

donsaurian affinities. Among the many remains discovered by the zealous research of Dr. Dawson, I do not know that a single specimen of one of the pectoral plates, so characteristic of all Labyrinthodonts, has made its appearance. They may possibly have been *Amphibia*; but their skulls, their cycloid scales, and their deeply biconcave, fish-like, vertebral centra appear to me to indicate a closer affinity with the *Ophiomorpha* (*Cocilia*, *Ichthyophis*, &c.) than with the *Labyrinthodontia*.

Of the unquestionable Labyrinthodonts which occur in the Carboniferous rocks, then, *Anthracosaurus* is the only genus regarding the vertebral column and ribs of which there is any information; and the description and comparisons which I have given seem to me to necessitate the conclusion that, side by side with the Archegosaurian type, the Mastodonsaurian type of vertebral organization, hitherto known to occur only in the Trias*, was well developed in the *Anthracosaurus* of the Scotch coal-field. At the same time, the ankylosed condition of the neural arches, the supratemporal foramina (which may, however, be parts of the 'mucous grooves' common upon Labyrinthodont skulls, the floor of which was very thin, or merely membranous in the temporal region of *Anthracosaurus*), and the strong median convexity of the snout, separate *Anthracosaurus* from any known Triassic Labyrinthodont. And though, in the general form of the cranium and in some other respects, *Anthracosaurus* has a certain resemblance to the Permian *Dasyceps*, it differs as widely as possible from it in its dentition.

3. On the THICKNESS of the PAMPEAN FORMATION, near BUENOS AYRES.

By CHARLES DARWIN, Esq., M.A., F.R.S., F.G.S., &c.

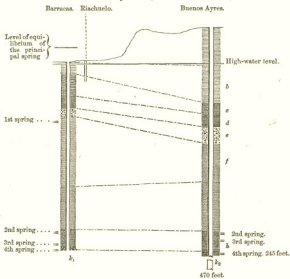
M. SOURDEAUX and J. Coghlan, Esq., C.E., have had the kindness to send me, through E. B. Webb, Esq., C.R., some excellent sections of, and specimens from, two artesian wells lately made at Buenos Ayres. I beg permission to present these specimens to the Geological Society, as they would be of considerable service to any one investigating the geology of that country. The Pampean formation is in several respects so interesting, from containing an extraordinary number of the remains of various extinct Mammifers, such as *Megatherium*, *Mylodon*, *Mastodon*, *Toxodon*, &c., and from its great extent, stretching in a north and south line for at least 750 geographical miles, and covering an area fully equal to that of France, that, as it appears to me, a record ought to be preserved of these borings. Southward, at the Rio Colorado, the Pampean formation meets the great Tertiary formation of Patagonia; and northward, at Sta. Fé Bajada, it overlies this same formation with its several extinct shells.

In the central region near Buenos Ayres no natural section shows its thickness; but, by the borings there made in two artesian wells (figs. 1 & 2), the Pampean mud, with Tosca-rock, is seen to extend

* Nothing is at present known of the vertebrae of *Dasyceps Bucklandi*, from the Bunter sandstein of this country. See Memoirs of the Geological Survey of Great Britain:—The Geology of the Warwickshire Coal-field; by H. H. Howells, F.G.S. 1859.

downwards from the level of the Rio Plata to a depth of 61 feet, and to this must be added 55 feet above the level of the river. These argillaceous beds overlie coarse sand, containing the *Asara labiata* (a shell characteristic of the Pampean formation), and attaining a thickness of about 93 feet*. So that the entire thickness

Fig. 1.—Comparative Sections of the Artesian Wells of Barracas and Buenos Ayres. (Distance $3\frac{1}{2}$ miles.)

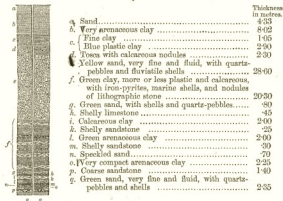


	Thickness at Barracas. Feet.	Thickness at Buenos Ayres. Feet.
a. Clays and Tosca	57
b. Sand	13	51
c. Very sandy clay	} 47	} 63
d. Dark-blue plastic clay.....		
e. Tosca with calcareous nodules		
f. Yellow sands, very fine and fluid	94	45
g. Green sands	66	62
h. Tertiary clay and sandstone (for details see fig. 2)	34	53
k ₁ . Hard sandstone at the bottom of the Barracas Well	4½	
k ₂ . Very calcareous red clay, becoming more marly beneath; bored through to a depth of.....		225

* The following extract from the Report of the borers relates to this bed:—
“The bed of yellow, fluid sands between 18^m·60 and 47^m·20 below the ground

of the great estuarine or Pampean formation near Buenos Ayres is nearly 210 feet.

