and their crowns look backward. It is owing to the gradual growth backward of this antrum and the maxilla that they are rotated round a quarter of a circle and so at last look down­ward (see A. Keith, *British Journal of Dental Science,* vol. xlv., June 16, 1902).

Extra teeth are occasionally met with in the incisor, premolar and molar regions; their significance will be better realized after the embryology and comparative anatomy of the subject have been sketched.

For an accurate and detailed description of man’s teeth see *A Manual of Dental Anatomy,* by C. S. Tomes, London, 1904.

Histology.

If a section be made vertically through a tooth all the exposed part or crown is seen to be covered with enamel, which, microscopi­cally, is composed of a number of fine hexagonal prisms arranged at right angles to the surface of the tooth, and formed chiefly of

calcium phosphate with small amounts of calcium carbonate, mag­nesium phosphate and calcium fluoride, but containing practically no organic matter. The enamel rests on the “dentine," of which hard yet elastic substance by far the greater part of the tooth is composed. It is made of the same salts as the enamel, but contains in addition a good deal of organic matter and forms a structureless mass through which the fine “ dentinal tubes ” run from the pulp cavity to the periphery.

Surrounded by the dentine is the “ pulp cavity,” which is filled by the tooth pulp, a highly vascular and nervous mass of branched connective tissue cells, which, in a young tooth, has a layer of epithelial cells, the “ odontoblasts, ” lying close against the wall of the cavity and forming new dentine. Slender processes (“ Tomes’s fibrils") project from these cells into the dentinal tubes, and arc probably sensory. A nerve and artery enter the apex of the root of the tooth, but it is not understood how the nerve ends.

Surrounding the dentine where it is not covered by enamel is the “ cement ” or “ crusta petrosa,” a thin layer of bone which is only separated from the bony socket by the alveolar periosteum.

Embryology.

The lip is marked off from the rest of the mouth region by a "lip groove,” which, in the case of the lower jaw, grows obliquely down­ward and backward, and the mass of ectodermal cells bounding it

penetrates for some distance into the surrounding mesoderm below the bottom of the groove. This is known as the “ tooth band.”

On the under surface of this oblique tooth band (still taking the lower jaw), and close to its edge, appear ten thickenings, below each of which the mesoderm rises up into a “dental papilla,” and so moulds the thickening into a cap for itself—the "enamel organ." The superficial cells of the dental papilla become the “ odontoblasts" and manufacture the dentine, while those cells of the cap (enamel organ) which are on its concave surface and therefore nearest the dental papilla are called "ameloblasts,” and form the enamel. The cutting or grinding part of the tooth is first formed, and the crown gradually closes round the dental papilla, so that at last, when the root is formed, the central part of the papilla remains as the pulp cavity surrounded by dentine except at the apex of the r∞t. The roots, however, arc formed slowly, and as a rule are not complete until some time after the tooth is cut. The mesoblastic connective tissue surrounding the developing tooth becomes condensed into a fibrous bag which is called the tooth-sac, and round this the lower jaw grows to form the alveolus. The crusta petrosa which covers the root is developed from the tooth-sac. It will therefore be seen that, of the various structures which make up a tooth, the enamel is derived from the ectoderm, while the dentine, pulp and crusta petrosa or cement are mesodermal.

So far only the milk dentition of the lower jaw has been accounted for.

Returning to the tooth band, it was noticed that the enamel organs were formed not at the extreme edge but a little way from it. From the extreme edge, which, it will be remembered, points inward toward the tongue, the permanent tooth germs are derived, and it is therefore clear that the permanent teeth must come up on the lingual side of their milk predecessors.

For further details and literature see *Dental Anatomy,* by C. S. Tomes, London, 1904; and *Development of the Human Body,* by J. P. McMurrich, London, 1906.

Comparative Anatomy.

The details of the teeth vary so greatly in different animals and groups of animals, and, on account of their being the most durable tissues of the body, are so important for classificatory purposes, that they are dealt with freely in the various zoological articles. All that can be done here is to give a broad general survey of the subject, taking the details of man’s dentition, already set forth, as a point of departure.

In some fishes the teeth are continuous over the edges of the jaws with the scales on the surface of the body, and there is no doubt that teeth should be regarded as modified scales which have migrated into the mouth.

In the Cyclostomata (lampreys and hags) the teeth are homy cones, but beneath them there are papillae of the mesoderm covered with ectoderm which resemble the dental papillae and enamel organs although no calcification occurs except in Bdellostoma. In the Elasmobranchii (cartilaginous fishes) the teeth are arranged in several rows, and as those of the front row fall out the hinder row take their place; sometimes they are triangular and very sharp as in the sharks, sometimes flattened and arranged like a pavement for crushing as in rays. These teeth only represent the crowns of man’s teeth, and they are not embedded in sockets except in the case of the teeth in the saw of the saw-fish (Pristis) ; moreover the dentine of which they are largely composed resembles bone and fills up the whole pulp cavity. From its structure it is known as *osteodentine.*

In the Teleostomi (teleostean and ganoid fishes) there is great variability; sometimes, as in the sturgeon, there are no teeth at all, while at others every bone bounding the mouth, including the branchial arches, bears teeth. As an example of a very full tooth armature the pike’s mouth and pharynx may be instanced. Both in the pike and the hake hinged teeth occur; these bend backward during the passage of prey down the throat, but are re-erected by elastic ligaments. As a rule, the dentine of the Teleostomi is of the variety already described as osteodentine, but sometimes, as in the hake, it is vascular and is known as vasodentine.

In the Amphibia teeth are not so numerous as in the fishes, though like them they are not confined to the jaws, since vomerine teeth are very constant. The toad is edentulous, while the frog has no teeth in the lower jaw. An extinct order of tailed am­phibians, the Stegocephali, are often called Jabyrinthodonts on account of the complex way in which the enamel is involuted into the interior of the teeth. Amphibians’ teeth are usually anchylosed to the jaw, that is to say, directly united by bone.

In the Reptilia many and various arrangements of the teeth are found. In the Chelonia (turtles) there are no teeth, although the ectodermal ingrowth (dental band) from which they are developed in other animals is present in the embryo. The place of the teeth in these reptiles is taken by homy jaw-cases.

In the Ophidia the non-poisonous snakes have two rows of teeth in the upper jaw, one on the maxillae and another on the palatine and pterygoid bones, while in the lower jaw there is only one row. These teeth are sharp pegs anchylosed to the bones and so strongly recurved that one of these snakes would be unable, even if it wished