is to be detected in the constituent parts of the cartilagin­ous cranium. Nevertheless it is undeniable that there is a singular secondary and induced resemblance to vertebræ in these ossified skeletal parts.

The osseous condition of the third category of cranial skeletal parts varies extremely in different classes of Verte­brates. The limits of this article are altogether insuffi­cient for more than a brief indication of the main varieties of the cranial structures of any of the three categories, and the reader must refer for details to the descriptions given in the various articles of this work which are devoted to different groups of animals.

The most anterior lateral descending bar or visceral arc is known as the mandibular arch. That part of it which extends forwards and forms the upper jaw presents us with the following ossifications arranged in two rows— one external, the other internal. The external row, pro­ceeding from before backwards, consists of premaxilla, maxilla, jugal (or malar), and very often of a quadrato- jugal, which latter, when present, is generally in the form of a bar of bone (with an interval between it and the skull), forming, or helping to form, an inferior lateral external arch analogous to the superior lateral arch already noticed as the “ zygoma.” There may be a pair of pre- maxillæ, or they may be represented by an azygous bone. The premaxilla, maxilla, and jugal often unite with the anterior outer margins of the nasal, frontal, and lachrymal to form a continuous bony external wall to the anterior part of the skull. The internal row of bones, proceeding again from before backwards, consists of the vomer, pala­tine, and pterygoid, which, with their fellows of the opposite side (and sometimes with the aid of the parasphenoid), form the bony roof to the mouth, which roof may (as in Mammals and Crocodiles) be a continuous bony partition, or may be but a sort of open bony framework. Besides the pterygoid proper, other ossifications, adjoining it, have been distinguished as the entopterygoid and ectopterygoid.

The lower part of the most anterior lateral visceral arc forms all or part of the lower jaw. In the *Mammalia* it forms the whole of that jaw, and is invested by but a single bone—the dentary. In other Vertebrates it forms but the distal, though greater, part of that jaw, and may be invested, not only by a dentary, but also by bones called angular, subangular, coronoid, and splenial. The jaw is further continued, proximally, by two bones—the articular and the quadrate—which are ossifications of the cartilaginous arc itself. This may, as in Birds and Rep­tiles, be directly articulated to the cranial wall, or it may be (as in Fishes) suspended therefrom by bones, the highest of which is termed the hyomandibular, which articulates with the ossified auditory capsule. The hyo­mandibular joins below two other bones, the anterior of which is called the metapterygoid and the posterior the symplectic, to both of which the quadrate is attached. Thus these four bones act as a “ suspensorium ” for the lower jaw, the joint between which jaw and the suspenso­rium is placed at the junction of the quadrate and the articular. In Mammals, parts answering to the suspen­sorium, the quadrate, and the articular form no part of the jaw but are of relatively minute size and are known as certain parts (the auditory ossicles, &c.) of the internal ear,@@1 and are protected externally by an ossifica­tion called the tympanic bone.

The second lateral descending bar or visceral arc, known as the hyoidean arch, may have its upper part ossified, in union with the preceding arch, as in the bony suspensorium of Fishes just described. On the other hand its upper part may, as in Mammals, be represented only by minute parts

@@@1 The exact and precise homologies of these parts seem still to be *sub judice.*

of the internal ear,—except the very summit of the arch, which forms the tympanohyal, and is anchylosed to the ossified auditory capsule of the internal ear. In Bony Fishes the hyoidean arch begins to free itself from the suspensorium, as a bone called the stylohyal, which is attached to the preceding or mandibular arch, between the hyomandibular and the symplectic. The arc then continues downwards as the epihyal and ceratohyal, ending below in the basihyal, from which a glossohyal may project forwards and a urohyal backwards. In Fishes certain styliform ossicles termed branchiostegal rays may project backwards from the hyoidean arch ; and above them certain membrane bones called opercular bones—the oper­culum, preoperculum, suboperculum, and interoperculum —are attached above to the hyomandibular, and lie outside the mandibular and hyoidean arches.

In the air-breathing Vertebrates the hyoidean arch may be well developed or very imperfectly so, and concurs with parts belonging to the more posteriorly situated lateral arches to form a complex bone—the os hyoïdes—as will be further described.

These more posterior lateral arches—the branchial arches—attain their most complex osseous condition in Bony Fishes, which have commonly five of them, not solidly united to the skull above, but connected one with another inferiorly and with the inferior part of the hyoid arch. From below upwards these arches consist generally of a basibranchial, a hypobranchial, a ceratobranchial, an epibranchial, and a pharyngobranchial, but the hindmost arch is less fully and complexly formed.

In air-breathing Vertebrates the already-mentioned os hyoïdes consists of a central part or “ body,” to which are attached two pairs of single or jointed processes termed cornua. The anterior pair of cornua (known in human anatomy as the lesser cornua) represent the hyoidean arch, and may contain all its bones, including the “ tym- panohyal.” The posterior pair of cornua (the greater cornua of human anatomy and the thyrohyals of Mammals generally) answer to or represent part of the branchial arches, and may be longer or shorter than the anterior pair of cornua. That they really have this homology is proved by the process of metamorphosis of the Tadpole, which in its early stage has distinct cartilaginous bran­chial arches that become the posterior cornua of the os hyoides of the adult Frog.

The osseous skull may, its bones remaining distinct, form a very solid whole, and the brain-case may be com­plete, as in Mammals, or it may be very loosely constructed and largely membranous, as, *e.g*., in most Lizards. Teeth may be connected with various bones,—most constantly with the dentary, maxilke, and premaxillæ,—but the palatines, pterygoids, parasphenoid (in *Plethodon),* pharyngo- branchials, and even the basioccipital (Carp and Tench), may be dentigerous.

The structure of the skull is so exceedingly complex and varied that it is impossible within the limits of the present article to do more than give the above general indications. For further particulars the reader is referred to the anatomical details which will be found in the several articles of this work which are devoted to the description of different single groups of Vertebrate animals, and especially to the description of the skull of Man in the article Anatomy.

APPENDICULAR SKELETON.

This part of the internal skeleton of Vertebrate animals normally supports two pairs of limbs only, but in one class—that of Fishes—there are azygous structures—the unpaired fins—which, as before said, must be reckoned as belonging to this category. These latter will be more