THE VOCAL TRACT

The Articulators

Having passed through the larynx, the air will undergo further changes as it makes its way upwards towards the mouth. The air passages above the larynx are known as the vocal tract (or supralaryngeal articulatory system). The vocal tract can be divided into the oral tract (the mouth and pharynx), and the nasal tract (within the nose). On average, the total length of the vocal tract (from the larynx to the lips/nostrils) is some 17 cm. (in men). The upper cavities of the pharynx, mouth and nose are called the resonating cavities. The parts of the vocal tract that can be used to form sounds are called articulators. The latter can be subdivided into active (those that move, e.g. tongue) and passive (those that are fixed, e.g. hard palate). Most sounds are produced with at least one active and passive articulator. When an articulator interacts with another, its said to articulate with it. For instance, in the production of the sound /b/, the lower lip articulates with the upper lip.

The Pharynx

The pharynx is a funnel-shaped muscle tube of ca. 8-12cm in length. It stretches from the larynx and oesophagus, past the epiglottis (see below) and the root of the tongue, to the area in the rear of the velum (see below). A muscle (sphincter) keeps the passage between the pharynx and the oesophagus closed except when swallowing.

The pharyngeal cavity is traditionally subdivided into three parts. At its top end, the pharynx is divided into two parts: the oropharynx, which is at the back of the mouth and covers the area between the root of the tongue and the velum; and the nasopharynx, which is situated opposite the entry to the nasal cavity (the nose). The lowest part (between the glottis and hyoid bone) is known as the laryngopharynx.

The shape, length, and volume of the entire chamber can be modified by the constrictive action of the muscles enclosing the pharynx, the movement of the back of the tongue, and by the position of the velum, which, when raised, excludes the nasopharynx. A result, it is in the pharynx that the voice pattern (distinctive voice quality) of an individual person is formed.
The Epiglottis

The epiglottis (or epiglottal fold) is a leaf-like cartilage which is attached to the anterior (forward) part of the thyroid cartilage, and to the root of the tongue. Its primary function is to cover the entrance to the larynx during swallowing, thus preventing food from entering the trachea. As the epiglottis is joined with the root of the tongue, the whole can be drawn back and down towards the wall of the pharynx in the production of, for instance, Arabic pharyngeal sounds.

The Velum

The velum (< Lat. ‘veil’, in reference to its soft membranous appearance), or soft palate, is a thin sheet composed of muscle fibres, tissue, blood vessels, nerves, and glands. Its main function is to separate the nasal cavity from the oral cavity (the mouth). If the velum is raised, it presses against the posterior (back) wall of the pharynx, and prevents air from going through the nose. This is known as velic closure, and occurs in the production of so-called oral sounds. If the velum is lowered, air passes through both the nose and mouth. If a lowered velum is combined with an obstruction at some point in the oral cavity, the resultant sound is nasal. Sounds which are pronounced with simultaneous oral and nasal articulation are said to be orinasal.

It has to be said that many people do not fully raise their velum in the production of oral sounds, which means there is some escape of air through the nasal cavity. Speakers who habitually leave the velum too much down produce what is known as nasalized speech, which is commonly called a nasal ‘twang’. This type of nasalized speech can also be heard when people have a cold, for instance. If one is unable to make an effective closure because the soft palate itself is defective or because an abnormal opening in the roof of the mouth gives access to the nasal cavity (as is the case for instance in people with a cleft palate), there will be an overall nasalization of the vowels and the failure to pronounce, for instance, /b/, /g/, /d/.

Sounds like /g/ or /k/, whereby the back of the tongue is in contact with the lower side of the velum are called velar consonants.
The Uvula

The *uvula* (< Lat. ‘little grape’) is a small fleshy flap of tissue that hangs in the back of the mouth and is the extension of the soft palate. Sounds articulated with the back of the tongue and the uvula are called *uvular*. An example of a uvular sound is the first consonant in the French word *rouge* (/ʁuʒ/). Velar and uvular sounds used to be known collectively as *guttural* (< Lat. guttur, ‘gullet’).

The Hard Palate

The *hard palate*, which is often simply called the *palate*, or the *roof of the mouth*, is the vaulted bony structure that lies just behind the *alveolum* (see No. 7). When the forward part of the tongue touches the hard palate, the resultant sound is said to be *palatal*: e.g. the initial consonant in the English word *yellow* (/ˈjeləʊ/).

7. The Alveolum

The *alveolum* (*alveolar ridge, teeth-ridge*) is the projecting grooved bony protrusion immediately behind the upper teeth. Sounds produced with the tongue touching this part are said to be *alveolar*: e.g. the initial and final consonants in the English word *sin* (/sɪn/).

The Tongue

The *tongue* is the most mobile articulator (with the tip, for instance, being capable of movements of up to 9 times per second) and can take up an almost limitless number of positions, both vertically and laterally. The versatility of the tongue can also be felt during eating as its main physical function is to move the food around in the mouth and pharynx during chewing and swallowing. The tongue is the principal agent in the formation of *vowel sounds*. The various parts of the tongue are (from back to front): root – back (the part facing the soft palate) – front (opposite the hard palate) – blade (the part facing the teeth-ridge) – tip (apex). The edges of the tongue are called the *rims*. 
In the production of vowels, the tongue tip usually remains low behind the lower teeth. Sounds produced with the tongue tip are apical; those made with the blade (< Lat. *lamen*) are laminal, and those made with the back (Lat. *dorsum*) of the tongue are dorsal. Sounds articulated with the tip or blade of the tongue raised towards the teeth, alveolum, or hard palate are said to be coronal (e.g. English */t/).

**The Teeth and Lips**

The teeth, particularly the various upper teeth (see Figure 10), are very important for the production of many consonants, like the initial sounds in the English words *this* (/ðɪs/) and *thing* (/θɪŋ/).

The lips – which are fleshy folds consisting of tissue, blood vessels, glands, nerves and muscle – assist in the formation of both vowels and consonants. For vowels, for instance, it is important to know whether they are rounded (e.g. /u:/ in *doom*) or spread (e.g. /i:/ in *heed*). They can also be pressed together they produced bilabial sounds (e.g. */p/, */b/), or the lower lip can articulate with the upper teeth, resulting in labiodental sounds (e.g. */f/, */v/).

Only the lower teeth and lip can move since they are attached to the lower jaw (or mandible). The latter is connected to the skull through a joint, located just before the entrance to the ear. You can easily feel the ‘hinge’ movement if you hold a finger near the forward part of the outer opening of the ear while raising and lowering your jaw.

**The Nose**

The nose, or nasal cavity, is divided into two cavities – i.e. the nostrils - by a central bone, known as the septum. The roof of the nasal cavity is very narrow, whereas the floor is smooth and relatively wide. The side walls are extremely irregular. At the back, the nasal cavity leads into the nasopharynx (see above), which, as we have seen, can be shut off from the oropharynx by means of the velum. The main biological functions of the nose are the humidification and heating of the air during respiration. In addition, it acts as a filter.
**Practice:**

Put your tongue between your upper and lower teeth, and then slowly proceed backwards and upwards, and describe exactly what you feel. You may find that you will not be able to touch some of the posterior parts. For those (e.g. the velum) you can use your finger (gently!). In order to complete the picture, you should use a mirror and try to identify the various sections on sight.