Geology and Palaeontology

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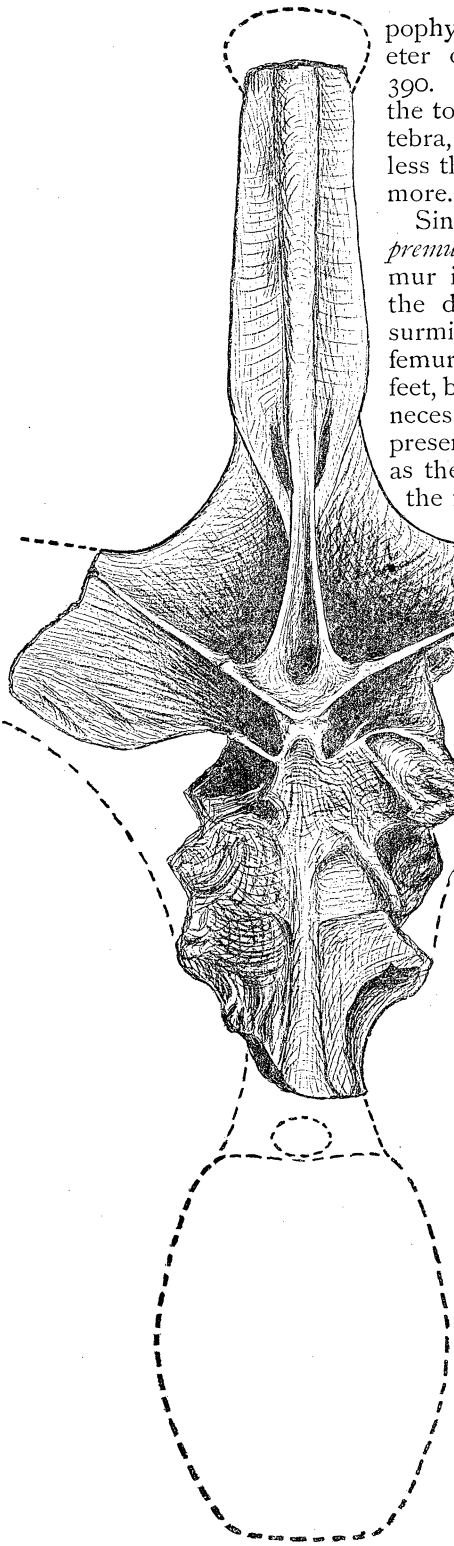
GEOLOGY AND PALÆONTOLOGY.

A NEW SPECIES OF AMPHICŒLIAS.—I have recently received from my indefatigable friend, Mr. O. W. Lucas, the almost entire neural arch of the vertebra of the largest saurian I have yet seen. It was found in the Dakota formation of Colorado, near Canyon city, in the same bed that has thus far produced the known species of *Camarasaurus*, *Amphicœlias*, *Hypsirophus*, etc. In the extreme tenuity of all its parts, this vertebra exceeds those of this type already described, so that much care was requisite to secure its preservation. It exhibits the general characteristics of the genus *Amphicœlias*, in the hyposphen, antero-posteriorly placed neural spine, and elevated diapophysis for the rib articulation. The diapophyses are compressed and supported by a superior and inferior, and anterior and posterior, thin buttresses, separated by deep cavities. As compared with the *Amphicœlias altus*, this reptile differs in the greater elevation and attenuation of the neural spine, as well as its different form; also in the generally more laminar character of its buttresses and walls The double rib of the anterior border of the spine of the *A. altus* is here represented by two laminæ which extend on each side, so as to give a horizontal section of the spine a T shape. The posterior zygapophyses have less lateral expanse than in *A. altus*, but they continue as horizontal laminæ with a deep cavity above and below: their superior surfaces contract into two ridges, which are separated by a deep groove. These ridges, unlike the anterior ones, approximate to each other closely on the border of the spine. The summit of the spine is wanting. The measurements are: total elevation of neural arch preserved, 1500 m.; elevation of posterior zygapophyses, 585; transverse expanse of posterior zyga-



Posterior dorsal vertebra of *Amphicalias fragillimus*, $\frac{1}{10}$th natural size.

pophyses, 190; vertical diameter of base of diapophysis, 390. These figures show that the total elevation of this vertebra, when complete, was not less than six feet, and probably more.

Since in *A. altus* and *C. supremus* the length of the femur is twice the elevation of the dorsal vertebra, we may surmise that the length of the femur of this animal was twelve feet, but this is of course not a necessary consequence of our present knowledge. But so far as the vertebræ are concerned the following rule is without exception among the Saurians of the Dakota epoch: It is, that *the size of the vertebra is in direct proportion to the attenuation of its walls.* This latter character, as seen in this and other species, resembles nothing so much as what is seen in deep sea fishes, as *Alepidosaurus*, etc., and suggests that these beasts may have walked in deep water and browsed on precipitous shores.

