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THE

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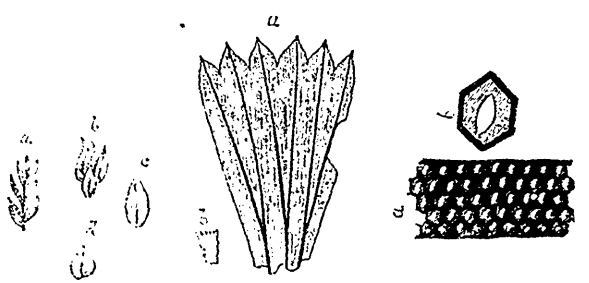

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THE

CANADIAN

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VOL. VII. JUNE, 1862. No. 3.

ARTICLE XVI.—*On the Primitive Formations in Norway and in Canada, and their Mineral Wealth.* By THOMAS MACFARLANE.

(*Continued from page* 127.—*Conclusion.*)

II. THE PRIMITIVE SLATE FORMATION.

B: *The Schistose Group.*

The second or schistose division of the Primitive Slate Formation in Norway, may be said to exist, with certainty, in two distinct areas, the one to the northeast and southeast of Vestfjord, in the Nordlands, and the other to the northeast, west, southeast, and south of Trondhjem. Keilhau describes the former of these regions as "The Mica Schist districts of Tromsen and Senjen." The latter region he includes in what he entitles "The Norwegian portion of the central transition territory of the Scandinavian Peninsula," because it appears, through transitions, to stand in intimate connection with the fossiliferous Silurian strata, which are developed around the northern end of Mjösen Lake. Believing however, with Naumann, that although the division line between the two formations, may sometimes become very indistinct, nevertheless, "on careful examination its existence will be found in most cases, capable of demonstration," I have assumed, with him, that the strata of the last mentioned region belongs to the Schistose Group of the Primitive Slate Formation.

The rocks of which they are composed are given in the following list, in the order of the frequency of their occurrence.

1. *Mica schist*, "a slaty crystalline mixture of mica and quartz,"* occurring most frequently and characteristic in the districts of Tromsen and Senjen. It is, however, often found of a more equivocal character, and is then called micaceous schist. It presents numerous transitions into the other schistose rocks of the group. Thus, gradually becoming fine-grained, it passes into clay slate, micaceous clay slate, or argillaceous mica schist, and by the disappearance of the mica, through quartzose mica schist, into quartz slate. Similarly, when chlorite and talc occur in it, it often becomes a chloritic or talcose mica schist; the former of these being the most frequent.

2. *Clay slate*, "an impalpable (indistinctly mixed,) distinctly foliated, soft rock; generally of a greyish, greenish, or bluish color,"† appears to be, next to mica schist, the most frequently occurring rock. It is however, more developed in the districts around Trondhjem, and is of a more variable character than even the mica schist. Besides the many varieties that may be included under the general term of argillaceous slate, which is frequently applied to these rocks, there occurs a clay slate, described as being both micaceous and chloritic, (Chloritischer Thonglimmerschiefer); from which it appears that, even mechanically, the same substances are distinguishable in some clay slates, which Sauvage found by chemical analysis to be present in the slates of the Ardennes; viz., a chloritic mineral which was decomposed by hydrochloric acid, with a micaceous mineral decomposable by sulphuric acid, and quartz.‡

3. *Chlorite schist*, "a soft schistose, mostly greenish colored rock, consisting principally of chlorite. Quartz or feldspar, or both together, are however frequently mixed with the chlorite."‖ It is often found in its characteristic form, but is also frequently described merely as chloritic schist, and occurs principally in the districts around Trondhjem.

4. *Limestone* comes next in frequency. It is developed especially in the districts of Tromsen and Senjen, where its texture varies from granular to impalpable, and its colour from white to dark grey. The limestone of the districts around Trondhjem, is mostly yellowish-white, and of an impalpable, sometimes slaty structure.

* Lehrbuch der Geognosie II, 281.
† Cotta: Gesteinslehre, p. 140. ‡ Idem, p. 147.
‡ Ann: des Mines VII, 441.
‖ Cotta: Gesteinlehre, p. 145.

5. *Quartz slate and Quartzite*, appear as transitions from mica schist, in the manner above referred to.

6. *Gneiss*, more or less characteristic, occurs in the group, especially towards the junction with the Primitive Gneiss Formation.

7. *Hornblende schist*, occurs in the Trondhjem region, and also in more northern districts. In both, it is connected with, and forms transitions into diorite.

8. *Diorite* and other *Greenstones*. Diorite is "a crystalline, granular mixture of hornblende and albite, sometimes also slaty or porphyritic."* Most of the greenstones in this group seem to be diorites. They are, however, often of very variable characters, and by the substitution of diallage for hornblende, graduate into a species of diabase.

9. *Granite and Syenite*, are also eruptive rocks occurring in the group, sometimes intimately associated with the diorites. *Hornblendic granite*, a connecting link between granite and syenite, and *granulite* are also mentioned.

