to make contact with the centre of the hard palate. There is quite a long area of contact. In some languages it appears that the tongue tip may be raised. As a hint for production see 10.6.

[ʎ] voiced palatal lateral approximant with egressive lung air

e.g. Spanish: [ʎeˈβɑ̝ɾ] - "to bring"

N.B. This sound, e.g. in Spanish and Italian, is often pronounced as [lj] or [j] instead of as [ʎ].

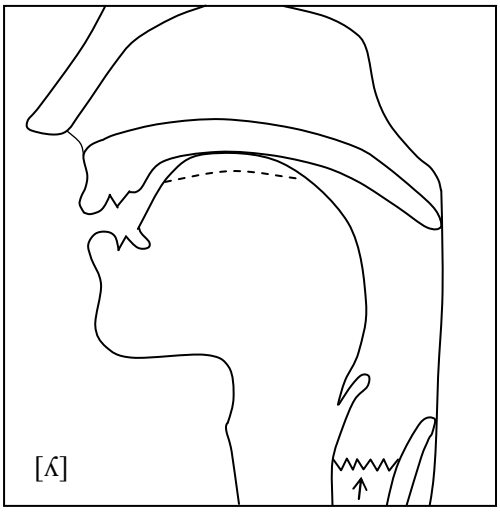


Figure 7.3

Chapter 8

Lateral Fricatives

Lateral fricatives are clearly similar to lateral approximants. The only difference will be in the narrowing or stricture. For lateral fricatives, the lowering of the sides of the tongue will be less than that for approximants so that friction will occur. Other than that, all the remarks about lateral approximants apply also to lateral fricatives.

8.1 Alveolar lateral fricatives

The centre of the tongue tip, and sometimes also the blade, makes firm contact with the alveolar ridge, whilst the sides of the tongue are not quite in contact with the back teeth. The air escapes over the sides of the tongue with noticeable friction.

To produce these sounds it is best to start with a lateral approximant. Make an [l], and then stop the voicing, continuing to breathe out. Some weak friction, produced by the air flowing over the sides of the tongue, should already be heard. By making the air stream stronger, and raising the sides of the tongue, the degree of friction can be increased. When you have achieved strong friction, you will have produced the voiceless lateral fricative.

You can now try for the voiced sound. The air stream may now have to be stronger than for the voiceless sound. It is vital that the tongue tip remains in contact with the alveolar ridge for both these sounds, and care must be taken not to imitate the sound by using another method such as [sl] or [xl].

For production of a true lateral fricative it is also important at the release stage to lower the tongue tip and the sides at the same time. If the tip is left up longer than the sides, a lateral approximant will be heard after the fricative. In many languages, however, there **is** a brief lateral approximant after the fricative and the student should always mimic exactly what the native speaker produces.

[ɬ] voiceless alveolar lateral fricative with egressive lung air

e.g. Tera (Gombe): [ˈɬe:bi] - “side”

[ɮ] voiced alveolar lateral fricative with egressive lung air

e.g. Tera (Gombe): [ˈɮepti] - “plaiting

NB It is physically possible to have lateral fricatives at other places of articulation.

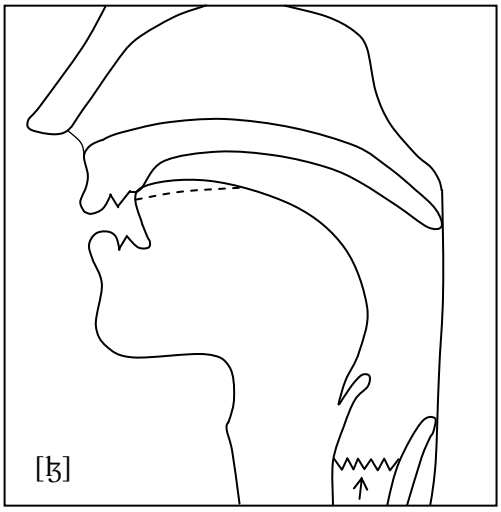


Figure 8.1

Chapter 9

Vibrants (Trills, Taps and Flaps)

Vibrants are another kind of sonorant sound. In vibrant articulation, the air stream is not cut off for any length of time, but only interrupted momentarily or intermittently at the place of articulation. Thus, the air stream is never stopped long enough for any great air pressure to build up behind the place of articulation and so the sound preserves its sonority.

In vibrant articulation, **one of the articulators is continually moving**. It moves very quickly to make contact at the place of articulation and immediately moves away again. The contact is quite loose and very momentary and may occur either just once or a number of times in rapid succession. Consequently we need to consider two main different types of vibrant:

- the **vibrant** in which one of the articulators strikes the other to shut off the air stream very briefly just once, either as a **tap** quickly up and down, or as a **flap** quickly from inside to out;

- the **trilled vibrants** in which one of the articulators makes a series of rapid contacts with the other.

The term ‘vibrant’ is used by SIL. Most phoneticians class the flaps and the trills together but do not give them a generic term such as vibrant. Consequently, technical descriptions do not include the term ‘vibrant’.

9.1 Tapped/Flapped vibrants

In the flapped vibrants, or flaps, one articulator starts from a position of rest, moves to a point of contact with the other articulator and either returns to the position from which it began (**tap**), or moves to another position (**flap**). The whole movement is involved in the production of the sound. Hence, if a voiced tap/flap is produced initially there seems to be a very short vowel before it, as the voicing starts before the contact is made. Similarly if the tap/flap is word final there seems to be a very short vowel after it as the voicing continues after the contact has been made. Likewise, with a voiceless tap/flap there seems to be a very short initial or final ‘h’ sound.

In taps/flaps with the tongue as an articulator, we have to distinguish between those that are **central**, where the air stream passes over the centre of the tongue, and **lateral**, where the air stream passes over the sides of the tongue. This distinction is simply parallel to the central versus lateral distinction between fricatives and between approximants, which we have already met.

We will deal first with the central taps/flaps as they are more common in languages, and then later with the lateral ones.

9.1.1 Central taps/flaps

The tongue is either flat or slightly grooved during the whole movement.

9.1.1.1 Labio-dental flaps

The sound begins with the lower lip lying back slightly over the lower teeth; it then moves rapidly forward catching the upper teeth lightly

[ⱱ] voiced labio-dental flap with egressive lung air

e.g. Shona [geⱱe] - "arrow"

9.1.1.2 Alveolar taps

The sound begins with the tongue lying at rest at the bottom of the mouth, slightly grooved. The tip moves up to make a rapid contact with the alveolar ridge and then returns to the rest position (or moves on).

[ɾ̥]/[ɾ] voiceless/voiced alveolar tap with egressive lung air

e.g. Etsako: [aɾ̥u] - "louse

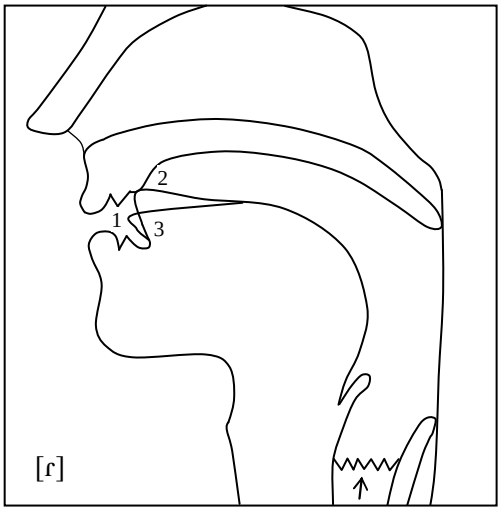


Figure 9.1

[aɾu] ”hat”

There is a variation of this found in the speech of some Americans. The tap is made against the alveolar ridge, but the tongue is totally flat. The IPA does not suggest a symbol for this, but some phoneticians use the following:

[ɾ̆] voiced alveolar flat tap with egressive lung air

e.g. American English: [ˈwɑɾ̆ɚ] - “water”

9.1.1.3 Retroflex flaps

The tip of the tongue is curled over backwards and makes a rapid movement forwards striking the alveolar ridge on the way past. It is also possible to have a front to back movement.

[ɽ̥]/[ɽ] voiceless/voiced retroflex flap with egressive lung air

e.g. Hausa: [ɽawaː] - “dance”

9.1.2 Lateral flaps

The basic movement of the lateral flaps is the same as that for the central ones, with the difference that the tongue sides are lowered during the movement. Alveolar and retroflex varieties have been reported in several languages in Africa and Papua New Guinea, but are quite rare.

[ɭ] voiced alveolar lateral flap with egressive lung air

e.g. Mossi (W Africa): [ɭumdi] - “knee”

9.2 Trilled vibrants

In the trilled vibrants, or trills, one articulator vibrates rapidly repeatedly against the other. It is not a case of conscious muscular movement but of the articulator being held in the correct position and vibrating like a reed in a wind instrument. The air stream needs to be quite strong to produce this vibration.

9.2.1 Bilabial trills

The two lips come close together and vibrate in the air stream. This is not at all a common sound in languages.

[ʙ̥]/[ʙ] voiceless/voiced bilabial trill with egressive lung air

e.g. Mewun (Vanuatu): [nɛmɑˈɜmʙ] - “lizard”

9.2.2 Dental trills

The whole body of the tongue is raised and very slightly grooved. The tip is held up slightly towards the back of the upper teeth. The whole tongue is relaxed, and the tip vibrates against the back of the upper teeth.

[r̥]/[r̬] voiceless/voiced dental trill with egressive lung air

9.2.3 Alveolar trills

The production of these sounds is the same as for the dental trills, with the only difference that the tongue tip is held up towards the alveolar ridge rather than the back of the upper teeth.

[r̥]/[r] voiceless/voiced alveolar trill with egressive lung air

e.g. Tera (Gombe) [rɛmta] - "subside"

9.2.4 Uvular trills

The back of the tongue is slightly raised and grooved, and scoops up the uvula which is bent forward. The uvula itself vibrates against the tongue back.

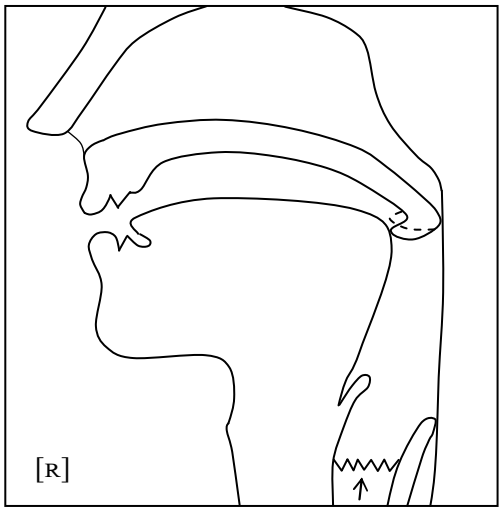


Figure 9.2

[ʀ̥]/[ʀ] voiceless/voiced uvular trill with egressive lung air

e.g. in careful pronunciation of German: [ʀɑnt^{h}] - "edge"

Chapter 10

Nasals

During the production of a nasal there is a closure at some place in the mouth, but, as the velic passage is open, the air escapes through the nasal cavity. This may be demonstrated very easily by pinching the nose during the production of any nasal. You will find that the production of the sound will cease.

Although the air does not escape through the mouth, it is still the shape of the mouth cavity that determines the quality of the nasal. This is because a capped air stream passes around inside the mouth producing a specific resonance, depending on the shape of the mouth cavity.

There is a series of nasals corresponding to the various plosives. If face diagrams do not occur in this chapter the reader may refer back to the face diagram for the corresponding plosive, remembering that for nasals the velic passage will be open.

Nasals are usually voiced, although voiceless nasals can and do occur in certain languages, often accompanied by a small degree of friction caused by the flow of air through the nostrils. The diacritic mark [̥] is added to the symbol to indicate voicelessness.

10.1 Bilabial nasals

The mouth closure is made by the two lips, as for a [b].

[m̥] voiceless bilabial nasal with egressive lung air

e.g. Oaxaca Chontal [ˈpɑm̥pɑ] - “he sat” (Mexico):

[m] voiced bilabial nasal with egressive lung air

e.g. English: [miːn] - “mean”

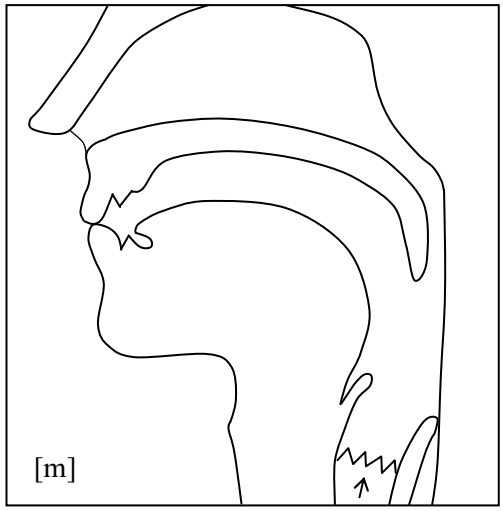


Figure 10.1

10.2 Labiodental nasals

The closure is made with the lower lip against the upper teeth. This type usually occurs when followed by a labiodental fricative.

[ɱ̥]/[ɱ] voiceless/voiced labiodental nasal with egressive lung air

e.g. Efik: [ɱfop] - “I am roasting”

10.3 Dental nasals

The closure is made with the tip of the tongue against the upper teeth or gum and corresponds to the [d̪].

[n̥̪]/[n̪] voiceless/voiced dental nasal with egressive lung air

e.g. English: [tʰɛn̪θ] - "tenth"
French: [n̪i] - "nest"

10.4 Alveolar nasals

The closure is made with the tongue tip or blade against the alveolar ridge, and corresponds to the [d].

[n̥]/[n] voiceless/voiced alveolar nasal with egressive lung air

e.g. English: [bɔːn] - "born"

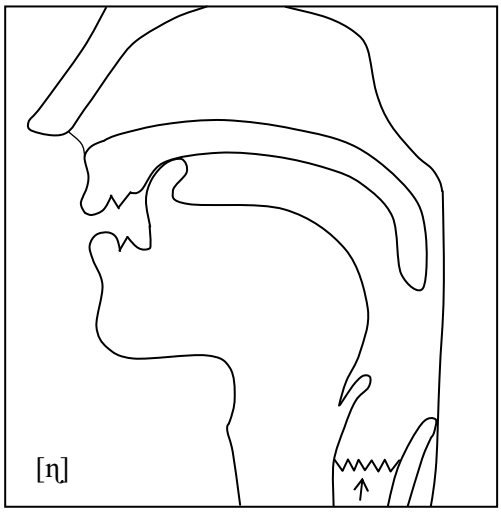


Figure 10.2

10.5 Retroflex nasals

The contact is made with the tip and underside of the tongue, which has been curled over, and the hard palate. It corresponds to the [ɖ]. The actual point of contact may vary a little. The important thing is the fact that the tongue tip is curled over backwards.

[ɳ̥]/[ɳ] voiceless/voiced retroflex nasal with egressive lung air

e.g. Pitjantjatjara (Australia): [ˈpɑɳɑ] - "sand"

10.6 Palatal nasals

The closure is made by the middle of the tongue against the hard palate. The tongue tip is usually held down behind the bottom teeth. Its place of articulation is the same as that of the plosive [ɟ].

[ɲ̥]/[ɲ] voiceless/voiced palatal nasal with egressive lung air

e.g. Tera (Gombe): [ɲakti] - "saliva"

In the production of the palatal nasals care must be taken to produce **one** sound, and not a sequence of an alveolar nasal followed by a palatal approximant

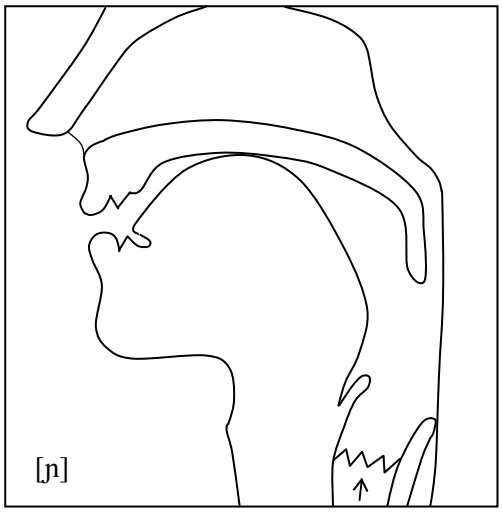


Figure 10.3

as in English [ˈʔɜnjən] - “onion”. Notice that the [nj] sequence has a tongue **tip** articulation because of the alveolar [n], whereas the palatal nasal [ɲ] has a tongue **middle** articulation.

10.7 Velar nasals

The closure is made by the back of the tongue against the velum and corresponds to [g]. In English it occurs word medially and word finally after short vowels, but not word initially. Some languages are like English in this respect but other languages may have it in all positions in the word, including the word initial position.

[ŋ̊]/[ŋ] voiceless/voiced velar nasal with egressive lung air

e.g. Tera (Gombe) [ŋa] - “I”

10.8 Uvular nasals

The closure is made by the back of the tongue being drawn backwards and upwards to the uvula. This sound has the same place of articulation as the plosive [ɢ]. Uvular nasals are not very common.

