The ducts are lined at their origins by epithelium which differs little from the pavement form. As the ducts enlarge, the epithelial cells change to the columnar type, and the part of the cell next the basement membrane is finely striated.

The lobules of the salivary glands are richly supplied with blood vessels which form a dense net-work in the interalveolar spaces. Fine plexuses of nerves are also found in the interlobular tissue. The nerve fibres pierce the basement membrane of the alveoli, and end in branched varicose filaments between the secreting cells. In the hilus of the submaxillary gland there is a collection of nerve cells termed Langley's ganglion.

Accessory Glands.—Besides the salivary glands proper, numerous other glands are found in the mouth. Many of these glands are found at the posterior part of the dorsum of the tongue behind the valleate papillae, and also along its margins as far forward as the apex. Others lie around and in the palatine tonsil between its crypts, and large numbers are present in the soft palate, the lips, and cheeks. These glands are of the same structure as the larger salivary glands, and are of the mucous or mixed type.

THE FAUCES.

The aperture by which the mouth communicates with the pharynx is called the isthmus faucium. It is bounded, above, by the soft palate; below, by the dorsum of the tongue; and on either side, by the glosso-palatine arch.

The glosso-palatine arch (arcus glosso-palatinus; anterior pillar of fauces) on either side runs downward, lateralward, and forward to the side of the base of the tongue, and is formed by the projection of the Glosso-palatinus with its covering mucous membrane.

The pharyngo-palatine arch (arcus pharyngo-palatinus; posterior pillar of fauces) is larger and projects farther toward the middle line than the anterior; it runs downward, lateralward, and backward to the side of the pharynx, and is formed by the projection of the Pharyngo-palatinus, covered by mucous membrane. On either side the two arches are separated below by a triangular interval, in which the palatine tonsil is lodged.

The Palatine Tonsils (tonsilla palatina; tonsil) are two prominent masses situated one on either side between the glosso-palatine and pharyngo-palatine arches. Each tonsil consists fundamentally of an aggregation of lymphoid tissue underlying the mucous membrane between the palatine arches. The lymphoid mass, however,
does not completely fill the interval between the two arches, so that a small depression, the supratonsillar fossa, exists at the upper part of the interval. Further, the tonsil extends for a variable distance under cover of the glossopalatine arch, and is here covered by a reduplication of mucous membrane; the upper part of this fold reaches across the supratonsillar fossa, between the two arches, as a thin fold sometimes termed the plica semilunaris; the remainder of the fold is called the plica triangularis. Between the plica triangularis and the surface of the tonsil is a space known as the tonsillar sinus; in many cases, however, this sinus is obliterated by its walls becoming adherent. From this description it will be apparent that a portion of the tonsil is below the level of the surrounding mucous membrane, i.e., is imbedded, while the remainder projects as the visible tonsil. In the child the tonsils are relatively (and frequently absolutely) larger than in the adult, and about one-third of the tonsil is imbedded. After puberty the imbedded portion diminishes considerably in size and the tonsil assumes a disk-like form, flattened from side to side; the shape and size of the tonsil, however, vary considerably in different individuals.

The medial surface of the tonsil is free except anteriorly, where it is covered by the plica triangularis; it presents from twelve to fifteen orifices leading into small crypts or recesses from which numerous follicles branch out into the tonsillar substance.

The lateral or deep surface is adherent to a fibrous capsule which is continued into the plica triangularis. It is separated from the inner surface of the Constrictor pharyngis superior usually by some loose connective tissue; this muscle intervenes between the tonsil and the external maxillary artery with its tonsillar and ascending palatine branches. The internal carotid artery lies behind and lateral to the tonsil at a distance of 20 to 25 mm. from it.

The tonsils form part of a circular band of adenoid tissue which guards the opening into the digestive and respiratory tubes. The anterior part of the ring is formed by the submucous adenoid collections (lingual tonsil) on the posterior part of the tongue; the lateral portions consist of the palatine tonsils and the ade-
noid collections in the vicinity of the auditory tubes, while the ring is completed behind by the pharyngeal tonsil on the posterior wall of the pharynx. In the intervals between these main masses are smaller collections of adenoid tissue.

