in the middle line, that is to say from the third visceral arch. The sinus arcuatus becomes gradually shallower as these two parts of the tongue grow together and eventually is indicated by the *sulcus terminalis;* in the mid line, however, the isthmus of the thyroid grows down from it, forming the *thyro-glossal duct* the remains of which are seen in the foramen caecum (see Ductless Glands). It will be seen that the tongue is developed ín connexion with the first, second and third visceral arches, and it is therefore to be expected that the fifth, seventh and ninth nerves which supply those arches would help to supply it, but the vagus from the fourth arch reaches it in addition, while the fact that most of the muscular substance of the tongue is supplied by the bypoglossal nerve is explained on the theory that some of the cervical skeletal musculature has grown cephalad into the tongue and has carried its nerve with it.

*Comparative Anatomy.*

The tongue is present in fishes but it is an immovable swelling in the floor of the mouth and is practically devoid of muscles. In the hag *(Myxine)* among the Cyclostomata, and pike (Esox) among the

Teleostei, teeth are developed on the tongue. In the Amphibia the tailed forms (Urodela) usually have tongues like fishes, though in the genus Spelerpes the organ is very free and can be protruded for a great distance. In the majority of the Anura the tongue is usually attached close to the front of the floor of the mouth so that it can be flapped, forward with great rapidity. There are, however, two closely allied families of frogs (Xenopodidae and Pipidae) which form the order of Aglossa, because in them the tongue is suppressed.

In the reptiles the tongue is generally very movable, though this is not the case in the Crocodilia and many of the Chelonia. the forked tongues of snakes and many lizards and the highly specialized telescopic tongue of the chameleon are familiar objects.

In birds the tongue is usually covered with horny epithelium and is poorly supplied with muscles. When it is very protrusible, as in the woodpecker, the movement is due to the hyoid, with the base of the tongue, attached, moving forward.

In the Mammalia the tongue is always movable by means of well- developed extrinsic and intrinsic muscles, while papillae and glands are numerous. The filiform papillae reach their maximum in the feline family of the Carnivora where they convert the tongue into a rasp by which bones can be licked clean of all flesh attached to them.

Foliate papillae are best seen in the rodents, and when they are

well developed the circumvallate papillae are few, often only one on each side. .

In the lemurs an under tongue or *sub lingua* is found, which is probably represented by the *plicae firnbriatae* under the human tongue, and by some morphologists is regarded as the homologue of the whole tongue of the lower vertebrates, the greater part of the mammalian tongue being then looked upon as a new formation.

For further details and literature see R. Wíedersheim’s *Compara­tive Anatomy of Vertebrates,* translated by W. N. Parker (London, 1907); C. Gegenbaur, *Vergleich. Anat. der Wirbelthiere* (Leipzig, 1901); A. Oρpel, *Lehrb. vergleich, mikroskop. Anat. der Wirbelthiere,* Teil 3 (Jena, 1900); Parker and Haswell, *Text Book of Zoology* (London, 1897). (F, G. P.)

*Surgery of the Tongue.*

During infancy it is sometimes noticed that the little band of membrane *(fraenum)* which binds the under part of the tongue to the middle line of the floor of the mouth is unusually short. The condition will probably right itself as the front part of the tongue takes on its natural growth. In some children the tongue is so large that it hangs out of the mouth, scratching itself upon the teeth. This condition is likely to be associated with weak intellect.

*Acute inflammation of the tongue* may be caused by the sting of a wasp or by the entrance of septic germs through a wound, and the trouble may end in an abscess.

*Chronic inflammation of the tongue* may be caused by syphilis, by the irritation. of decayed teeth or of a badly-fitting plate of artificial teeth, or by excessive smoking. The condition is one of danger in that it may lead eventually to the tongue becoming the seat of cancer. The treatment demands the removal of every source of irritation. The teeth must be made sound and smooth and must be kept so.. Smoking must be absolutely and entirely given up, and salt, mustard, piekles, spirits, aerated waters, and everything else which is likely to be a cause of irritation must be avoided.

*Cancer of the tongue* is the result of chronic irritation which produces an excessive growth of the scaly covering of the tongue and causes an invasion of the deeper parts of the tongue by the scales. It is more often found in men than women and is usually asso­ciated with a hard swelling at one side of the tongue—perhaps near a jagged tooth or at the spot where the end of the pipe-stem approaches the tongue. The nerves of the tongue being caught and compressed in the growth, pain is constant and severe, and the move­ments during mastication cause great distress. The swelling gradually increases in size and, spreading to the floor of the mouth, hinders the free movements of the tongue. In due course it breaks down in the middle and a hard-walled ulcer appears. All this time the small scales of the cancer are finding their way along the lymph-channels and causing a secondary enlargement in the glands just below the jaw and along the side of the neck. Enlargement of the cervical glands is a very serious complication of cancer of the tongue.

The only treatment for cancer of the tongue which is at present known in surgery is the early removal, by operation. It not seldom happens that because there is a certain amount of doubt as to the exact nature of the growth in the early weeks delay in operating is reasonably permitted, but during this time there is the risk of the cells of the disease finding their way to the lymphatic system. Still, inasmuch as there may be great difficulty in determining the diagnosis from tertiary syphilitic disease, a course of treatment by iodide of potassium may well be recommended. Syphilis is often the precursor of lingual, cancer, and it is impossible to say exactly when the syphilitic lesion becomes malignant. In the ease of a cancerous tumour of the tongue being so deeply or so widely attached that its removal cannot be recommended, relief may be afforded by the extraction of most, or all of the teeth, by limiting the food to the most simple and unirritating kinds, and possibly by dividing the great sensory nerves of the tongue.

Cancer of the tongue is now operated on in advanced cases such as in former years would not have been dealt with by a radical operation. An incision is made beneath the jaw and through the floor of the