10. *Serpentine* sometimes occurs in considerable masses. It is confined to the schistose districts south of Trondhjem, and consists of the common dark-coloured *variety*, *differing* altogether from the light coloured serpentines of the Primitive Gneiss Formation. Chromic iron ore invariably accompanies it.

11. *Euphotide*; a rock thus named is described by Keilhau, as containing large grained diallage or hypersthene. This is however a feldspathic rock, and by reference in a note in a former portion of this paper, p. 17, it will be seen that it is to be regarded as a kind of diabase, and distinct from the true euphotides of the Alps.

12. *Talc schist.*

13. *Steatite or Soapstone.* This, together with the rocks yet to be enumerated, is of comparatively rare occurrence.

14. *Dolomite.*

15. *Conglomerates and breccias*, somewhat resembling in character those already described in the quartzose division of the schistose formation.

The rocks above enumerated form, as already mentioned, two distinct geographical regions, which differ also in petrographical characters. The first is the one already mentioned, of Tromsen

* Cotta: Gesteinlehre, p. 57.

and Senjen, where the preponderating rock is mica schist; with which limestone, more or less granular, is very generally interstratified. Besides these, more or less characteristic gneiss, hornblende, chlorite, and talc schist occur as subordinate constituents. Well-defined clay slate is of comparatively rare occurrence, although the mica schist often assumes an argillaceous character.

The second region is that spread out to a considerable distance, in the directions before mentioned, around Trondhjem. In this also the mica schist may be termed the preponderating rock, but the interstratified limestone is less frequent. Moreover clay slate and chloritic schist are of far greater frequency than in the first named district, as is also serpentine; which latter rock may be said to be characteristic of the second district, especially of that part of it which constitutes the Dovrefjeld Mountains. The serpentine masses seem to be irregularly interstratified with the slates, and sometimes to graduate into them. The greenstones and granites, besides occurring in distinct beds, often form irregular masses and regular veins, intersecting the schistose members of the group. Here, as in the two groups of rocks already described in this paper, these crystalline rocks, as they approach their limits, gradually assume a schistose structure. Not only does the greenstone, in this way, change into hornblende slate or greenstone slate, and the granite become gneissoid, but the greenstone is found even to graduate into mica schist and clay slate. The more purely granular the greenstones are, the more does the form of the deposit deviate from that of a layer or bed.

Various subdivisions or zones have been distinguished in this group, which greatly differ in their general strike. The principal zone of the Dovrefjeld Mountains, seems to run E.N.E., which is also about the direction of the Dovrefjeld range. The dip varies much, but seems to be, on an average, about 45°. To judge from the direction of the dips given on the geological map, various folds occur in the strata, from their junction with the primitive gneiss, to where they graduate into fossiliferous beds.

In the country south of Trondhjem, the mountain masses of Dovrefjeld and Fillefjeld, consist principally of the micaceous, argillaceous, and chloritic schists, already referred to. They constitute as it were, the pedestal for the higher peaks of these ranges, such as the Jotunfjeld. These peaks are generally of igneous rocks. The Faastenen are, however, composed of serpentine, and Snehætten, of a peculiar sort of gneiss.

The most important mines of the district south of Trondhjem, are the copper mines of Röraas and its neighborhood, the chrome mines on the Dovrefjeld, and the nickel mines of Espedal.

The rocks around Röraas consist of micaceous slates, partly chloritic, and partly argillaceous. They graduate into glossy clay slates, and are sometimes described simply as green slates. These frequently assume the character of fahlbands, being impregnated with pyritous minerals, and weathering red. The deposits of Röraas, which have been worked since 1744, seem to partake of this nature. They form layers in the slates, varying from one to fourteen feet in thickness; the whole of which, however, by no means consists of cupreous minerals, but usually of many small pyritous beds, lying side by side; these being again divided into smaller ones, separated from each other by scales of chlorite schist. The preponderating ores are copper pyrites, and iron pyrites, which are sometimes mixed with magnetic pyrites and zinc blende; while chlorite, brown mica, quartz, garnet, actinolite, and asbestos, also accompany the metallic sulphurets. The ores, as they are delivered to the smelting houses at Röraas and Foldal, average only five per cent., and frequently are as low as three per cent. They are roasted in heaps, and then smelted to regulus in shaft furnaces; little or no flux being required. The resulting regulus is roasted repeatedly upon hearths, (stadeln) and again smelted, when black copper is obtained, which is refined on the small gahr hearth. The copper is principally sold for home consumption, but part is also sent to the Hamburg market, where it is known as "Drontheimer" copper.

