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WHATCOMBE,
BLANDFORD.
—AND TELEGRAPH—

August 30 - 1876

My dear General Pitt Rivers

Thank you very much for your kind letter and renewed invitation to meet the Archæological at Rushmore. I should be delighted to come on Thursday (or Friday if you are detained at Cowleaze) and stay till Monday. My wife begs to thank Mrs Pitt Rivers for her kind invitation for the 7th inst. She may not be able to accompany me. Thank you also for your promise to send me a copy of your new Volumes. What a rich interest

do your excavations - annoyed
by Bokerly Dyke evidence! I
wish I lived nearer and
could work with you. I
feel great pity for the
poor little people and their
fate when deprived of Roman
protection. I feel very little
doubt when the East has
been examined as carefully
as Europe we shall find
prehistoric man less degraded
and savage than in the West
and that Palaeolithic &
Neolithic man commenced
the race from nearly the
same centre many centuries
interim. The Landlord's
prospects get worse & worse
every year. I had hoped with
you that the favourable
spring prospects would have

tided us some way up
the shore of prosperity - but
hope told a flattering tale.
Looking forward with much
pleasure to the 18th & with
very kind regards to Mrs Pitt
Rivers Believe me

Yours very truly

J. Mansel-Pleydell

Note on a Plesiosaurus from the Oxford Clay
Weymouth

Towards the end of the Mesozoic age a remarkable diminution of the huge reptiles which swarmed in the seas of that period commenced, and at the beginning of the succeeding age (*the Tertiary*) their annihilation was nearly complete, occasioned by great physical changes, especially affecting the relative positions of land and sea, the sea predominating largely over the land in Europe. We pass from strata of considerable uniformity and of immense thickness over large and extensive areas to beds of great variety of structure, from deep to shallow seas, estuaries, and rivers, where not only these cold-blooded animals disappeared but whole families of other sections of the animal kingdom as well, which were succeeded by others which appeared on the stage of life for the first time. With one or two doubtful exceptions, not a single Mesozoic species passed up into the Tertiary strata; their numbers, both in genera and species, greatly exceeding that of the previous age. Western Europe at this period had four considerable seas instead of one as now—the Anglo-Parisian, the Pyrennean, the Mediterranean, and one which covered the western parts of France from Normandy to Nantes. As the chalk rose above the sea and underwent extensive denudation, the emergence and consequent diminution of the sea-depths occasioned a material diminution of temperature, through alterations of the ocean currents and other causes, which had a disastrous result upon reptile life. During the deposition of the oolitic beds there was a complete uniformity—no great or important break occurred, although there were occasional subsidences, as shown by the clay formations of the Oxford and Kimmeridge clays; also there are previous evidences of tide-level and shore conditions. At the commencement of the Cretaceous age, on the other hand, a gradual submergence of land occurred, accompanied by a considerable extension of the sea-area. The marine beds of Punfield, near Swanage, which rest upon the great fresh water deposits of the Hastings sands, are a good illustration of this initiatory change. Its effects are remarkably shown in the Vale of Blackmore, where there is a great overlap or covering over of the upper oolitic beds by the cretaceous sea. The Hastings sands, Purbeck beds, and Portland strata are hidden, causing an apparent unconformity of the beds, as if the Lower greensand had succeeded the Kimmeridge clay directly, without first covering over the above mentioned intervening beds. Another subsidence and consequent invasion of the sea occurred during the deposition of the Upper greensand, which spread itself over the oolitic formations as it passed on westwards, finally resting on the Triassic formations of East Devon. These changes materially affected the climate and temperature of those parts which came under their influence, especially through the alteration of ocean-currents, upon which both temperature and climate so much depend. What would the climate of the greater part of Europe be if the Gulf Stream was stopped or deflected? The Atlantic would be deprived of one-fifth of the amount of heat it is now receiving in addition to what it has in virtue of the temperature of space. The temperature of Europe would be lowered to a condition of climate as severe as that of North Greenland at the present day. If, again, the warm currents of the North Pacific were to be stopped the northern hemisphere would be subjected to an entire glaciation. The fossils of the Palæozoic age seem to indicate a uniform mild or temperate condition of climate, but not so in the succeeding Carboniferous age, which shows signs of reaction. The late Mr Godwin Austin found large angular blocks in the carboniferous strata of France, which could only be accounted for by referring their inclusion to the agency of ice-carriage, by glacier or iceberg. Large blocks of granite are met with in Scotland in the detrital beds of the coal-basins, which Professor Geikie and other eminent geologists attribute to glacial action. A large block of crystalline rock resembling granite was found embedded in a pit of white chalk near Croydon, and with it were other smaller boulders, all water-worn and composed of a different kind of rock, together with a compact mass of siliceous sand derived from the waste of coast line of crystalline rocks, of which there are none in the neighbourhood of Croydon. All had sunk together without separating, hence they must have been firmly held together, both during the time that they were floating, and whilst sinking to the bottom of the cretaceous sea. Independent of seasonal changes, circulation between the surface and the sea-depths is aided by the co-operation of heat and gravitation. The Gulf of Mexico, which is not exposed to any cold supply of water from the North Pole, is a perfect reservoir of heat; further north, close to the shore of Massachusetts, is a cold current running southwards 60 or 80 miles wide. Thus there are two currents of different temperatures running side by side in opposite directions and only mingling where their edges impinge upon each other. Again, the Gulf Stream divides itself into several channels, the water of which is warm where the channels are deep, and cold in the shallow channels, occasioned by the water, low in temperature, rising from considerable depths over submarine elevated ridges. We can now see the influence ocean currents had, as they have now, upon determining the temperature of the globe, and the consequent disastrous effect upon cold-blooded reptiles when it is suddenly lowered. We have not time to dwell further upon this part of the subject, nor to show that Europe had not at the commencement of the Tertiary age its present continental character, but an insular one, giving free access to the polar currents without the counteracting exchange of warm equatorial currents.