[ɴ̊]/[ɴ] voiceless/voiced uvular nasal with egressive lung air

e.g. N. Totonac (Mexico): [kiɴˈqɑn] - “my skirt”

Just as we had plosives made at two places of articulation simultaneously (see 4.9), so nasals can be made at two places of articulation simultaneously:

10.9 Labial-velar and labial-alveolar nasals

There are **two closures**, a bilabial one and either a velar one, as in the labial-velar plosives, or an alveolar one, as in labial-alveolar plosives. The voiced labial-velar nasal occurs in many West African languages. The voiced labial-alveolar nasal is much less common, but it does occur in Margi, but also in Bura and Margi as a syllabic consonant (see 12.5) before [pt]. The voiceless ones are not known.

The ligature linking the symbols indicates simultaneous articulation.

[ŋ͡m] voiced labial-velar nasal with egressive lung air

[mn] voiced labial-alveolar nasal with egressive lung air

e.g. Idoma [aŋ͡maa] - “body marks”

Margi [mna) “mouth

Chapter 11

Release of Consonants

Speech does not consist of a series of separate and isolated sounds. When a person is speaking, the vocal organs move smoothly, producing a stream of sounds. It is important, therefore, to study both the way in which one sound flows into another utterance **medially**, and what happens **at the end** of a stream of speech. This chapter deals with various ways of **releasing consonants**. **The release is the separation or the moving away of the two articulators** one from the other.

11.1 Aspiration

Plosives and some affricates (see 11.2) may have an intervening flow of air, known as "aspiration", before the following sound is produced.

11.1.1 Voiceless aspirated plosives

Aspiration or non-aspiration of voiceless plosives depends on the stricture (i.e. degree of opening) of the vocal cords. In voiceless aspirated plosives, the vocal cords are wide apart, resulting in two effects. First, there is a greater volume of air passing through them leading to greater air pressure at the oral closure of the plosive. Second, if there is a following voiced sound, then when the oral closure is released it will take the cords some time to come together again so that they can vibrate and produce voicing. During this delay there is no voicing and the air pressure is released as aspiration. In unaspirated plosives, on the other hand, the vocal cords are less wide apart, resulting both in less build-up of air pressure behind the oral closure, and practically no delay in the onset of voicing of a following voiced sound. Hence there is no puff of air.

Examples:

[p^h] voiceless aspirated bilabial plosive with egressive lung air

e.g. English: [p^hɪn] - "pin"

11.1.2 Voiced aspirated plosives (or murmured plosives)

In voiced plosives, the vocal cords vibrate throughout the time of the oral closure. If another voiced sound (e.g. a nasal or a vowel) follows the plosive, the voicing simply continues. In voiced **aspirated** plosives, the vocal cords are further apart during the time of the oral closure than they would be in making the more common voiced unaspirated plosives. This gives a breathy quality to the voicing, just as it does for breathy vowels (see 16.2.4). There is also a greater build-up of air pressure. When the oral closure is released, it will take the widely separated vocal cords some time to come together before they can vibrate to produce normal

voicing. During this time delay, the breathy voice continues, giving an effect known as voiced aspiration (or murmur).

Note that what is common to both voiceless and voiced aspiration is that the vocal cords are wider apart during the closure of the articulators than they are in the corresponding unaspirated plosives.

Sample symbol and technical name:

[b^h] voiced aspirated (or murmured) bilabial plosive with egressive lung air

e.g. Igbo: [ib^he] - "slice, cut small"

11.1.3 Other aspirated consonants

Normally aspiration is a feature of plosives and affricates, but aspirated fricatives are known to occur in languages such as Karen of Burma and Amuzgo of Mexico. The aspirated fricative is articulated with a wider opening of the glottis and there is a period of voicelessness following the fricative articulation.

Sample symbol and technical name:

[$ʃ^h$] voiceless aspirated postalveolar grooved fricative with egressive lung air

e.g. Amuzgo (Mexico): [$ʃ^hoo̰$] - "machete"

11.1.4 Pre-aspirated consonants

There is a sharp flow of air just before the closure of the plosive rather than after, as in the case of the previous aspirated sounds.

e.g. S. Jerónimo Mazatec (Mexico): [$^ht\grave{\alpha}$] - "voice"

11.2 Affrication

An affricate is a sequence of a plosive released directly into a fricative by a single articulator at the same or nearly the same place of articulation. Both the plosive and the fricative in any one affricate must technically be either voiced or voiceless, never one of each. In actual life, however, things are not always either black or white, therefore it can sometimes be difficult to establish whether an affricate is voiceless or voiced.

The reason this special combination of sounds is treated in a phonetics course is that one requires some practice in recognising them. As they often function in a language as one sound unit (one phoneme) the plosive and fricative component may be shorter than they would be "on their own" and they are therefore harder to detect. Word medially the affricates are fairly easily distinguished from fricatives, but word initially the voiceless affricates are most easily detected by noting the "sharp edge" on the fricative caused by the release of the plosive.

In order to make the two sounds homorganic it will be noticed that both the plosive and the fricative, sometimes only one, may have to be articulated slightly differently in each case. This difference does not have to be symbolised, unless there is some very special reason to do so, as such **assimilation** (when a sound becomes phonetically more similar to an adjacent sound) occurs regularly in all speech (see 12.6).

In production practice it is easiest to begin with the fricative, then to add the plosive in front of it, firstly between vowels, then initially, e.g. [αxα], [αkxα], [xα], [kxα].

11.2.1 Affricates involving flat fricatives

[pɸ], [pf], [tθ], [t̪ɹ̝̊], [cç], [kx], [qχ]
[bβ], [bv], [dð], [d̪ɹ̝], [ɟʝ], [gɣ], [ɢʁ]

e.g. Shona [pfumo] "spear"
Tswana [kxama] "hartebeest

11.2.2 Affricates involving grooved fricatives

[t̪s̪], [ts], [tʃ], [tɕ]
[d̪z̪], [dz], [dʒ], [dʑ]

e.g. Nupe: [tsav] - "power"
Nupe: [dzal] - "juice"

The grooved affricates may also be aspirated. In this case the aspiration is noted both during the fricative (as the vocal cords are wider open than for an unaspirated sound) and after the release (as a short puff of air). In English we use an aspirated grooved affricate as the "ch" sound in a word such as "chin". It is interesting to compare the English words "chin" and "shin". In the first the fricative is shorter than in the second.

e.g. Tswana [kx^{h}osi - "chief"
]

11.2.3 Affricates involving lateral fricatives

[tɬ], [tɬ^{h}]
[dɮ]

Sometimes the first and third are confused with the clusters [kɬ] and [gɬ] because in the fricative the air escapes at the sides of the mouth beside the upper back teeth, so that the alveolar release is not always heard clearly.

e.g. Tswana: [tɬa] - "to come"
Tswana (S. Africa): [tɬ^{h}ɔmα] - "to plant"

11.3 Close and open transition

When one consonant follows another the transition between them is made in one of two possible ways. Either the articulation for the second one is made before the first is released, so that no intervening sound is heard, as the 'kt' sequence in the English word "actor" [ˈæktə] or the 'fl' sequence in "flee" [fli:]; or else the articulation for the second consonant is begun after the first one has been released, so that a short intervening sound is heard, as the '-sm' sequence in some pronunciations of the English word "prism" [pˌɹɪzᵊm]. The first type of transition is known as **close transition** and the second type as **open transition**. See Figure 11.1.

When need be, the type of transition can be marked in the phonetic transcription:

[˺] Close transition

e.g. English [ˈæk˺tə] - "actor"

Open transition is usually left unmarked. However, if an audible aspirastion or neutral vowel is heard in the transition it can be marked with [ʰ] or a superscript schwa [ᵊ].

e.g. English [pˌɹɪzᵊm] - "prism"

The fact that the vowel symbol is raised above the line indicates that it does not represent a full syllable.

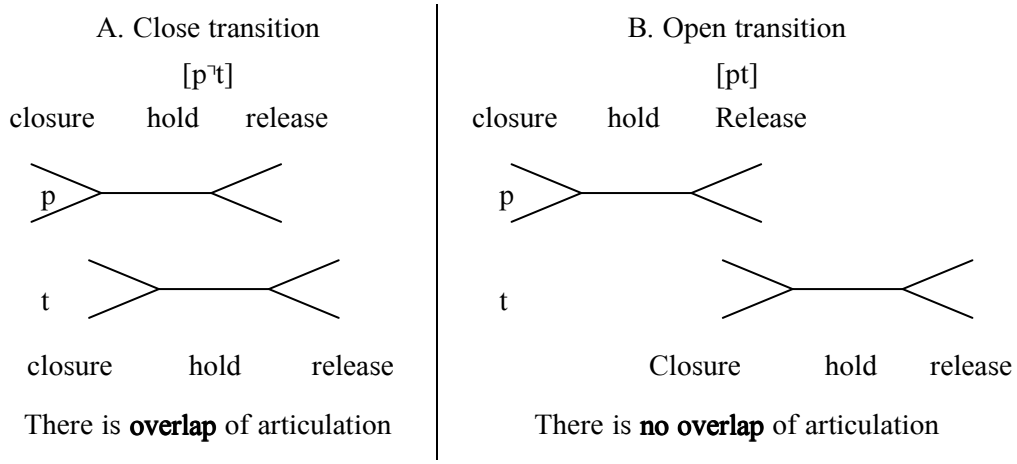


Figure 11.1 Diagram of close transition and open transition sequences of [p] followed by [t].

Examples:

Close transition: [αt˺pα], [αd˺nα], [αg˺sα], [αk˺bα]

Open transition: [αtpα], [αdnα], [αgsα], [αkbα]

11.4 Consonants in final position

When an utterance ends with a consonant there are three main ways of release.

11.4.1 Unreleased final consonants

In unreleased final consonants the articulation and the breath stream end at the same time so that the actual "moving away" of one of the articulators from the other is not audible. One could compare a final unreleased consonant with the first consonant in a close transition sequence, as the release of such a consonant is not audible. The symbol [˺] e.g. [p˺] is used for unreleased final consonants.

Sample symbolisation: [αp˺], [αt˺], [αk˺], [αkp˺]
[αb˺], [αd˺], [αg˺], [αgb˺]

Unreleased voiceless plosives do occur in a vast number of languages, often with several, including the [ʔ], in contrast in that final position. In production, therefore, care must be taken to ensure that the preceding sound, usually a voiced vowel, is continued right up to the time of closure, and that if the closure is in the mouth, there should be no simultaneous glottal closure. In order to produce e.g. [αp˺], it is best to think of saying [αpα], dropping the final vowel.

e.g. Efik [mbup˺] - expression of disgust

N.B. A glottal stop is not often marked as unreleased.

11.4.2 Released final consonants

The consonant may be released before the breath stream ceases, so that there is an audible release. In the phonetic transcription, this is the default type of release and is usually left unmarked. If the presence of an audible aspiration or neutral vowel following the release needs to be emphasised, either [^{h}] or a superscript schwa can be used, e.g. [αb^{ə}] or [αn^{ə}].

11.4.3 Final release through affrication

If the final consonant is a plosive and the release is realised slowly, then it will give rise to a fricative sound after the plosive. The plosive is said to be released through affrication (see 11.2).

Chapter 12

Modification of Consonants

12.1 Introduction

Consonants may be modified in a variety of ways. Some of the most common ways of doing so are as follows:

- there may be a modification of the shape of the vocal tract. In sounds modified in this way, there is, in addition to the **primary articulation**, another **secondary articulation**, usually a more open articulation in another part of the vocal tract
- there may be a brief period of another sound at the beginning or the end of a sound. Usually this other sound is a nasal, so this is known as **pre**- or **postnasalisation**
- there may be a change in the **duration** of the articulation (i.e. in how long the consonant is articulated). This is dealt with in 20.2.2
- there may be a change in the **tenseness** of the articulation (i.e. in how forcefully the consonant is articulated)
- there may be a change in the **syllabicity** of the sound
- there may be a modification of the sound by its **environment**, in which the consonant becomes like the sound adjacent to it

12.2 Changes due to a secondary modification of the vocal tract

Many consonants are made with only **one stricture** at one place of articulation, e.g. [f] has a labiodental place of articulation, [ŋ] a velar place of articulation, etc. These are called **primary articulations**.

However, consonants can be made with **two strictures** at two different places of articulation (co-articulation). In addition to the primary articulation there is then another **secondary articulation** involving a (usually) lesser degree of stricture (i.e. a greater gap between the articulators). Secondary articulations are often approximant articulations. The most common secondary articulations which modify consonants are labialisation, palatalisation and pharyngealisation. A secondary articulation is **simultaneous** with the primary articulation.

12.2.1 Labialisation

During the production of a consonant the lips may be rounded, making a secondary bilabial approximant articulation.

Sample symbol and technical name:

[k^w] voiceless unaspirated velar **labialised** plosive with egressive lung air

e.g. Tera (Gombe): [k^wɑ:ɣi] - "raven"

Note that the [k^w] is a co-articulated (pronounced simultaneously) sound, **not** a sequence of [k] and [w]. The [^{w}] only symbolises the **lip-rounding** during the [k]. Any consonant may be labialized, including the voiceless palatal fricative [ç]; the symbol for the labialized form is [ɥ̥] (see p 84).

In many languages the labialisation is accompanied by raising of the back of the tongue towards the velum, in which case such a modification would be called **labiovelarisation**.

12.2.2 Palatalisation

In addition to the primary articulation, **the middle of the tongue is raised to an [i]-position.** This gives a wide area of stricture at the hard palate behind the alveolar ridge and leads to **two kinds of palatalised sounds**.

The first kind is a palatalised alveolar sound. The alveolar palatalised plosive [t^j] is illustrated in Figure 12.1. In addition to the primary articulation of the tongue tip, **the tongue blade makes the secondary articulation**, which creates an **extended area of closure**.

The second kind of palatalisation is when a high front tongue position, as for [i], is applied to a non-alveolar sound. This can happen to e.g. [p], [b], [f], [v], and is common in Chadic languages. **The palatalised sound is not a sequence. The secondary articulation is simultaneous with the primary one, and should not linger**.

We must be careful not to confuse an alveolar palatalised plosive like [t^j] with a sequence of an alveolar plosive followed by a palatal approximant [ç] or [j] giving [tç] or [tj]. These are **sequences** of two sounds or phones involving a **movement** of the tongue tip, whereas the alveolar palatalised plosive is a single phone. One must be specially careful as they sound so alike. See Figure 12.1. A palatalised sound may sound affricated.

There is also some acoustic similarity between a "palatalised" and a "palatal" consonant. The following diagram shows the difference in the articulation. With the nasal and lateral pairs the difference is hardly audible.

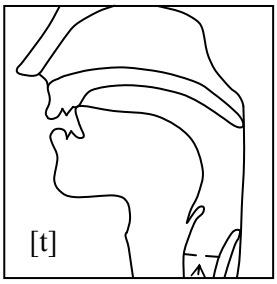
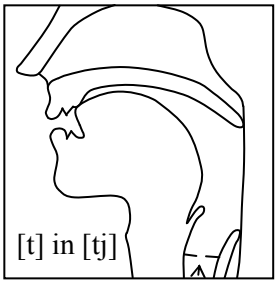
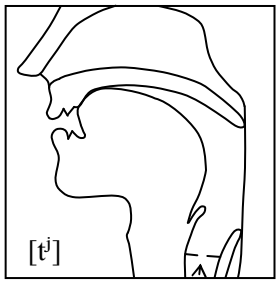
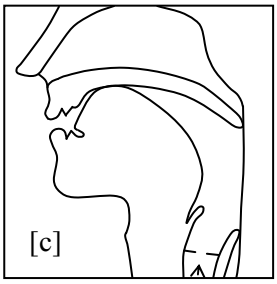
ALVEOLAR PLOSIVES			PALATAL PLOSIVES
Normal articulation	Sequence of plosive and pal. approximant	Palatalised	
t d	t(ç) t(j) d(j)	t^j d^j	c ɟ
			
tongue tip touches alveolar ridge			tongue tip down behind lower teeth
+	+	+	+
rest of tongue relaxed	tongue blade & middle raised towards palate, without touching, ready for [j]	tongue blade raised & touching, behind alv. Ridge	tongue middle touches palate

Figure 12.1

Tongue positions for palatalised plosives compared to palatal plosives

Sample symbol and technical name:

[t^{jh}] voiceless aspirated alveolar **palatalised** plosive with egressive lung air

e.g.

Fante (Ghana) [αp^{j}ɪm] - "thousand"

NB. The diacritic [^{j}] only indicates a **palatal tongue position**, **not** a little [j], which is a voiced approximant.

12.2.3 Velarisation

This is a modification which occurs particularly with alveolar sounds. The tongue tip or blade is used for the primary articulation, but during the production of the sound, the tongue back is raised towards the velum, giving a characteristic effect. This has been referred to already when dealing with the lateral approximants, as the "dark l" is in fact a "velarised 'l'".

