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THE OTTAWA NATURALIST.

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NOTES ON THE PLEISTOCENE GEOLOGY OF A FEW PLACES IN THE OTTAWA VALLEY.

By W. J. WILSON, Ph. B.,
Of the Geological Survey of Canada.

The Ottawa River rises near the height of land in Latitude 48° N. and Longitude 76° W., whence it flows westwardly for a distance of 250 miles to Lake Temiscaming. From this lake its course is south-east till it reaches the St. Lawrence River. Its whole length is about 650 miles, but from its source to the St. Lawrence River in a direct line is less than 200 miles. Its branches on the north or Quebec side are the Dumoine, Black, Coulonge, Gatineau, Lièvre, and Rouge, all of which flow nearly south. From the west or Ontario side it receives the waters of the Montreal, Mattawa, Petewawa, Bonnechere, Madawaska, Mississippi, Rideau, and South Nation, all of which flow eastward. The whole area drained by the Ottawa is approximately fifty-six thousand square miles.

It is the purpose of this paper to record the result of observations made at a few points extending from the city of Ottawa to Pembroke, a distance of eighty miles, during the summers of 1895-96, more especially the district included in the townships of Ross, Westmeath, Stafford, Wilberforce, Bromley, S. Algona, Sebastopol and Grattan, in Renfrew county.

Everywhere in this district there is abundant evidence of ice action, both in the polished and striated rocks and in the general distribution of boulder-clay and boulders. The question of the direction of the ice movement is comparatively simple. Near the Ottawa River the striæ follow closely the course of the

valley as seen north of Allumette Island in two places, at Vinton, Portage du Fort, and near Bristol, on the Quebec side, where the course is from S. 10° E. to S. 30° E * On the south side the same courses were seen north of Pembroke, at several places in Ross and Bromley townships; at Shamrock, south of Renfrew, and at Galetta. In Ottawa city, "Barrack Hill,"† the course is S. 45° E., and Dr. Ami reports striæ on Park Avenue and Nicholas Street almost due east and west.‡ Near Hintonburg on the Ottawa, Arnprior and Parry Sound Railway, the course is S. 87° E. While the south-east course is constant in the valley close to the river, at a distance of ten to twenty miles back the ice moved west of south. On the south side of the river a large number of observations show the direction to be from S. 2° W. to S. 35° W., the most common being from S. 15° W. to S. 25° W. It is probable that the south-west course is the older of the two, and that the south-east course was produced when the ice had become so thin that it was deflected by the minor irregularities of the surface, and so followed the course of the river. At an earlier stage the ice had evidently been thick enough to over-ride irregularities of surface of considerable size, the course being south-west, as above stated, where the present drainage is to the east. The south-east and the south-west courses were not observed on the same surface in the area under consideration, but in the vicinity of Lake Temiscaming these two courses are frequently seen crossing each other, and Mr. Barlow states that the oldest course is about S. 20° W., while the more recent courses follow the river valleys.

Speaking generally of the glaciation of the district particularly referred to, it may be said that good exposures of rock are common where the results of ice movement can be studied.

* The bearings are referred to the true meridian.
† Geology of Canada, p. 892.
‡ Ottawa Naturalist, 1887, p. 69.

Splendid examples of stossing are numerous, and even where the rock is so weathered that no striæ are visible, the rounded and smooth appearance of the north side of exposures, and the abrupt and sharp edges on the south, so characteristic of glacier action, may be seen and often enable us to determine with considerable accuracy the direction in which the ice moved. Boulder-clay, boulders, Leda-clay, sand and gravel are also abundant, while the less common phenomena of surface geology, viz.: kames, asar or eskers and moraines are occasionally seen.

BOULDER-CLAY.

