

Whitcomb
I return to
Amelid Kochy

IX.—*On the Lower Cretaceous Rocks of British Columbia.*

By J. F. WHITEAVES.

(Read May 25th, 1882.)

The equivalents of the Upper Cretaceous Rocks of Great Britain have been recognized over a vast extent of country in the United States and in Canada, but until recently, with two doubtful exceptions, no deposits have been discovered in North America which can be satisfactorily referred to the Middle or Lower sub-divisions of the Cretaceous. The possible exceptions are the so-called Dakota Group of the Western States and the Shasta Group of California. The Dakota Group is a local name employed to designate a series of sandstones containing numerous remains of terrestrial plants, and a few fresh water or estuarine types of mollusca. These sandstones, which are stated to underlie the oldest members of the Upper Cretaceous series both directly and conformably, have been regarded as probably synchronous with the English Upper Greensand. The Shasta Group is a term applied provisionally to strata of different ages, all of which are described as being older than the Upper Cretaceous and newer than the Jurassic. These deposits, which occur at various localities in the coast range of California and which hold a somewhat varied assemblage of marine mollusca, are believed in a general way to be the representatives of the Gault and Lower Greensand of Europe, but no attempt has yet been made to correlate them more closely than this with their foreign equivalents.

During the past seven years, however, the researches of Dr. G. M. Dawson in the mainland of British Columbia and in the islands off the coast have resulted in the acquisition by the Survey of large collections of fossils from various localities, and by means of these we are now enabled to recognize the probable existence in that Province of the equivalents of each of the sub-divisions of the Middle Cretaceous; viz., those of the Upper Greensand and Gault, as well as those of the upper sub-division of the Lower Cretaceous, which in England is known as the Lower Greensand and in France as the "Néocomien supérieur."

The Coarse Conglomerates and Lower Shales of the coal-bearing rocks of the Queen Charlotte Islands, and probably the Agglomerates and Lower Sandstones of Dr. Dawson's report, can now be shown, on both stratigraphical and palæontological grounds, to represent the whole of the Middle Cretaceous, but as this subject will be treated more fully in an illustrated report on these fossils now in course of preparation, it will not be necessary to refer to it at any greater length on the present occasion.

In Great Britain the Lower Cretaceous rocks have been divided into two subordinate groups, known respectively as the Lower Greensand and the Wealden formation. In France the upper member of the Lower Cretaceous is called the *Neocomien Supérieur* and the lower the *Neocomien Inférieur*. Deposits holding fossils, which, in the writer's judgment are probably synchronous, or nearly so, with the upper part of the Lower Cretaceous and which therefore indicate an horizon equivalent to that of the Lower Greensand or

Upper Neocomian, were discovered by Dr. G. M. Dawson in 1875 at Tatlayoco Lake. This lake, it may be mentioned, empties itself into the Homathco River, which in its turn flows into Bute Inlet. Two years later, rocks holding a similar assemblage of fossils, of which good collections were made, were observed by Dr. Dawson on the head waters of the Skagit River, and at three or four localities in the lower part of the valley of the Fraser. Lastly, in 1878, a small series of fossils, from rocks of apparently the same geological horizon, was collected by Dr. Dawson at Forward Inlet, Quatsino Sound, on the N. W. coast of Vancouver Island. The following is a complete list of all the species obtained at these localities, with descriptions of three that are believed to be new to science:—

BELEMNITES IMPRESSUS, Gabb.

Tatlayoco Lake, rare and badly preserved. Skagit River, frequent but fragmentary and in poor condition. North slope of Jackass Mountain, one characteristic fragment.

OLCOSTEPHANUS QUATSINOENSIS, Nov. Sp.

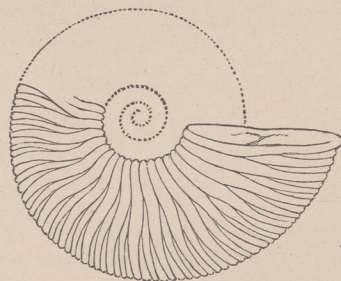


FIG. 1. *OLCOSTEPHANUS QUATSINOENSIS*.