Sample symbol and technical name:

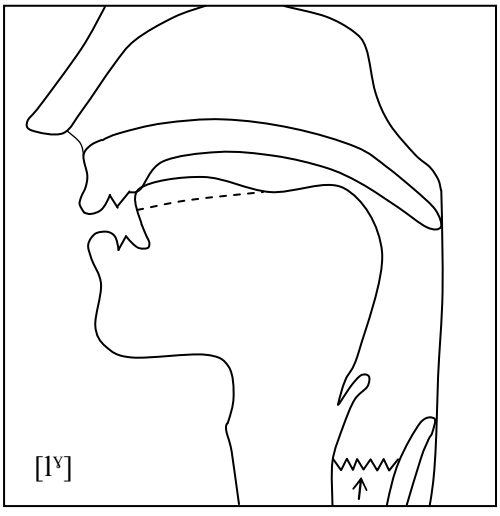


Figure 12.2

[lˠ] voiced alveolar **velarised** lateral approximant with egressive lung air

e.g. English: [fiːlˠ] - "feel"

This diagram could be compared with that of the unmodified lateral approximant [l] on p.41.

IPA allows the use of the "tilde" [~] for both velarisation and pharyngealisation. To avoid ambiguity we recommend the use of the raised gamma [ˠ] for velarisation.

12.2.4 Pharyngealisation

This modification occurs chiefly with consonants made with the tip or blade of the tongue. During the primary articulation the body of the tongue is flattened causing the tongue root to be drawn backwards towards the pharyngeal wall. This will cause a constriction of the pharyngeal cavity. There may also be a lateral constriction of the pharynx.

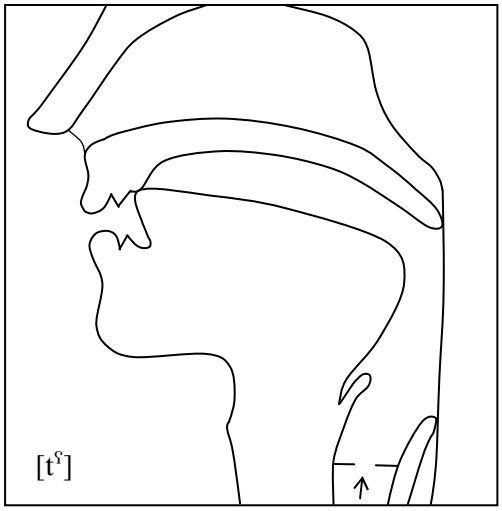


Figure 11.3

The very characteristic "swallowed" effect is heard on the adjacent vowels, particularly the one preceding the pharyngealised consonant. These sounds are found particularly in Semitic languages, e.g. Arabic, and are sometimes called **emphatic** consonants.

Sample symbol and technical name:

[tˤ] voiceless unaspirated alveolar **pharyngealised** plosive with egressive lung air

e.g. Arabic: [ˈtˤɑlˠɑb] - "a request"

The symbol for pharyngealisation was previously the same as the one for velarisation, i.e. a tilde. If no contrast needs to be made, the tilde may still be used also for pharyngealisation.

In production it is easiest to start with unmodified fricatives, e.g. [ð] or [z], and then whilst making one of these, draw the tongue back for the pharyngealised sounds [ðˤ] and [zˤ]. Once the fricatives have been mastered the plosives usually come easier.

The pharyngealised consonants are similar in their manner of articulation to the pharyngeal ones; they are traditionally known as **emphatic consonants**. In both cases there is general constriction of the pharynx involving the tongue root, but in the pharyngealised consonants this is **secondary** to the main articulation, whilst in the pharyngeal fricative it is the **only** articulation. Also, in the case of the pharyngeal fricatives the constriction is so great that friction is produced in the pharyngeal cavity, but in pharyngealised consonants there is no friction in that cavity.

12.3 Pre- and postnasalisation

Consonants can also be modified by adding a brief nasal at the beginning or end of the sound. The most common example of this is **prenasalisation**.

In prenasalised sounds the sound begins as a nasal with the air stream escaping through the nose, but the velum rises very quickly to close the velic passage, so that there is effectively only a very short nasal onset to the oral sound. Some African languages have a great deal of prenasalisation.

All types of oral consonants, plosives, fricatives, affricates, lateral approximants and vibrants can be prenasalised. The nasal onset is usually homorganic or nearly homorganic with the main (i.e. oral) part of the consonant.

12.3.1 Prenasalised plosives

[ᵐp] [ⁿt̪] [ⁿt] [ⁿʈ] [ᵑk] [ᵑk͡p] [ᵑ͡ᵐk͡p]
[ᵐb] [ⁿd̪] [ⁿd] [ⁿɖ] [ᵑg] [ᵑg͡b] [ᵑ͡ᵐg͡b]

e.g. Efik: [ᵐbɔ] - "I accept"
[ⁿd] -
[ᵑka] - "I am going"

12.3.2 Prenasalised fricatives

[ᵐf] [ⁿs] [ᶮç] [ᵑx]
[ᵐv] [ⁿz] [ᶮʝ] [ᵑɣ]

e.g. Efik : [ⁿsio] - "different"

12.3.3 Prenasalised affricates

[ⁿts] [ⁿtʃ] [ᵑkx]
[ⁿdz] [ⁿdʒ] [ᵑgɣ]

e.g. Tswana (S. Africa and Botswana): [ⁿtʃɑː] - "dog"

12.3.4 Prenasalised lateral approximants

[ⁿl] [ᶮʎ]

e.g. Gã (Ghana): [miⁿlɑ] - "I am singing"

12.3.5 Prenasalised vibrants

[ⁿr] [ᶯɽ]

12.3.6 Postnasalised plosives

Plosives can also be postnasalised, i.e. there is a homorganic nasal release following the plosive. This can be seen as a form of plosive release.

e.g. Russian: [dⁿo] - "bottom"

12.4 Changes due to the tenseness of articulation – fortis/lenis

The term **fortis** is sometimes used to describe a **tensely** articulated consonant, while its opposite, **lenis**, means a consonant with a more **lax** articulation. As these terms may cover a number of phonetic characteristics the actual realisation of fortis and lenis consonants may differ from one language to another.

Fortis fricatives will be produced with a greater degree of muscular tension at the place of articulation (articulators more firmly together), and with greater air pressure, i.e. they will be produced with a stronger build-up of air pressure behind the constriction, resulting in a sharper and more prominent release. Lenis consonants are pronounced with a relaxed articulation and less build-up of air pressure within the oral cavity. The exact mechanisms involved in the production of fortis and lenis consonants are still being debated. The IPA offers no symbols.

In languages, fortis consonants are often voiceless (as increased air pressure inhibits vocal cord vibration) and aspirated, while lenis consonants are often voiced. However, one should not think of the voiceless/voiced contrast as necessarily characteristic of the fortis/lenis contrast.

Sample symbols and technical names:

[p͈] voiceless unaspirated bilabial **fortis** plosive with egressive lung air

[p̫] voiceless unaspirated bilabial **lenis** plosive with egressive lung air

In some languages, such as Korean, fortis and lenis consonants distinguish between words.

e.g. Korean [s͈αl] - “rice”

[s̫αl] “flesh”

The distinction also occurs in a small number of other languages, e.g. Javanese and some Caucasian languages.

12.5 Syllabic consonants

In the majority of cases, when we divide a word into syllables, the number of syllables corresponds to the number of vowels or vowel glides in the word. Thus, the English word “ahead” [əˈhɛd] has two syllables. The first consists of the vowel [ə] and the second consists of the sequence [hɛd] of which the vowel [ɛ] forms the nucleus, or more prominent part, and the consonants form the margin, or less prominent part. The nuclei tend to be louder and longer than the margins. Thus, the number of syllables in a word depends on the relative **prominence** of the sounds, the most prominent sounds (usually the vowels) forming the syllable nuclei, and the less prominent sounds (usually consonants) forming the syllable margins.

In some cases, however, a consonant can be prominent enough to form a syllable nucleus. Such a consonant is said to be **syllabic** and has the syllabic diacritic [̩] placed under it in phonetic transcription. A syllabic consonant is tenser and slightly longer than an ordinary consonant. In Konkomba of Ghana, for example, the word for “children” is [m̩̄bim] where the

first syllable comprises the consonant [m̩] and the second syllable comprises the vowel [i] as the nucleus with a margin of the consonants [b] and [m].

Some English words can also be pronounced with syllabic consonants. E.g. the word "prism" may be pronounced [ˈpʰɹɪzm̩] where the nucleus of the second syllable is formed by the syllabic consonant [m̩] Similarly the word "saddle" is often pronounced [ˈsædl̩ˠ] with a syllabic lateral approximant forming the second syllable.

It is the sonorant consonants such as nasals, lateral approximants and vibrants which are most often syllabic consonants, as these can more easily become prominent.

Syllabic nasals occur frequently in many African languages, usually followed by a plosive or a fricative. As the nasal forms its own syllable it would also carry its own tone, which may or may not be different from the tones of adjacent syllables. This characteristic often helps in identifying a syllabic nasal.

Sample symbol and technical name:

[n̩] voiced alveolar syllabic nasal with egressive lung air

e.g.	Konkomba (Ghana):	[n̄bím]	-	"children"
	Ngizim (Yobe)	[n̩tutu]	-	"loving"
	Glavda (Borno)	[pl̩ʃa]		"horse"
	Glavda (Borno)	[tr̩ba]		"mud"

In the articulation of syllabic consonants care should be taken to avoid any trace of a vowel just before the syllabic consonant. You can ensure correct pronunciation of initial syllabic consonants by making sure the articulation for the consonant has been made before you start the voicing.

12.6 Modification of sounds by their environments

Dr. Kenneth Pike (1947) put forward the general premise that **sounds tend to be like their environments**, i.e. the neighbouring sounds. This is true in many languages. The term **assimilation** is used to describe this phenomenon. It simply means that one sound becomes phonetically more like a neighbouring sound.

12.6.1 Place of articulation modified by the environment

One way in which a sound can be more like its environment is when it changes its place of articulation to be more like (or identical with) the place of articulation of a sound next to it. Thus in **fronting** of a consonant, the place of articulation of the consonant is a little further forward (fronted or advanced) than its usual place of articulation because the articulation of a neighbouring sound is further forward. Thus, the English alveolar plosives [tʰ] and [d] become dental plosives [t̪ʰ] and [d̪], respectively, when they precede dental fricatives [θ] or [ð]. The dental place of articulation of the fricatives has overlapped onto the plosives.

Examples: [ʔɛˈt̪θ] - "eight"

[wɪd̪ð̬] - "width"

Here, one could view the dental plosives as fronted alveolar plosives.

Similarly, in **backing** of consonants, the place of articulation is a little further back (backed or retracted) than usual because the place of articulation of a neighbouring sound is further back. In English, [k^h] has a place of articulation which is front velar when it precedes front vowels, and a place of articulation which is back velar when it precedes back vowels. Fronting is marked with a subscript plus [$_+$] and backing with a subscript minus [-]. Thus:

[k_+^hiː] - "key" (preceding front vowel)
[k^hɜːt] - "curt" (preceding central vowel)
[k_-^hɒt] - "cot" (preceding back vowel)

Sample symbol and technical name:

[k_+^h] voiceless aspirated **fronted** velar plosive with egressive lung air

The prefixes **pre**- and **post**- are very useful in expressing fronting and backing, and may be added to several places of articulation. The term postalveolar, e.g., refers to a sound that is basically alveolar, but produced right at the back of the alveolar ridge. The term pre-palatal refers to a sound produced at the very front part of the palate. As the palate extends over quite a long area, the exact point may sometimes have to be stated. Again, the [k_+^h] before [i] in English may be described as "pre-velar".

In most languages there will not be phonemic distinctions between similarly fronted and backed varieties of consonants. Nevertheless one should be on the alert in listening to and transcribing a language to be sure where the precise place of articulation of a consonant is. One should not just assume beforehand that the place of articulation is exactly the same as in one's mother tongue, because that is the way to incorrect pronunciation, and even the wrong analysis.

12.6.2 Nasalisation of oral consonants caused by the environment

Another way in which a sound can become more like its environment is when oral consonants become nasalised when contiguous to nasalised vowels. Thus, for example, in Yoruba (Nigeria):

[ɛ̃ɪ̃ɔ̃] - "meat"
[ɛ̃w̃ɔ̃] - "chain"

and in Dogon (Mali):

[ɑ̃ɾ̃ɑ̃] - "rain"

The [ɪ], [w] and [ɾ] have become nasalised because they occur between two nasalised vowels. The nasal articulation has overlapped onto the consonant.

In such sounds the velum, which has been lowered for the articulation of the first nasalised vowel and needs to be lowered for the second, simply remains lowered during the articulation of the consonant in between, thus nasalising it.

Sample symbol and technical name:

[ɾ̃] voiced alveolar **nasalised** flap with egressive lung air

e.g. Dogon (Mali): [ɑ̃ɾ̃ɑ̃] - "rain"

Some languages have whole words or whole sequences of syllables which consist of nasalised sounds. That is, all the vowels are nasalised and so are the consonants between them, be they fricatives, approximants (central or lateral) or vibrants. Yoruba and Dogon are examples of this and so are Guaraní (Brazil), Shiriana (Brazil), and Tujuca (Colombia).

It is clear that opening the velic passage during the articulation of oral fricatives, approximants and vibrants gives rise to nasalised fricatives, approximants and vibrants. In fact, any sound made with the velic passage closed has a corresponding nasalised sound made with the velic passage open. In this way we can see that what is traditionally considered a nasal consonant, e.g. [n], is, in one sense, a nasalised plosive, since the primary articulation is as for the voiced alveolar plosive [d], but as the velic passage is open, the air escapes through the nose.

12.6.3 Devoiced consonants

Sometimes when we make a voiced consonant immediately before a voiceless environment (for instance silence, if the sound is utterance final) the voicing may cease before the end of the articulation of the sound. Thus, the voiced consonant fades into a voiceless one. This phenomenon is known as **devoicing** and is symbolised by the small circle for voicelessness under the consonant concerned. For example, when the English words "these", "sad", and "pads" occur utterance finally or before a word beginning with a voiceless consonant, the final consonant of each word may be devoiced:

Examples: [ðiːz̥] - "these"
[sæˑd̥] - "sad"
[pʰæˑdz̥] - "pads"

Note that we do not transcribe these final consonants as [zs] and [dt] as the whole segment is very brief and constitutes only one sound unit in the language.

Devoicing normally occurs at the end of a word, and may be superimposed on both released and unreleased consonants. In the case of a final voiced plosive, the voicing may fade before the release.

When the voiced sound is made completely voiceless by its voiceless environment, devoicing is said to be complete. For instance the voiced [v] in the English word "have" may change to a voiceless [f] in the phrase "have to" because of the following voiceless [t]: [ˈhæftʰu̥]. Devoicing is very common in English, so English speakers need to exercise great care when learning languages in which it does not occur.

12.6.4 Modifications caused by co-articulation

When articulation occurs at two different places simultaneously the sound is a **co-articulated** sound. Double consonants and sounds with secondary articulations (e.g. palatalisation,

labialisation) are co-articulated sounds. Co-articulation is an essential feature of some sounds whatever the environment is. Other secondary articulations may be caused by the sound's environment. E.g. labialisation may be caused by an adjacent lip-rounded sound, palatalisation by an adjacent palatal sound, velarisation by an adjacent velar sound and pharyngealisation by an adjacent pharyngeal sound.

Modifications caused by co-articulation should not be confused with phonemic modifications. For example, in Russian, palatalisation is phonemic, and palatalised consonants contrast with non-palatalised ones. In other languages, however, sounds can only be palatalised when the environment is palatal and the palatalisation is predictable and non-phonemic.

The co-articulation caused by an overlapping of two articulations is possible because any articulator that is not directly involved in the production of a given sound may start moving towards its position for the next sound in which it is a primary articulator.

Consider, for example, the pronunciation of English "flew" [flu̟:], in which two co-articulations can occur. Firstly, the tongue, which is not involved in the articulation of the initial [f] may be moved into position against the alveolar ridge, in anticipation of the following [l], during or even before production of the [f]. Secondly, there may be anticipatory labialisation as the lip-rounding involved in the vowel [u̟:] may be anticipated so that the [f] and the [l] become labialised (cf. the pronunciation of "flee" [fli:]).

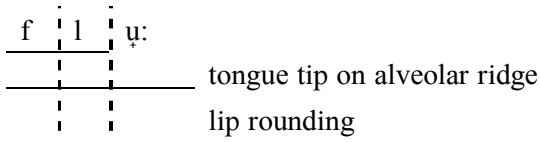


Figure 11.4

12.6.5 Release modified by the environment

We have already seen different types of plosive releases in Chapter 11. Plosives can also have other releases which are modifications caused by the following sound. For example, an alveolar plosive like [t] will, when followed by an alveolar lateral approximant [1] have a different release stage from that of the same plosive when followed by a vowel. Normally we think of a [t] being released by a lowering of the tip of the tongue, possibly into aspiration or affrication. But where a lateral follows the [t], the sides of the tongue will be lowered while the tip remains in contact with the alveolar ridge for the following lateral sound. This is known as lateral release.

e.g. English: [ˈbɒt̺lˠ] - "bottle"

Similarly, if an alveolar plosive is followed by an alveolar nasal, the release stage is effected by a lowering of the velum to open the velic passage diverting the air through the nose, while the tongue tip does not move, but remains up against the alveolar ridge. This is known as nasal release (not always syllabic).

e.g. English: [ˈsad̺n̺] - "sadden"

SECTION II - VOWELS

Chapter 13

Describing Vowels

People usually have a pretty good intuitive idea of what a vowel is; whatever language our mother tongue is, it will have vowels. Now the time has come to look more closely at how vowels are made so that we can describe them accurately for any language. That is an important step in learning to say them accurately in any language (not just our own).

