

XI.—*On the Discovery of a New Species of Pterodactyle in the Lias at Lyme Regis.*

BY THE REV. W. BUCKLAND, D.D. V.P.G.S., F.R.S. F.L.S.

PROFESSOR OF GEOLOGY AND MINERALOGY IN THE UNIVERSITY OF OXFORD,
&c. &c. &c.

[Read Feb. 6th, 1829.]

IN the same blue lias formation at Lyme Regis, in which so many specimens of Ichthyosaurus and Plesiosaurus have been discovered by Miss Mary Anning, she has recently found the skeleton of an unknown species of that most rare and curious of all reptiles, the Pterodactyle, an extinct genus, which has yet been recognized only in the upper Jura limestone beds of Aichstedt and Solenhofen, in the lithographic stone, which is nearly coëval with the chalk of England.

The history of the only two perfect specimens that have yet been found of this most anomalous genus of extinct reptiles, is familiar to all geologists from the minute and detailed descriptions which Cuvier has given of them : and the *Pterodactylus longirostris* and *Pterodactylus brevirostris* are pronounced by him to be incontestably the most extraordinary of all the extinct animals which have come under his consideration ; and such as, if we saw them restored to life, would appear most strange and most dissimilar to any thing that now exists. “Ce sont de tous les êtres dont ce livre nous révèle l'ancienne existence, les plus extraordinaires, et ceux qui, si on les voyait vivans, paroîtroient les plus étrangers à toute la nature actuelle*.”

In size and general form and in the disposition and character of its wings, this fossil genus, according to Cuvier, somewhat resembled our modern bats and vampyres, but had its beak elongated like the bill of a woodcock, and armed with teeth like the snout of a crocodile ; its vertebræ, ribs, pelvis, legs, and feet, resembled those of a lizard ; its three anterior fingers terminated in long hooked claws like that on the fore-finger of the bat ; and over its body was a covering, neither composed of feathers as in the bird, nor of hair as in the bat, but of scaly armour like that of an Iguana ;—in short, a monster resem-

* Cuv. vol. v. Part II. p. 379.

bling nothing that has ever been seen or heard-of upon earth, excepting the dragons of romance and heraldry. Moreover, it was probably noctivagous and insectivorous, and in both these points resembled the bat; but differed from it, in having the most important bones in its body constructed after the manner of those of reptiles. With flocks of such-like creatures flying in the air, and shoals of no less monstrous Ichthyosauri and Plesiosauri swarming in the ocean, and gigantic crocodiles and tortoises crawling on the shores of the primæval lakes and rivers,—air, sea, and land must have been strangely tenanted in these early periods of our infant world.

As the most obvious point of difference between our new species of Pterodactyle and those described by Cuvier, consists in the greater length of the claws, I propose to designate it by the name of *Pterodactylus macronyx*, and for the peculiarities of its structure, refer to my subjoined description of the details of its skeleton, and to Plate XXVII. lithographed from the specimen, and from a drawing which Mr. Clift kindly prepared to accompany this paper.

The individual we possess must have been nearly of the size of a raven:—the head is wanting, but much of the skeleton, though dislocated, is nearly entire; part of the neck is also lost. Mr. Clift and Mr. Broderip have discovered that the remaining cervical vertebræ are surrounded with small cylindrical bony tendons of the size of a thread*. These run parallel to the vertebræ, like the tendons that surround the tails of rats, and resemble the bony tendons that run along the back of the Pygmy Musk (*Moschus Pygmaeus*), and of many birds, and are familiar to us in the leg of the common Turkey: these bony tendons must have materially added to the power of the neck and head of the Pterodactyle. Of the vertebræ of the back and the ribs but few remain: the sternum is much crushed, but appears to have been large; the pelvis also is large and well preserved. Three vertebræ of the tail remain, and show by their size that it was large and powerful: the legs are longer and stronger than in any of the bats or vampyres, and terminate in a long foot;—the lower extremities being thus altogether more adapted for standing and moving on the ground, after the manner of birds.