Shell discoidal, sides compressed, periphery narrowly rounded; umbilicus somewhat small, rather more than one-fourth the entire diameter. Outline of aperture narrowly ovate elliptical, apart from the rather deep emargination caused by the encroachment of the preceding whorl. Surface marked with fine, transverse and flexuous bi-dichotomous ribs. Septum unknown. Diameter, twenty lines; maximum thickness rather more than four lines; width of umbilicus, six lines.

Forward Inlet, Quatsino Sound. A single well preserved but imperfect specimen.

This species rather strongly resembles the *Ammonites (Olcostephanus) bidichotomus* of Leymerie, from the Lower Neocomian of France and Switzerland, especially in its sculpture, but may be readily distinguished from that shell by its flatter sides, narrower umbilicus and finer ribs.

ANCYLOCERAS PERCOSTATUS, Gabb.

North slope of Jackass Mountain. One very large but imperfect example.

ANCYLOCERAS REMONDI, Gabb.

West side of the Fraser River, below Lytton and opposite Boston Bar. One specimen, collected by — Keefer, Esq. Loose and probably drifted down the stream from a locality

a little further to the north. Another example was collected by Dr. G. M. Dawson on the north slope of Jackass Mountain.

PHOLADOMYA VANCOUVERENSIS, Sp. Nov.

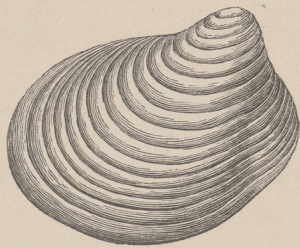


FIG. 2. PHOLADOMYA VANCOUVERENSIS.

Shell swollen and convex in front of the middle, obliquely compressed behind. Valves very inequilateral, transversely subovate, gaping a little behind and nearly closed in front. Anterior end very short, contracted both above and below, and subtruncated at the extremity; posterior end elongated, rounding gradually into the basal margin below and more abruptly above into the superior border. Cardinal margin nearly straight for some distance behind the beaks and sloping downwards very abruptly in front of them. Basal margin produced and gibbous in the centre. Umbones depressed, rather wide but narrowing rapidly into the abruptly attenuated, slender and acute beaks, which curve distinctly inwards, downwards, and a little forwards. The position of the beaks is anterior, and they are very nearly but not quite terminal. From the anterior side of the beak, in each valve, a faint ridge descends in a nearly vertical line to the junction of the ventral with the anterior border, and immediately behind this ridge there is a slight inflection of the test below.

Surface marked by coarse concentric sulcations, and by a few faint, centrally disposed radiating striæ.

Length, twenty lines; height, behind the beaks, thirteen lines and a half; maximum convexity, twelve lines.

North-east slope of Jackass Mountain, in the valley of the Lower Fraser. Two specimens.

This *Pholadomya* appears to be somewhat closely allied to the *P. Uralensis* of D'Orbigny, but it is a smaller shell, with much more depressed beaks, and a very different style of surface ornamentation.

GONIOMYA.

A small fragment of a species of *Goniomya* was collected by Dr. Dawson at the same locality as the fossil last described, but it is impossible to identify such an imperfect specimen.

INOCERAMUS QUATSINOENSIS, Sp. Nov.

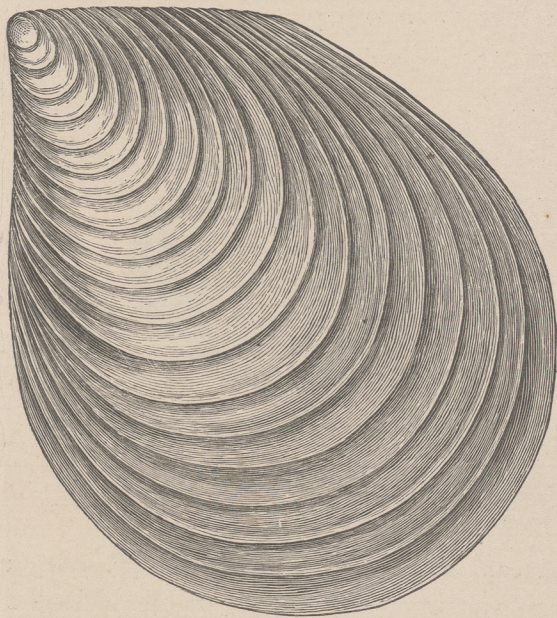


FIG. 3. INOCERAMUS QUATSINOENSIS.