How, then, do we go about describing vowels? Basically, the same broad principles that we used in describing consonants still apply. The most important questions involve **the shape of the vocal tract**, and in particular **where the stricture or narrowing is**, **which articulators are involved**, and how they work to produce the particular shape of vocal tract for any particular vowel, **what the air stream is doing**, and **whether there is voicing**.

However, we need to remember that vowel qualities are far more flexible and variable than consonant qualities. In describing a consonant, we can say quite precisely what the place of articulation is and what the manner of articulation is. Once we have done that, we know the shape of the vocal tract and can describe the way the articulators work to produce that sound. To give an example, once we say that [z] is a voiced alveolar grooved fricative with egressive lung air, we can easily draw its face diagram because we know what articulators are involved (front of tongue and alveolar ridge), what the stricture is (that for a grooved fricative), that there is voicing and so on.

Vowels are more flexible in their quality, so we cannot spell out the place and manner of articulation for them in the precise way that we can for consonants. However, what we can do for any vowel is describe the general shape the vocal tract has when we make the vowel, and this mostly means the shape of the oral tract. We need also to consider whether voicing is present, or any modification such as nasalisation or laryngealisation.

In thinking about the shape of the oral tract, notice that the two most used articulators in making vowels are the tongue and the lips. Basically, where the tongue is concerned, we need to know **where** the narrowing or stricture is and **how open** it is.

First, in order to make the stricture, some part of the tongue (i.e. the front, the middle or the back) is humped up or raised above the level of the rest of the tongue. See Figure 14.1, p.69)

Second, how open the stricture is depends on **how high or low in the mouth the tongue is**. Thus, we have, to start with, the following **two parameters for vowel quality**:

(i) The **position** of the stricture on a **horizontal** scale - **front**, **central**, **back**.

(ii) The **openness** of the stricture on a **vertical** scale - the extreme values for this are **open** and **close**, and there are two subdivisions between these, **open-mid** and **close-mid**.

Then a front vowel is any vowel made with the narrowing or stricture at the front of the tongue. Similarly, a central vowel is made with the stricture at the mid part of the tongue, and a back vowel has the stricture at the back of the tongue.

A close vowel is any vowel made with close stricture, i.e. with the tongue hump very close to the palate; an open vowel is any vowel made with open stricture, i.e. with the hump low in the mouth. Open-mid and close-mid vowels will have the tongue hump in the corresponding intermediate positions.

The parameter "horizontal position of the stricture" does for vowels what place of articulation does for consonants, while openness of stricture equates to manner of articulation.

A **third** parameter for vowel quality is **the shape of the lips**, which can be either **rounded** or **unrounded**.

Putting these three parameters together gives the following lay-out:

	front		central		back	
	unrounded	rounded	unrounded	rounded	unrounded	rounded
close						
close-mid						
open-mid						
open						

Figure 13.1

13.1 Definition of a vowel

According to the classification given in Figure 3.2, p.22, phonetic vowels are both centrals and sonorants.

By **central** we mean that a vowel sound is made by the air stream passing over the centre of the tongue. (This excludes **laterals**, for which the air stream passes round the sides of the tongue, and also excludes **nasal consonants,** for which the air stream does not pass down the tongue at all. The definition does not exclude nasalised vowels, however.)

By **sonorant** we mean that the narrowing or stricture is wide enough so that there is no local friction at the place of articulation. (This excludes all obstruents, i.e. plosives and fricatives.)

Notice, however, that trills and flaps and approximants are also sounds that are central sonorants.

Chapter 14

The Cardinal Vowels

We have already seen that vowel qualities are very flexible and varied, and one would think that it would be helpful to have some reference points of vowel quality so that any vowel of any language can have its quality compared with the quality of the reference vowels. It would not do to take the qualities of the vowels in any particular language (e.g. English, German, etc.) as reference points because there is so much variation of vowel quality across the different dialects of the same language.

However, we can get a reliable set of reference points by referring to the vowels you can say at the very extreme limits of articulation. Four of the most important points of reference would therefore be the **most close**, the **most open**, the **most front** and the **most back**. The late Professor Daniel Jones devised such a system, based on x-ray photographs, which he called the **cardinal vowels**. These are called "cardinal" in the sense of acting as a basic standard. We will, in this chapter, essentially describe Daniel Jones' system of cardinal vowels.

The cardinal vowels are referred to by numbers, and by phonetic symbols. There are two sets of cardinal vowels, the **primary** cardinal vowels, and the **secondary** cardinal vowels. See Figure 14.2, p.69.

The **primary** cardinal vowels are numbers 1 to 8. Of these, numbers 1 to 4 are four front unrounded vowels from close to open, number 5 the open back unrounded vowel and 6-8 the back rounded vowels from open-mid to close. In this set the front vowels are unrounded and most of the back ones are rounded because this is the way rounding and backness are associated in the vowels of most languages, including the languages of Nigeria and West Africa.

The **secondary** cardinal vowels are numbers 9 to 16. For these the lip positions of the primary cardinal vowels are altered to the opposite, while keeping the tongue positions the same. Therefore, the front vowels and the open back vowel (numbers 9 to 13) are rounded while the other back vowels (numbers 14 to 16) are unrounded.

Two close central cardinal vowels, one unrounded and one rounded ([ɨ] and [ʉ]) are sometimes included as cardinal vowels 17 and 18.

The cardinal vowels are mostly referred to by phonetic symbols. The following two diagrams show first the tongue position for four cardinal vowels as taken from x-ray photographs and then how the two sets of cardinal vowels are distributed on the vocal chart.

The Face Diagram of the Cardinal Vowels [i], [a], [ɑ] and [u]

X-ray photographs of the vocal tract during the production of the vowels [i], [a], [ɑ] and [u] lead us to the following tongue positions for these four cardinal vowels.

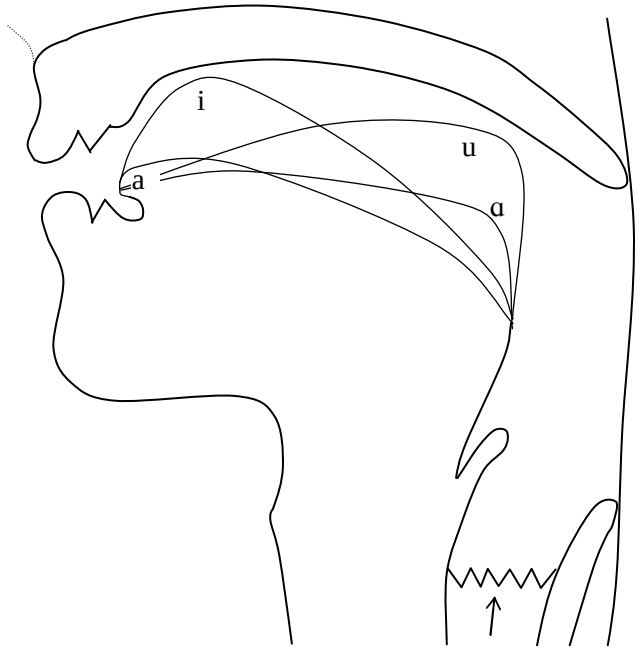


Figure 14.1

From this, the traditional vowel diagram has been created, showing the position of the vowels as follows:

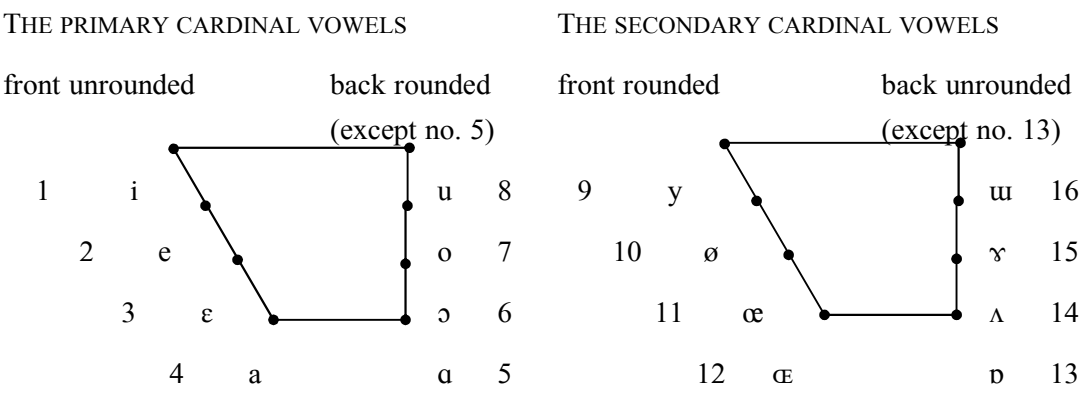


Figure 14.2
The Cardinal Vowels

Note that the unrounded and rounded front vowels and the unrounded and rounded back vowels are in exactly the same positions on the vowel chart. This is because the tongue position is the same. It is the lip position which has changed, but lip position is not shown on this diagram. Also note that the "front line" is slanted because the "hinge" of the jaw allows a wider range of opening at the front than at the back.

As we go on to explain in detail how the cardinal vowels are produced we shall use the phonetic vowel symbols to refer to them. Strictly speaking, this is the most correct technical use

of these symbols. However the cardinal vowels are extreme in their articulations. Therefore, in all practical situations, when we are transcribing the vowel sounds of a natural language, the actual vowels of that language are not likely to be in the precise cardinal positions.

One would then have to use the cardinal vowel symbol nearest to the language vowel in question. This is an approximation, but works out well in practice, and is the usual way to transcribe vowels. Diacritical symbols are available to mark modifications of the cardinal vowel.

14.1 The primary cardinal vowels

[i] (Cardinal l)

The tongue is humped as far forward as possible and as near to the palate as possible without causing any friction. The mouth is almost closed. The lips are spread, which in the technical description is called unrounded. The French "i" is quite close to the cardinal position.

[i] voiced close front unrounded vowel with egressive lung air

e.g. Yoruba: [ki] - "greet

[e] (Cardinal 2)

The tongue is kept as far forward as possible with the tongue somewhat lowered in comparison with [i], in order to make the gap between the tongue and the palate slightly bigger. This, and all the cardinal vowels, should not be "glided", i.e. not as in English "gate", where you start with an [e]-like sound and end up with an [i]. Scottish doesn't glide.

[e] voiced close-mid front unrounded vowel with egressive lung air

e.g. Yoruba: [ke] - "cry"

[ɛ] (Cardinal 3)

The tongue is kept well forward (it helps to keep the tongue tip behind the bottom teeth), and the gap between the highest part of the tongue and the palate is increased compared to [e].

[ɛ] voiced open-mid front unrounded vowel with egressive lung air.

e.g. Yoruba: [bɛ] - "jump

[a] (Cardinal 4)

The tongue is humped as far forward as possible and the lips are unrounded. The tongue is as low as possible. The jaw is opened widely. The low tongue position and the open jaw position make the opening between the palate and the tongue as open as possible. The Northern English "a" (as in "past") is close to the cardinal position, although not quite as open.

[a] voiced open front unrounded vowel with egressive lung air

e.g. Northern English: [man] - "man"

[ɑ] (Cardinal 5)

The tongue is as low as possible and as far back as possible. In this way it is the exact opposite to [i], which is one reason it is kept as cardinal vowel 5, while the other back vowels in the primary set are rounded. The lips are unrounded. It does not often occur in 1anguages.

[ɑ] voiced open back unrounded vowel with egressive lung air

[ɔ] (Cardinal 6)

The tongue is kept far back and a bit higher than for [ɑ]. However, the lips are rounded (they were unrounded for [ɑ]).

[ɔ] voiced open-mid back rounded vowel with egressive lung air

e.g. Yoruba: [kɔ] - "teach

[o] (Cardinal 7)

The tongue is kept far back but higher than for [ɔ]. The lips are rounded.

[o] voiced close-mid back rounded vowel with egressive lung air

e.g. Yoruba: [bo] - "peel"

[u] (Cardinal 8)

The tongue is as far back as possible and as near to the roof of the mouth as possible so that the opening between the tongue back and the velum is as narrow (close) as possible. The lips are heavily rounded.

[u] voiced close back rounded vowel with egressive lung air

e.g. Yoruba: [ku] - "die"

14.2 The secondary cardinal vowels

Cardinal vowels 9-12 are front rounded. To produce these, it is probably easiest to first pronounce the front unrounded ones and then concentrate on the position of the tongue before rounding the lips.

[y] (Cardinal 9)

The tongue position is as for [i], but with the lips rounded. The French "u" is quite near this sound.

[y] voiced close front rounded vowel with egressive lung air

e.g. French: [l̪yn̪] - "moon"

Bambara [syfɛ] "at a night"

[ø] (Cardinal 10)

The tongue is kept far forward with the tongue tip just at the edge of the bottom teeth and a bit lowered in comparison with the [y]. The tongue position is as for [e] but the lips are rounded and somewhat protruded.

[ø] voiced close-mid front rounded vowel with egressive lung air. The "eu" in French is quite close to this sound,

e.g. French: [fø] - "fire"

[œ] (Cardinal 11)

The tongue is held far forward by putting the tongue tip behind the bottom teeth. The tongue position is as for [ɛ] but the lips are kept well rounded. The jaw needs to be kept open to the same degree as for [ɛ].

[œ] voiced open-mid front rounded vowel with egressive lung air

French has a sound very close to this vowel.

e.g. French [bœːʁ] - "butter"

[ɶ] (Cardinal 12)

The tongue position is as for [a] with the lips rounded. A dialect of Swedish uses a vowel near to this cardinal position.

[ɶ] voiced open front rounded vowel with egressive lung air

e.g. dialectal Swedish: [ˈʔɶːgɜ] - "eye"

[ɒ] (Cardinal 13)

The tongue position is as for [ɑ], but with the lips rounded.

[ɒ] voiced open back rounded vowel with egressive lung air

e.g. English: [p^hɒt^h] - "pot"

Cardinal vowels 14-16 are back unrounded. To produce them, it is simplest to pronounce the back rounded vowels and then to spread the lips.

[ʌ] (Cardinal 14)

The tongue position is the same as for [ɔ] but with the lips unrounded.

[ʌ] voiced open-mid back unrounded vowel with egressive lung air

e.g. Ngwe (Cameroon) [ntsʌ - "water"

This symbol is also regularly used for the vowel sound in British English *cut*: [kʌt] in most descriptions of English phonetics, because historically the vowel used to be articulated as a back vowel rather than the central [ɜ] (see chapter 15); hence the traditional use of [ʌ].

[ɤ] (Cardinal 15)

The tongue position is the same as for [o] but with the lips unrounded.

[ɤ] voiced close-mid back unrounded vowel with egressive lung air

e.g. Ngwe(Cameroon) [mbɤ] - "gong"

[ɯ] (Cardinal 16)

The tongue position is as for [u], but with the lips unrounded.

[ɯ] voiced close back unrounded vowel with egressive lung air

e.g. Ngwe(Cameroon) mbɯ - "dog"

Chapter 15

Other Vowels

In addition to the cardinal vowels it is helpful to specify certain other positions which are commonly used in the production of vowels. The central vowels are particularly important.

15.1 Central vowels

There may be a whole variety of central vowels. Some of them will be mentioned below. It should be noted that in the central vowels the rounding or unrounding of the lips is usually not so pronounced as in the front or back vowels.

15.1.1 Central unrounded vowels

[ɨ] voiced close central unrounded vowel with egressive lung air

The tongue is in a position midway between [i] and [ɯ] and very close to the roof of the mouth. The lips are unrounded. The [ɨ] is regarded as Cardinal Vowel no. 17 by some linguists.

e.g. Tera (Gombe): [zɨ] - "said"

[ɘ] voiced close-mid central unrounded vowel with egressive lung air

The tongue is situated between [e] and [ɤ]. This vowel does not often occur in languages.

[ɜ] voiced open-mid central unrounded vowel with egressive lung air

The tongue is situated between [ɛ] and [ʌ].

e.g. Hausa: [zɜmɜ] - "become

Ngwe [mbɜ] tadpoles

[ɑ] voiced open central unrounded vowel with egressive lung air

The tongue is situated between [a] and [ɑ]. The symbol is an "alpha". The IPA does not have a symbol for a vowel in this position. As it is, however, one of the most common vowels found in languages, SIL field linguists recognise a need for a vowel in this position. If there is no contrast, most transcriptions would use the [a] or [ɑ] symbol,

e.g. English: [spɑ:] - "spa"

15.1.2 Central rounded vowels

[ʉ] voiced close central rounded vowel with egressive lung air

The tongue position is between [y] and [u], keeping the lips rounded. The [ʉ] is regarded as Cardinal Vowel no. 18 by some linguists.

e.g. Scottish English: [bʉk] - "book"

[ɵ] voiced close-mid central rounded vowel with egressive lung air

The tongue position is between [ø] and [o], keeping the lips rounded.

e.g. Bari [lɵri] - "drum"
(Sudan)

15.2 Intermediate vowels

As we have seen already the actual cardinal positions with their extreme articulations are seldom found in language, although positions very near to them are often used. There is an infinite number of intermediate vowels. It is possible to describe any vowel by the relationship of its position to that of the cardinals. However, a few of these intermediate vowels are given special symbols by reason of their frequent occurrence.

