

A PLATE illustrative of the article, "On Bones of an Animal resembling the Megalosaur, found in the Rhætic formation at Wedmore," will be sent out with the next volume.

On Bones of an Animal resembling the Megalosaur, found in the Rhoetic formation at Medmore.

BY W. A. SANFORD.

MOST persons who have paid any attention to geology, know well that during the secondary or Mesozoic period, a race of animals belonging to the lizard group existed, some of which reached a very large size. As far as we at present know, two species of the oldest of these animals were found some years ago in the Magnesian Conglomerate on Durdham Down, near Bristol, the age of which has been determined by the Geological Survey to be Triassic or New Red Sand, and rather late in the formation, being probably contemporaneous with the bottom beds of the Keuper. They were named by the discoverers, Dr. Riley and Mr. Stuchbury, "Thecodontosaurus" and "Palæosaurus"; the first of these names signifying that they had teeth implanted in sockets. From the fragments that were found, they appear to have been animals of moderate size. Until very recently no bones of Triassic date had been discovered which indicate larger animals than these, that is lizards which were under twelve feet long from nose to tip of the tail. But in several parts of the world, such as in England and in America, footsteps of animals have been found imprinted on slabs of the New Red Sandstone, which indicate animals which may have been of the same character, but of much larger dimensions: some of these which shewed only two

impressions and not four, as others did, were attributed to gigantic birds, having toes of twenty inches or more long. They were accompanied by others which were evidently the traces of gigantic frogs or newts: these mostly had five toes, whereas the others shewed the marks of three or at most four.

In the Oolitic or Jurassic and later strata, however, animals of this order have left bones, and in some cases, as in Belgium, entire skeletons, of enormous size and extraordinary forms.

Entire skeletons of the Iguanodon or iguana-toothed lizard are found in Belgium, which shew indisputably that it was an herbivorous animal in the form of a kangaroo, though not like that animal going with its hock or heel on the ground, but like a bird on its toes, which, when it stood up, was at least fifteen feet high* to the top of the head, and it was at least thirty feet in length. Isolated bones of this giant have been found in the Wealden strata in Sussex and in the Isle of Wight. These strata belong to the Neocomian or Green Sand period, much later of course than the New Red Sand, having the whole of the Jurassic or Lias and Oolite rocks between them. A rather smaller form of this animal was the first discovered of the order, and was found in Tilgate Forest, in Sussex, by Dr. and Mrs. Mantell, in 1822. Other allied forms, both larger and much smaller, have been found in America, Europe, and India. One in America, the atlantosaur, had a thigh bone upwards of six feet in length, and if organized like the large iguanodon may have been thirty feet high and perhaps seventy or eighty feet long.† The remains of another, the ornithopsis, found in the Isle of Wight, indicate an animal of nearly the same size; others seem to have been quite as large, and some remains have been found which indicate animals of bulk still more vast. But other considerations shew that it was probable that these great creatures walked on all fours, and some of them almost

* This is as the specimen is mounted in the Brussels Museum. It is probably too high, the inclination of the femur being too slight.

† Estimate of Dr. Marsh.

certainly lived habitually amphibious or aquatic lives, so that they would not have been stranger on account of their bulk than whales. As far as we know, most of these seem to have had teeth which shew them to have lived on vegetables or at least on the softest animals. But they were accompanied by animals of considerable size, of a somewhat similar structure, but which had teeth which shew that they were probably carnivorous, some of these also being furnished with strong grasping claws. These have had given them several names, the best known of which is "Megalosaurus" or great lizard. Remains of one of these animals were first discovered by Dr. Buckland, at Stonesfield, in Oxfordshire, in 1824. It was smaller than the iguanodon, but still a very large animal. One allied form, the ceratosaur, found in America, was estimated by Dr. Marsh, the discoverer, to have been twenty-two feet long, and to have stood eleven or twelve feet high. It is convenient to class all these, whether large or small, under the name of dinosaurs. But they are separated into several sub-orders by palæontologists.

Hitherto, in England, no bones of these very large forms of carnivorous lizards have been found in strata lower than the strictly Jurassic series, which range from the Lias to the Purbeck beds inclusive. They range also into the higher Neocomian and Chalk periods, but those that were found in the Trias are of the smaller or more moderate sizes, not larger perhaps than the larger kangaroos. But now I have good evidence that a very large carnivorous dinosaur existed in Somersetshire during the period that the Rhœtic or highest member of the Trias was in course of deposition.