Shell nearly equivalve, both valves being very convex; general outline obliquely subovate, the height being somewhat greater than the length. Hinge line short, less than one-half the greatest length of the valves, straight and forming nearly a right angle with the upper part of the anterior margin. Anterior border slightly concave above and gently concave below the middle; posterior margin broadly rounded, forming an obtusely subangular junction with the hinge line above and rounding into the ventral margin in a somewhat regular semi-ovate curve. Beaks depressed, incurved and somewhat recurved, anterior, terminal and overhanging.

Surface marked with well defined, broad, concentric plications.

Height, three inches and a quarter; maximum length, not quite two inches and three quarters.

Forward Inlet, Quatsino Sound. One tolerably perfect cast and a fragment of another.

The outline of this shell is almost precisely similar to that of the *I. Neocomiensis* of D'Orbigny, from the French Neocomian, and it is possible that both may prove to be extreme forms of one species. But, on the other hand, the French shell is much smaller than the one just described, and the sculpture of the former is described as consisting of comparatively fine striæ of growth, rather than broad, concentric undulations or plications.

AUCELLA PIOCHII, Gabb.

Exceedingly abundant at Tatlayoco Lake and Forward Inlet, and not uncommon on the banks of the Upper Skagit. A study of more than one hundred examples of this

species, collected by Dr. Dawson, has convinced the writer that the *Aucella Piochii* of Gabb cannot be distinguished from the *A. Mosquensis* of Von Buch, even as a local variety. In the neighborhood of Moscow the latter species, according to Eichwald, forms great banks of shells, just as its American representative appears to do in certain localities in British Columbia. *Aucella Mosquensis* has been recorded as occurring at many places in the Russian Empire, "from the Lower Volga northward to the mouth of the Petschora." Nordenskiöld found it at Spitzbergen, and Lieut. Payer and Dr. Copeland, at Kuhn Island, off the east coast of Greenland. The exact age of the *Aucella* schists of Europe has been the subject of much discussion among geologists, and authorities are still at issue on this point. In the "Geology of Russia," published in 1846, D'Orbigny places them in the Oxfordian division of the Jurassic. In the Moscow Journal for 1861, and in the second volume of the *Lethea Rossica*, which bears date 1867, Eichwald maintains that they are of Neocomian, and, therefore, of Lower Cretaceous age. Trautschold, in the Journal of the German Geological Society (Berlin) for 1864 and 1866, claims that they are Jurassic, and about the age of the Kimmeridge clay, though, in a subsequent paper, contributed to the Moscow Journal of 1875, he places them a little higher in the Jurassic system, in the Tithonic group of Opper, and this latter opinion of Trautschold is endorsed by Rudolph Ludwig.

Mr. Gabb has already shown that in California *Aucella* are among the most characteristic fossils of the Shasta Group, which is unquestionably Cretaceous, but it is now practicable to state more than this. The upper part of the Shasta group, which may provisionally be called the Queen Charlotte Island Group, is the equivalent of the Middle Cretaceous, and in this division, *Aucella*, though rare, are certainly present. The lower part of the Shasta Group corresponds to the upper part of the Lower Cretaceous, and it is in this division that *Aucella* are so abundant. In America, as in Europe, the writer holds with Eichwald, that the presence of *Aucella* in abundance is a sure proof of the Neocomian age of the rocks in which they are found. Very few fossils have been found in the auriferous slates of California, and the few that have been found are both distorted and badly preserved. One of these, the *Lima Erringtoni* of Gabb, has been supposed by Prof. Meek to be probably identical with *Aucella Mosquensis*, and if this be the case, then these slates will probably prove to be of Neocomian, and not, as now generally supposed, of Jurassic age.

ARCA.

Two casts of a small *Arca*, which very much resemble the *A. Carteroni* of D'Orbigny in shape, one from the N. slope of Jackass Mountain, the other from the West bank of the Fraser, near the thirty-sixth mile-post on the wagon road to Yale.

CUCULLÆA.

A small cast of a bivalve, also from Jackass Mountain, which appears to belong to this genus, but not in its most restricted sense.