15.2.1 Intermediate front vowels

[ɪ] voiced near close front unrounded vowel with egressive lung air

The position for the lips is almost as for [i], but a little relaxed, and the hump of the tongue is a little lower and further back. It is heard as being in between [i] and [e].

The two aspects of being a little lower and further back than the [i] are both implied in the term **"near"** or **mid-centralised**[1], which means moved towards the centre of the vowel chart,

e.g. English: [fɪʃ] - "fish"

Manjako (Guinea-Bissau): [ɜˈlɪŋ] - "to be sufficient"

The fact that this vowel is always short in English is not inherent in the vowel quality as such.

[ʏ] voiced mid-centralised close front rounded vowel with egressive lung air

The lip position is as for [y] but the hump of the tongue is lowered a little and further back, exactly as for [ɪ]. The sound is, in other words, the rounded variety of [ɪ].

e.g. German: [ˈdʁʏkʰən] - "to push"

[æ] voiced near open front unrounded vowel with egressive lung air

This vowel is produced between the vowels [ɛ] and [a], i.e. not fully open, but fully front. It commonly represents the pronunciation of the vowel in "bad" in standard British and American English

e.g. English: [bæd] - "bad"

---

[1] N.B. The IPA diacritic for mid-centralisation which can be used with any vowel, is [̽] e.g. [å]

15.2.2 Intermediate back vowel

[ʊ] voiced near close back rounded vowel with egressive lung air

The lip position is almost as for [u], only a bit relaxed, whilst the hump of the tongue is a little lower and further forward. These two aspects are both implied in the term "mid-centralised"[1] meaning "moved towards the centre of the vowel chart" . The vowel sounds between [u] and [o].

e.g. English: [pʰʊʃ] - "push"

Manjako (Guinea-Bissau): [ʊˈkoŋ] "type of fish"

The fact that this vowel is always short in English is not inherent in the vowel quality as such.

15.2.3 Intermediate central vowel

[ə] voiced mid central vowel with egressive lung air

The tongue and lip positions are neutral. This vowel is common is unstressed positions in many languages.

e.g. English: [əˈɦɛd] - "ahead"

Kanuri [ʃəntəra "a kick"

Diagram of all vowels studied

The diagrammatic presentation of the vowels can be made as on the following chart:

VOWEL CHART

	FRONT		CENTRAL		BACK	
	Unrounded	Rounded	Unrounded	Rounded	Unrounded	Rounded
CLOSE	**i** ɪ	y ʏ	**ɨ**	**ʉ**	ɯ	**u** ʊ
CLOSE-MID	**e**	ø	ɘ **ə**	ɵ	ɤ	**o**
OPEN-MID	**ɛ** æ	œ	ɜ		ʌ	**ɔ**
OPEN	a	ɶ	**ɑ**		ɑ	ɒ

Figure 15.1

It is obvious that this table does not represent all possible vowels. However, this scheme does provide a framework in which the positions of the vowels in any language may be located. Usually it is sufficient to use the symbols in the table with an explanation of their position or addition of a diacritic. The 9 vowels that are most commonly heard in Nigerian and other West African languages are highlighted in **bold**.

Chapter 16

Modification of Vowels

The basic vowel sounds have already been considered in previous chapters. In this chapter attention will be drawn to certain modifications which can be made. The actual tongue position may be modified from that of the cardinal vowels, there may be some other modifications whilst maintaining a stationary tongue position, or there may be an actual movement of the tongue during the production of the vowel sound.

16.1.1 Modified tongue position

The vowels of any language may be described in terms of their relationship to the cardinal vowels. It is not expected that the actual vowels encountered in a language will coincide with the cardinal vowels, but their exact quality can be shown on a chart, e.g. as on the following

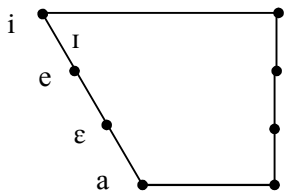


Figure 16.1

diagram for [ɪ]: what this means is that the position of the tongue is a little more open than for Cardinal 1 and slightly more central.

Alternatively, the exact quality of the vowels of a language can be indicated with the following diacritics:

tongue raised:	̝	[e̝]	indicating a vowel between [i] and [e], cardinals 1and 2.
tongue lowered:	̞	[e̞]	indicating a vowel between [e] and [ɛ], cardinals 2 and 3
tongue advanced:	̟	[u̟]	indicating a vowel slightly further forward than [u], cardinal 8
tongue retracted:	-	[i̠]	indicating a vowel slightly further back than [i], cardinal 1

These modification symbols may be combined, e.g. [ɔ̟̞] which will be a vowel slightly further forward and slightly lower than [ɔ], cardinal 6. For most practical purposes, such a system of notation is too cumbersome, especially if the actual vowels are basically modifications very close to cardinal positions. In this case the cardinal symbols may be used, provided that a general note of the actual position of the vowels is made, and that there isn't also the cardinal vowel.

16.1.2 Alternative symbolisation

A further diacritic [̈] may be used to indicate that a vowel is **centralised**, i.e. the position of the vowel is towards a central vowel. This is different from mid-centralisation, in which the vowel is moved towards the centre of the vowel chart, and depending on the original position could be also lowered or raised in addition to the centralisation. This diacritic is called a **dieresis** or **umlaut** (from German).

16.2 Modified articulation

16.2.1 Voiceless vowels

Although vowels are usually thought of as being voiced, they may also be produced with the vocal cords at rest and the glottis wide open. The shape of the rest of the vocal tract is exactly the same as for the voiced vowel.

When voiceless vowels occur after plosives they sound like a fairly strong and prolonged aspiration with a distinct vowel quality. In Totonac (Mexico), e.g., the words [ˈʃkutɪ̥] “badger”, [ˈʃkutɑ̥] “sour”, and [ˈʃkutə̥] “untie”, need to be carefully distinguished. Here the voiceless vowel is the syllable nucleus in the second syllable.

If a voiceless vowel is non-syllabic and of the same quality as an adjacent voiced vowel, it can often be regarded as a voiceless glottal fricative [h] (see 5.1.8). Whether the voiceless segment should be treated as a consonant or vowel is a matter for phonology.

Sample symbol and technical name:

[ɑ̥] **voiceless** open central unrounded vowel with egressive lung air

e.g. Cheyenne (U.S.A.): [mɑɑ̥to̥] - “leggings”

NB. Voiceless vowels are classified as **sonorants** although it looks as if there is not much resonance involved. The point is that for any voiceless vowel, there would be resonance if the voicing were turned on. The same thing could not be said of voiceless fricatives.

16.2.2 Nasalisation

During the production of a nasalised vowel the velic passage is open so that **the air stream passes out through both the oral and nasal cavities**. The shape of the oral cavity, being governed by the position of the tongue and lips, determines which vowel is being produced, whilst the nasal cavity whose shape is fixed, adds the characteristic nasal resonance. Because of this extra resonance, nasalised vowels are less easily distinguished than non-nasalised ones.

The fact that the air stream passes through the nasal cavity may be demonstrated either by pinching the nose during the production of the vowel and noting the change in the sound, or by placing a mirror under the nose and noting the steaming of the surface of the mirror.

Sample symbol and technical name:

[ɔ̃] voiced open-mid back rounded **nasalised** vowel with egressive lung air

e.g. Yoruba: [sɔ̃] - "pay"

16.2.3 Laryngealisation

Laryngealised vowels are sometimes called **creaky** vowels or **creaky voice**. The effect is caused by the **arytenoid cartilages**, which are situated at the back of the larynx. They regulate the opening of the vocal cords, and **during the production of a laryngealised vowel these cartilages come tightly together so that they allow the vocal cords to vibrate only at the other, front, end**. The vocal cord vibration is also slower than usual.

In some languages laryngealised vowels contrast with non-laryngealised ones, whilst in other languages they are characteristic of certain tone or intonation patterns.

Sample symbol and technical name:

[ɛ̰] voiced open-mid front unrounded **laryngealised** vowel with egressive lung air

e.g. Highland Mazatec (Mexico): [tsɛ̰^{4}] - "membrane"

cf. [tsɛ^{3}] - "big"

N.B. This language has four level tones, the two lowest are 3 and 4.

16.2.4 Breathiness

For the production of **breathy vowels** (IPA calls them **breathy voiced**), the **vocal cords are further apart than they are for normal voice**. A strong airflow is used so that enough vibration is set up to produce voicing, but without the vocal cords ever actually closing. There is a breathy effect giving the impression that the speaker is "out of breath".

Breathy vowels may be used in contrast with non-breathy ones. In some languages it has been found that they usually take on a particular tone.

Sample symbol and technical name:

[ɔ̤] voiced open-mid back rounded **breathy** vowel with egressive lung air

e.g. Dinka (Southern Sudan): [ɔ̤ːtʃ] - "to observe it"

cf. [ɔ́ːtʃ] - "to buy"

16.2.5 Retroflexion

Vowels may be produced with the tongue tip raised and sometimes even curled over. The actual position of the hump of the tongue will be somewhat different from the cardinal position, but the relative positions remain the same. Retroflexed vowels may occur adjacent to retroflex consonants, but also in other positions. One form of the English "r" is, in fact, a retroflexed vowel.

Sample symbol and technical name:

[ɑ˞] voiced open central unrounded **retroflexed** vowel with egressive lung air

e.g. in some dialects of American English: [bɑ˞d̪] - "bird"

16.2.6 Tongue root position

Another part of the tongue whose shape and position can affect vowel quality is the **tongue root**. The root of the tongue may be **advanced** (i.e. moved forward), or **retracted** (i.e. moved backward), thus enlarging or decreasing the size of the pharyngeal cavity.

Sounds with **Advanced Tongue Root (+ATR)** are characterised by an expansion of the pharynx caused by moving the tongue root forwards and lowering the larynx. The feature Advanced Tongue Root is crucial to the vowel systems of many African and some Asian languages. These languages have two sets of vowels, one with and one without the Advanced Tongue Root feature. Usually vowels from only one set can occur together in any one word. This is called **vowel harmony**. The only exception is when [ɑ] is a neutral vowel in the language, in which case it occurs with vowels of both sets.

In West Africa, where the perceived difference is one of **vowel quality**, the sets are often symbolised as follows:

set 1 +ATR		set 2 –ATR	
i	u	ɪ	ʊ
e	o	ɛ	ɔ

e.g. Asante (Ghana): [wúbétó] - "you will pull out"

[wúbɛ́tɔ́] - "you will put"

The feature can also be symbolised as follows: + ATR [e̘] o̘]
– ATR [e̙] o̙]

If these symbols are used, the 2 sets could have the same vowel symbols.

In East Africa, however, the difference between the sets is perceived as one of **voice quality** rather than vowel quality. The +ATR set sounds muffled or hollow, while the -ATR set sounds brassy or choked.

16.2.7 Pharyngealised vowels

The retraction or drawing back of the tongue root together with general constriction of the pharynx produces a **pharyngealised** vowel similar to that described in connection with pharyngeal and pharyngealised consonants (see 5.1.8 and 12.2.4). A pharyngealised vowel can be described as if a retracted [ɒ] or [ɑ] is superimposed on the vowel. In Arabic, vowels adjacent to pharyngeal and pharyngealised consonants are produced in this way. Pharyngealised vowels also occur in the Caucasian languages.

Sample symbol and technical name:

[ɔˁ] voiced open-mid back rounded **pharyngealised** vowel with egressive lung air

Chapter 17

Central Approximants which Correspond to Vowels

(For other approximants see Chapter 6.)

In order to discuss approximants we first need to deal with the matter of **vowel glides**.

17.1 Non-syllabic vowels - gliding articulation

During the production of a vowel the tongue and lips may move from one position to another, so that the initial position is that for one vowel and the final position is that for another. For example, in the English word "now", as soon as the consonant is released, the vocal apparatus takes up the position for the vowel [α]. Towards the end of the production of the vowel, the tongue glides smoothly towards the [u] position whilst the lips become rounded. Such a sequence is a **vowel glide**. The term **glide** refers to the movement of the tongue from one position to another; that movement must be contained within a single syllable.

In order to symbolise glides, three things must be noted. Firstly, the **starting point** of the glide; secondly, the **finishing point**; and thirdly, **which of these is more prominent** and **forms the centre of the syllable**. The less prominent vowel is non-syllabic, forming the syllable margin. There are **two kinds of glides**, **off-glides** and **on-glides**, depending on which vowel is more prominent.

17.1.1 Off-glides

In an off-glide it is the **first** part of the vowel which is more prominent, and the second part less so. In the English word "now", for example, the glide starts from [α], finishes at [ʊ] with the [α] being the more prominent. The word "now" may be symbolised as [nαᵘ], "boy" as [bɔᶦ], and in a southern British English pronunciation the word "fear" may be written as [fiᵊ]. The most prominent vowel is always written **on** the line, whilst the less prominent and shorter is written **raised** above the line, i.e. as a superscript.

The three examples just given show the most usual directions of off-glides, viz: towards [ʊ], [ɪ] and [ə], but there can be glides to other points as well.

17.1.2 On-glides

In the on-glides the **second** part of the vowel sequence is the more prominent one and forms the syllable centre (syllable nucleus).

In English, on-glides are used in a word such as "wet". In this case the word starts with the tongue and lips in the position for the vowel [u] but they quickly move into the [ɛ] position. The word may be symbolised as [ᵘɛt]. Similarly, "yet" starts with [i] and glides to the more prominent [ɛ], and may be written as [ⁱɛt].

17.1.3 Examples of off-glides and on-glides

Hausa examples: [ʃa^{i}da:] “evidence”, [sa^{ʊ}na] “sit” (off-glides)

[^{i}a:^{i}a:] “how?”, [^{ʊ}a:sa:] “playing” (on-glides)

Sometimes the glides are referred to as **diphthongs**. In addition there can also be **triphthongs** when the glide occupies **three** vowel positions, e.g. in the English word [fɑ^{ɪə}] “fire”.

17.2 Approximants corresponding to close vowels

For **close** vowels, e.g. [i] or [u], the narrowing or stricture is the narrowest possible for vowels and is in fact close to the stricture for approximant consonants (which have the smallest possible stricture without causing fricative noise). As mentioned above, when these vowels are next to, but less prominent than, the other vowel in the glide, they are non-syllabic. Since they are non-syllabic and the size of the stricture approaches consonantal stricture, they function like consonants. In phonology, which considers how sounds function in a system, such close vowels are often found to function as consonants.

Such a non-syllabic vowel at the beginning or end of a syllable is, therefore, usefully regarded as an approximant, and this kind of approximant is sometimes called a **semivowel** in phonology.

So to most close vowels we have a corresponding approximant. Just as for other consonants, we can specify a particular place of articulation for each of these approximants. Thus we have:

Palatal approximants, corresponding to the close front unrounded vowel [i]

Labial -palatal approximants, corresponding to the close front rounded vowel [y]

Velar approximants corresponding to the close back unrounded vowel [ɯ]

Labial-velar approximants corresponding to the close back rounded vowel [u].

There is also a voiced - voiceless distinction for each approximant. Hence we have the following:

17.2.1 Palatal approximants - corresponding to the vowel [i]

[j] voiced palatal approximant with egressive lung air

e.g. Hausa [jaːja:] - “how?”

English [jʉː] - “you”

17.2.2 Labial-palatal approximants - corresponding to the vowel [y]

[ɥ] voiced labial-palatal approximant with egressive lung air

e.g. French: [ɥi̯t^{h}] - “eight”

Twi [ɥe] “chew”

17.2.3 Velar approximants - corresponding to the vowel [ɯ]

[ɰ] voiced velar approximant with egressive lung air

17.2.4 Labial-velar approximants – corresponding to the vowel [u]

[w] voiceless/voiced labial-velar approximant with egressive lung air

e.g. Hausa [wa:sa:] - "playing"

English [wɪtʃ] - "witch"

Below is a chart of these central approximants and their close vowel counterparts. The symbol of the vowel to which it corresponds is placed to the left of the approximant symbol.

	CORRESPONDING TO CLOSE FRONT VOWELS		CORRESPONDING TO CLOSE BACK VOWELS	
	palatal	labial-palatal	velar	labial-velar
	i = j	y = ɥ	ɯ = ɰ	u = w

Figure 17.1

The nearest voiceless equivalents of these approximants have a degree of friction in order to make them audible; voiceless [j] is heard as a voiceless palatal fricative [ç], voicless [ɥ] as a voiceless labial-palatal fricative [ɥ̊], voiceless [ɰ] as the voiceless velar fricative [x], and a voiceless [w] as a voiceless labial-velar fricative [ʍ]. Examples from English include
[çu:] "hue"
[ʍɪtʃ] "which" (in Scottish and some American accents)

17.3 Consonant clusters with approximants

Clusters, or sequences, of a consonant followed by an approximant are common in language. The first member of the cluster can be almost any consonant. In English there is a wide variety of such clusters in words such as [vjʉ̟:] "view" and [swɪlˠ] "swill", etc. Again, in French we have similar clusters in words like [l̟ɥi] "to him", and [mwɛt̟] "seagull".