The chromic iron mines of Röraas in Sundal, and in Lessöe, have been, and still are wrought with very considerable success. They all occur in serpentine, and in one year as many as 100 have been worked. Some of these are large and regular deposits, and others are of less extent. The most important of them are situated in the districts to the east of Röraas, Röhammerne, and Feragsfjeldene, and are owned and worked by the proprietors of the chromate of potash manufactory at Leren. Three different sorts of ore are produced at the mine, : No. 1, the best, which is exported to England, although its content in chromic oxide is much beneath what is usually contained in the Baltimore ore; No. 2, an inferior sort, which is worked up into bichromate of potash at Leren; No. 3 is a still poorer quality, which is stamped and washed, the products being also used in the manufacture of

bichromate. At the manufactory, the ore in fine powder is simply ignited in a reverberatory furnace, with about 30 per cent. of calcined potash, and little or no saltpetre. The resulting mixture yields, on lixiviation with water, a solution of neutral chromate of potash, which separates as a granular salt on evaporation. It is redissolved, and the solution is treated with a certain quantity of sulphuric acid, when crystallized bichromate of potash is obtained. The sulphuric acid is manufactured in the same establishment. One hundred parts of ore yield about thirty-seven of bichromate, so that the ore used must contain only about twenty per cent. of chromic oxide.

The nickel mines of Espedal, which are now abandoned, furnished an ore much of the same character as those of Ertelien in Ringerike, described in the first part of this paper. The mode of treatment was also similar.

The rocks of the two areas just described, offer, as we have seen, very considerable lithological differences. Those of the northern region do not appear to present any striking resemblances with the Canadian rocks, but the region about Trondhjem strongly resembles that of the Eastern Townships of Canada, and agrees with it in the very points in which it differs from the mica schist region of Tromsen and Senjen. Among these are the predominance of clay slates, the presence of serpentines, with chromic iron, and the occurrence of ores of copper disseminated in the schists. These rocks of Eastern Canada have been traced from the line of the state of Vermont, for 140 miles north-eastward to the Chaudière River, and thence, at intervals, as far as Gaspé. As described in the Reports of the Geological Survey, they consist in great part of mica schists, passing into a gneiss, sometimes granitoid, on the one hand, and into clay slates on the other. Roofing slates are abundant in this series, and beds of steatite and chlorite slate are not uncommon. Quartzites, sometimes conglomerate, are met with, and limestones, which are very often magnesian, and weather of a reddish or brownish color from the presence of iron or manganese. They are sometimes replaced by carbonate of magnesia. Beds of serpentine are an important feature in this series; they are often mingled with limestone, dolomite or magnesite, and always impregnated with chrome and nickel. These serpentines are sometimes associated with diallage and with feldspathic rocks, which constitute varieties of diorite and diabase. These same rocks are traced southwards

in the Green Mountains, through a large part of the United States. All of them find representatives in the Norwegian group around Trondhjem, and in the Dovrefjeld.

This resemblance is still further traced in the metalliferous deposits of the two regions. In the Eastern Townships of Canada, copper sometimes occurs in the native state, in clay slate, but much more frequently in the form of yellow and variegated sulphurets, or of copper glance, disseminated in micaceous or chloritic slates, or in limestone. These deposits are of the nature of fahlbands. Those of Sutton and Ascott, especially the latter, have a strong resemblance to that of Röraas. The copper ores of this region are generally subordinate to the stratification. The short and irregular veins of quartz and bitter-spar, which traverse these copper-bearing strata, sometimes however carry rich ores of copper, occasionally with gold.

Iron schists, which consist of scaly peroxyd of iron, intermingled with various proportions of quartz and chlorite, constitute important beds of iron ore in some parts of this series, as in the townships of Brome and Sutton, where they were formerly wrought to a small extent. These schists resemble the itabirite of Brazil.

Chromic iron accompanies the serpentine in Canada, as in Norway. The deposits of this ore occurring in the townships of South Ham, Bolton, and Melbourne, greatly exceed those of Norway in richness and extent. The deposit in the first named township has been worked, producing an ore containing forty-three per cent of chromic oxide.

As far as regards the developement of the mineral resources of the group, Norway is in advance of Canada. Not only has the mining of copper and chrome ores been long established, but the manufacture of the valuable products obtainable from these, has been long and profitably pursued. The mines of Röraas are beginning to suffer from the scarcity of fuel at the great height, (2080 feet above the sea,) and the chrome mining and manufacturing has had to contend with expensive cartage, and often with high prices for potash, which is to a great extent imported from Russia. In Canada, around the mines of the Eastern Townships, the settler destroys acres of timber, the softer sorts of which he might burn to charcoal; and manufactures tons of potash, which the chrome miner might buy, and use to manufacture his ore into chromate of potash, at a rate alike profitable to producer and consumer. I am not aware of any district where greater advantages

exist. May they soon be appreciated, and taken advantage of, as they deserve.

These crystalline rocks in the Eastern Townships are regarded by the Geological Survey of Canada, as a metamorphosed portion of the Quebec group, which belongs to the inferior part of the Lower Silurian series. This view of their age coincides somewhat with that of Keilhau, relative to the similar formation around Trondhjem, which according to him "appears, through transitions, to stand in intimate connection with the fossiliferous Silurian strata."