YOLDIA.

A single valve from the Skagit River, but too imperfect and too badly preserved to be either identified or described.

GRYPHÆA, OR OSTRÆA.

Skagit River, one valve only. Possibly a variety of the *Gryphæa Nebrascensis* of Meek.

SYNCYCLONEMA MEEKANA, Whiteaves.

This species, which was originally described from specimens collected by Mr. Richardson at the Queen Charlotte Islands, has since been recognized in the Lower Cretaceous of Jackass Mountain, also between Fountain and Lilloet, and near the thirty-sixth mile-post on the wagon road to Yale—all localities on the Lower Fraser River.

XI.—*On Some Supposed Annelid-Tracks from the Gaspé Sandstones.*

By J. F. WHITEAVES.

(Presented May 27th, 1882.)

At various horizons in the Palæozoic rocks of Canada, in addition to the ordinary and more characteristic fossils, there occur certain markings or impressions whose nature and origin are alike uncertain. Some of these markings have been regarded as footprints, tracks or burrows, as the case may be, of various kinds of marine invertebrates, while others have been supposed to be casts or pseudomorphs, as it were, of fucoids. To the former class belong such forms as the *Protichnites*, *Climactichnites* and *Scolithus* of the Potsdam Sandstone, and to the latter, such genera as *Cruziana*, *Palæophycus*, *Licrophycus*, *Rusophycus* and *Arthropycus*. The impressions to which the name *Protichnites* was given by Prof. Owen were thought by that careful observer to be probably footprints of large extinct crustaceans allied to the king crab of existing seas, and the huge tracks described by Sir W. E. Logan as *Climactichnites* were supposed to have been made by some mollusc of the period, though Prof. Chapman has since expressed the opinion that they are more likely casts of some unknown marine plant. The cylindrical holes or vertical perforations in the Potsdam and Medina Sandstones to which the name *Scolithus* was applied by Dr. Emmons, were so designated, as the name implies, on the presumption that they were burrows of marine worms. In an unpublished paper read some years ago before the Natural History Society of Montreal, Mr. E. Billings endeavored to shew that these supposed worm burrows are really moulds of funnel-shaped sponges, and in the catalogue of North American Palæozoic Fossils published by Mr. S. A. Miller in 1877, the genus *Scolithus* is placed in the vegetable kingdom. Of the obscure "fucoids" of the older Palæozoic rocks none shew any true vegetable or indeed any other kind of minute structure under the microscope, and Principal Dawson has suggested that the name *Rusophycus* in particular should be changed to *Rusichnites* on the ground that the specimens on which the former genus was based are not remains of fucoids but casts of the burrows of trilobites.

In addition to those which have been figured and described, or identified with genera and species already defined, the Museum of the Survey contains examples of at least two or three kinds of impressions which have either not been reported upon at all, or only in a very brief and insufficient manner. Those which form the subject of the present communication are well shewn on the surface of three large slabs of sandstone from the Lower Devonian rocks of the S. E. side of Gaspé Bay, two of which are represented on a reduced scale (see plate). A short description of the exact stratigraphical position of these slabs and of the most obvious characters of the impressions upon them was published on page 399 of the "Geology of Canada," 1863, in the chapter devoted to the consideration of the Gaspé Sandstones. The passage referred to reads as follows:—"Between Tar Point and Douglstown a section of 3,800 feet was observed, after which the summit of the series became concealed. At about 500 feet from the base of this section

there are met with the remains of a coniferous tree described by Dr. Dawson under the name *Prototaxites Logani*. About 600 feet still higher among these strata, several surfaces in succession are marked by serpentine impressions, about an inch wide, deeply grooved into the stone, marked by small parallel transverse furrows, which are about a quarter of an inch apart. These are perhaps worm tracks and are associated with a few bivalve shells of the genus *Rensseleria*, perhaps *R. ovoides*."