This nearly complete fossil belongs to that section of the extinct reptilian family included in the Order Enaliasaurian or sea lizards, but subsequently divided by Sir Richard Owen, F.R.S., into the *Ichthyopterygia* and *Sauropterygia*, the former is represented by one genus only, *Ichthyosaurus*, the latter by several. Until the year 1841 *Plesiosaurus* was the only representative of this order in Great Britain. At that date Sir Richard Owen removed out of the genera two species, Plesiosaurus Grandis and Plesiosaurus Trochanterius, and made for them a new genus—viz., Pliosaurus. The fossils of this genus were first founded upon two limbs, of which one is preserved in the British Museum, the other in our County Museum. It had an enormous head, supported by a short neck, in which it approached the great freshwater Saurians. It had characteristic vertebræ, having a tubercular rising in the centre centrum, and resembled the Plesiosaurus in its fin-bones and elongated phalanges. Their vertical range was restricted to the middle and upper oolites, whereas Plesiosaurus extended from the Lower lias right through to the chalk. Plesiosaurus is characterised by a very long neck and a short tail. The vertebræ are deeper and more solid than those of Ichthyosaurus; the neural arches are anchylosed with strong outstretched transverse blades to strengthen the spinal column and so sustain the strain upon it in shallow water such as coast lines, estuaries, and rivers, which, I believe, were their usual resorts. Their remains have been found in the Wealden freshwater deposits, into which they drifted probably from the rivers above. Ichthyosaurus, on the other hand, lived in the deep seas, visiting the land only occasionally, either to deposit its eggs or to bask upon the rocks. It had a weak spinal column. The two faces of the centrum nearly met in the centre and the neural arches were unanchylosed, in which it differed from Pliosaurus. The humerus and femur of *Pliosaurus* and of some *Plesiosaurus, e.g., Plesiosaurus manselii* have a third bone in addition to the ulna and radius, and the tibia and fibula, which Mr. Hulke, F.R.S., calls the *os intermedium*, and placed it between the ulna and radius, and between the tibia and fibula, the homologue of which is found in the front and hind limbs of some living saurians. A very interesting morphological question arises as to the possibility of tracing the homology of these bones and their relation to the carpal and tarsal elements of the higher vertebrates. I have already referred to Mr. Richardson's splendid Plesiosaurian specimen in my Paper on the fossil reptiles of Dorset, which will appear in the forthcoming volume of the "Proceedings" of our Club. I have expressed an opinion there that it would possibly turn out to be *Plesiosaurus plicatus* of Phillips. On comparing the typical vertebræ of that species with those of the animal before us, as well as others of *Plesiosaurus* (Murænosaurus) ~~leedsii~~, as described by Professor Seeley in the Quarterly Journal of the Geological Society, vol. xxx., I am inclined to change my mind and to place it with the latter species. *Murænosaurus* is, in Professor Seeley's estimation, a subgenus of *Plesiosaurus* characterised by its shoulder and pelvic girdles, having only one coraco-scapula and one obturator foramen, distinct by a difference in the union of the neural arches, as well as by the distinct forms of the ulna and radius, the tibia, and fibula. I do no think these differences will be held sufficient by Mr. Lydekker to justify Professor Seeley's separating them into a subgenus. This able Palæontologist is now engaged in tabulating and arranging the fossil reptilian remains in the cases of the British Museum. The result of his labours on the Crocodilia and Deinosauria will soon be before the public, as the volume is now in the printer's hands, and will be doubtless as invaluable an addition to Palæontological literature as are his five volumes upon the Fossil Mammalia of our National Museum. The remains of this Plesiosaurus were found in a bed of Oxford clay in the neighbourhood of Weymouth last winter, and through the indefatigable and intelligent industry of Mr. and Mrs. Richardson, of "Montevideo," they have been built up in their present satisfactory condition. The head is missing, which is not surprising, as having only one articulation with the neck, and that an exceedingly small one, it possibly became detached before the carcase settled down in its grave of clay; that a considerable time elapsed previous to its being finally covered over may be inferred by the aggregations of oyster shells upon the vertebræ and bones, which could only be so attached when the body was uncovered. The spinal column consists of 71 vertebræ, of which 35 are cervicals, 15 dorsals, 2 sacrals, and 19 caudals. The shoulder-girdle is nearly complete, consisting of coracoids, scapulæ, and pre-scapulæ, two fore and one hind limb (humerus and femur), a small portion only of the pubes, ischia, and ilia, radius, ulna, tibia, fibula, carpal, and metacarpal bones, many phalanges, and ribs.

