

3. *Notice of the DISCOVERY of ADDITIONAL REMAINS of LAND ANIMALS in the COAL-MEASURES of the SOUTH JOGGINS, NOVA SCOTIA.* By J. W. DAWSON, LL.D., F.G.S., Principal of McGill College.

In the long range of rapidly wasting cliffs at the South Joggins, every successive year exposes new examples of erect trees and other fossils; and, as the removal of the fallen débris is equally rapid with the wasting of the cliff, it is only by repeated visits that the geologist can thoroughly appreciate the richness of this remarkable section, while every renewed exploration is certain to be rewarded by new facts and specimens. The present notice is intended to record the gleanings obtained in my last visit, in connexion with the presentation to the Society of a suite of specimens of the fossil Reptiles and other land-animals of the locality, which I desire to deposit in the Museum of the Society, that they may be more fully studied by comparative anatomists, and may remain as types of the species, accessible to British geologists.

In the bed which has hitherto alone afforded reptilian remains in its erect trees, two additional examples of these were exposed. One was on the beach, and in part removed by the sea. The other was in the cliff, but so far disengaged that a miner succeeded in bringing it down for me. In the first comparatively little was found. It afforded only a few shells of *Pupa vetusta*, and scattered bones of a full-grown individual of *Dendroterpeton Acadianum*.

The second tree was more richly stored; and, being *in situ*, was very instructive as to the mode of occurrence of the remains. Like all the other trees in which reptilian bones have been found, it sprang immediately from the surface of the six-inch coal in Group XV. of my section\*, which is also Coal No. 15 of Sir W. E. Logan's section †. Its diameter at the base was 2 feet, and its height 6 feet, above which, however, an appearance of additional height was given by the usual funnel-shaped sinking of the overlying beds toward the cavity of the trunk. The bark is well preserved in the state of bituminous coal, and presents externally a longitudinally wrinkled surface without ribs or leaf-scars; but within, on the "ligneous" surface, or that of the inner bark, there are broad flat ribs and transversely elongated scars. The appearances are precisely those which might be expected on an old trunk of my *Sigillaria Brownii*, to which species this tree may have very well belonged ‡.

The contents of the trunk correspond with those of others previously found. At the bottom is the usual layer of mineral charcoal, consisting of the fallen wood and bark of the tree itself. Above this, about 2 feet of its height are filled with a confused mass of vegetable fragments, consisting of *Cordaites*, *Lepidodendron*, *Ulo-dendron*, *Lepidostrobus*, *Calamites*, *Trigonocarpum*, stipes and fronds of Ferns, and mineral charcoal; the whole imbedded in a sandy paste blackened by coaly matter. In and at the top of this mass occur the animal remains. The remainder of the trunk is occupied with

\* Quart. Journ. Geol. Soc. vol. ix. p. 58, and vol. x. p. 20.

† Reports of Geol. Survey of Canada, 1845.

‡ Quart. Journ. Geol. Soc. No. 68. p. 523.

grey and buff sandstone, containing a few fragments of plants, but no remains of animals.

Portions of six reptilian skeletons were obtained from this trunk. The most important of these is a large and nearly complete skeleton of *Dendropereton Acadianum*—by far the most perfect example, as I suppose, of any carboniferous reptile hitherto found. I shall not attempt to describe this specimen, and the new points of structure which it illustrates; but I send the specimen itself, in the hope that its details may be examined and described by the eminent naturalist by whom the species was originally named and characterized. Another specimen found in this trunk is a jaw of an animal about the size of *Dendropereton Acadianum*, but with fewer and larger teeth. I send this specimen, which may possibly indicate a new species. The remaining skeletons were imperfect, and belonged to a small individual of *Dendropereton Acadianum*, two of *Hylonomus Lyelli*, and one of *Hylonomus Wymani*. The dislocated condition of these and other skeletons is probably due to the circumstance that, when they were introduced, the matter filling the trunk was a loose mass of fragments, into the crevices of which the bones dropped, on decay of the soft parts. Most of the skeletons lie at the sides of the trunk, as if the animals had before death crept close to the walls of their prison. At the time when the reptiles were introduced, the hollow trunk must have been a pit 4 feet in depth.