Till, or boulder-clay has been described as a "firm, tough tenaceous clay which gives evidence of having been subjected to great pressure. Often the accumulation becomes coarser and sandier. Again it may be described as a coarse agglomeration of subangular and angular stones set in a scanty matrix of coarse earthy grit and sand. Sometimes the stones in the till are so numerous that hardly any matrix of clay is visible." It will be seen that the term boulder-clay embraces deposits whose appearance differs widely, but however it may vary in appearance and composition it can ususlly be recognized by the peculiar shape and striation of the stones contained in it. Typical boulder-clay may be seen in many places near Ottawa, as in the cutting on the Ottawa, Arnprior and Parry Sound Railway near Hintonburg already referred to, at Hog's Back, and in very many places in the area under consideration. In connection with the boulder-clay a word about the distribution of boulders will be in place. This district is no exception to the general rule that most of the boulders in the boulder-clay and those scattered over a country are from rocks near at hand, and only a few of the harder kinds are carried to a great distance. In this district the boulders commonly seen are limestone, usually flat and angular, and gneiss, granite, etc., more rounded and worn. Dr. Ells has already referred to the great blocks of Black

River limestone which occur along the Opeongo Road on a ridge south of Clear Lake, at a height of nearly fourteen hundred feet above sea-level.* Some of these blocks are five to eight feet through and very angular. As far as known the Black River formation nowhere occurs in the vicinity of Clear Lake at a greater height than eight hundred feet, so that if the relative levels of the country have not changed since the glacial period, these boulders have been carried upward a distance of five to six hundred feet. Travelled boulders in similar positions have been frequently noted. Sir J. W. Dawson records large Laurentian boulders on Montreal Mountain which, he says, must have been carried probably a hundred miles from the Laurentian region to the north-east.† Dana states that Mount Katahdin in Maine has many boulders on its northern face derived from the Devonian rock of the low country to the north, three thousand feet below it in level.‡ In Nova Scotia sandstone boulders are common on the Cobequid Mountains at a considerable height above the present level of the Carboniferous beds, from which they were derived. The position of these boulders at such heights forms a most interesting subject for study, and many theories have been advanced in regard to it. Among the theories put forward the following may be mentioned. Some writers claim that these erratics were placed in their present position by floating ice. They claim that the land was submerged to a depth sufficient to allow icebergs or ice jams to pass over or become stranded on the higher ground, where they deposited whatever material was embedded in them, or carried on their surface. Another explanation is that the land was covered by a glacier to a depth equal to or more than the greatest height at which these boulders are found, and that this mass moved over the country, carrying boulders, etc., along with

* The Ottawa Naturalist, December, 1896, p. 171.
† Canadian Ice Age, p. 201.
‡ Manual, p. 690.

it and deposited them wherever it chanced to be when the ice ceased to move forward. In connection with this it is urged that blocks of stone, entering the bottom of the glacier under certain conditions, gradually rise to the surface and in this way often reach a height far above their original position. It may be remarked that more or less serious objections have been raised against all these explanations.

LEDA CLAY.

The next formation in ascending order is the Leda clay, which is common in all the lower levels of the Ottawa Valley, where it forms broad stretches of level country. It is a bluish-gray clay, somewhat unctuous, and when dry becomes very hard and cracks into square or oblong shaped blocks. In Ross and Bromley townships there are large areas covered with this clay. In one place in Ross is a plain five miles across which extends lengthwise for a much greater distance, The approximate height of these plains is from four hundred to four hundred and fifty feet. Though the roads traversed passed over many miles of this formation the only fossil found was a fragment of a shell which was too small to be identified.

For a description of this deposit below the City of Ottawa, I quote the following. "Along the south bank of the Ottawa River from the city of Ottawa to Hawkesbury, and again from Point Fortune to its junction with the St. Lawrence the lower clay is seen in banks of from twenty to forty feet in height. . . . The greatest breadth of the level clay surface which has been observed here is in the township of L'Orignal, where it extends about fifteen miles back from the river. . . . On the north side of the Ottawa, from Hull to Isle Jesus, the clay often covers a considerable breadth between the river and the Laurentian Hills and extends among these for several miles up the larger tributaries."* Mr. A. E. Barlow states that this clay is abundant at

* Geology of Canada, p. 916.