**Structure** (Fig. 1027).—The follicles of the tonsil are lined by a continuation of the mucous membrane of the pharynx, covered with stratified squamous epithelium; around each follicle is a layer of closed capsules consisting of lymphoid tissue imbedded in the submucous tissue. Lymph corpuscles are found in large numbers invading the stratified epithelium. It is probable that they pass into the mouth and form the so-called salivary corpuscles. Surrounding each follicle is a close plexus of lymphatics, from which the lymphatic vessels pass to the deep cervical glands in the neighborhood of the greater cornu of the hyoid bone, behind and below the angle of the mandible.

**Vessels and Nerves.**—The arteries supplying the tonsil are the dorsalis linguae from the lingual, the ascending palatine and tonsillar from the external maxillary, the ascending pharyngeal from the external carotid, the descending palatine branch of the internal maxillary, and a twig from the small meningeal.

The veins end in the tonsillar plexus, on the lateral side of the tonsil.

The nerves are derived from the sphenopalatine ganglion, and from the glossopharyngeal.

**Palatine Aponeurosis.**—Attached to the posterior border of the hard palate is a thin, firm fibrous lamella which supports the muscles and gives strength to the soft palate. It is thicker above than below, where it becomes very thin and difficult to define. Laterally it is continuous with the pharyngeal aponeurosis.

**Muscles of the Palate.**—The muscles of the palate (Fig. 1028) are:

- Levator veli palatini
- Tensor veli palatini
- Musculus uvula
- Glossopalatinus
- Pharyngopalatinus

The **Levator veli palatini** (*Levator palati*) is a thick, rounded muscle situated lateral to the choana. It arises from the under surface of the apex of the petrous part of the temporal bone and from the medial lamina of the cartilage of the auditory tube. After passing above the upper concave margin of the Constrictor pharyngis superior it spreads out in the palate velum, its fibers extending obliquely downward and medialward to the middle line, where they blend with those of the opposite side.

The **Tensor veli palatini** (*Tensor palati*) is a broad, thin, ribbon-like muscle placed lateral to the Levator veli palatini. It arises by a flat lamella from the scaphoid fossa at the base of the medial pterygoid plate, from the spina angularis of the sphenoid and from the lateral wall of the cartilage of the auditory tube. Descending vertically between the medial pterygoid plate and the Pterygoideus internus it ends in a tendon which winds around the pterygoid hamulus, being retained in this situation by some of the fibers of origin of the Pterygoideus internus. Between the tendon and the hamulus is a small bursa. The tendon then passes medialward and is inserted into the palatine aponeurosis and into the surface behind the transverse ridge on the horizontal part of the palatine bone.

The **Musculus uvulae** (*Azygos uvulae*) arises from the posterior nasal spine of the palatine bones and from the palatine aponeurosis; it descends to be inserted into the uvula.

The **Glossopalatinus** (*Palatoglossus*) is a small fleshy fasciculus, narrower in the middle than at either end, forming, with the mucous membrane covering its surface, the glossopalatine arch. It arises from the anterior surface of the soft palate, where it is continuous with the muscle of the opposite side, and passing downward, forward, and lateralward in front of the palatine tonsil, is inserted into the side of the tongue, some of its fibers spreading over the dorsum, and others passing deeply into the substance of the organ to intermingle with the Transversus linguae.

The **Pharyngopalatinus** (*Palatopharyngeus*) is a long, fleshy fasciculus narrower in the middle than at either end, forming, with the mucous membrane covering
its surface, the pharyngopalatine arch. It is separated from the Glossopalatinus by an angular interval, in which the palatine tonsil is lodged. It arises from the soft palate, where it is divided into two fasciculi by the Levator veli palatini and Musculus uvula. The posterior fasciculus lies in contact with the mucous membrane, and joins with that of the opposite muscle in the middle line; the anterior fasciculus, the thicker, lies in the soft palate between the Levator and Tensor, and joins in the middle line the corresponding part of the opposite muscle. Passing lateralward and downward behind the palatine tonsil, the Pharyngopalatinus joins the Stylopharyngeus, and is inserted with that muscle into the posterior border of the thyroid cartilage, some of its fibers being lost on the side of the pharynx and others passing across the middle line posteriorly, to decussate with the muscle of the opposite side.

Fig. 1028.—Dissection of the muscles of the palate from behind.