A number of specimens of *Pupa vetusta* and *Xylobius Sigillarix* were found, but nothing throwing further light on these species.

I found in this trunk, for the first time, indications of the presence of *Insects*. The remains observed were disjointed and crushed fragments, and as they did not include wings or elytra, I cannot give any decided opinion as to the orders to which they may have belonged. The most probable conjecture would be that they were *Neuroptera* or *Orthoptera* of large size. The most interesting fragment obtained is a compound eye, imbedded in coprolitic matter, along with obscure portions of limbs and abdominal segments. Its facets are perfectly preserved, and are lined with a brownish bituminous matter, simulating the original pigment. These remains are at least sufficient to prove that in Nova Scotia, as in Europe, *Insects* inhabited the coal-forests, and that they furnished a portion of the food of *Dendropereton* or its allies. I may mention here that in other coprolites quantities of segments of *Xylobius* occur, and that there are some little groups of bones of very small reptiles, which are probably coprolitic.

The beds on a level with the top of this erect tree are arenaceous sandstones, with numerous erect *Calamites*. I searched the surfaces of these beds in vain for bones or footprints of the Reptiles which must have traversed them, and which, but for the hollow erect trees, would apparently have left no trace of their existence. On a surface of similar character, 60 feet higher, and separated by three coals with their accompaniments, and a very thick compact sandstone, I observed a series of footprints which may be those of *Dendropereton* or *Hylonomus*. The impressions are too obscure to show the toes di-

stinctly. They are half an inch in length, with a stride of about 2 inches. On neighbouring layers were pits resembling rain-marks, and trails or impressions of a kind which I have not before observed. They consist of rows of transverse depressions, about an inch in length and  $\frac{1}{4}$  of an inch in breadth. Each trail consists of two of these rows running parallel to each other, and about 6 inches apart. Their direction curves abruptly, and they sometimes cross each other. From their position they were probably produced by a land or freshwater animal—possibly a large Crustacean or gigantic Annelide or Myriapod. In size and general appearance they slightly resemble the curious *Climactichnites* of Sir W. E. Logan, from the Potsdam Sandstone of Canada.

I have long looked in vain for remains of land-animals in any other situation than the erect trees of the bed above referred to; but on my last visit I was much gratified by finding shells of *Pupa vetusta* in a bed 1217 feet below the former, in the upper part of No. 8 of my section, or about 15 feet below Coal No. 37 of Logan's section. The bed in question is a grey and greyish-blue under-clay, full of Stigmarian rootlets, though without any coal or erect trees at its surface. It is 7 feet thick, with sandstone above and below. The shells occur very abundantly in a thickness of about two inches. They have been imbedded entire; but most of them have been crushed and flattened by pressure. They occur in all stages of growth; but the most careful examination did not enable me to detect any new species. With them were a few fragments of bone, probably reptilian. This discovery establishes the existence of *Pupa vetusta* in this locality during the deposition of twenty-one coal-seams, and the growth and burial of at least twenty forests; and from the occurrence of numerous specimens at both extremes of this range, without any other species, it would seem as if, for this locality at least, this was the only representative of the shell-bearing Pulmonates.

I append a list of the specimens forwarded to the Museum of the Society, and which, with those formerly sent, constitute a complete collection of the air-breathing animals hitherto recognized in the Coal-measures of Nova Scotia.

*List of specimens of Reptiles, &c., from the Coal-formation of Nova Scotia, accompanying this paper.*

1. *Hylonomus Lyelli*. A nearly complete skeleton, and the maxillary bone and teeth of another specimen.
2. *H. acedentatus*. Maxillary bone, vertebræ, ribs, scales, and foot.
3. *H. Wymani*. Lower jaw, vertebræ and other bones, and scales.
4. Jaw of a Reptile, supposed to be new.
5. Skin and dermal plates of *Hylonomus*.
6. *Dendrerpeton Acadianum*, Owen. A nearly complete skeleton.
7. *Pupa vetusta*\*. From a bed 1217 feet below that in which the species was originally recognized.

\* I observe that Professor Owen proposes the name "*Dendropupa*" ('Palæontology,' 1860, p. 79); but I have retained *Pupa* for the present, not being satisfied