Lake Temiscaming, the level of which at high water is five hundred and ninety-six feet above the sea. Perhaps the most remarkable thing about this clay is the scarcity of marine shells even where it is known to be far below the level reached by the sea during the Champlain subsidence. Marine fossils are recorded at Montreal at a height of five hundred and sixty feet, at Smith's Falls four hundred and twenty feet, near Galetta four hundred and seventy-five and Chelsea four hundred and twenty-five, so that the land in this valley during the time the Leda clay was laid down must have been six hundred feet lower than at present. We can therefore, I think, fairly assume that the stratified clays which are not more than five hundred or six hundred feet above sea level are marine. The marked resemblance of the clays on the higher levels to those on the lower, where fossils are found, is strong corroborative evidence of a similar origin. Even at the lower levels fossils are by no means common in this clay. In the city of Ottawa where excavations are frequently made and large quantities of clay are throwu out, I have seen fossils in two places only. At Mohr's Corners, about a mile from the village of Galetta, there is a sand terrace abounding in marine shells. Underlying the sand there is a bed of this clay, well stratified, twenty to thirty feet deep, and although there was a section ten feet deep on the roadside for a quarter of a mile, a careful examination revealed no fossils. Sir J. W. Dawson says: "Where the Leda clay is thick and well developed it admits of sub-division into a lower Leda clay, unfossiliferous or with only shells of *Leda glacialis* and *Macoma Grænlandica*, and an upper Leda clay, usually more sandy and holding a rich boreal fauna identical with that of the northern part of the Gulf of St. Lawrence at present."* Mr. F. B. Taylor in a recent article says "Near the city of Ottawa the upper limit

* Canadian Ice Age, p. 60.

of the Champlain submergence was not less than four hundred and seventy-five feet above the sea and was probably higher. Beaches undoubtedly belonging to this submergence have been found near Renfrew, and also at about four hundred and fifty feet at Pembroke, and also at about five hundred and thirty feet at Mackey's Station on the Ottawa River. Between Hudson Bay and Lake Superior shells of the same age have been found up to four hundred and fifty feet above the sea, and within one hundred and fifty miles of the lake. The upper limit of the submergence was probably still higher. It seems almost certain that during the Champlain submergence the sea extended far up the Ottawa valley, probably reaching the head of Lake Temiscaming." He says, however, that within the area no continuous tracing of the marine beaches has been made.

SAXICAVA SAND.

The Saxicava sand is also well represented in the Ottawa valley. It is a shallow water or shore deposit, and where a section is complete rests on the Leda clay. It is yellow or brownish and varies from fine sand to coarse gravel. Sometimes there is a distinct line between this formation and the Leda clay, while in other places the one runs into the other. It is at the junction of the two that the fossils are most plentiful Exposures of this sand are abundant everywhere in this valley, and in many places nothing else is seen for a long distance. Many such areas were noted in Renfrew county, but no fossils were seen. In a cutting a short distance north of Chelsea Station on the Gatineau Valley Railway there is a narrow seam of coarse yellow sand which in places is full of shells of *Saxicava rugosa* and *Macoma fragilis*. Near this seam, if not in it, a small perfect shell of *Leda arctica* was found, and in a higher bank of Leda clay a fragment of a *Balanus*, probably *Hameri*. These deposits attain a height of four hundred and twenty-five feet at this point. About half a mile west of Carp station this sand forms

a terrace known as Johnston's Grove, in which *Saxicava rugosa* and *Macoma fragilis* are abundant at a height of about three hundred and fifty feet. These shells are also found in a cutting at Carp Station, as stated by Dr. Ells. At Mohr's Corners, already referred to, there is a sand terrace which rises to a height of four hundred and seventy-five feet and contains the above shells in great abundance. In a cutting through a gravel bed on the Electric Railway west of Hintonburg, *Leda arctica*, *Saxicava rugosa* and a fragment of a *Balanus* were found. This is so different from the other localities that it deserves special mention. It is composed of a beach-like gravel, distinctly stratified and well water-worn The pebbles are generally one to two inches in diameter, with a small number of larger ones, the interstices being filled with sand. *Leda arctica* is the most abundant here, while at the other places named, only one specimen was found. The shells are small but well preserved, and in some cases the two valves are joined. The few specimens of *Saxicava rugosa* which were found were also well preserved. This cutting is on the edge of a terrace which extends back to the Ottawa, Arnprior and Parry Sound Railway and is about two hundred and thirty feet above sea level.