Nerves.—The Tensor veli palatini is supplied by a branch from the otic ganglion; the remaining muscles of this group are in all probability supplied by the accessory nerve through the pharyngeal plexus.1

Actions.—During the first stage of deglutition, the bolus of food is driven back into the fauces by the pressure of the tongue against the hard palate, the base of the tongue being, at the same time, retracted, and the larynx raised with the pharynx. During the second stage the entrance to the larynx is closed by the drawing forward of the arytenoid cartilages toward the cushion

of the epiglottis—a movement produced by the contraction of the Thyreoarytenoidei; the Arytenoidei, and the Arytendoepiglottidei.

After leaving the tongue the bolus passes on to the posterior or laryngeal surface of the epiglottis, and glides along this for a certain distance; then the Glossopalatini, the constricators of the faucæ; contract behind it; the palatine velum is slightly raised by the Levator veli palatini, and made tense by the Tensor veli palatini; and the Pharyngopalatini, by their contraction, pull the pharynx upward over the bolus, and come nearly together, the uvula filling up the slight interval between them. By these means the food is prevented from passing into the nasal part of the pharynx; at the same time, the Pharyngopalatini form an inclined plane, directed obliquely downward and backward along the under surface of which the bolus descends into the lower part of the pharynx. The Salpingopharyngei raise the upper and lateral parts of the pharynx—i.e., those parts which are above the points where the Stylopharyngei are attached to the pharynx.

Mucous Membrane.—The mucous membrane of the soft palate is thin, and covered with stratified squamous epithelium on both surfaces, excepting near the pharyngeal ostium of the auditory tube, where it is columnar and ciliated. According to Klein, the mucous membrane on the nasal surface of the soft palate in the fetus is covered throughout by columnar ciliated epithelium, which subsequently becomes squamous; some anatomists state that it is covered with columnar ciliated epithelium, except at its free margin, throughout life. Beneath the mucous membrane on the oral surface of the soft palate is a considerable amount of adenoid tissue. The palatine glands form a continuous layer on its posterior surface and around the uvula.

Vessels and Nerves.—The arteries supplying the palate are the descending palatine branch of the internal maxillary, the ascending palatine branch of the external maxillary, and the palatine branch of the ascending pharyngeal. The veins end chiefly in the pterygoid and tonsillar plexuses. The lymphatic vessels pass to the deep cervical glands. The sensory nerves are derived from the palatine and nasopalatine nerves and from the glossopharyngeal.

THE PHARYNX.

The pharynx is that part of the digestive tube which is placed behind the nasal cavities, mouth, and larynx. It is a musculomembranous tube, somewhat conical in form, with the base upward, and the apex downward, extending from the under surface of the skull to the level of the cricoid cartilage in front, and that of the sixth cervical vertebra behind.

The cavity of the pharynx is about 12.5 cm. long, and broader in the transverse than in the antero-posterior diameter. Its greatest breadth is immediately below the base of the skull, where it projects on either side, behind the pharyngeal ostium of the auditory tube, as the pharyngeal recess (fossa of Rosenmüller); its narrowest point is at its termination in the esophagus. It is limited, above, by the body of the sphenoid and basilar part of the occipital bone; below, it is continuous with the esophagus; posteriorly, it is connected by loose areolar tissue with the cervical portion of the vertebral column, and the prevertebral fascia covering the Longus colli and Longus capitis muscles; anteriorly, it is incomplete, and is attached in succession to the medial pterygoid plate, pterygomandibular raphé, mandible, tongue, hyoid bone, and thyroid and cricoid cartilages; laterally, it is connected to the styloid processes and their muscles, and is in contact with the common and internal carotid arteries, the internal jugular veins, the glossopharyngeal, vagus, and hypoglossal nerves, and the sympathetic trunks, and above with small parts of the Pterygoidei interni. Seven cavities communicate with it, viz., the two nasal cavities, the two tympanic cavities, the mouth, the larynx, and the esophagus. The cavity of the pharynx may be subdivided from above downward into three parts: nasal, oral, and laryngeal (Fig. 994).

The Nasal Part of the Pharynx (pars nasalis pharyngis; nasopharynx) lies behind the nose and above the level of the soft palate: it differs from the oral and laryngeal parts of the pharynx in that its cavity always remains patent. In front (Fig. 1029) it communicates through the choanae with the nasal cavities. On its lateral wall is the pharyngeal ostium of the auditory tube, somewhat triangular in shape, and bounded behind by a firm prominence, the torus or cushion, caused by the medial end of the cartilage of the tube which elevates the mucous membrane.