In the foregoing, I have endeavoured to compare in their petrographical and economic relations, the three groups of rocks mentioned at the commencement of this paper. It was not originally my intention to pursue the subject farther than this; but seeing that the comparison which I have endeavoured to institute would be incomplete without some reference to the mutual geological relations of these groups in Norway, I offer the following remarks before concluding.

The oldest of these groups is the Primitive Gneiss formation. This at least was the opinion of the older geologists, such as Naumann, Keilhau and others, who specially studied the saviour Scandinavian formations, but Kjerulf and Dahll, to whose researches I have yet to refer, have lately declared themselves opposed to this view. According to Keilhau, the gneiss formation of Kongsberg and of Flesberg, is, to the east of these districts, conformably overlaid by the Tellemarken quartzose group, into the rocks of which the gneiss forms a gradual transition. The same relations are described by Keilhau, as occurring at other points of junction, and he concludes that the Tellemarken quartzose group is to be regarded as filling up a very broad depression in the underlying gneiss formation. The quartzose group is not found in contact with any of the schistose series described, but the analogous quartzose group of Alten and Quænanger is overlaid conformably by the mica schist rocks of Tromsen and Senjen. The relations of the latter to the Dovrefjeld slates are unknown, for wherever the last mentioned come in contact with strata belonging to the primitive gneiss formation, both the quartzose and mica schist groups are absent, and the slates of Dovrefjeld rest conformably on the gneissoid strata. On the other hand, these Dovrefjeld slates form a continuous transition, through less and less crystalline slates, greywacke slates, and

sandstones, into the fossiliferous Silurian strata of the district north of Mjösen Lake. It seems therefore that the succession of these groups, in the order of their antiquity, is as follows:—

1. Primitive Gneiss formation.
2. Quartzose group.
3. Micaceous group.
4. Argillaceous and chloritic group.

} Primitive Slate formation.

5. Greywacke slates, sandstones, and limestones.
6. Fossiliferous Silurian strata.

It is to be remarked, that besides these stratified groups, various eruptive formations occur, whose age or place in the above list it is difficult to determine. Among these, the gneiss-granite of Vestfjord, and the granite and gneiss-granite in the southern parts of Bratsbergs Amt are the most important. The relations of the latter to the Tellemarken quartzose group, have been minutely investigated by Dahll, and described in his paper "Om Tellemarkens Geologie." He there unequivocally establishes the following succession, commencing with the more modern formations.

1. Syenite with associated granite, rhomboidal porphyry and augite porphyry.
2. The Devonian formation.
3. The Silurian formation.
4. Gneiss-granite and granite.
5. The slate formations of Tellemarken.

The relations of the latter formation to the primitive gneiss are not touched upon in Dahll's paper; but in another "Om Kongsbergs Erts District," by Kjerulf and Dahll, it is asserted that the gneiss and mica schist of Kongsberg, or as they are called, the Kongsberg slates, "are exactly the same as those which in a more unchanged condition, are spread over large areas in Tellemarken," but separated from these by a band of eruptive gneiss-granite. The primitive gneiss formation is declared to have no existence, but to be resolvable into gneiss-granite, which is eruptive, and into slates, whose two principal types are quartz slate and hornblende slate. It is even said that gneiss "as a petrographical term, in its older and more extended meaning, is no longer advantageous to science, but the opposite." The order of succession in these older groups, according to Kjerulf and Dahll, is as follows, commencing with the oldest:

1. Tellemarken slates.
2. Granite and gneiss-granite. (Eruptive.)

3. Œsterdal slates (which are the same as the Dovrefjeld slates.)
4. Silurian formation.
5. Devonian formation.
6. Younger granite, syenite, &c. (Eruptive.)

That the extreme opinions entertained by Kjernlf and Dahll as to the gneiss formation, are capable of being substantiated, is much to be doubted. At least it seems to me that in their work above cited, nothing very conclusive is brought forward in support of their views, and moreover, no reference is made to the many well substantiated facts, upon which the older view, as to the age of the Tellemarken quartzose rocks, is founded. This total obliteration of the gneiss formation, is perhaps the most extreme point to which the supporters of ultra metamorphism have yet attained.

The views of the Canadian geologists as to the Laurentian and Huronian series are the same as those of the older geologists of Norway, where, as has been shown, these rocks are represented by the Primitive Gneiss, and by the quartzose division of the Primitive Slate formation. The Dovrefjeld slates, with their serpentines, are regarded as more recent, and as closely related to the adjacent Silurian strata. This is precisely the view of the Canadian geologists, with regard to the Quebec group, except that they include this, with its slates and serpentines, in the Silurian series, regarding it as a peculiar development of the lower part of this, and younger than the Primordial Zone. According to Sir W. E. Logan, this Quebec group was connected with a deep sea, and with movements of elevation and subsidence, the result of which is, that along the outcrop, or the shore line of the original basin, these peculiar strata are wanting. Mr. Sterry Hunt has called attention in a recent paper in this Journal, to the fact that a similar condition of things to that of Canada, seems traceable across the ocean, into Scotland, and probably as far as Scandinavia. In the Scottish Highlands, we find a schistose series, having the lithological characters of the Quebec group and the Dovrefjeld slates. This series has been the subject of much controversy. As in Norway, some have maintained that these strata are older than the lowest Silurian rocks, but Sir Roderick Murchison, with Ramsay and Harkness, seems to have shown that they are really younger than the oldest fossiliferous rocks of Scotland, and that the condition of things described by the Canadian geologists in Eastern Canada, extends across the Atlantic. Can. Nat. Vol. VI, 93.