To this description the following particulars may be added: The impressions or tracks are invariably imperfect at each end, but the longest continuous one would be nearly four feet in length, if straightened out. The width varies in different parts of the same individual, in consequence of the inequalities of the surface of the rock, but it does not appear that one extremity is wider than the other. The tracks (if tracks they are) curve in almost every direction and hence suggest the idea that the organisms by which they were produced were totally devoid of anything approaching to rigidity. Thus one specimen is deeply curved in two directions, so that the outline produced is like that of the central portion of a snake when in motion, while another forms a single, flexuous loop with the two ends crossed. In every case the impressions or tracks are quite simple and shew no indications of their having proceeded from anything of the nature of a root, nor do they ever bear or throw off lateral branches or branchlets, though the frequency with which they cross and recross each other is remarkable. No vestiges can be detected of a longitudinal central furrow like that of *Crossopodia*, nor of any lateral appendages like those of *Phyllodocites* or *Nereites*. The transverse grooves are by no means always equidistant, though this appearance may be really due to the accidental obliteration of some of them, the matrix being very coarse. These cross grooves also, are not quite parallel, nor are they placed exactly at a right angle to the main axis of each impression, but their direction is, no doubt, much affected by the frequent and abrupt flexures of the tracks themselves.

In some respects these supposed tracks bear a certain general resemblance to impressions made by stems of large crinoids. The Trenton limestone near Ottawa city has yielded crinoidal columns, specimens of which may be seen in the Museum of the Geological Survey, which are nearly four feet in length, though their breadth is less than half an inch. But the stems of crinoids, although flexible to a considerable extent, yet possess a definite and appreciable amount of rigidity, and their transverse annulations are rectangular, equidistant, parallel and very regularly disposed. Moreover, the late Mr. E. Billings, who in his lifetime was justly regarded as one of the best authorities on the crinoids of the older rocks, and who probably either wrote or endorsed the description of these tracks already quoted from the "Geology of Canada," does not even suggest this as a possible explanation.

The mould or reverse of the *Arthrophyucus Harlani* of the Medina Sandstone would also almost certainly present some characters in common with the tracks or markings now under consideration. The former fossil, which was first described by Conrad in 1838 as *Fucoides Harlani*, is the type and only species known of Hall's genus *Arthrophyucus*, which is thus defined in the second volume of the Palæontology of New York, published in 1852: "Stems simple or branching, rounded or subangular, flexuous, ascending, transversely marked by ridges or articulations." To this diagnosis the following comments are added: "The species of this genus yet known consist either of simple elongated stems of nearly equal dimensions throughout, or of those which divide near the root into

several branches and afterwards remain simple. The species from the Medina Sandstone may be regarded as the typical form." If the word "ascending," and the qualification "or branching" were omitted from the generic definition of *Arthropycus*, the latter would apply sufficiently well to the impressions on the Gaspé Sandstones. But, the genus at present only contains one named species, the *A. Harlani*, which is distinctly stated by Hall to be composed of "stems, which divide near the base into numerous elongated branches." There is nothing to prove that *Arthropycus* was a plant at all, except that it appears to have branched upwards from below and to have had an ascending habit, two important if not essential features in which it differs widely from the Gaspé tracks.

Taking into consideration all the characters which these markings exhibit, it does not seem practicable to refer the latter to any known genus of plants or animals. Their true nature and affinities cannot be satisfactorily elucidated, no doubt, until more perfect specimens are obtained, but in the mean time it will be convenient to designate them by a provisional and local name. On the supposition, therefore, that they are tracks or burrows of some invertebrate animal and more particularly on the hypothesis suggested in the "Geology of Canada," that they are annelid tracks, the writer ventures to propose for them the name *Gyrichnites Gaspensis*. At present it is impossible to say which of the characters are generic and which are specific, but the aggregate of both may be thus defined :