The species above described may be called *Amphicœlias fragillimus*. The dimensions of its vertebræ much exceed those of any known land animal.—*E. D. Cope.*

THE RELATIONS OF ANCIENT AND MODERN CROCODILES.—Prof. Owen has recently directed attention to the adaptive character of the modifications of structure which have

taken place in the course of development of the crocodilian order. These changes consist in the advance forwards of the external nares, the more posterior location of the internal nares, the increasing irregularity of the alveolar borders and sizes of the teeth, and the change from amphicœlous to procœlous vertebral articulations.

Prof. Owen proposes that these changes were concomitants of a gradual restriction of aquatic and increase of terrestrial habits, and the gradual diminution of a purely fish diet, and the adoption of land animals as food. The capture of the latter and their retention below the surface of the water until devoured, directly relate to the uses of, and hence necessity for, the new structures in question.

A NEW DIADECTES.—This very singular genus[1] of supposed Saurians, is represented by a third species from the Permian of Texas. The teeth are more completely molar in their character than in the species already described, being in the unworn condition as broad across the crown, as the latter is high. In the transverse direction the crowns are two and half times as long as wide. The extremities are rounded, and there is a median cusp extending across the crown; on each side of the cusp, the face of the crown is slightly concave. The enamel is strongly but finely wrinkled. The tooth series terminates abruptly in a tooth of half the transverse extent of the penultimate. Length of space occupied by penultimate and ante-penultimate teeth M. .021; length of base of penultimate .010; width of do. .024; elevation of crown, least .006; do. at cusp, .009.

This species is larger than those heretofore described, and the teeth are adapted for crushing harder bodies—having perhaps a use like those of *Placodus* or *Pycnodus*. It is called *D. molaris*.

GEOLOGY OF THE BRITISH ARCTIC EXPEDITION.—Geological investigation in the Polar regions is beset with difficulties of so grave a character that very few collections have hitherto been brought home by Arctic explorers, and these have necessarily been meagre. During Sir George Nares' expedition, however, special attention was paid to geological observations wherever practicable, and Captain Fielden thus contrived to collect more than two thousand specimens of rocks and fossils. He also had the good fortune to find his collections brought home in safety—a fact worth mentioning, because some other fine collections have been lost to science through the mishaps incident to Arctic traveling. The recently formed collections, and the results deduced from their study, were lately laid before the Geological Society. In working out the stratigraphical results, Captain Fielden has had the benefit of Mr. de Rance's aid, and in the palæontological department that of Mr. Etheridge. The fundamental rocks

[1] American Naturalist, 1868, May, p. 327.

of the area under examination consist of gneiss which is probably of Laurentian age, the Canadian rocks extending into Polar area. These are followed by unfossiliferous slates and grits, known as the Cape Rawson beds, which are evidently older than the fossil-bearing Upper Silurians. It is proved, indeed, by the recent expedition, that Lower Silurian rocks exists in Grinnell and Hall Lands, thus disproving Murchson's view that the Polar area was dry land during the Lower Silurian period. Sixty species of fossils have been determined by Mr. Etheridge, ranging from the Lower to the Upper Silurian, and including some characteristic forms of Llandecilo and Wenlock age. The cream-colored dolomites found in abundance by some of the previous explorers are believed to represent the whole of the Silurian, and perhaps part of the Devonian period. True marine Devonians have been discovered for the first time in Grinnell Land. Here, too, the carboniferous limestone was found rising to a height of 2000 feet. This formation extends to the most northern point yet reached, and probably strikes beneath the Polar Sea to Spitzbergen. About thirty species, chiefly Brachiopods and Polyzoa, were procured from the carboniferous limestones of Cape Joseph Henry, the most northerly of the twenty localities from which fossils were collected.

Mr. Etheridge points out the greater resemblance of the Arctic palæozoic fauna to that of America than to that of Europe. No mesozoic rocks are known until we reach the cretaceous strata, which are represented in Greenland by plant-bearing beds that indicate by their fossils a warm climate something like that of Egypt at the present day. The vegetation of the miocene beds in the Arctic regions points to climatal conditions about thirty degrees warmer than those which at present prevail. The miocene beds of Grinnell Land contain the common fir (*Pinus abies*) the birch, poplar, and other trees similar to those which occur in Spitzbergen. A seam of miocene coal, thirty feet in thickness, was discovered by the expedition at Lady Franklin Sound.—*Academy.*

GEOGRAPHY AND TRAVELS.[1]

COLONEL PREJEVALSKY'S THIRD JOURNEY.—This distinguished Russian explorer has sent, under date of August, 1877, to the Russian Geographical Society, a report of a third journey in Central Asia. Translations of this report have been made by Dr. Petermann, published as a supplement to his *Mittheilungen*, with the original route maps and an Uebersichts-Karte of his journeys from 1872 to 1877; and also by Dr. R. Kiepert for the *Globus*. At the meeting of the Berlin Geographical Society, on the 6th of April last, Herr Von Richthofen read a very interesting paper upon the results of this journey. Colonel Prejevalsky was most fortunate

[1] Edited by ELLIS H. YARNALL, Philadelphia.