Fig. 2.—Detailed Section of the Artesian Well at Barracas.



This formation rests on various marine beds of indurated green clay, sand with corals, sandstone, and limestone, altogether 107 feet in thickness. These beds contain fragments of the great *Ostrea Patagonica*, *O. Alvarezii* (?), *Pecten Patagonensis*, and other shells, apparently the same (but they have not been rigorously compared) with those enumerated by M. A. d'Orbigny and by myself as found at Sta. Fé Bajada, as well as at various points on the coast of Patagonia. The already enormous continuous extension of the Patagonian Tertiary formation is thus largely increased. Beneath these beds a mass of red calcareous clay, becoming in the lower part more and more marly, containing layers of sand, and of the thickness of 213 feet, was bored through to a depth of 470 feet from the level of contains a subterranean ascending current, the level of which has not varied by a centimetre for three years. The level is 0^m.60 (2 feet over the level of the wells at Barracas). This bed ('napa') is powerfully absorbent. At 68^m.30 a second subterranean current ('overflowing') was met, which rose one foot over the surface of the ground at Barracas. The discharge was about 50 pipes daily, but the water was salt and undrinkable. At 73^m.30 was found a third subterranean current ('overflowing'), which reached with difficulty the level of the ground. The discharge might be calculated at 100 pipes daily. The water was very salt, and absorbed that of the first overflowing current. The great spring was met with at 77^m.65."

As regards the quality and abundance of the water, Mr. Coghlan remarks that "The quantity of water discharged per hour through a tube of about 4½ inches in diameter, at a level of 6 feet above high-water mark, was 2658 gallons. Its temperature was 21° Cent., and it had a slightly disagreeable taste, from its being impregnated with salts of lime and magnesia and a small quantity of sulphuretted hydrogen."

the Rio Plata. This lower mass contained no fossils, and its age is of course unknown* ; but, I may add, that I saw at two points in Western Banda Oriental, beneath the marine tertiary strata, beds of red clay with marly concretions, which, from their mineralogical resemblance to the overlying Pampean formation, seemed to indicate that at an ancient period the Rio Plata had deposited an estuarine formation, subsequently covered by the marine tertiary beds, and these by the more modern estuarine formation, with its remains of numerous gigantic mammalia ; and that, finally, the whole had been elevated into the present plains of the Pampas.

4. GEOLOGICAL NOTES on the Locality in SIBERIA where Fossil Fish and ESTHERIA have been found. By C. E. AUSTIN, Esq., Mem. I.C.E., F.G.S. With a Note on ESTHERIA MIDDENDORFII ; by Professor T. RUPERT JONES, F.G.S.

(Abridged.)

IN 1858 I had the pleasure of presenting to the Society some slabs of fossiliferous shale, containing specimens of the fossil fish mentioned by Dr. von Middendorf† as having been obtained by him at Nertchinsk, during his last journey in Siberia, and named *Lycoptera Middendorffi* by J. Müller‡.

The slabs also contain the remains of a number of *Estheria*, referred to by Müller as *Linnæidæ*§, as well as portions of reeds and stems of plants, some lignite, and two imperfectly preserved shells which probably belong to a species of *Linnæus*, but may possibly be *Paludina*. They were taken by me from the bed, *in situ*, in the year 1848.

The bed lies about 160 versts south by east of Nertchinsk, at the base of a cliff from 6 to 10 feet high, extending north and south, and forming the west or right bank of a small clear stream, called the Toorga, which flows southward into the River Onon. The bed dips westward about 25°.

The east bank of this stream, where it flows by the fossiliferous strata, rises gradually, and extends, above the level of the water, into a plain, on which conspicuous masses of igneous rocks are distributed.

At a point eight versts to the south of that where the fossils were found, an abrupt hill of augite-porphry rises from the plain to an elevation of more than 100 feet. Its southern face is composed of rhomboids cemented together by quartz into one solid mass, and thus a rock is formed which is not uncommon in the mountainous districts of Siberia.

* It was supposed by Dr. Burmeister to be Silurian.

† A. Th. von Middendorf's 'Siberische Reise,' Band i. Theil. 1. Rinleitung ; Klimatologie ; Geognosie. Fossile Fische, bearbeitet von Johannes Müller: 4to. St. Petersburg, 1847. See also Quart. Journ. Geol. Soc. vol. vi. part ii. Miscell. pp. 45-48.

‡ *Op. cit.* p. 262, pl. 11.

§ *Op. cit.* p. 261.