Some months ago Mr. Sydenham Hervey, my brother-in-law, told me that a large bone had been found in his parish of Wedmore. On the first opportunity I had of visiting Wedmore I was with a party of ladies, and therefore had but a short time for examination. There is a small quarry or pit about the spot marked on the map of the Geological Survey

by the letter D of the word Wedmore to the south-east of the village of Wedmore. Mr. Hervey went into this quarry where the bones had been found and came out with a large fragment of bone on his shoulder, which I instantly recognised as the lower part of the large bone of the leg of a very large saurian. We collected a few other smaller fragments, and went to the cottage of one of the workmen, who had saved other bones from the quarry, and I obtained a nearly complete femur or thigh bone, a number of large portions of vertebræ or backbone joints, and some other fragments. Subsequently Mr. Hervey obtained from the workmen some other bones, including a perfect claw bone and other portions of the foot, the lower ends of the two small bones of the hind leg, and fragments of ribs, some of which fitted together. On cleaning the bones, I almost at once found that they were clearly the bones of a large dinosaur, but was much surprised to find that the stratum in which they were found was marked in the maps as Rhœtic, particularly as I had not at the time found the characteristic shells of that formation in or near the quarry. I therefore took the bones to London, and carefully compared them with the dinosaurian bones in the national collection. I soon found that the femur differed from all those of the herbivorous forms, such as the iguanodon, by the peculiar inward curvature of the proximal or higher end, and especially by the substitution, for the great well-separated trochanter of the iguanodon, of a strong ridge following the general curvature of the bone, the whole surface of which is roughened for the attachment of powerful muscles. But although in this respect the femur differs essentially from that of the iguanodon, and to a certain extent resembles, and in fact exaggerates, that of the megalosaur, there may be in the perfect bone a resemblance to that of the former animal which is wanting in the latter. There is a fracture of the surface of the bone about two-fifths of its length from the lower end, near where in the iguanodon there is the lower or inner hatchet-shaped trochanter; of this I could

find no trace in this position in the femora of megalosaur. If this trochanter is found at this point in other specimens of our fossil it would indicate an approach to the herbivorous animal, and a departure from the carnivorous form. But this is not probable, as there is in very nearly the same position as in the megalosaur, but covered with matrix in our specimen, an apparent roughness in the bone, very similar to that which is recognised as the equivalent of the inner trochanter of the megalosaur. The bone is also far more robust in its proportions than that of the megalosaur, particularly at its distal or lower end, and also at the neck of the bone, and this massive character extends to the vertebræ, which in other respects correspond in form with those of the carnivorous animal. The only other bone which gives us any distinct information is the claw bone: this differs from all those of the iguanodon, and resembles those of the megalosaur that I have examined in its deeper and stronger section, and the absence of flatness which in the claw of the iguanodon suggests fitness for the support of weight, rather than the strength required in a claw for the purposes of defence or activity, which is shown in our fossil.

Thus, I think we have enough to say with tolerable certainty that an animal having resemblances to the megalosaur and of very large size, was an inhabitant of the Mendip slopes and of the rising Triassic shore at their base before the Lias commenced to be deposited.

I am warned, by the mistakes which have been, from time to time, made by palæontologists far more able than myself, to give no more than a very general description and measurements of one or two of these bones. Nor do I think it right to give a specific name to the animal, until we find out a good deal more about it. It is almost certainly specifically distinct from any animal hitherto known, and it probably may form the type of a new genus.

It is absolutely necessary in the interests of science that the specimens should be with the large collection of these giants

in the national collection, but it will be represented in our county museum by casts carefully made by experts in the British Museum.

	Femur: Saurian. Wedmore.		Femur: Iguanodon Bernisartensis. I. of Wight.		Femur: Megalosaurus Bucklandi. Stonesfield.	
	M.	IN.	M.	IN.	M.	IN.
Length	0.96	37 $\frac{3}{4}$	1.15	45 $\frac{5}{8}$	0.81	31 $\frac{1}{2}$
Circumference near Proximal end of shaft ... }	0.453	17 $\frac{3}{4}$	0.76	29 $\frac{1}{16}$ $\frac{5}{16}$	0.34	13 $\frac{1}{2}$
Round Trochanter ...	0.473	18 $\frac{5}{8}$	0.48	18 $\frac{7}{8}$	0.31	12 $\frac{1}{4}$
Distal Circumference	0.736	29	0.55	21 $\frac{3}{4}$	0.36	14 $\frac{1}{8}$
	Tibia: Saurian Wedmore.				Tibia: Megalosaurus Bucklandi.	
	M.	IN.			M.	IN.
Distal Circumference	0.675	26 $\frac{1}{2}$			0.27	10 $\frac{5}{8}$

