40. NOTE on an OS ARTICULARE, *presumably that of IGUANODON MANTELLI*. By J. W. HULKE, Esq., F.R.S., F.G.S. (Read March 20, 1878.)

MORE than forty years have passed since the late indefatigable Gideon Mantell's discovery of a tooth first brought to light the former existence of the Iguanodon. Since then the remains of this great Dinosaur have been plentifully obtained from the Wealden districts in Kent, Sussex, and the Isle of Wight; and of most segments of its skeleton we now possess a better knowledge than we have of the bony frame of any of its larger contemporaries.

It is of the heads of these Dinosaurs that our knowledge continues to this day very defective. Tooth-bearing portions of the mandibles and maxillæ of *Iguanodon Mantelli* are now to be seen in the principal public and in some private collections; but of crania proper which can with much probability be referred to *Iguanodon*, the only remains known to me are a mutilated base, with side-walls, and several fragments of the vault and sides of the skull in the Rev. W. Fox's collection, obtained near Brixton, Isle of Wight, and the skull which, several years ago, I brought under the notice of this Society, and of which a figure is given in vol. xxvii. pl. xi. of the Quarterly Journal. It came from the Wealden clay at Brooke.

The articular element of the mandible is one of the missing parts which has escaped recognition (no mandible yet figured, or, so far as I know, in any collection, possesses it); and I am happy to have now an opportunity, through the courtesy of Mr. Fox, of bringing before the Society a form of articular bone to which, from intrinsic characters, and also from its *gisement*, the Iguanodon appears to me to have a paramount claim.

After several years of fruitless search in every accessible collection for the Iguanodon's *os articulare*, Mr. Fox, in 1869, submitted to me a bone the skeletal place of which he had not been able to decide; and indeed, apart from the rest of the mandible, its identification by one who had not specially studied anatomy offered considerable difficulty. There could not, however, be any doubt that the bone in question was the detached *os articulare* of a very large reptilian mandible. Mr. Fox had long possessed three, which, as he afterwards told me, he had obtained from the same localities that had yielded him magnificent mandibular rami of Mantell's Iguanodon. I suggested at the time to their fortunate possessor that he should publish an account of these valuable specimens; but it appeared to him wiser to wait for additional evidence confirmatory of their really belonging to the Iguanodon. Since then he has obtained two others, making five in all, of which four belong to right rami; and in May of last year he proposed to me to communicate to the Society an account of them.

Taking the least imperfect specimen as the type (in all the ante-

rior border is mutilated), this os articulare may be described as consisting of a vertical plate largely appearing in the outer surface of the jaw, and of a horizontal plate projecting inwards from the former in a shelf-like manner, bearing the tympanic articular surface.

Vertical plate.—The outer surface of this is smooth; so much of it as lies in advance of the tympanic joint has a roughly quadrilateral outline (see fig. 1); and here its vertical depth is about double that of the part behind it abreast of the tympanic joint, which narrows chiefly by the sharp descent of the upper border of the plate. Below, the quadrilateral part is bent inwards, which makes its upper border overhang, particularly above a large foramen to be shortly described. Abreast of the tympanic joint the surface of the plate bends inwards, through the tapering-off of the hinder end of the jaw.

At the bottom of a shallow circular pit, rather behind and above the middle of the quadrilateral part of this plate, is a large foramen, which would give passage to a cedar drawing-pencil (fig. 1, *b*). Its inner opening is deeply placed beneath and hidden by a thin lip or sheet rising from the front of the tympanic surface (figs. 1, 2, 3, *c*).

Figs. 1-4.—*Right Os articulare of Iguanodon, one third natural size.*

Fig. 1.—*Outer View.*

a. Tympanic joint. *b.* Foramen. *c.* Ascending process from tympanic surface.

Fig. 2.—*Tympanic Surface, from above.*

c. Ascending process.

Fig. 3.—*Inner View.*

a. Tympanic surface.

c. Ascending process.

Fig. 4.—*Under Surface.*

a. Under surface of articular face.

b. Outer surface.

c. Sutural surface for angular bone.

This foramen is present in all Mr. Fox's specimens, and may be looked on as constant in this type of articular bone. I find it also in the *Hypsilophodon's* mandible. A perforation in a bony element, and not a space between the angular, surangular, and dentary pieces, this foramen does not correspond to the large oval opening in the mandible of extant and extinct crocodilians, but rather to the foramen, sometimes double, present in the surangular element in some extant lizards. (Such foramina are to be seen in *Iguana tuberculata*, 672 A, and *Sphenodon*, 662 a, Mus. Roy. Coll. Surg.)

In its whole preserved extent the upper border of the vertical plate is a thin, non-articular, smooth, rounded lip. From in front it gradually and gently rises to a short distance behind the large foramen just described, where it reaches its greatest height; and thence it descends in a sinuous S-curve, the first bend of which is steep and abrupt, the second bend shallow and open. In front of the tympanic joint the whole inner surface of the vertical plate is non-articular, but less smooth than the outer surface of the same part. It is much hidden by the sheet rising from the front of the tympanic surface, with which it forms the sides of a large and deep hollow, in the fresh state presumably filled with the persistent

remains of the cartilaginous rod upon which the bony elements of the jaw were laid down. All that part of the vertical plate which underlies and supports the tympanic surface is stout and sutural. The lower border of the vertical plate in front, where it is broken through, is 1 to $1\frac{1}{4}$ inch wide; and behind it tapers to nothing at the hinder end of the jaw. In its whole length this border is longitudinally grooved by sutural marks.

The horizontal plate bearing the tympanic surface, viewed from above, has a roughly triangular outline (fig. 2; fig. 3 a). Its inner border is almost straight; and for its anterior two thirds it projects inwards beyond the vertical plate in a shelf-like manner. It meets in front the anterior border, making with this an angle which, in a less incomplete example, ran forward for about an inch in a tongue-like form. The anterior border, rising and at the same time acquiring a slight outward twist, becomes a highly inclined curved sheet, which above, at its outer border, is separated by a shallow groove from the upper lip of the vertical plate.

The tympanic articular surface is hollow from side to side, and also from before backward. Its greatest length is in the direction of the axis of the jaw; and in this direction, behind, a low median rising imperfectly marks off an inner and an outer part.

The above details will have made it apparent that the mandible represented by this articular bone differed greatly from that of Crocodilia, and in a less degree from those of extant lizards; whilst in some important features it resembled that of *Hypsilophodon Fovii*. This, and the occurrence of the bone in relative abundance in the same beds and localities which have yielded Iguanodon-mandibles, always wanting the articular element, appear to me sufficient warrant for (at least provisionally) referring this os articulare to the Iguanodon.