Thus is it not only in Canada, that the position of the rocks of the schistose group is equivocal. Different views prevail as to their age in different countries. In Cornwall, they are considered Devonian, in Scotland, Lower Silurian, and in Bohemia, as in Norway, Pre-Silurian. In Belgium, Rhenish Prussia, Westphalia and Nassau, they are by some geologists regarded as Devonian, and by others as belonging to an older formation. In East Russia, on the western slope of the Ural Mountains, they are supposed to represent metamorphic Lower Silurian strata. A dissimilarity of views will probably continue to prevail as to the position of these rocks, until the question is decided, as to what value, in the absence of fossil remains, the petrographical characters of a group, taken in connection with its stratigraphical position, should have in determining its age. Perhaps there prevails at present, too much of a tendency to attribute extraordinary influences to metamorphic agencies. So soon as the true limits and effects of metamorphism are recognized, it will probably be acknowledged that, whatever view may be entertained as to their origin, the schistose rocks above referred to, underlie the Silurian, and all unaltered or metamorphosed fossiliferous strata. Following close upon more moderate views as to metamorphism, will probably come the recognition of Werner's old rule, as to the succession of these older rocks; namely that the gneiss groups generally underlie those in which mica schist preponderates, and that the latter are overlaid by argillaceous and chloritic groups. Thus the ground will be cleared for an impartial investigation into the origin of the primitive formations.

Acton Vale, Canada East, 8th April, 1862.

ARTICLE XVII.—*On the Mammals and Birds of the District, of Montreal.* By ARCHIBALD HALL, M.D., L.R.C.S.E.

(*Continued from page* 78.)

ORD. II. PASSERINÆ.

Fam I. Dentirostres.—Genus Lanius.

Gen. char. Bill long, compressed, toothed on the upper mandible, and much bent; tip of the lower one suberect, and not notched; nostrils concealed by nuchal bristles; cere wanting; nostrals subrotund, half closed by a membrane. 3rd and 4th primaries longest.

L. excubitor. Great American Shrike or butcher bird.
L. septentrionalis. Gmelin! Buonaparte!
Collyrio borealis? Buonaparte! Baird!

v.s.p. Bill horn colour; claws black; irides hazel; eggs 6, cinereous white, mottled and streaked at their large end with rufous.

Dorsal aspect. Crown, nape of neck, interscapular region, and scapulars, drab slate colour, or French white; auriculars black, as also the streak in front and behind the orbits and the nuchal bristles; above and below the orbits a narrow streak of white; small wing coverts light brown, scapulars tipped with white; greater wing coverts black, tipped with brownish white; rump white; tail coverts white, with distal halves of the dorsal tint; tail cuneiform, two central feathers black, two next tipped with white; the white predominates in the others as far as the outer or lateral feathers, the outer vanes of which are wholly white, the inner vanes half white, the quill half being black; quills of the primaries white—the remainder black, with minute brown white tips; secondaries black, tipped with white.

Ventral aspect. Dirty brownish white, intersected by linear zigzag lines of slate brown; vent, tail and wing coverts white; primaries and secondaries slate colour; tail black, verging to slate, except the white of the upper surface, already mentioned, which apears more conspicuous on the ventral aspect.

4th primary longest; 3rd a little shorter; tarsi black, slender; middle toe a little longer than hind toe; claw of hind toe longest and stoutest, all of them grooved; inner edge of talon of middle toe slightly salient. Length 10 inches; alar expanse about 14 inches.

Genus Muscicapa.

Gen. char. Bill moderately large, subtriangular, depressed at the base, and compressed towards the tip which is deflected, both mandibles emarginate; nostrils basal, suboval, and partly concealed by nuchal bristles; tarsus as long as the middle toe; 4th primary longest; external and middle toes basi connected; outer toe not versatile.

M. tyrannus. Tyrant Fly-catcher.
Tyrannus Carolinensis? Baird.

v.s.p. Bill, tarsi, and claws black; irides hazel. Eggs 5, yellowish-white, blotched with brown.

