

NOTES ON NEW POINTS AND CORRECTIONS IN ACADIAN GEOLOGY.
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THE matters referred to in this paper relate more or less directly to subjects noticed in the recently published edition of my "Acadian Geology," but it is not my purpose either to review my own book or to defend it from reviewers. It would be the less necessary to undertake the latter task since the book has on the whole been very mercifully treated by critics, while much friendly notice has been taken of it by men high in scientific position on both sides of the Atlantic. For all this I am grateful, but am not desirous to take any undue advantage of it. In this spirit I now propose to point out and correct some errors which I have myself detected, or which have been pointed out to me by others, and to add a few new facts which have come to my knowledge in course of the past summer.

One of the most remarkable developments of mining industry in British America, is that which has occurred within the last ten years in the coal-field of eastern Cape Breton. Districts which were a perfect wilderness have become studded with mining villages and opened out by numerous roads; wild and dangerous shores have been rendered accessible by the excavation of artificial harbours; and more than a dozen of new collieries have been opened and have been producing a larger amount of coal than that of any other coal district in Nova Scotia. The opening of these collieries and the surveys in connection with them have not only greatly enlarged our knowledge of the district, but have raised many questions as to the correspondence of particular beds of coal, of a very perplexing character, and which I found much difficulty in disposing of in such a way as to give any satisfaction to myself or to those of my friends interested in the matter, either on economical or geological grounds. I was therefore glad in the past summer to have the opportunity of exploring under favourable circumstances, and in company with Mr. Ross of the Victoria coal mine and Mr. Moseley of Sydney, the remarkable coast section on the south side of Sydney harbour between Low Point and the South West Bar, and which I believe exposes all or nearly all the workable coal seams known in eastern Cape Breton. The section, as exhibited on this coast, stands thus, in descending order:—

1.—"Carr" Seam.....	4 feet.
Sandstone, Shales, &c., about.....	429 feet.
2.—"Paint" Seam	13 feet 4 inches.
Sandstones, Shales, &c., about.....	216 feet.
3.—"Crandall" Seam	4 feet 4 inches.
Sandstones, Shales, &c., about.....	400 feet.
4.—"Ross" Seam.....	6 feet 7 inches.
Sandstones, Shales, &c., about.....	325 feet.
5.—"William Fraser" Seam.....	2 feet.
Sandstones, Shales, &c., about.....	112 feet.
6.—"Number Three" Seam.....	4 feet.
Sandstones, Shales, &c., about	138 feet.
7.—"H. McGillivray" Seam.....	5 feet.
Sandstones, Shales, &c.....	122 feet.

- 8.—“D. McGillivray” Seam 2 feet.
 Sandstones, Shales, &c., about.....1000 feet.
 9.—“Fraser” Seam 6 feet.
 Sandstones (Millstone Grit series.)

This fine series of coal-beds I believe to represent the whole of the workable beds known at North Sydney as well as those of Glace Bay and Cow Bay. The high angle of dip brings their outcrops nearer to one another than is usual in this district, and a good coast cliff and beach section enables them to be well studied. This section is the best guide I have seen to the vexed question as to the equivalents of the several coal-beds in the different mining areas of Cape Breton, but its application is by no means easy. On the south side of Sydney harbour the coal-beds above-mentioned dip about N 5° E at angles of 30° to 45°. On the opposite side of the harbour the corresponding beds dip to the north east at an angle of 10° or less. Consequently the beds, crowded together on the south side, spread out like a fan on the north side. In addition to this when we measure the thickness of the beds intervening between the several seams of coal, it is evident that they must vary greatly both in character and thickness within very short distances. Making due allowance for these differences, it would seem that the “Paint” seam of the above list must be the “Lloyd’s Cove” seam of the North Sydney series and also the “Phelan” or “Phalen” seam of the Glace Bay series. In this case the main seam at North Sydney is equivalent to the Ross seam, which will be upon the horizon of certain lower beds known as the Spencer seam at Glace Bay, and which I believe are not yet worked in that region, and the whole of these beds must belong to the upper member of the middle coal measures, while the lower member of that series is represented in this section by one workable bed only, the Fraser seam, which seems to correspond to the Tracey seam on Miré Bay. Between the two, but more closely connected with the upper member, the Number Three and its associated small seams are on the horizon of the Gardiner seam, near Bridgeport, and its continuation northward to Mire. These facts so far modify my statements in *Acadian Geology*, as to remove the Millstone grit formation to a greater distance from the Sydney main seam than I had supposed, and to diminish somewhat the probable importance of the lower beds of coal underlying those worked at Glace Bay and Cow Bay, though it would still appear that these lower measures actually include the equivalents of the Sydney Main seam, the Gardiner seam, and the Fraser seam; the latter not being as yet known as North Sydney, and being apparently below some of the beds at that place reckoned by Mr. Brown as millstone grit. To these points I may add the statement that in my sketch map, page 413, the strike of the beds at the east side of Sydney harbour should turn a little more to the south, and that the outcrops should be closer to each other; and that by an error in the engraving the town of Sydney is removed from its true position on the southern arm of the harbour to the south-west Bar. I am indebted to Mr. Moseley of Sydney for information bearing on some of these points.