The scapulæ and coracoids are remarkably perfect, and much resemble those of birds: the wings when unfolded must have reached nearly four feet from tip to tip; their membrane was expanded by an elongation of the phalanges of the fourth finger, aided by the legs, and probably by the tail. The three anterior fingers are of unequal length; the first having two phalanges, the second three, and the third four, as in the foot of crocodiles and lizards. In all three fingers the penultimate phalanges, next the unguis bone, are the

* Plate XXVII. fig. 1^a.

longest; and in the second and third fingers the antepenultimate is the shortest. This is precisely the arrangement pointed out by Cuvier in the *Pterodactylus longirostris*. These three fingers, terminating in claws so long that I have chosen them to characterize the species by the name *macronyx*, must have formed a powerful paw, wherewith the animal was enabled to creep, or climb, or suspend itself from trees:—thus, like Milton's fiend, all-qualified for all services and all elements, the creature was a fit companion for the kindred reptiles that swarmed in the seas or crawled on the shores of a turbulent planet.

“The Fiend,
O'er bog, or steep, through straight, rough, dense, or rare,
With head, hands, wings, or feet, pursues his way,
And swims*, or sinks, or wades, or creeps, or flies.”

Paradise Lost, Book II. line 947.

I had for some time past suspected the existence of the Pterodactyle in the lias at Lyme; partly from having heard, about twenty years ago, that in the collection of Mr. Rowe, then made at Charmouth, there was the skeleton of a fossil bird, which I never saw, but imagine may have been a Pterodactyle; and partly from having found, four years ago at Lyme, in the collection of Miss Philpots, some bones of a wing and toe, which I could refer to no other animal, and of which a drawing was then made for me. More recently, I have discovered in the cabinet of Miss Philpots a thin elongated fragment of flat bone, which appears to be the jaw of a Pterodactyle; it is set with very minute, flat, lancet-shaped teeth, bearing the character of a lacertine animal—A drawing of it is annexed†.

Having thus established the existence of this genus at so early a period in the secondary formations as that of the lias, I revert to an opinion expressed to me in 1823 by Mr. I. S. Miller of Bristol,—that many of the bones in the Oxford Museum, from the oolitic slate of Stonesfield, which have generally been considered as the bones of birds, ought rather to be referred to the Pterodactyle. At that time I saw much reason to adopt his opinion with respect to many specimens; and I now, on further examination, am disposed to think that they may all be referred to a flying reptile rather than a bird; and it is

* In the Zoological Journal, No. XVI. p. 458, is a paper by G. Tradescant Lay, Esq. on the *Pteropus Pselaphon*, or Vampire Bat, of the Island of Bonin, which shows that animal, in case of need, to possess the power of swimming. “One of them being placed by the sailors on a raft thrown into the sea, and having for some time laboured in vain to find a convenient place to suspend itself, abandoned the raft, and swam pertinaciously after the boat.”

† Plate XXVII. fig. 3.

remarkable that the elytra of coleopterous insects, on which this reptile might have fed, occur at Stonesfield in the same stratum with its bones. Here then we have another new and important locality of the genus *Pterodactyle*, nearly in the middle region of the oolite formation, in a place intermediate between the lias and the lithographic limestone: and from its occurrence at the two extremes, and nearly in the centre of the series of the successive deposits which are grouped together under the name of Jura limestone, we may with probability infer, that its existence extended through the entire long period of this great formation from lias to chalk. Within this period are included all the strata of Tilgate Forest: and it deserves inquiry whether many of the bones discovered therein, which Mr. Mantell has referred to birds, may not on more careful examination prove to belong also to the *Pterodactyle*; and whether there be any certain evidence of the existence of fossil birds in strata more ancient than the tertiary.

I now proceed to my description of the details of the skeleton of *Pterodactylus macronyx**.

As many of the bones are moved from their natural place, they will be recognized more easily by reference to Plate XXVII. fig. 2, where the extremities are restored.

In my description, I shall follow, as nearly as possible, the order and illustrations adopted by Cuvier in his admirable account of the *Pterodactylus longirostris*.

Head.—The head is entirely wanting:—the fragment of a jaw† found in the same lias at Lyme Regis, and now in the collection of Miss Philpots, is probably that of our *Pterodactyle*; the teeth are simple, and like one another—flat, and shaped at the point like a lancet‡: the jaw bone is very thin.

Neck.—The anterior part is lost, and the remainder much obscured by pyrites; one vertebra only at *a*, is distinctly seen to be three quarters of an inch in length; thus corresponding with the cervical vertebræ of *Pterodactylus longirostris*. Around this long vertebra, and extending from it in both directions towards the head and back, are small cylindrical bony tendons, resembling the soft tendons that run parallel to the vertebræ in the tails of rats. They seem to terminate in the first dorsal vertebra, but the specimen is too imperfect to show this with certainty.

Vertebræ.—The vertebræ are much dislocated, and many of them lost; the bodies of four are seen near *a'*; two also are visible beneath the neck, at *b*; and one dorsal vertebra, at *b'*, retains the spinous process, and one transverse

* Plate XXVII.