Dorsal aspect. Eyelids white; auriculars black; forehead, sides of the crown, and nape of neck black, the quill end of the feathers grey; crown orange red or scarlet, tipped with black, forming a crest erectile at pleasure. Scapulars, interscapulary region and rump, brown, with occasional greyish-white tips to the feathers, especially on the back. Primaries and secondaries pure brown, with their outer vanes edged with white; greater and smaller wing coverts brown, edged with white; tail coverts black, tipped with white; tail subrotund, of 12 feathers, black, with a broad terminal band of white on the central feathers; the lateral feathers minutely edged with white.

Ventral aspect. White, except on breast, sides, and flanks, which are slate colour; wing coverts slate colour, shaded to white towards the edges and tips; tail coverts white; wings slate brown; tail blackish-brown.

2nd primary longest; 1st and 4th subequal; toes and tarsi of equal length; middle toe longest; two outer toes equal; talons short, a salient inner ridge to the middle one. Length 8¼ inches; alar expanse 13 inches. Female and young resemble the male in every respect except in the scarlet crest, which is wanting.

M. Crinata. Great crested Fly-catcher.

V.S.P. Bill brownish externally, yellow internally; claws and tarsi black; irides hazel; eggs 4, dull white, blotched and mottled with purple.

Dorsal aspect. Coronal crest brown; feathers acuminate, erectile at will; nape of neck, scapulars, and dorsal region, olive brown; greater and smaller wing coverts clove brown, tipped with dull white; primaries and secondaries clove brown, inclining to bright rufous on the outer vanes of the former, and to white on the outer vanes of the latter, with a paler rufous tinge on the inner vanes of both. Tail of 12 feathers, square, the 2 centre feathers clove brown, all the others clove brown on the outer vanes, and bright rufous on the inner vanes.

Ventral aspect. Chin, throat, and auriculars bluish-grey, shaded on the breast into bright sulphur yellow, which clothes the breast, belly, vent, and tail and wing coverts. The bluish-grey of the breast is continued along the sides as far as the flank, becoming in its course blended with the sulphur yellow.

2nd and 3rd primaries subequal; 1st and 5th equal. The bill of this bird is about 1⅕ inch long from the angle of the mouth to

the apex, and about 7 lines broad at the angles. The tooth is situated close to the apex, and not well defined. The curve commences immediately above it. There is a slight emargination at the apex of the lower jaw correspondent with the tooth of the upper one. Nostrils subrotund, imperfectly concealed by the nuchal hairs; and between the orbit and the nostrils a few white mottlings on the feathers are occasionally seen. Length 9 inches; alar breadth about 13 inches. The female has the same tints as the male but less bright.

Genus Muscipeta.

Gen. char. Bill large, broader than deep, ridged above, much depressed; upper mandible notched and hooked; hook short; base set with strong nuchal bristles, which imperfectly conceal a round nostril; side toes unequal; external toe longer than the internal, and united to the middle one; 3rd and 4th primaries longest.

M. nunceola. Phœbe Flycatcher or Peewit.
M. atra of Gmelin!
M. phœbe of Latham!
M. fusca of Buonaparte!
Sayornis fuscus. Gmel.! Baird!

V.S.P. Bill, tarsi, and claws black; irides hazel; eggs 5, pure white.

Dorsal aspect. Dark olive brown, tips of wing coverts brown, secondaries edged with brownish-white on their outer vanes; tail square, brown, outer vane of the last feather minutely edged with white.

Ventral aspect. Yellowish-white, except the sides of the breast which are of the dorsal tint.

3rd primary longest; 2nd and 4th subequal; 1st and 6th subequal. Length 6 inches; alar expanse about 9 inches. The crown feathers of this bird, as well as of the birds of this genus, form a crest which is erectile at pleasure.

M. virens. Wood Pewee.
M. rapax of Wilson.

D.C. "Bill, tarsi, and claws black; irides hazel; eggs 3 to 4, yellowish-white, spotted and blotched with lilac and dark brown. Whole dorsal aspect brownish-olive, verging to blackish on the head. Ventral aspect, pale yellowish almost inclining to white; tail subfurcate; 2nd primary longest. Length 6 inches; alar breadth 10 inches." (Nuttall).

M. querula. Small Pewee.

v.s.p. Bill blackish-brown; tarsi and claws black; eggs 5, white; irides hazel.

Dorsal aspect. Dull olive green, darker on the head; primaries and secondaries brown, the latter edged with brownish-white; orbit surrounded by a ring of the same colour. Tail square, of same colour as the wings, with a minute edging of white on the outer vane of the lateral feathers.

Ventral aspect. Pale yellowish-white verging to an olive brown on the sides of the breast; inner wing and tail coverts pale yellow. 3rd primary longest; 2nd subequal to 4th; and 1st to the 6th. Length 6 inches; alar breadth 9¼ inches. I feel utterly unable to identify this species with the catologue list of Mr. Baird.

Genus Setophaga.