Leaving these local details I may now refer to some curious fossil plants met with in the coal formation of Cape Breton, and deserving of record as additions to our knowledge of its Flora. Among the rarest of

fossil plants in the coal rocks of Nova Scotia have hitherto been the trunks of tree ferns. The scattered fronds are sufficiently abundant, but trunks of arborescent species are seldom found. Mr. Poole's collections at Glace Bay enable me to add another fine species to the coal flora of Nova Scotia. It is a huge flattened stem, a foot or more in diameter, marked with many wrinkles over the whole surface, and with large distant oval leaf scars $1\frac{1}{2}$ inch in diameter and three inches in length, to which large fronds must have been attached. It is a near ally of *Caulopteris Macrodiscus*, Sternberg, but has larger and more distant scars, more obtuse above. I would name it *Caulopteris Glacensis*. It belongs to the genus *Ptychopteris* of Corda. Another remarkable trunk which I found obscurely preserved in coarse sandstone at North Sydney, appears different from anything hitherto described. It seems to have had four vertical rows of scars, the form of which could not be made out; but I have little doubt that it belonged to an arborescent fern with a stem four inches in diameter and several feet at least in height. Near an abandoned coal mine at Bridgeport I also found a fragment of one of these tree-ferns surrounded with aerial roots to which the name *Baronius* has been given, but not admitting of specific description.

As I have been able hitherto only to describe four species of trunks of tree ferns, these are considerable additions. Among other interesting specimens in the collection of Mr. Poole, I also saw the curious sigillaroid tree *Syringodendron cyclostigma*, Brongniart, and a species of sigillaria new to Nova Scotia and allied to *S. rugosa* of Brongniart, though scarcely sufficiently perfect for description. Another remarkable form collected by Mr. Poole is a flattened striated stem about an inch in width with two rows of punctiform marks at the sides and giving off alternate slightly curved branches, at right angles, and in one plane. It may have been the stipe of a fern, but is at present quite a problematical species.

Another interesting fossil observed at North Sydney, was an erect Sigillaria with that peculiar bulb-like enlargement of the base, figured by Sternberg on Plate xxxviii. of his great work, but which I had not before seen, the sigillariæ found in Nova Scotia usually enlarging regularly toward the base in the manner of ordinary trees. This bulb-like appearance seemed to be a natural feature of the growth of the plant, which had the markings of *S. reniformis*. Through the kindness of my friend Mr. Brown, of the Sydney colliery, the specimen was carefully taken down from the cliff, and forwarded to Montreal; and it now stands a column five feet in height, in the museum of McGill university.

In the past summer the Pictou coal area has had the advantage for the first time of a detailed survey under our ablest stratigraphical geologist, the eminent head of the Geological Survey of Canada. The results are not yet published, but I believe they will contribute in a very important degree to the solution of many of those difficulties in the distribution of the coal beds, especially on the east side of the river. More especially the persevering labour of Sir William Logan has enabled him to trace what I could only vaguely characterize as the "line of fracture skirting the outcrop of the New Glasgow conglomerate," for a great distance, and to ascertain that it is of the nature of an important fault. He has also ascertained several other subordinate faults, and has accumula-

ted a great mass of new facts bearing on the curves and flexures of the beds. When Sir William's map of his explorations shall be published, geologists will be able for the first time to appreciate fully the difficulties and anomalies of this remarkable coal district, so different in its features from the other coal regions of Acadia. Until we have Sir William's results it would be rash to attempt to add anything to what I have already ventured to say of this district. I have, however, to make a correction of an error, pointed out to me by Mr. Rutherford, in the thickness assigned to the coal-beds of the "Montreal and Pictou" Coal Company. The sectional list given in page 341 from Mr. R's. report, is stated to be taken at right angles to the horizon, but it seems that this was a misconception on my part, as it is really at right angles to the bedding, which makes a material difference in the actual thickness intended.

I was much struck when in Nova Scotia with the great mass of slate and other rocks exposed in the Pictou railway between East River and Truro; and suspect that rocks of Devonian age may yet be found to be represented in this district, as well as those of the Silurian period. I also had the opportunity to examine the new gold region of Mt. Uniacke, and to make some interesting notes as to the features of its gold veins; but I must defer these to some future occasion. I may merely state that I saw no reason to depart from the view of the structure and origin of the gold veins, stated in my work, and which I think has been strengthened by the recent interesting observations communicated to the Royal Society by Mr. T. A. Phillips, on the nature and origin of the gold veins of California, which though much more recent than these of Nova Scotia, and indeed in some places actually in course of formation, must resemble our gold mines in structure and contents. The peculiar features of the Mount Uniacke veins do not imply any different mode of formation from those at Waverley and Montague; but I observed in addition to the banded "leads" interstratified in the almost vertical beds, one remarkable instance of a true fissure vein of auriferous quartz. I also noticed in the veins parallel to the bedding, several appearances indicative of aqueous infiltration rather than sedimentary deposition. I had hoped to have taken time to make farther explorations in the gold districts, with the view of satisfying myself more fully as to the alleged connection of the gold veins with anticlinal lines, and the reasons of this, if really a general fact; but the time at my disposal proved altogether insufficient, and I was obliged again to defer the discussion of this point, which I had found it necessary, for similar reasons, to pass over with a mere notice of Mr. Campbell's observations on it, in the chapter on the Gold region in "Acadian Geology." The geological survey, which has already, in the excellent report of Mr. Hunt, given a very good account of the gold regions, may perhaps follow up this part of the subject in its explorations of next summer. I may add that all that I have seen tends to confirm the high opinion which I have elsewhere expressed of the extent and value of the auriferous veins of Nova Scotia, and my belief that a much larger amount of capital than at present might be profitably expended in their exploitation, both in the larger extension of the workings in many of the areas now known to be productive, and in the opening up of new districts.