† Plate XXVII. fig. 3.

‡ See magnified view of them at fig. 3.

process with the head of the articulating rib in contact with it. C is the body of a vertebra showing a convex articulating surface, as in the crocodile, with a cast of the medullary cavity at 2; the annular portion is lost. Traces of the spinous processes of another vertebra are seen at C 1.

d. Vertebra, probably lumbar, showing its concave articulating surface, one transverse process, and two anterior spinous processes. Behind this we see the body and large transverse process of another vertebra, probably sacral.

e. Ribs dislocated; impressions of other ribs appear on the stone.

K. Tail.—Three caudal vertebræ, much larger in proportion than those of *P. longirostris*; the legs also are larger and longer: and the tail was probably longer, and may have cooperated with the legs in expanding the membrane for flight:—a long and powerful tail is in strict uniformity with the character of a lizard.

9. 9. Omoplates;—long and narrow as in crocodiles, but still more nearly resembling those of birds.

X.X. Coracoid bones;—large as in birds for support to the wings in flight.

Clavicle;—none apparent.

18. Sternum—is much broken, and its form indistinct, but was large and broad for the attachment of pectoral muscles.

1. 1. Humeri;—lower extremities.

1". 1". Humeri;—upper extremities having the anterior tuberosity salient as in birds, but partly broken off; the right humerus and right scapula are much displaced; the left humerus and other bones of the left wing are nearly in their natural juxta-position, 1. 2. 3. 4. 5.

2. 2. Fore-arms;—showing no traces of any ulna. The right fore-arm is imperfect.

Carpus.—In the left carpus four bones are distinctly visible, *f. g. h. i.* Three of these are in contact with the radius, and the fourth (*i*) is in contact with the largest metacarpal bone: the bones of the right carpus are all dislocated and dispersed, *j. k. l. m.*

3. First, second, and third metacarpal bones of the right hand;—the under surface placed upwards.

3'. First, second, and third metacarpal bones of the left hand.

3". Metacarpal bone supporting the fourth or wing-finger of left hand.

3'''. Metacarpal bone supporting the fourth finger of right hand.

S. Three fingers of the left hand terminating in long claws;—there are two phalanges in the first finger, three in the second, and four in the third finger, as in crocodiles and lizards.

S'. The right hand;—all the bones of the first and third fingers are present,

and but little disturbed ; but the unguis and anterior part of the second bone of the second finger are hid by the humerus.

4. First bone of the fourth or wing-finger.—This finger had probably four phalanges ; parts of the two first, and an impression of part of the third, are all that remain*. There is no vestige of a fifth finger. The proportions of the phalanges of the first three fingers are as follows : The penultimate of each is the longest ; and of the phalanges of the second and third finger, the antepenultimate is the shortest : the form of all the claws is that of a half-crescent compressed, and sharp at the point.

Pelvis.—The three bones of the right side of the pelvis are very distinct, and nearly in place. M. Ilium. L. Ischium. Y. Pubis.

N. left femur. N'. right femur displaced.

O. right tibia. O'. left tibia compressed so as to give the false appearance of a fibula, but there is no trace of a fibula near the right tibia.

T. Tarsus.—The bones of the tarsus are too much covered with pyrites to be made out : portions of two only are visible.

P. Four bones of metatarsus of the left foot distinct and undisturbed, their lower side being uppermost ; the metatarsus of the right foot is concealed.

R. Phalanges of the left toes ; all the unguis bones are wanting.

In the first toe, there remains a fragment of the first phalangeal ;—in the second toe, a fragment of the first and of the second phalangeal ;—in the third toe, the first phalangeal entire, and portions of the second and third ;—in the fourth toe, four bones remain, the unguis only being lost ; of these the penultimate is the longest, and the second and third shortest, as in the *P. longirostris* and in lizards : these second and third bones of the fourth toe, and the second bone of the third toe, are depressed and partly covered by a fragment of the second phalangeal bone of the wing, which I have taken off and replaced.

R'. Toes of the right foot much dislocated ; one claw alone remains at R'' ; it is smaller than the smallest claw of the first finger at S.

The length of the foot and of the tibia and femur shows that the animal must have stood firmly on the ground, where, with its wings folded, it probably moved after the manner of birds. It could perhaps also perch on trees, and lay hold of their branches with its foot and toes, like birds and lizards.

* Plate XXVII. 4. 5. 6.