Gen. char. Bill depressed, with nuchal bristles; both mandibles of equal length and acute, upper one scarcely notched, scarcely bent at tip, and scarcely inflected on the lower; 2nd and 3rd primaries subequal; tail long and subcuneiform. The birds of this genus are included under the sub gen. Saxicola of Genus Motacilla of Cuvier. They appear, however, to deserve a separate generic position by themselves, being intermediate between the Muscipetal and Sylvian tribes, possessing the depressed inflected bill of the former, and the long tail and tarsi of the latter, being more musical than the former, in fact emulating the latter in point of vocal capacity.

S. ruticilla. American Redstart.
Muscicapa ruticilla, of Linnæus and Wilson !!
Ruticilla minor Americana of Edwards !
Setophagus ruticilla. Baird !

v.s.p. Bill, tarsi, claws and irides black; eggs 3 to 4, cream white mottled with yellowish-brown.

Dorsal aspect. Crown of head, nape of neck, dorsal region, rump and scapulars deep black; tail of 12 feathers, long, round, four centre ones black, the others orange, with thin distal halves black; primaries and secondaries, except the outer web of the 1st, and the three or four last secondaries orange at their insertion, and the remainder black, the orange gradually increasing in breadth and depth of tint as far as the secondaries.

Ventral aspect. Throat, chest, and front of the belly black; sides of the chest, and wing coverts bright orange; lower part of

the belly, and vent and tail coverts white; wings pale orange except the distal ends which verge to slate colour.

2nd primary longest; 3rd scarcely a line shorter, and 1st a little shorter than 3rd; tarsus much longer than the middle toe slender; toes slender; claws slender, compressed; outer toe connected to inner one at the base. Length about 5 inches; alar breadth about 7 inches. The female has the tints paler, and the orange changes to a yellow. The young birds thus far resemble the female, but in exception they are deficient in the orange tint of the wings, and are paler in other respects.

S. Buonapartii. Buonaparte's Gnat-catcher.

v.s.p. Upper mandible blackish-brown; lower one pale at base edged with blackish brown; tarsi, toes and nails pale; eggs unknown.

Dorsal aspect. Greyish-ash except the crown, the feathers of which are black minutely tipped with grey, and the interscapular space which is faintly olive green. A yellow streak from the nostrils invests the eye, and a black streak from the angle of the mouth proceeds below the eye to the shoulders, where it appears to commence the zone of black spots which cross the chest like a necklace; auriculars grey; primaries and secondaries with the tail pale brown. The two former paler on the inner vanes and edged with white towards the quills.

Ventral aspect. Bright gamboge yellow, only interrupted by a zone of black spots across the chest. These spots are caused by the feathers in that place being tipped with black. Tail and wing coverts whitish.

3rd primary longest; 2nd and 4th subequal; 1st shorter than the 4th, but longer than 5th. Length $4\frac{3}{4}$ inches; alar expanse 8 inches. This bird is rarely met with. The specimen from which the foregoing description is taken, was killed at St. Remi in the spring of 1858. Is their sufficient difference between this bird and the *Sylvia pardalina*, to constitute two species of different genera?

Genus Vireo.

Gen. char. Bill short, moderately compressed, curved at the base, with nuchal bristles; upper mandible curved at the extremity, slightly notched, resembling in this respect the Muscipeta, but differing from the latter in being more compressed, and not at all depressed, in consequence of which it is deeper than broad; lower mandible a little shorter than the upper, and recurved slightly at

the tip; tongue cartilaginous and bifid; 2nd and 3rd primaries longest; outer toes connected at the base. Prevailing dorsal tint olivaceous green, whence the familiar appellation "Greenlet."

V. flavifrons. Yellow-throated Greenlet.

V. (*Lanivireo,*) flavifrons. Baird!

V.S.P. Bill, tarsi, and feet greyish-blue; irides hazel; eggs 4, white, mottled with light and dark brown at the larger ends.

Dorsal aspect. Crown, and nape of neck olive; scapulars and dorsal region dark ash colour almost slate; greater and smaller coverts edged and tipped with white on the outer vanes, causing an appearance of two bars of that colour; primaries and secondaries clove brown, edged with olive which verges to white on the outer vanes, and tipped with white on the inner vanes of all except the three last secondaries; tail of 12 feathers, round, clove brown, with the three outer feathers edged with white on both sides, and the centre feathers invariably edged with brownish-white on their outer vanes.

Ventral aspect. A yellow streak round the orbits, intersected anteriorly by a streak of dark olive passing from the base of the bill; chin, throat, and upper part of the breast, bright yellow, almost king's yellow, changing to olive on the sides of the breast, and below the shoulders, and assuming an ashy tint on the flanks; belly, vent, wing and tail coverts white.

2nd and 3rd primaries subequal and longest; 1st and 4th subequal. Length 5½ inches; alar breadth 9 inches.

V. olivaceus. Red-eyed Greenlet.

Muscicapa olivacea of Wilson!

M. altiloqua of Viellot!

Vireo (*vireosylvea*) *olivaceus.* Linn.! Viel.! Baird!