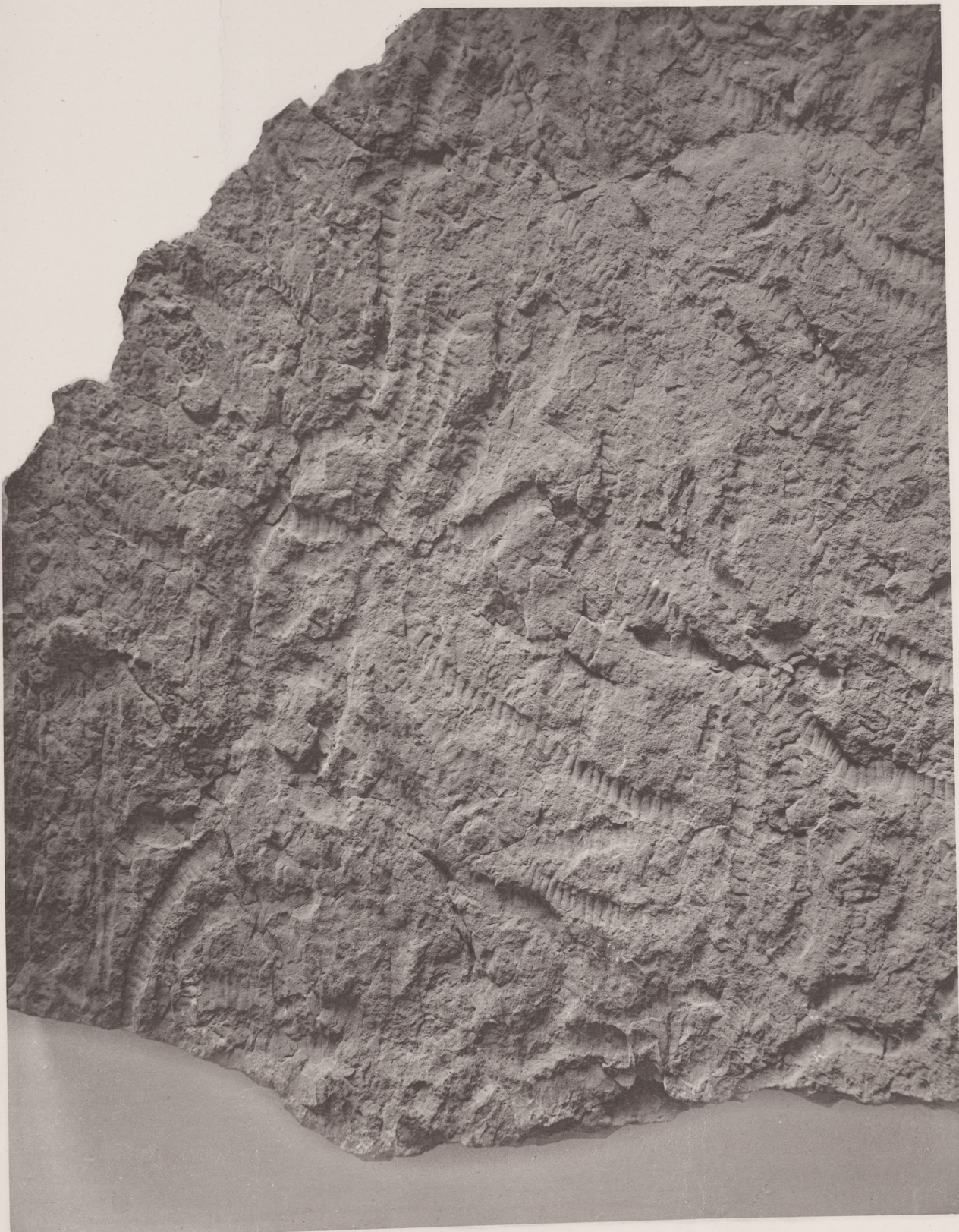
Tracks or burrows of large size, consisting of simple, undulating, much elongated, slender, rounded furrows, of almost equal width throughout and marked transversely by nearly straight, continuous, subparallel and subequidistant semiannular grooves. General habit prostrate, never ascending nor erect.



GYRICHNITES GASPENSIS, Whiteaves.

LOWER DEVONIAN: DOUGLASTOWN, P. Q.

REDUCED BY PHOTOGRAPHY FROM LARGE SLABS OF SANDSTONE COLLECTED BY SIR W. E. LOGAN, AND NOW IN THE MUSEUM OF THE GEOLOGICAL SURVEY. ABOUT ONE NINTH NATURAL SIZE.



ARTOTYPE, PATENTED.

G. E. DESBARATS & CO.

GYRICHNITES GASPENSIS, Whiteaves.

LOWER DEVONIAN: DOUGLASTOWN, P. Q.

PORTION OF ANOTHER SPECIMEN COLLECTED BY SIR W. E. LOGAN, ABOUT ONE THIRD NATURAL SIZE.