Since writing the above, I have again visited Wedmore, and, in company with my brother-in-law, have excavated a large part of the quarry. We found but scattered bones of the animal; but close to the spot where the vertebræ and large limb bones occurred we found portions of the lower jaw, which gave us the positive information which we required to establish the fact of the carnivorous character of the animal. Portions of the lower jaw and an entire tooth were found, the root of which I fear has crumbled into powder; but the crown is still nearly perfect, and it is distinctly and unmistakably that of the carnivorous form, but it appears to me, though smaller, to be stouter and more circular in section than the later Jurassic forms. The posterior or concave edge is distinctly though slightly serrated. Large portions of dorsal vertebræ of great size have also been recovered, and portions of other teeth, and many fragments of different parts of the animal.

I must now turn to the deposit in which these remains have been found. If you look at the most recent edition of the map

of the district issued by the Geological Survey, you will see, running in a north-west and south-east direction, an irregular brown band interrupted by a red spur projecting from a red band to the north-east of the brown band. In this red spur lies the village of Wedmore, and the ridge of Wedmore hill is largely marked by the brown band. The red band represents the Keuper Red Marl and the brown the Rhœtic bed which lies upon it. The yellowish band to the south and south-east of the brown represents the Lias which lies upon the Rhœtic beds. These Rhœtic beds were formerly classed with the Lias, but the fossils which they contain shew that they are more closely connected with the underlying Trias, than with the overlying Lias. These fossils are the teeth of reptiles, and of fish, and of batrachians, or frog or newt-like animals, and the beds are generally well marked by two or three shells, particularly the *Avicula contorta*, the *Cardium Rhœticum* and a peculiar pecten. Towards the upper part of the beds at Wedmore, there is a sheet, from a foot to two feet six inches in thickness, of a peculiar hard limestone, in which are many impressions of shells and some teeth, the mass of the rock being formed of twisted and plaited laminae, which appear to be formed from the substance of the animal remains re-deposited from the water which has dissolved them. Among these shells we find the shells and teeth which characterize the Rhœtic beds. The surface of this sheet is from three to thirteen or fourteen feet beneath the surface of the ground, on the top of the hill, it being covered with strata of clay and of a thin coarse "gravelly," or rather concretionary, bed. This top "gravelly" bed, which seems to be tolerably definite in its position, is covered by a bed of sticky dark blue clay and then by the top soil. This dark clay has been examined, and is found to contain foraminifera, which seem to be unknown to science, and are probably peculiar to the formation. The bones were found resting on the rock, mostly in hollows more or less definite, imbedded in the lower sandy greenish clay which contained

much vegetable fossil matter and many teeth and fragments of shell, apparently identical with those imbedded in the rock, which itself contained the typical *Avicula contorta* and *Cardium Rhœticum*, though these shells were not definitely recognised in the clay itself. I see, therefore, no solid reason for doubting the Rhœtic age of the clay as determined by the Government Geological Survey.

I give the thickness of each of the beds in the quarry where the bones were found.

	<i>Inches.</i>
1. Top soil	12 to 15
2. Dark sticky clay ... maximum	29
3. Thin shaly or concretionary bed, locally "gravelly"	1 to 3
4. Somewhat similar—some clay and shale mixed, irregular in composition, large septaria about	8
5. Light-coloured sandy clay, some few fossil teeth and shells	9
6. Darker clay with small septaria numerous, some teeth and bits of bone... ..	9
7. Saurian bed, the bones generally found next the rock, many teeth of reptiles, fish, and batrachians? vegetable re- mains	9 to 10 or 12
8. There is a bed found in places and next the rock, generally near the larger bones, whitish or even quite white like mortar. It seems to be composed of the mycelium of a fungus which pene- trates the joints of the clay, and dying, stains them of a black colour ... from	1 to $\frac{1}{2}$
9. The Wedmore stone described above, in three beds generally, from a few inches to	2ft. 6in. thick

The thickness of the beds varies much over the hill : in some places there are several feet of beds resembling those below, above the dark sticky clay. And I was informed by Mr. Wall, the architect of the new board school near Mudgeley, that when he sunk a well through the Lias, he found from twenty-five to thirty feet of these beds between the Lias and the "Wedmore stone." Hence, we may conclude that the great saurian bed is at least that depth below the lowest Lias.

Professor Seeley, who has given me much information, has most kindly undertaken to carefully examine these bones, and to give a technical description of them. I cannot but feel that I am especially fortunate in obtaining the assistance of so eminent a palæontologist in this matter as he, from a cursory examination of some of them, states that he takes great interest in them.