TERRACES.

Terraces and old shore lines or beaches have been described as occurring in many places along the Ottawa Valley. A good example of a cut terrace may be seen on the Montreal road near Green's Creek, at a height of about two hundred feet, but this may be of fluviatile origin. At Chelsea there is a terrace at a height of three hundred and fifty feet, and one round the base of King's Mountain seven hundred and five feet high, North of the west end of Muskrat Lake on the road leading to Beachburg, a fairly well defined shore-line occurs at a height of from four hundred to four hundred and fifty feet. In many places where the level tracts of Leda clay occur there are sloping

ridges rising on each side fifty to one hundred feet, and just where one would expect to find a cut terrace, but none were seen that could safely be put down as such. On the north-west side of Lake Doré there is a well defined gravel terrace at a height of four hundred and fifty feet above sea level and forty feet above the level of the lake.

A few sand and gravel ridges occur in this district, though none of any great length were seen. Two small ridges occur in Westmeath township. They are composed largely of sand and gravel, and are ten to fifteen feet high. They lie about S. 30° E. Another low ridge was seen near Caldwell Station on the Ottawa, Arnprior and Parry Sound Railway, though the material in this one is more of the character of boulder clay. On the road between Concessions XXI and XXII, Lot 12, Wilberforce township, just east of the stream from Green Lake there are four ridges running parallel to each other, course S. 23° E. The first is only a few rods from the stream which cuts through it south of the road. In this part it is very regular in shape and rises about twenty feet above the surrounding ground. Where the road cuts through it, it is about two hundred and twenty-five feet wide, flanked on each side by a low ridge four or five feet high The sides are steep and meet in a sharp ridge at the top, Between the first and second ridges there is a peat bog two hundred feet wide. The second ridge is about the same size as the first, then another narrow bog, and the third crosses the road. It is similar to the other two only not quite as high. A short distance from this is a fourth ridge, but it is low and rounded at the top. A good section is shown in each where the road crosses. They are composed of well rounded water-worn pebbles, sand and gravel and a few angular fragments of rock, but the second one mentioned differs considerably from the others. A section in descending order is—rounded pebbles, sand and gravel, five feet ; fine sand well stratified

twelve feet, covered near the base with boulder clay. Striæ on the same road a short distance to the east run S. 2° W. These ridges do not extend for any great distance as far as could be seen from the road, but on the next Concession road to the north-west, I saw short ridges composed partly of boulder-clay and partly of water-worn material, which were in the same line with those just described but not continuous. Gravel ridges and mounds occur near Beachburg and eastward and enclose small lakes. Mounds partaking of the character of drumlins occur on the road between Concessions VIII and IX, Wilberforce township.

MORAINES.

The Geology of Canada mentions ridges of glacial drift or boulders running north and south and resembling moraines as occuring at the Hudson Bay Company's post eighteen miles from the head of Lake Temiscaming, at Long Sault just below the Lake, at the mouth of the Maganissippi, about twenty miles above the Mattawa, at Roche Capitaine, near Green's Creek, and at L'Orignal where six ridges occur in less than a mile. Along the south side of Mink Lake in Wilberforce township there is an irregular mass which extends continuously more than a mile and rises in places to thirty feet in height. It has an average breadth of three hundred and fifty feet. It does not rise to a sharp ridge like those at Green Lake just referred to, but is flat on the top and in some parts there are two or more ridges parallel, or diverging at an angle of from 10° to 20°. At the west end it is broken up into hillocks or mounds and at the east end it is lower and bends toward the north following the shore of the lake, but it does not continue across the marsh at the north east end of the lake. A low ridge which may be a continuation of it was seen to the east. Many large angular blocks of limestone are scattered over the surface, and sections both transverse and lateral showed that it was composed of clay and

angular or sub-angular stones such as are seen in ordinary till. Water-worn or stratified material was seen in it. Its approximate height is five hundred feet above sea level, course nearly east and west. Striæ on road along side of ridge. Course S 7° E.