17.3.1 Consonant clusters with [w] and [ʍ]

Comparing the English words "scare" and "square", it will be noted that they are very similar, except that in "square" the lips are rounded during the [sk] sequence, ready for the approximant. As the voicing starts immediately on the release of the [k], the approximant is the voiced one, [w].

Comparing the words "kite" and "quite", a similar rounding of the lips takes place during the [k] of "quite" in preparation for the approximant. However, there is delay in the onset of voicing following the release of the [k], during which the tongue moves from the [u] to the [ɑ]

position to give the voiceless labial-velar fricative [ʍ]. Thus "quite" can phonetically be written [kʍɑithi].

The [ʍ] can in English also follow a word initial "t", e.g. in [tʍɪg] "twig". Here, the voicelessness of the approximant results from the aspiration of the preceding plosive. With other consonants the approximant is normally the voiced one as in "sweet" [swiːt].

The lip-rounding of the consonant before a labial-palatal or labial-velar approximant (in other positions, too) is referred to as **labialisation** (see 12.2.1). These consonants, therefore, are referred to as "labialised".

17.3.2 Clusters involving [j] and [ç]

In English these clusters are more common than those with [w] and [ʍ]. In the sequences with plosives there is a pattern in which a voiced (unaspirated) plosive is clustered with the voiced approximant [j], whereas a voiceless aspirated plosive is clustered with the voiceless fricative [ç]. This will be seen in the following words:

VOICED UNASP. PLOSIVE				VOICELESS ASP. PLOSIVE			
Plosive only		Plos. + [j]		Plosive only		Plos. + [ç]	
"booty"	[b]	"beauty"	[bj]	"pool"	[pʰ]	"pewter"	[pç]
"spoon"	[p]	"spume"	[pj]	"tool"	[tʰ]	"tube"	[tç]
"do"	[d]	"due"	[dj]	"cool"	[kʰ]	"cube"	[kç]
"stool"	[t]	"stew"	[tj]				
"goose"	[ɡ]	"argue"	[ɡj]				
"scooter"	[k]	"skewer"	[kj]				

During the production of the plosive followed by these approximants the tongue middle is raised towards the palate ready for the approximant on the release (see Figure 12.1, p.58). This difference in articulation, caused by assimilation, is not marked, as it is assumed in such a sequence.

In English, as already mentioned, these clusters may be formed with other consonants as well as plosives. In these cases the approximant is normally voiced as in "few", "new", etc.

17.3.3 Clusters involving [ɥ] and [ɥ̥]

In a number of West African and Asian languages clusters with the labial-palatal approximants [ɥ] and [ɥ̥] are known. There is often a noticeable whistle through the voiceless one.

e.g. Twi (Ghana): [ẗɥ̥i] - "Twi", the name of the language

17.3.4 Clusters with [ɯɥ] and [ɯ̥ɥ]

Clusters with the velar approximants [ɯɥ] and [ɯ̥ɥ] also occur, but are rare.

SECTION III - OTHER AIR MECHANISMS

Chapter 18

Pharynx Air Mechanism

As mentioned in Chapter 2 (2.2) the air stream used in the production of speech sounds may be set in motion by one of three mechanisms: the lung, pharynx or mouth air mechanisms. The range of sounds produced by the lung air mechanism is very much greater than that produced by either of the other two mechanisms. This chapter will deal with the production of sounds with pharynx air and the following chapter with mouth air.

18.1 Production of pharynx air sounds

When the vocal cords come together to close the glottis, the lungs are shut off from the rest of the vocal tract. This is what happens when we hold our breath. The larynx with the closed glottis can move up and down in the trachea like a piston in a cylinder. When it moves up it pushes air out (egressive air) and when it moves down it draws air in (ingressive air).

If the larynx rises, and if there is also a closure in the mouth, the air in the pharyngeal cavity between the glottis and the mouth closure is compressed and it is this compressed air that will give rise to the air stream in making these sounds. When the mouth closure is released, the air goes **out** from the pharynx and past the point where the closure was. Thus a plosive with **egressive pharynx air** is produced. It is **egressive** because the air stream goes **out** of the mouth; and it is a **pharynx** air sound because the air stream originates from the compressed air in the pharynx.

Similarly, if you have a closure in the mouth and at the same time **lower** the larynx, then the air in the cavities above will be rarefied (made thinner) and suction will result. When you release the mouth closure, the air from outside will rush **in** past the mouth closure and **into** the pharynx, and you will get a plosive with **ingressive pharynx air**.

The pharynx air mechanism may be used for the production of a whole series of plosives, fricatives, affricates, clusters with approximants, vibrants and possibly other consonants. In practice the range of sounds produced with ingressive pharynx air is more limited than that with egressive. These sounds are often said to have a "glottalic air stream".

18.2 Consonants with egressive pharynx air

These are usually referred to as **ejectives**. As the initiating mechanism is the **closed** glottis, the sounds are all voiceless. The symbol [’] after the consonant or cluster indicates this air mechanism.

Sample symbols:

[pʼ] [kʼ] [tsʼ] [fʼ] [ɽ̥ʼ]

Sample technical name:

[kʼ] velar plosive with egressive pharynx air, or velar ejective

(Note that the term "aspirated" or "unaspirated" is not relevant in the description of these sounds.)

e.g. Hausa [kʼwα^{i}] - "egg"

All oral voiceless consonants except nasals and the pharyngeal fricative can be produced in this way. Note that because the air available is much less than for lung air sounds, voiceless fricatives with egressive pharynx air will have a very short duration, especially velar and uvular ones.

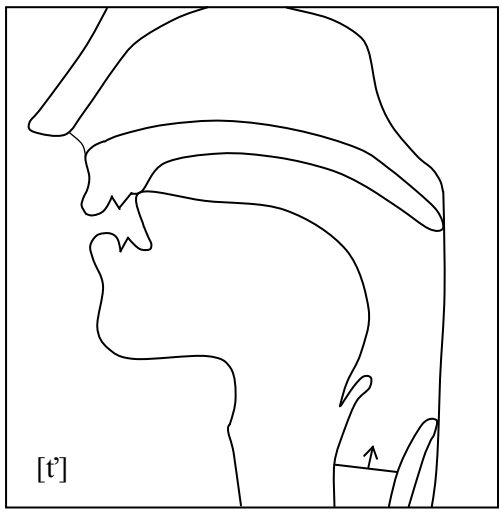


Figure 18.1

18.3 Consonants with ingressive pharynx air

These are usually referred to as **implosives**. They are characterised by a peculiar "popping" noise accompanying the release.

18.3.1 Voiceless ingressive pharynx air sounds

As a closure is formed in the mouth, the air stream is produced by a lowering of the larynx, with glottis closed, causing a slight suction or reduction of pressure in the mouth and pharynx. When the oral closure is released, air flows **in** from the outside into the pharyngeal cavity, and an **implosive** sound is produced. Although fricatives are possible with this mechanism, only plosives have been reported in languages. They occur in African languages, but are not common elsewhere.

Sample symbols: [ɓ] [ɗ] [ƙ] [k͡ɓ] (IPA has discontinued using these symbols)

Sample technical name:

[ɓ] voiceless bilabial plosive with ingressive pharynx air or, voiceless bilabial implosive

e.g.

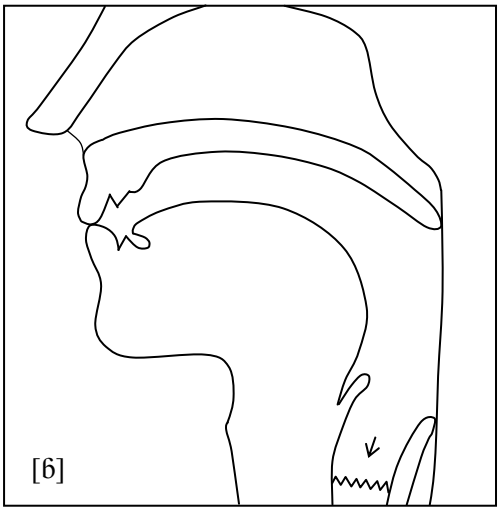
18.3.2 Voiced ingressive pharynx air sounds

Consonants with ingressive pharynx air can also be made voiced. These are very common in West Africa. In making these sounds there is, as for the voiceless ones, a closure in the mouth and the air stream is again produced by the **larynx moving down** causing a slight suction, or rarefying of the air. However, the glottis is not completely closed, so that the **vocal cords are allowed to vibrate** on an air stream from the lungs. This does not interfere with the suction, as the air passing out through the vocal cords is not enough to equalise the air pressure in the

pharynx. When the oral closure is released, air flows from the outside into the pharyngeal cavity, and a voiced implosive sound is produced.

Most people find that it is not possible to control this mechanism by conscious effort, but it is quite easy to gain control of it by mimicry. Or you can start by producing heavy voicing with the mouth closed. As you do you can feel with your finger that the larynx moves down. Do it again, but release the mouth closure whilst the larynx is still moving. Alternatively, making [b] and [ʔ] simultaneously may help.

Another way of getting the larynx to move down is to sing on the highest note followed by the lowest note. The larynx will move up and down. Second, do it silently. Third, say a [ɓ] during a "down" movement.



N.B. The ingressive pharynx air mechanism is shown by the arrow **above** the glottis pointing downwards.

Figure 18.2

Sample symbols: [ɓ] [ɗ] [ƒ] [ɠ] [ɠ͡ɓ]

Sample technical name:

[ɓ] voiced bilabial plosive with ingressive pharynx air or, voiced alveolar implosive

e.g.	Tera (Gombe):	[ɓala]	-	"talk"
		[ɗana]		"safe"
		[ɠa:ndi]		greeting

Chapter 19

Mouth Air Mechanism

An air stream may be set in motion by the tongue back making contact with the velum and then moving backwards, sucking air into the mouth. This is the action used when sucking through a straw. If there is a second closure in the mouth, in front of the velar closure, then, when this is released, a plosive with "ingressive mouth air" is produced. This air mechanism is sometimes called "ingressive velaric".

Although these sounds are plosives they are usually referred to as **clicks**. They are quite distinctive and occur in some languages in Southern Africa, including Zulu and Xhosa.

19.1 Consonants with ingressive mouth air

A **dental** click is the sound sometimes used by English speakers when reproving children, and is often written "Tut! Tut!".The **lateral** click, in which the side or sides rather than the centre of the tongue is released is sometimes used to encourage horses.

A face diagram for a click will need to show the **two simultaneous closures**, and an **arrow** in the mouth cavity pointing **inwards** indicating the mouth air mechanism.

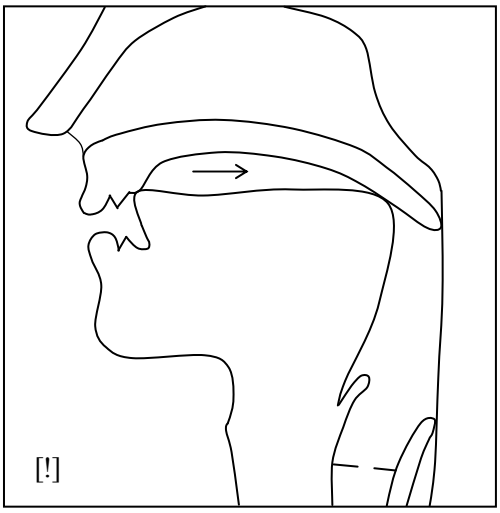


Figure 19.1

There are separate symbols for the more common clicks:

bilabial: [⊙]

dental: [ǀ]

alveolar: [!]

palatoalveolar: [ǂ]

lateral: [ǁ]

Sample symbol and technical name:

[!] voiceless alveolar plosive with ingressive mouth air or, voiceless alveolar click

e.g. Zulu (S. Africa): [ǁoǁ] - "to relate"

[!omα] - "to select"

The mouth air sounds may be released in a variety of ways, either directly into a vowel, or else followed by a glottal fricative, a glottal plosive, a voiceless velar fricative or voiceless velar plosive:

[!α] [!hα] [!ʔα] [!xα] [!kα]

19.2 Consonants produced with mouth air and lung air simultaneously

As the main initiation of the mouth air mechanism is at the velum, it is possible to have simultaneous voicing, with the velic passage either open or closed. If there is voicing, with the velic passage **open**, then a simultaneous [ŋ] is produced, and the face diagram would show the velic passage open and the vocal cords vibrating (in addition to the two oral closures). These sounds are called **nasalised clicks**. The nasalized dental click [ŋ͡!] is often used by English speakers as a mild expression of contempt.

If there is voicing with the velic passage **closed**, a simultaneous [g] would be produced. On the face diagram the vocal cords would be shown as vibrating (in addition to the two oral closures). These sounds are called **voiced clicks**.

Sample symbols: [ŋ͡!] (nasalised) and [g͡!] (voiced), etc.,

e.g. Nama (Namibia): [ŋ͡!ɑn] - "to put on"

Zulu (S. Africa): [g͡!inα] - "to wax a beehive"

SECTION IV – SUPRASEGMENTALS

Chapter 20

Stress, Length and Rhythm

Suprasegmentals are features which affect speech on a level beyond, or above, the segments (vowels and consonants). These features include stress, length, rhythm, pitch (tone), and intonation. Because these features are "above the segments", it sometimes feels as if they are less "measurable" and more difficult to record than actual segments. The ear possibly needs more training to accurately hear, record and produce suprasegmental features.

Suprasegmental features are used for various purposes in speech. Most of them can have a significant phonemic load, i.e. they may make a difference in the meaning of two words. Others are mainly important characteristics of a language. The following chapters will give more details.

20.1 Stress

In English words such as "demonstration" or "uninhibited" it will be noticed that some syllables are more prominent (i.e. they stand out more) than others. In words such as "convert", "rebel" or "convict" the meaning of the word is determined by which syllable is prominent. If the first syllable is prominent then the words are nouns, but if the second is prominent then they are verbs. Such prominence, in English or any other language, is commonly known as **stress**.

When a listener hears a syllable as stressed, he is hearing and reacting to a **combination** of things. **A stressed syllable is usually louder, longer, and on a higher pitch than an unstressed syllable**. Not all these things are necessarily involved, and languages combine them in many different ways.

The speaker uses more muscular energy in saying a stressed syllable than in saying the same syllable unstressed. The muscles of the rib cage will then contract more and so push more air out of the lungs. This affects the loudness. Increased activity of the muscles of the larynx will produce an increase of pitch. There may also be increased muscular activity at the place of articulation itself.

Strictly speaking there is no such thing as a totally unstressed syllable, but some syllables have more stress than others. The symbol used to mark stress is a raised dash [ˈ] before the beginning of the stressed syllable. If we need to mark more than one degree of stress (not necessary in every language), then the raised dash is used for the primary stress, a lowered dash [ˌ] for secondary stress, whilst tertiary stress is left unmarked. Thus the word *demonstration*

could be written "ˌdemonˈstration". Some dictionaries mark stress differently, but the system used would always be explained.

It is important to remember that in transcribing a language stress must be marked on any utterance of more than one syllable, otherwise the correct pronunciation will not be clear, and in a few languages there is a phonemic contrast, which has to be marked, e.g. in English:

[ˈɪnsɑ^{i}t^{h}] 'insight'
[ɪnˈsɑ^{i}t^{h}] 'incite'

However, in most West African tone languages stress appears to be irrelevant and does not have to be marked. Stress at sentence level might still be relevant.

20.2 Length

20.2.1 Vowel Length

The time of the production of a vowel may be increased, giving a lengthened vowel.

In English the length of the vowel depends on the vowel quality, the position of the vowel in a word and the other adjacent sounds. Experiments conducted on the speech of a particular person showed that the voiced vowel in the word "he" lasted 0.38 seconds, that in "heat" for 0.20 seconds, that in "hid" for 0.25 seconds, and that in "hit" for 0.19 seconds.

Although vowel length is not used in English to distinguish between meanings of words, it is in other languages, e.g. Hausa.

Sample symbol and technical name:

[uː] voiced close back rounded **lengthened** vowel with egressive lung air

e.g. English [ʃuː] - "shoe"
Hausa [tʃuːtaː] - "illness"

The IPA symbol consists of two small triangles [ː], but the two dots are commonly used. Whenever two degrees of lengthening need to be marked, [·] is used for the first degree, e.g. [a·], and [ː] for the second, e.g. [aː]. Sometimes the first degree of lengthening is known as extra half length.

20.2.2 Consonant Length

It is possible to change the duration of the articulation and thus produce **lengthened consonants**. For lengthened sonorant consonants or lengthened fricatives the sound simply continues for a longer time. For lengthened plosives the hold phase continues for a longer time than for non-lengthened plosives, and if the plosive is also voiced then the voicing is maintained during this hold phase. In languages such as Amharic the length of consonants is a feature which is used to distinguish between words.

