as the place where the dorsum sellae will be. It is partly surrounded by the mesenchyme just as it is completely in the rest of the axial skeleton, and this mesenchyme extends dorsally on each side to wrap round the nerve cord, which is here the brain. In this way the brain becomes enclosed in a primitive membranous cranium, the inner part of which persists in its primitive condition as the dura mater, while the outer part may chondrify, chondrify and ossify, or ossify without a cartilage stage. That part of the cranium which is in front of the notochord is called *prechordal,* while the posterior part into which the notochord extends is *chordal.* On each side of the notochord chondrification takes place and a basicranial plate of cartilage is formed which soon meets its fellow of the opposite side, and forms the floor of the skull as far forward as the dorsum sellae, and as far back as the external occipital protuberance. Laterally it comes in contact with the mesenchyme surrounding the internal ear, which is also chondrifying to form the cartilaginous *periotic capsule,* and the two structures fuse together to form a continuous floor for the back of the skull. A. Froriep has shown that in the hinder occipital region of the calf there are evidences of four vertebrae having been incorporated with the basicranial plate, that is to say that the plate and its coalesced vertebrae represent five mesodermic somites (“ Zur Entwickelungsgeschichte der Wirbelsäule, insbeson­dere des Atlas und Epistropheus und der Occipitalregion,” *Archiv für Anal. u. Phys.,* Anat. Abth., 1886). It has more recently been shown by Levi that the same thing is true for man. K. Gegenbauer has pointed out that the primitive membranous skull shows, in the chordal region, signs of metameric segmentation in the way in which the cranial nerves pierce the dura mater one behind the other. These segments, however, had lost their distinctness even before the cartilaginous cranium had become developed, so that there is no real segmental value in the elements of this, still less in those of the bony skull. The only place in which segmental elements can be dis­tinguished is in the occipital region, which is in structure transitional between the head and vertebral column. The notochord, it has been shown, ends just behind the place where the stomodaeum pouches up through the cranial base to form the anterior part of the pituitary body (see Brain). Where it ends two curved bars of cartilage are formed, which run forward till they meet the olfactory capsules, which are also now chondrifying. These bars are the *prechordal cartilages* or *trabeculae cranii* and enclose between them the *cranio-pharyngeal canal* by which the pituitary body ascends,. but later on, as they grow, they join together and cut off the pituitary body from the pharynx. By their growth outward they form the floor of the prechordal part of the chondro-cranium, so that from them is developed that part of the cartilaginous skull which will later on be part of the basisphenoid, the presphenoid, orbito- sphenoid and alisphenoid regions. It has hitherto been assumed that this process held good for man, but recent research shows that the anterior part of the base of the skull chondrifies in the same way that ice appears on a pond and that the trabeculae are at no time definite structures. Chondrification of the nasal capsules is later than that of the parts of the skull behind, so that there is a steady progress in the process from the occipital to the ethmoidal region. There is a median centre of chondrification, the *mesethmoid cartilage,* which projects down into the fronto-nasal process (see Olfactory System), and two lateral *ectethmoid cartridges* which eventually join with the mesethmoid to form the cartilaginous ethmoid.

The cartilaginous base of the cranium is now formed, but rhe vault is membranous. While the base has been developing the two anterior visceral arches have been also forming and have gained an attachment to the cranium, but the formation and fate of these is recorded in the article Skeleton ( *Visceral).* About the sixth week of foetal life ossification begins at different points in the membranous vault of the skull. In this way the frontal, parietal, supra-occipital, and a little later the squamous part of the temporal bones are formed. About the eighth week, too, the lachrymal, nasal and vomer appear in the membrane lying superficial to dif­ferent parts of the olfactory capsule. All these are dermal bones, comparable to the deeper parts of the scales of fishes, and developed in the mesenchyme lying deep to and in con­tact with the ecto­derm. It is therefore necessary to think of the primitive skull as a three-layered structure, the deepest layer persisting as the dura mater, the middle forming the chondro-cranium, which ossifies to form the base, and a super­ficial layer close to the skin or mucous membrane (ectoderm), from which the bones of the vault and superficial parts of the olfactory capsules are derived. At the four angles of the parietal, ossification is checked for some time to form *fontanelles,* of which the *bregma* is the most important, and at each of these points, as well as elsewhere in the sutures, accessory centres of ossification may occur to form *Wormian bones.*

Along the middle line of the base of the skull the same progress of ossifica­tion from behind forward is seen that was noticed in the process of chondrifica­tion. Bilateral centres for the basioccipital appear about the sixth week, for the basisphenoid in the eighth, and for the pre­sphenoid in the tenth, while the lateral mass of the ethmoid does not ossify till the fifth month and the mesethmoid not until the first year of extra- uterine life. In the lateral part of the base the ex- occipitals and alisphenoids begin to ossify about the eighth week and the pre- sphenoids about the tenth. In connexion with the alisphenoíd there is a small extra centre of morphological interest only, which forms a little tongue-shaped process called the *lingula,* pro­jecting back into the middle lacerated foramen and apparently corre­sponding to the *sphenotic* bone of lower vertebrates.

The auditory or *periotic capsule,* like the olfactory, is late in ossifying; it has four centres (pro-otic, epiotic, opisthotic and pterotic) which do not come until the fifth month.

Some parts of the chondro-cranium do not ossify at all; this is the case in the anterior part of the mesethmoid, which remains as the septal cartilage of the nose, while, as has been already pointed out, a buffer of cartilage persists between the basioccipital and basi- sphenoid until the twentieth year of life.

From what has been said it is evident, and it will be still more evident if the article Skeleton *(Visceral)* be looked at, that some of the bones of the adult skull are compounded of various contributions from the different elements which make up the adult cranium. These, recapitulated, are (1) the dura mater or entocranium, which in man does not ossify except perhaps in the crista galli. (2) The chondro-cranium or meso­cranium. (3) The superficial part of the mesenchyme (ecto­cranium) from which dermal bones are formed. (4) The olfactory and auditory sense capsules. (5) The visceral arches. (6) Some fused verte­brae posteriorly.

The occipital bone, for ex­ample, has the basioccipital, exoccipital and basal part of the supra-occipital derived from the chondro-cranium and fused vertebrae, while the vault part of the suρra- occipital has four dermal centres of ossification corre­sponding to the interparietal and preinterρarietal bones of lower mammals (see fig. 4). In the accompanying figure the latter centres have fused with the interparietal, but an indica­tion of their line of junction is seen on each side of *g.* The bone of Kerkring (c) is an abnormality, the meaning of which is not understood.

The temporal is also a very composite bone; in it the petro- mastoid portion represents the auditory sense capsule; the tabular