In Hull there are several moraine-like ridges. One crosses Bridge street about half a mile from the Ottawa River, and is a mass of large limestone blocks mixed with a small quantity of sand and gravel. It reaches a height of ten to twenty feet and is three hundred feet wide. It lies in an east and west direction. It extends east of Bridge street a short distance and west to the next street where there is a break, but about two hundred feet to the north another ridge of similar character begins and continues westward to Brewery Creek. Two short ridges strike off from this at right angles to the south but extend only for a short distance. A section is exposed along the south side of the long ridges and clearly shows their composition. They are made up of large, flat, angular blocks of limestone (some are ten feet long and nearly as wide), arranged in layers overlapping each other and generally dipping south at different angles. This feature is very noticeable in walking over the ridges and is also seen in the lateral sections. On the surface no fine material was observed, but down in the mass there is a small quantity of water-worn gravel and stones, an occasional rounded boulder from the Laurentian rocks occurs. As far as observed these are well rounded and smooth but not striated.

The underlying limestone is polished and bears distinct striæ, course S. 60° E. Not more than one hundred and fifty feet from the western and longest part of the ridge an almost parallel ridge lies to the north. This is composed almost entirely of well rounded Laurentian boulders, gneiss, granite, etc., with an occasional flat limestone block. There are no openings in it, so that it is impossible to say what it is like below the surface, but judging from what can be seen there is more clay mixed with the boulders than in the first mentioned, It is crescent shaped

the concave side, facing the north, and is highest midway tapering and spreading out towards both ends. Further observation has shown that these ridges with slight breaks extend eastward through the city of Hull toward Lake Flora. Northward as far as the Gatineau River there are many low ridges of rounded boulders of much the same material as in the most northerly ridge referred to above.

The diversity both in the character and condition of the material composing the first ridges described, taken in connection with their proximity, makes it somewhat difficult to account for their origin, Those lying to the north and extending to the Gatineau River are probably moraines, and were left in their present position by ice moving down the Gatineau Valley.

The angular condition of the blocks in the most southerly ridge shows that they have not been transported any very great distance. The following section is from this ridge near Chaudiere street and is in descending order,

1.	Large angular blocks of limestone mixed with sand and gravel, and an occasional rounded boulder of granite, etc.....	8 feet
2.	Fine sand and gravel.....	2 "
3.	Fine tough bluish stratified clay (Leda clay).....	1¼ "
4.	Boulder clay.....	3 "
5.	Limestone rock in place, glaciated, striæ, course S. 60° E.	

If No. 1 of this section is of morainic origin, then after the ice which glaciated the underlying rock had receded, leaving the boulder-clay, the land remained submerged long enough to admit of the deposition of the clay and sand. (Nos 3 and 2 of the above section) after which the ice again advanced, and without displacing the underlying material deposited the limestone blocks composing the ridge. Another explanation is that it was formed by ice jams in the Ottawa River when it flowed through the channel where Brewery Creek now runs.

THE GEOLOGICAL SOCIETY OF AMERICA.

TENTH WINTER MEETING, MONTREAL, CANADA, 1897.

The Geological Society of America, which counts nearly forty Fellows from Canada, met in Montreal, Canada, Dec. 28th, 29th and 30th, 1897, for the reading of papers and the transaction of regular annual business. It was the Tenth Winter Meeting. This is the third time that the Society has met in Canada, the two former meetings having been held in Toronto in 1890, and in Ottawa in 1892.

There were some thirty visitors from south of the international boundary, prominent among whom were: The President, Dr. E. Orton, Ohio; Prof. B. K. Emerson, Amherst, Mass.; Prof. J. J. Stevenson, New York City, President-elect for 1898; Dr. I. C. White, Virginia; Prof. David White, U. S. National Museum, Washington, D.C.; Prof. W. M. Davis, Cambridge, Mass.; Prof. Whitman Cross, U. S. Geol. Survey, Washington, D.C.; Profs. Quereau, W. N. Rice, J. F. Kemp, H. D. Campbell, H. P. Cushing, J. P. Iddings, W. B. Scott, of Princeton, N.J.