There is usually no need to mark more than one degree of length in a language, but if there is, the first degree of length can be marked [·] e.g. [m·] and the second [ː] e.g. [mː]. (These are

often known as half length and double length, respectively.) When only one degree of length needs to be marked, the symbol [ː] is used, or the consonant symbol is repeated.

Sample symbol and technical name:

[mː]/[mm] voiced bilabial **lengthened** nasal with egressive lung air

e.g. Fula damːe "red fleas"
or damme

If you find long consonants difficult to hear at first, try listening for the **difference in rhythm** between a word with a long consonant and a word with a short consonant. For example, practice on the following minimal pair:

e.g. Nambiquara (Brazil): [αɪtɛɾαwα] - "I want to hunt"
[αɪtːɛɾαwα] - "I want to walk"

How much longer than a short sound a lengthened sound is, varies from language to language.

20.3 Rhythm

Rhythm is a suprasegmental feature (a feature superimposed on the syllables) together with stress, pitch, intonation and length.

It is easy to forget all about rhythm, but it is much more important to language learning that one would care to know. Take a non-native English speaker who speaks English with correct pronunciation, and hardly makes a grammatical mistake. How can you hear that the person is not a native speaker? He or she doesn't have the correct rhythm: this is the common answer. He or she is probably using the rhythm of the mother tongue.

Various definitions of rhythm:

- from Crystal, Dictionary of Linguistics and Phonetics: "... the perceived regularity of prominent unities of speech."
- from Laver, Principles of Phonetics, p. 152: "Rhythm is the complex perceptual pattern produced by the interaction in time of the relative prominence of stressed and unstressed syllables."
- from Hayes, Metrical Stress Theory, p. 31: "... regular succession of weak and strong stresses."

The factors these definitions have in common are: regularity/pattern, and prominence/stress. Various combinations would create certain kinds of beat/rhythm. Maximally regular patterns are found in poetry, the patterns would be metrical, one such is a trochee. Natural language stress patterns are not as regular as in poetry and music, with perfectly regular intervals. Speech deliberately produced in this way sounds quite odd (see Hayes p. 28-31).

There are two main kinds of rhythm: stress-timed (stress-based) and syllable-timed (syllable-based).

20.3.1 Stress-timed rhythm

The definition according to Laver, (1994: 156): “when a language shows a rhythmic patterning perceived as based on the intervals between stressed syllables tending to sound approximately equal.” English, German, Arabic and Russian are some stress-timed languages.

The definition according to Crystal (1991: 329): “The stressed syllables recur at regular intervals of time, regardless of the number of intervening unstressed syllables.” “...tendency to regularity...”

The definition according to the SIL Language Learning Handbook, p. 35: “the stressed syllables in an utterance **tend** to come at regular intervals with a varying number of less stressed syllables in between.”

The definition according to O’Connor, (1973: 197): “Rhythm is based on the stressed syllable. Utterances are broken up into groups of syllables each of which contains one and only one stressed syllable.”

Laver again (1994: 157): “The unstressed syllables are compressed in time, more or less in proportion to the number of syllables in the rhythmic unit (or foot). This compression usually takes the form of **vowel reduction**, making the vowel shorter, less loud, lower in pitch and more central in quality.”

Compare “The man laughed” and “The manager laughed”. The syllables [mæːn] and [lɑːft] are stressed in both, but (the length of) [mæn] is very much shorter in “manager” than in “man”, because there is a rather strong tendency for the syllables between stresses to be compressed into the same time; so we say the word “manager” in not much more time than “man”. It follows that the syllables “na.ger” have to be said very short. (Example from O’Connor, (1973: 197))

Another example (from O’Connor, (1973: 238)) is:

- 'nine 'famous 'men
- 'nine 'ignorant 'men
- 'nine 'terrifying 'men

Here one would compress the syllables in the words “famous” and “ignorant” so that they don’t take up more time than “nine” and “men”. One would try to do the same with “terrifying”, but since there is a limit to the number of syllables which can be articulated in a given space of time, this word might take a bit longer. However, there is **this strong tendency to have the stress occurring on a regular beat**, so one would try to get all the syllables in at the same time as in the other utterances. This gives a very typical rhythmical character to the language, sort of bursts of energy, and can give the impression that the speaker is angry.

The SIL Language Learning Handbook (pp. 34-36) has more examples. Try to get a regular beat with your hand on something, and practise to get the varying number of unstressed syllables in a stress-group (also called “foot”) in at the same time**, so that each stress-group takes about the same time**.

20.3.2 Syllable-timed rhythm

Definition according to Laver (1994: 157): “When a language shows a tendency for every syllable to be heard as lasting very approximately for the same amount of time”.

Examples of syllable-timed languages are French, Spanish, and Yoruba and most other West African languages.

In a syllable-timed language there is no tendency for the **stressed** syllable to fall at regular intervals, it is rather the **syllable** (stressed or unstressed) which is in focus. The rhythm is dominated by the **syllables which tend to follow each other at regular intervals**.

As examples read a couple of sentences in some language with syllable-timed rhythm, and then the some sentences with stress-timed rhythm. Also refer to the examples above of stress-timing, get the beat and say the longer phrases with syllable-timing. It does not fit the beat.

A language does not have to be either stress-timed or syllable-timed. Japanese is an example of another kind of languages which have **mora-based rhythm**. A mora is the phonological length of a light syllable. In such languages (very few) it is the **syllable weight**, not the stress, which is the determining factor.

20.3.3 Vowel elision

One effect of rhythm is the loss of a vowel in a syllable to smooth the transition from one word to the next. The loss is referred to as **elision**. This procss occurs in both stress-timed and syllable-timed rhythm. In (stressed-time) English, the sequence *I am* is commonly reduced to *I’m* by the elision of the vowel of *am*. Similarly, in (syllable-timed) Yoruba, the sequence *eku ile* (greeting at home) is regularly reduced to *ekule*, with the elision of the first vowel of *ile*. Vowel elision typically occurs when a word ending in a vowel precedes a word beginning with a vowel, but it is not automatic or obligatory. In English, the vowel of *am* is retained if the word is stressed, e.g. *I* am *coming.*

Chapter 21

Intonation and Tone

Intonation and tone are two aspects of the change of pitch which occur in speech. However, they are quite distinct and have to be considered separately.

21.1 Intonation

No language is spoken on a monotone. There is always some variation in the pitch of the voice, giving rise to the characteristic "tunes" of a language. The tune may comprise pitch, stress, length, speed, vowel quality, and possibly other features. The term "intonation" refers to the pitch variation only, although the other features may be noted.

In English, intonation is used a great deal and a fair proportion of the emotive meaning of an utterance is carried by the intonation. In listening to a person speaking on a telephone, we soon realise that a wide area of meaning can be given to the words "yes" and "no" by the intonation that is used. They may convey anything from mild agreement or disagreement to excited surprise. Some speakers may have a generally high "register" and others a lower one. Some speakers will have a wide variation between the high and low notes in speech, others will have a much narrower one. A given speaker may use a wide variation (or "wide band") when telling a story animatedly as to children, and a narrow variation (or "narrow band") on other occasions. A speaker using a narrow band tends to sound dull or uninteresting to English ears.

In **learning to speak a language** it is not only essential to pronounce the sounds correctly and put the words in the correct order, but also **to use the correct intonation patterns**. Use of the wrong patterns may either alter the intended meaning, or simply sound "foreign".

The intonation patterns of any language are:

- significant, carrying a definite part of the meaning, perhaps most importantly about the speaker's own attitude to the topic under discussion, to the listener, to the situation, etc.
- characteristic, in that each language has its own patterns of intonation, just as it has its own sounds and its own grammatical constructions.

In each language there is a clearly defined number of preferred intonation patterns. E.g., it must not be assumed that because surprise or disappointment is signalled by a certain intonation, or tune, in English, the same will be true of other languages.

21.2 Tone

All languages have intonation, but in addition to this a large number of languages are so-called "**tone languages**". In these languages variations in pitch affect the **lexical and/or grammatical meaning** of a word, whilst intonation affects the emotive meaning of the word or utterance. For example in Bassa of Liberia, the word [bɑ:] can mean "concerning", "to pray",

"a term of address to one's father", "father's", "an animal", "lead" (the metal), or "plant it" (imp.), according to its relative pitch; whilst the word [g͡bɑ:] can mean "palm worm", "shelter", "to make a roof", "to redeem", "hat", or "spread it"' according to the relative pitch of that word. One writer commented that in West Africa words consist of tones, consonants and vowels!

When considering tone, it needs to be emphasised that the concern is not with the **absolute** pitch, but with the **relative** pitch of all words or syllables in relation to each other.

When there is interaction between pitch and intonation, it is doubly important to recognise that it is the relative and not the absolute pitch of a syllable which has to be considered.

Stated in its simplest form, there are two main types of tone languages: **level tone languages** and **contour tone languages**.

21.2.1 Level tone languages

In these there is a series of two, three, four or even five levels. Usually the pitch of any syllable is described in terms of these levels. Usually t**he pitch of a syllable is level** in itself, and there is a definite step from one level to another. Glides do occur, and any gliding pitches are described in terms of a glide from one level to another: high to mid, mid to low, or low to high, etc. Many African and American Indian languages are of this type. They have, in short, "more levels than glides".

This simple picture may be modified by the fact that certain sequences of tone, e.g. three high tones in a row may not be "permitted" by the rules of the language, so that certain changes (**perturbations**, or **tone sandhi**) have to take place. All this, however, is described in terms of the main levels.

21.2.2 Contour tone languages

In these languages **glides** are more common than level tones, and the **contour**, or **shape**, of each tone is distinctive, rather than the relative level, or height, of each tone. In a true contour tone language each tone will have a distinct contour (level, rising, falling, falling-rising, etc.) though many languages which are basically contour tone languages do contrast tones of the same shape at different pitch levels. Many Far Eastern languages are of this type. They have, in short, "more glides than levels".

21.3 Analysis of intonation and tone

In the collection of any linguistic data note must be taken of pitch variations right from the very beginning. One way of recording such is to set out the data with plenty of space between lines and with a set of parallel lines drawn above each line of data. The tonal contour of the utterance is then recorded within these lines (or, record it above the data without lines). (See below.)

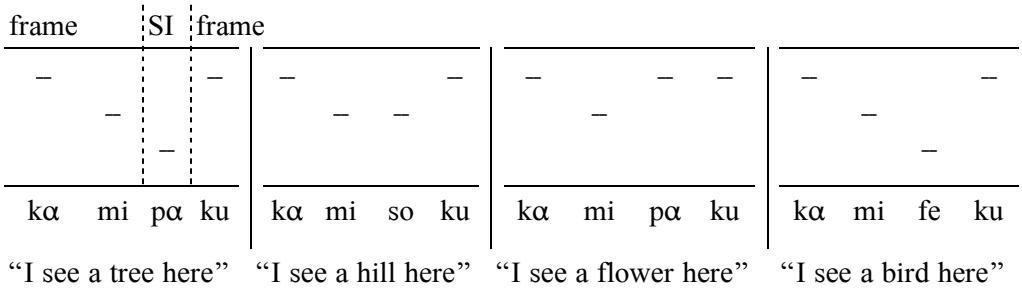
If it appears that very similar utterances have different pitch patterns and different meanings, then it may well be that the language is tonal, and further analysis must be undertaken.

For analytical purposes use is made of a **tone frame**. For example, it is possible to compare a series of words, each of which will fit into the sentence "I see a .... here". In the example below, the words "I see a .... here" form the **tone frame**. Assuming that the pitch of the frame is not modified by the pitch of the substituted item, then the pitch of the frame forms a fixed point of reference against which the pitches of the substitute items may be measured. This may be illustrated in the following hypothetical example:

Frame:	"I see a ..... here"			[kɑmi ..... ku]		
Substitution items (SI):	"tree"	-	[pɑ]	"hill"	-	[so]
	"flower"	-	[pɑ]	"bird"	-	[fe]

"I see a tree here": [kɑmipɑku]; "I see a hill here": [kɑmisoku] etc.

The relative pitches after checking may be marked between a pair of parallel lines as follows:



The parallel lines mark the highest and lowest limits of pitch variation, whilst the dash above each syllable indicates its pitch in relation to that of the others.

In this example the syllables [kɑmi .... ku] "I see a .... here", form the tone frame into the middle of which the other items are substituted. In this way they can be compared with a point of fixed tone and thus with each other. It will be seen that the pitch of [pɑ] "tree", and [fe] "bird" are below the frame (they need to be compared in a frame containing an adjacent low tone); [so] "hill" is level with the second syllable of the frame, whilst [pɑ] "flower" is higher than the second syllable of the frame and level with the first and last syllables. The words for "tree" and "flower" differ only in tone. The frame allows their comparison to be made.

A series of steps in the analysis of tone might be as follows:

Step 1. Select words which are of the **same grammatical class**, so that they can fit into the same frame. The words should also have a **similar syllable and stress pattern**, and, if relevant, **similar vowel** and **consonant length**. For example one could choose disyllabic nouns of a CVCV pattern.

Step 2. Assuming that the language assistant can read, prepare the list so that he can read it. Have the assistant say the words in isolation (if this is possible), and note the relative pitches of the syllables of each word, i.e. note whether the second syllable is higher than, level with, or lower than the first syllable, etc. Note any of the syllables which have gliding pitch, preferably put them aside to check separately.

It is wise to have the language assistant read the list twice, the second time in a different order in case there are factors of intonation which may affect the reading of a list (especially at the end). This step is only an initial sorting of the words and not the main checking.

If the language assistant doesn't know how to read (and in many field situations he may not be able to do so), you can still make progress by prompting him with the translations of the word list into the trade language. In the extreme cases when the language assistant can neither read nor understand the trade language, you can prompt him by your attempted pronunciation of the words in the vernacular. A true native speaker is unlikely to mimic your wrong pronunciation of tone when he has been used to doing it right all his life.

Step 3. Re-arrange the words into groups convenient for checking, e.g.:

(a) those in which the second syllable was thought to be higher than the first;
(b) those in which the second syllable was thought to be level with the first;
(c) those in which the second syllable was thought to be lower than the first.

These lists should then be read by the language assistant to check on the analysis thus far. Depending on the number, either check each list separately or in the same list but without mixing them. Always try to be consistent.

Step 4 Find a suitable experimental **frame** for the words. There are several requirements for a good frame:

- The frame and the substitution item together should form a sentence that makes sense in the target language. Thus, for instance, if the word list is a list of nouns, then a good frame would have a verb in it so that the substitution words could be subjects or objects of the verb.
- There should be a bit of the frame **preceding** the substitution slot and a bit of the frame **following** it. If that is the case, then the words in the substitution slot do not come either at the beginning or at the end of a phrase. The beginning and end are danger points because there the words to be checked may be affected by pitch changes.
- It is sometimes not possible to find a frame with both a preceding and a following part. If so, the words must be checked several times, both with a frame preceding the items and a frame following them.
- There should be **several syllables** in the frame, and, preferably, one of the syllables in the frame should be on a high pitch. (This high-pitched syllable is then a good reference point for all the other pitches in the whole phrase formed from the frame and the substitution items.)

A frame consisting of a single syllable is of very limited use. Use such a frame only if you can't possibly find any other.

There are times when the frame will change the tones on the **substitution** items when they are put in the frame. If this happens, the only thing to do is to try other frames in the hope that sooner or later you will find a frame where it doesn't happen.

There are also times when the substitution items will change some of the tones on the **frame** - usually the last tone in the frame before the substitution item. Again, the best thing to do is to try other frames.

Step 5 Decide if you want to start checking the first or second syllable of the words and compare it with the frame. If the preceding part of the frame ends on a high pitch, then compare that tone with the first syllable of the substitution items. Vice versa, if the post-frame starts on a high pitch, compare the second syllable of the substitution items with that one.

Listen while the language assistant repeats the frame with the various substitution items. Listen to the pitch patterns as each utterance is repeated. Whistle them and try to get the language assistant to whistle them, too (or hum if he doesn't whistle). Keep in mind all the time what you are listening for, the tone of the first or the second syllable.

The listening (checking) can be done in two ways. One way is to listen to all the items one by one several times. After noting down the pitch patterns, the ones marked as having the same patterns need to be checked against each other, to be safe by using one of them as the reference point.

Another way is to use no. 1 as the reference point from the beginning and to compare all the other words with no. 1, in the same way as sounds are usually checked. This should produce a number of "sames" which then only have to be read one after the other to make sure they do have the same pitch. The ones different from no. 1 will then have to be checked in the same way, using the first "different one" as no.1, etc. until all the words are checked and in consistent lists. Their actual pitches will then have to be marked.

As you note down the pitch patterns, the following are some of the most common possibilities:

Syllables may be heard to have pitches higher than, level with and lower than the frame. In this case the frame is a mid tone, but it must not be assumed that there is only one mid tone. The words that are higher and lower than the mid tone frame would need to be compared with a high and a low frame respectively. If all those syllables whose pitch were above that of the mid tone frame are shown to be high tone by being level with the high tone frame, and all those syllables whose pitch were lower than the mid tone frame are shown to be low tone by being level with the low tone frame, then it can be assumed that there is only one mid tone.