leedsii provisionally.

Dorsal vertebræ.—The dorsal vertebræ resemble the last two cervicals, the centrum is rough, its height and length about equal, and both shorter than the breadth. In the fore part of the dorsal region the neural spines are inclined backwards, they at first become vertical, and ultimately slope forwards farther back. The neural arches are not well preserved, and only a few retain the transverse processes. The centrum is altered in form to allow the rib to be raised on to the neural arch. The sides are compressed, with a foramen near the middle of several. The neural spines widen and are extremely compressed from side to side. The position of the transvere processed remain the same throughout. The cervical and caudal vertebræ are characteristics of this long-necked, short-tailed family, by the non-attachment of the ribs to the shoulder girdle of the former, and by the long chairon bones of the latter.

Pectoral girdle.—The coracoids have a short median symphysys five inches long; they diverge from their posterior border, taking an outward diagonal direction, and terminate after making a convex sweep outwards into an extremely thin dilated plate. The bones are thickest where the scapula and humerus articulate, forming a transverse ridge or keel. This ridge is equally marked on the dorsal as well as the ventral surface. Their width immediately behind the articulation is 15 inches, the least width across is 20 inches. The length of the scapula-articulation is three inches, looking obliquely and forward, and lies in front of the ridge.

Scapula.—The scapula consists of a plate which is anchylosed to the coracoid, and from which a bone rises and ascends towards the dorsal surface, making an angle with the central plate of about 50°. This plate is 6in. long and 4in. broad. The inner margin, which is thin and concave at the base, is a continuation of the curve of the front border of the coracoid bone. There is no indication of clavicle or inter-clavicle bones. The inner margin of the ascending plate is concave, the outer straight. The coraco-scapula foramen is not subdivided into two foramina as is the case with many of the genus, and this is one of the differences upon which Professor Seeley forms his genus Murænosaurus. This continuous foramen is bounded laterally by the concave inner border of the scapula and posteriorly by the anterior margin of the coracoid. It is 14in. wide from side to side and 4in. inches from the anterior to the posterior margins.

Pelvic bones.—The pubes is thin, and only a small portion of it is preserved. There is no indication of the symphysis, this part of the bone being unfortunately lost. The outer margins are compressed from side to side and are not so deep as those of the coracoid. The length is 18¾ inches. Both ischia are well preserved. The line of articulation with the pubes is 1½ inch long, and both together with the ilium from the acetabulum with the femur are 2½ inches long. Their length from the median line to the femoral margin is 8 inches, breadth at distal end 5½ inches, breadth at proximal end 3½ inches, breadth at the narrowest part is 2½ inches. The iliac bones are expanded at both extremities, so as to extend over the upper part of the head of the femur, but it is difficult to determine by what surfaces each could have formed the pubes and femur, so as to form the articulation of the femur. Each bone is compressed in different places inclined at an angle to each other. Their length is 6½ inches, breadth at one extremity 1¾ inch, breadth at the other extremity 1½ inch.

Humerus.—The proximal end is cylindrical and thick to its third part where it widens out into a broad flat distal end. The ulna and radius are short, the distal end shows an articulate surface. The part opposite the radius is concave. The carpal bones are polygonal, with two trigonal.

Femur.—The articulate surface is deeply pitted and tuberculate. The proximal end is constricted below the head before it begins to expand. Both margins are nearly straight and gradually flatten out into a broad distal end. It is 1⅝ inch long and 8 inches broad, 3¾ inches at the narrowest part of the shaft. The tibula and fibula, as well as several of the carpal and phalangal bones, are preserved.