Of the Canadian geologists present, there were: Dr. G. M. Dawson, Director of the Geological Survey of Canada; Prof. A. P. Coleman, Toronto University; Dr Robert Bell, Dr. R. W. Ells, Prof. F. D. Adams, Mr. Chalmers, Mr. J. B. Tyrrell, Mr. R. G. McConnell, Mr. A. E. Barlow, Mr. R. W. Brock, Mr. A. A. Cole, Mr. N. N. Evans, Mr. W. F. Ferrier and the writer.

An address of welcome to the members of the Geological Society was read by George Hague, Esq., on behalf of the Governors of McGill University. Prof. E. Orton, President of the Society replied, acknowledging in gracious terms the kindness of the University in throwing its buildings and treasures open to the visiting geologists. The reports of the Council and Auditors were then submitted, and the new Fellows elected. The Editor was, according to the vote taken by ballot, elected an officer of the Society.

Prof. W. B. Scott then gave a very comprehensive and instructive biographical sketch of the late lamented Fellows in the person of Prof. E. D. Cope. Cope's work in the Oligocene or White River beds, in the Eocene as known in the Unita and Bridger or Wind River and

Green River equivalents, the Wasatch and Puerco faunas, in the Blanco and Good-night beds of Pliocene age as well as in the Loup Fork and John Day series of Miocene age, was described in its broader bearings and results, together with further work in the Pleistocene deposits of Pt. Kennedy, &c. Cope's correlations of American strata with European equivalents, from a palæontologist's point of view, have proved to be "exactly right."

Prof. J. F. Kemp then read the obituary notice of the late Prof. J. F. James of the U S. Geological Survey, prepared by Mr. T. W. Stanton, of Washington. It showed the amount and nature of the work done by this enthusiastic geologist, who died at such an early age.

There were some very interesting papers read, among which we note the following titles and abstracts of special interest to Canadians and the members of this Club :—

ELLS, DR. R. W.—"*Notes on the Sands and Clays of the Ottawa Basin.*"

In this paper Dr. Ells showed the views held in 1863, when the chapter on "The Superficial Geology of Eastern Canada and the Lower Ottawa," was written in the "Geology of Canada" (Logan). He went on to describe the relative heights of principal points in the Ottawa Valley, Grand Lake, 900 ft.; Lake Temiscaming, 585 ft.; Head-waters of the Rideau River, 417. The general distribution of the marine clays and sands throughout the Ottawa valley was also given and the occurrence of fossiliferous calcareous nodules at Lachute, Rouge River, Besserer's, Green's Creek, and west as far as Bryson. Fish remains and shells occur in the marine beds. The Chalk River sand plains were also noticed and their genesis indicated.

BELL, DR. ROBERT.—"*Fossil-like forms in the Sault Ste. Marie Sand-stone.*"

The markings noticed were said by Dr. Bell to be "probably casts of dessication cracks."

BELL, DR. ROBERT.—"*Mastodon and Mammoth Remains found near Hudson Bay.*"

Notes (1) the discovery of Mastodon remains near the junction of

the Mattagomi and Missinaibi Rivers, in the southern part of the basin of Hudson Bay; (2) the finding of a small Mammoth's tooth on Long Island off the east main coast of Hudson Bay.

AMI, H. M.—"*The Mastodon in Western Ontario.*"

In the course of this paper, the writer gave a brief sketch of the interesting discovery of remains of portions of three skeletons of the mastodon in the counties of Norfolk and Essex, Ont.

TAYLOR, FRANK B.—"*Notes on the Moraines of the Georgian Bay Lobe of the Ice-sheet.*"

When the ice-sheet had retreated in the basin of Lake Huron so far as to leave the summit of Blue Mountain south of Georgian Bay uncovered, there still remained a well defined glacial lobe projecting towards the south-east nearly to Toronto and eastward beyond Lake Simcoe. This lobe was divided in two parts by the Penetang peninsula, the larger one extending south-east from Nottawasaga Bay and the smaller one extending east-south-east from Matchedash Bay. Recently the moraines of the eastern limb of the Nottawasaga lobe were partially explored and a well defined series of five moraines was found filling the interval from the head of Georgian Bay to the 'Oak ridges" north of Toronto. During the latter stages of this lobe there was a glacial lake covering Lake Simcoe and a considerable area to the east, and probably held up on that side by a lobe projecting from the north-east up the Valley of the Trent river. Its beach is 90 to 100 feet above the Algonquin beach a few miles north-east of Barrie. Well marked glacial striae were found on the summit of the promontory of Blue Mountain over 1100 feet above Georgian Bay, running S. 60° E. Some of the moraines running along the east side of Lake Huron were also traced northward to the vicinity of Durham and Flesherton.