Step 6 Step 5 will help decide about the tone of **one** of the syllables of the words, but it may prove necessary to repeat the procedure to decide the tones of the other syllables, or the limits of tone glides. Other frames may be needed for this.

21.4 Marking tone and intonation

21.4.1 Marking Tone

In a phonetic transcription the notation of the relative pitches of the syllables between a pair of parallel lines should prove not only adequate, but also to be the most accurate system of

marking. However, as one becomes more familiar with the language, or gets near the time for a decision on an orthography for the language, then a simpler form of notation is needed. There are several systems in use, three of the most common being:

1. The use of **accents over the syllables**, see examples below. The actual meaning of the accents will have to be stated (see below).

2. The use of **small raised numbers after the syllables**. Some systems take number 1 as high tone, others as low tone.

Examples:	1. **accents**	2. **numbers**
high tone	lá	la^{1}
mid tone	lā	la^{2}
low tone	là	la^{3}
high-low fall	lâ	la^{1-3}
low-high rise	lă	la^{3-1}

3. The use of **extra letters** at the end of syllables. These may be letters of the alphabet which are not otherwise used in the orthography, or else letters which are used to signify certain sounds in the language, but which do not occur at the end of syllables. In the Meo language of S.E. Asia, e.g., there are no final consonants, so certain consonants are used in the Roman orthography to signify the tones:

-b	high tone	-j	falling tone	-v	rising tone
-s	low tone	-g	breathy	-	(unmarked) mid tone
-m	low glottalised				

4. A similar system is used in Lisu (Thailand), but in this case the six tones are marked with **punctuation marks**:

. high staccato tone, always with a short vowel
, mid rising tone
.. mid level tone
., mid level with slight rise at the end
: low falling tone
; low staccato tone, always with a short vowel

Thus in the script one can have these words in Lisu:

Ho. “to pour out”
Ho, “to be compatible”
Ho.. “to argue”
Ho., “iron”
Ho: “to pour into”

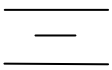
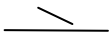
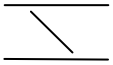
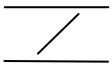
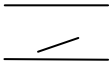
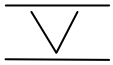
21.4.2 Marking intonation

We give below three possible ways of marking intonation:

Column I uses a marking between two **parallel lines above the data**. Column 2 draws the contour **through the word itself**, but this is messy and not very clear. Column 3 uses an **accent mark before the word**.

If you use the method in column 2 you should by all means **avoid** the bad habit of indicating intonation contours by vague **wavy** lines at no well defined levels. Such contours are impossible for anyone other than the original transcriber to interpret, and often he is unable to read them after a lapse of time.

The following examples of the English word “no” may help to illustrate these three ways of marking intonation:

	1.	2.	3.	Most common meaning
level	 no	no	˗ no	sad; lacking in interest
low-fall	 no	no	˧ no	non-committal
high-fall	 no	no	ˋ no	insistent
high-rise	 no	no	ˊ no	surprise
low-rise	 no	no	˨ no	mild surprise
fall-rise	 no	no	˅ no	doubtful or encouraging
rise-fall	 no	no	ˆ no	sharp, insisting

21.5 Pitch accent languages

In talking about stress, we were considering languages where words have one syllable (or sometimes more than one syllable) that carries stress. Often an increase in energy is needed to articulate the syllable; this results in the stressed syllable being more **prominent**. Such languages could be called **stress accent languages** or **intensity accent languages**.

By contrast, there is another kind of language called **pitch accent languages**. There are quite a number of them in Papua New Guinea and some in East Africa. In these languages, words also have a prominent syllable, but that prominence comes in the form of **high pitch** on the syllable, rather than the high energy on a stressed syllable in a stress accent language. The other syllables in the word, i.e. the non-prominent ones, tend to carry a rather indeterminate, default (non-contrastive) pitch, which can be anywhere from mid to low (and sometimes even almost high), depending on the pitch environment.

There are two difficulties that native speakers of European languages (which are mostly stress accent languages) will most likely experience when learning a pitch accent language:

The first is to mistake the high pitch for stress. That is to say, the foreigner will pronounce a syllable with intensity stress, where the native speaker would pronounce it with high pitch. This sounds very foreign.

The second mistake is to suppose that the unaccented syllables must all take a low pitch. In fact, in a pitch accent language, as mentioned above, the unaccented syllables take a default (non-contrastive) pitch, which can be anywhere from quite low to quite high, depending on surrounding syllables.

APPENDICES

I. THE VOWEL/CONSONANT DISTINCTION

It may have become clear as the course has progressed that there are problem areas in Phonetics, and one of these is the way we define and classify vowels and consonants. The usual definition of a vowel is "a central sonorant" (see 13.1. and Figure 3.2 p.22), but later, when we came to the approximants corresponding to vowels, in Chapter 17, we found that there were certain apparent vowel sounds that we wanted to call consonants. Either our definition or our terminology (or both) seems to need revising.

What then is a vowel? Many people consider a vowel to be necessary to form a syllable, and a quick investigation seems to bear this out. More thought shows us, however, that this will not hold - we do not even have to refer to African languages with syllabic consonants. An English word like [ˈsædn̩] has two syllables, undoubtedly, but only one vowel.

It is a combination of these two approaches (purely phonetic, and syllabic) that K.L. Pike used when he suggested a solution in his book *Phonetics* (1943). In his phonetic approach he tries to exclude any reference to linguistic function. That is a good thing to do, because as we confront a new, unknown language, we must not "import" ideas which we have gained from a knowledge of our own languages.

Pike introduced the terms **vocoid** and **contoid**. A vocoid is defined as a central resonant oral sound. Contoids are all other sounds. Viewed like this, therefore, sounds like [i], [j], [w], and [ɹ] are all vocoids.

Pike, then, looks at the phonetic sounds (the contoids and vocoids) of a language in a different way - he examines their function (part of phonemics) to see if the sounds form the centre (nucleus) or the margin of syllables for that particular language. In this way we end up with four categories:

1. **syllabic vocoids**
2. **non-syllabic vocoids**
3. **syllabic contoids**
4. **non-syllabic contoids**

Syllabic vocoids and non-syllabic contoids are those most commonly found, and Pike retains the terms "vowel" and "consonant" for these, respectively.

Thus, we now have a means of approaching a new language without phonemic notions.

To summarise, there are two approaches to the sounds of a language:

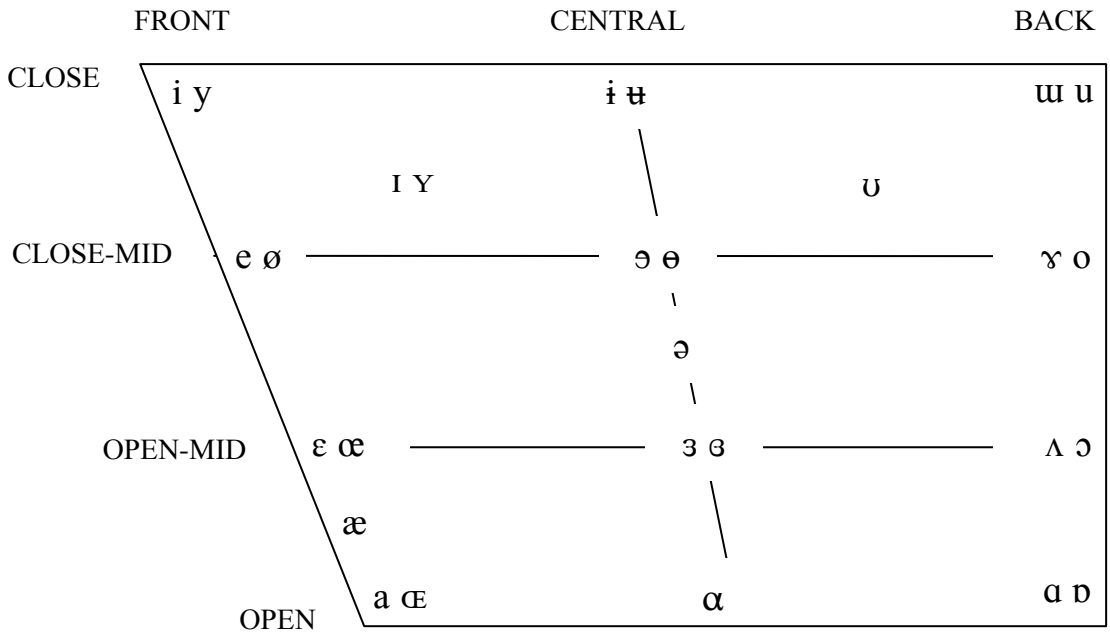
- a **phonetic** approach (the sounds are vocoids and contoids)
- a **phonemic** approach (the sounds are vowels and consonants)

II. CONSONANT CHART

CONSONANT CHART

MANNERS OF ARTICULATION			PLACES OF ARTICULATION										
			Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Retro-flex	Alveolo-palatal	Palatal	Velar	Uvular	Pharyn-geal	Glottal
PLOSIVES	Vl.	asp.	pʰ		t̪ʰ	tʰ		ʈʰ		cʰ	kʰ	qʰ		
		unasp.	p		t̪	t		ʈ		c	k	q		ʔ
	Vd.	asp.	bʰ		d̪ʰ	dʰ		ɖʰ			gʰ			
		unasp.	b		d̪	d		ɖ		ɟ	g	ɢ		
CENTRAL FRICATIVES	flat	Vl.	ɸ	f	θ	ɹ̥˔				ç	x	χ	ħ	h
		Vd.	β	v	ð	ɹ˔				ʝ	ɣ	ʁ	ʕ	ɦ
	grooved	Vl.			s̪	s	ʃ	ʂ	ɕ					
		Vd.			z̪	z	ʒ	ʐ	ʑ					
LATERAL FRICATIVES		Vl.			ɬ̪	ɬ								
		Vd.			ɮ̪	ɮ								
NASALS		Vd.	m	ɱ	n̪	n		ɳ		ɲ	ŋ	ɴ		
FLAPS		Vd.		ⱱ	ɾ̪	ɾ		ɽ						
TRILLS		Vd.	ʙ		r̪	r						ʀ		
LATERAL APPROXIMANTS		Vd.			l̪	l		ɭ		ʎ	ʟ			
CENTRAL APPROXIMANTS	–unrounded	Vl.								j̥	ɰ̊			
		Vd.	β̞	ʋ		ɹ		ɻ		j	ɰ			
	-rounded	Vl.								ɥ̊	ʍ			
		Vd.								ɥ	w			

III. VOWEL CHART



In pairs of symbols, the one on the left is always unrounded, the one on the right rounded. ʊ is rounded, æ unrounded and ə neutral.

IV. Symbols of Modifications

MODIFICATION OR FEATURE TO BE MARKED		WITH VOWELS	WITH CONSONANTS
Affricates	- flat		e.g. pɸ, bv, tθ, gɣ
	- grooved		e.g. ts, ts^h, dz, dz^h tʃ, $tʃ^h$, dʒ, $dʒ^h$
Apical		-	t̪, d̪
Aspiration	- voiceless	-	t^h
	- voiced	-	d^h
Breathy voiced		e̤	r̤
Centralisation		ë	
Final consonants	- unreleased	-	αp˺, αb˺
Dental		-	t̪
Fortis & lenis, resp.		-	s̪ , s̬
Gliding articulation		$ɛ^i$, $^iɛ$	-
Labialisation		-	k^w
Laminal		-	d̻
Laryngealisation		ḛ	n̰
Length	- long	eː	mː
	- half-long	e·	m·
Mid-centralisation		ă	-
Nasalisation		ẽ	w̃
Palatalisation		-	t^j
Pharyngealisation		$ɑ^ʕ$	$t^ʕ$
Prenasalisation		-	^{m}b, ^{n}z
Retroflexion (rhoticity)		e˞	ʈ
Simultaneous articulation		-	k͡p, ŋ͡m
Stress	- primary	ˈtɑtɑ	
	- secondary	ˌtɑtɑˈtɑ	
Syllabic		-	n̩, l̩

Tongue position	- raised	e̝	ɪ̝
	- lowered	e̞	ɪ̞
	- advanced	o̟	k̟
	- retracted	e̠	k̠
Tongue root position			
	+ ATR (advanced)	e˖	-
	–ATR (retracted)	e˗	-
Transition	- close	-	αtⁿpα, αdⁿbα
Velarisation		-	lˠ
Voicelessness (& devoicing)		e̥	m̥, r̥, z̥

OTHER AIR MECHANISM SOUNDS	
Egressive pharynx air (ejectives)	[p’], [t’], [c’], [k’], [q’], [ts’], [tʃ’]
Ingressive pharynx air (implosives)	[ɓ], [ɗ], [ʄ], [ɠ], [ʛ], [ɗ], [ʄ], [ɠ]
Mouth air (clicks)	[ǀ], [ǃ], [ǂ], [ǁ], [ŋ͡ǃ], [g͡ǃ]

V. International Phonetic Association Alphabet (revised to 2005)

CONSONANTS (PULMONIC)

	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Retroflex	Palatal	Velar	Uvular	Pharyn-geal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant.

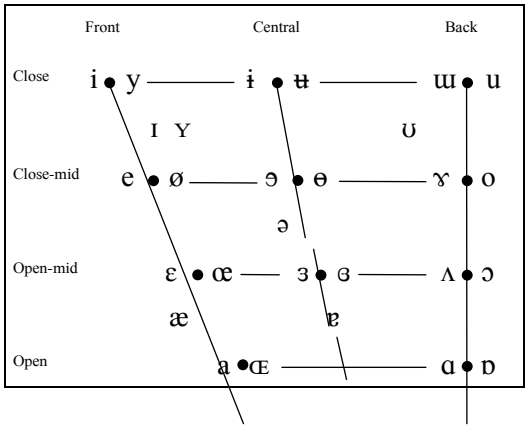
CONSONANTS (NON-PULMONIC)

Clicks		Voiced implosives		Ejectives	
ʘ	Bilabial	ɓ	Bilabial	’	as in:
|	Dental	ɗ	Dental/alveolar	p’	Bilabial
!	(Post)alveolar	ʄ	Palatal	t’	Dental/alveolar
ǂ	Palatoalveolar	ɠ	Velar	k’	Velar
‖	Alveolar lateral	ʛ	Uvular	s’	Alveolar fricative

SUPRASEGMENTALS

ˈ	Primary stress		ˌ	Syllable break	
ˌ	Secondary stress		|	Minor (foot) group	
ː	Long	eː	‖	Major (intonation) group	
ˑ	Half-long	eˑ	#	Pause	
˘	Extra-short	ĕ	‿	Linking (absence of a break)	

VOWELS



OTHER SYMBOLS

ʍ	Voiceless labial-velar fricative	ɺ	Voiced alveolar lateral flap
w	Voiced labial-velar approximant	ɧ	Simultaneous ʃ and x
ɥ	Voiced labial-palatal approximant	Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary.	
ʜ	Voiceless epiglottal fricative	t͡s k͡p	
ʢ	Voiced epiglottal fricative		
ʡ	Epiglottal plosive		
ɕ ʑ	Alveolo-palatal fricatives		

DIACRITICS

◌̥	Voiceless	n̥ d̥	◌̤	Breathy voiced	b̤ a̤	◌̪	Dental	t̪ d̪
◌̬	voiced	s̬ t̬	◌̰	creaky voiced	b̰ a̰	◌̺	Apical	t̺ d̺
◌ʰ	Aspirated	tʰ dʰ	◌͡◌	Linguo-labial	t̼͡ d̼͡	◌̻	Laminal	t̻ d̻
◌̹	More rounded	ɔ̹	◌ʷ	Labialized	Tʷ dʷ	◌̃	Nasalized	ẽ
◌̜	Less rounded	ɔ̜	◌ʲ	Palatalized	tʲ dʲ	◌ⁿ	Nasal release	dⁿ
◌̟	Advanced	u̟	◌ˠ	Velarized	tˠ dˠ	◌ˡ	Lateral release	dˡ
◌̠	Retracted	i̠	◌ˤ	Pharyngealized	tˤ dˤ	◌̚	No audible release	d̚
◌̈	Centralized	ë	◌̴	Velarized or Pharyngealized	ɬ			
◌̽	Mid-centralized	e̽	◌̝	Raised	e̝	ɹ̝	(= voiced alveolar fricative)	
◌̩	Syllabic	n̩	◌̞	Lowered	e̞	β̞	(= voiced bilabial approximant)	
◌̯	Non-syllabic	e̯	◌̘	Advanced tongue root	e̘			
◌˞	Rhoticity	e˞	◌̙	Retracted tongue root	e̙			

Diacritics may be placed above a symbol with a descender, e.g. n̊

TONES AND WORD ACCENTS

LEVEL TONE			CONTOUR TONE		
Extra high	˥	˩	Rising	˧˥	˩˧
High	˦	˨	Falling	˥˩	˧˩
Mid	˧	˧	High rising	˦˥	˨˦
Low	˨	˦	Low rising	˨˧	˩˨
Extra low	˩	˥	Rising-falling	˩˥˩	˧˥˧
Downstep		↓	Global rise		↗
Upstep		↑	Global fall		↘

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Index

Index of Languages