DAWSON, SIR J. WM.—"*Note on Lepidophloios Cliftonensis.*"

In connection with this paper, Sir William writes the following synopsis which appears in the printed programme of the Montreal meeting: "In the bulletin of this Society for May, 1891, appeared a paper by the author on Fossils from the Carboniferous of Newfoundland, including new species of *Lepidodendron* (*L. Murrayanum*). In connection with this species I noticed what seemed a closely allied form from New Brunswick, which I had named *L. Cliftonense.* Later studies of this species have shown me that it should rather be placed in the allied genus *Lepidophloios.* I have so placed it in a more recent paper on that genus in the present year.* It should, therefore, be named *Lepidophloios Cliftonensis*, but is one of the species of that genus nearest to *Lepidodendron* and especially to my *L. Murrayanum* and to *L. Wortheni* of Lesquereux, as I have already stated in the paper to which this note is an addendum and erratum."

*Trans. Royal Society of Canada.—Paper read before meeting at Halifax, N.S., June, 1897.

CUSHING, HENRY P.—"*Syenite-porphyry Dikes in the Adirondack Region.*"

Recent work in Clinton county N.Y., has shown the existence of dikes belonging to the syenite-trachyte family of eruptive rocks, which are of different age from the bostonites described by Kemp and Marsters from the near vicinity. They are older than the Potsdam sandstone as they have furnished pebbles to its basal conglomerate. On the other hand the older rocks of the region were metamorphosed before their extrusion. Together with the associated diabases they show great resemblance to the Keweenawan eruptives of the Lake Superior region. They possess considerable petrographical interest.

ADAMS, DR. F. D.—"*Nodular Granite from Pine Lake, Ontario.*

The paper describes a granite from a recently surveyed portion of the Province of Ontario, which in places contains an abundance of nodules scattered through it. These nodules differ in a marked manner from those occurring in any of the hitherto described nodular granites, among other things in being more acid in composition than the rock itself. They are frequently found to be arranged in long lines which, when followed up, coalesce into sheets having all the characters which are commonly presented by secondary quartzose veins. The phenomenon evidently results from a process of differentiation in the original magma and has an intimate bearing on the question of "contemporaneous veins."

ADAMS, F. D. and NICHOLSON, J. T.—"*Experiments on the flow of rocks now being made at McGill University.*"

This valuable paper on experimental geology was very well received and threw not inconsiderable light upon the behaviour of rock material under great pressures. Numerous experiments made upon the compressibility of marble and the form assumed by a cylinder of marble after being submitted to great pressure were carefully described and illustrated. The bearing of the results obtained even at these early stages of the investigation on the nature of the action of rock masses on a large scale in nature—on earth movements in general—were also pointed out.

COLEMAN, A. P.—"*Clastic Huronian Rocks of Western Ontario, and the relation of Huronian to Laurentian.*"

The Presidential Address by Prof. Orton was on the subject: "*Geological probabilities as to Petroleum.*"

NOTES.—The Sessions were held in the Lecture Room of the Peter Redpath Museum of McGill University.

On the evening of Wednesday, Dec. 29th, a private reception was tendered to the Fellows of the Society by Mrs. Porter and Mrs. Adams, in the new Macdonald Mining Laboratories of McGill University.

The thanks of the Society were tendered to the Governors of McGill University, and to Profs. Adams and Porter for their kindness and attention during the meetings.

Dr. Adams, Dr. Ells and the writer having been requested by Secretary Fairchild to give notes on the geology of Montreal, Dr. Adams led in an interesting talk, which was followed with much interest by all present.—H.M.A.

INDEX.