V.S.P. Upper mandibles blackish-brown; lower one pale; claws pale with a black lateral streak; middle one with a salient inner ridge, all of them much compressed; irides red in the adult, hazel in the young birds; eggs 3 to 4, white, mottled with light and dark brown.

Dorsal aspect. Crown of head ash colour, with a lateral margin over the eyes of a darker tint, a streak of white above the eye, and a faint streak of grey from the angle of the mouth to the auriculars; neck, back, rump, and scapulars olivaceous green; primaries, secondaries, and tail light brown, with their outer vanes edged with olive green and their inner ones with white.

Ventral aspect. White with an inclination to pale yellow on the sides; wing and tail coverts white tinged with yellow.

2nd primary longest. Length 5¾ inches; alar breadth 8 inches.

V. gilvus. Warbling Greenlet.

Muscicapa melodia of Wilson!

M. gilva of Viellot!

Vireo gilvus. Viel.! Buon.! Baird!

D.C. "Length 5 inches; above pale olive green much mixed with ash on the neck and shoulders; line over the eye and lower parts whitish; near the breast and sides, and under the wings tinged with pale greenish-yellow; wings greyish-brown, edged with pale olive green inclining to grey; tail similarly edged and slightly forked; legs, feet and bill above lead colour; the lower mandible pale flesh colour; iris dark hazel. The sexes nearly alike." (Nuttall).

Genus Sylvia.

Gen. char. Bill subulate, straight, slender, deeper than broad at the base; upper mandible frequently notched; lower one straight; nostrils lateral, suboval; tarsus longer than the middle toe; bastard wing short or wanting; 2nd and 3rd primaries usually longest and subequal; scapulars and wing coverts short.

S. citrinella. Summer Warbler.—Yellow-bird.

Dendroica æstiva. Baird!

V.S.P. Bill bluish; tarsi and feet pale; claws horn colour; irides hazel; eggs 4, dull white mottled with brown.

Dorsal aspect. Crown gamboge yellow; nape of neck, interscapulary region, and rump olivaceous green; wing coverts, primaries, secondaries, and tail clove brown edged with yellow. The two central tail-feathers have a minute yellow edging. The others nearly altogether yellow except a clove brown streak along each side of the shafts, which widens as it approaches the tips.

Ventral aspect. Light gamboge yellow streaked with rufous orange.

Bastard wing wanting; 1st, 2nd, and 3rd primaries subequal, if anything the second longest. Length 5¼ inches; alar breadth 7½ inches. One of our most common songsters.

S. varia. Black and White Warbler.

Certhia maculata of Wilson!

Mniotilta varia. Baird!

V.S.P. Bill black above, pale below; upper mandible slightly

curved and compressed towards the apex; tarsus not much longer than the middle toe; irides black; eggs 5, whitish mottled with brown.

Dorsal aspect. A white streak bordered by a black one, and this by a white one immediately above the eye, proceeding from the base of the bill, traverses the crown of the head and nape of the neck, and is lost upon the shoulders. A black streak from the angle of the mouth proceeds below the eye and includes the auriculars. This is separated by a white line on the throat from its fellow. Dorsal feathers black streaked with white; tail coverts, and greater and smaller wing coverts black, with white edging and tips on the outer vanes; primaries and secondaries clove brown, with white edgings to the inner vanes of all, and slate coloured edgings to the outer vanes, except on the 1st primary and two last secondaries; the former of which is minutely, and the latter broadly edged with white; tail feathers clove brown; the two outer ones with broad white tips on the outer vane, the rest, except the centre ones, edged with white on the inner vanes, and slate white on the outer vanes. The two centre feathers clove brown, with slate white edgings; tail subfurcate.

Ventral aspect. Chin and throat black, all the rest white with black streaks.

2nd primary longest; 1st and 3rd equal. Length $4\frac{3}{4}$ inches; alar breadth 8 inches. The female has the crown wholly black; primaries edged with olive, and less yellow; the throat, as also in the young bird greyish; bastard wings rudimentary.

S. coronata. Yellow-crowned Warbler.—Myrtle-bird.

Dendroica coronata. Baird!

V.S.P. Bill, tarsi and toes black; irides hazel; eggs unknown.

Dorsal aspect. Crown of head, and rump bright orange-yellow; forehead black, all the other parts slate colour spotted with black, the spots most conspicuous in the interscapulary region, and least so on the nape of the neck; they are subtriangular; greater and smaller wing coverts brownish black, edged with slate and tipped with white; primaries and secondaries clove brown, edged with brownish-white; tail subfurcate, clove brown, edged with brownish-white, and with a large white spot on the distal end of the inner vanes of the three outer feathers.

Ventral aspect. Chin, belly, vent, and tail coverts black; breast black, with white tips; sides of the breast king's yellow; wing coverts slate; flank feathers streaked with black. A black

line from the angle of the mouth proceeds backwards and includes the auriculars.

2nd primary longest; 1st and 3rd equal. Length 5½ inches; alar expanse 8½ inches. Winter plumage brownish-olive, with scarcely any black, and the yellow much fainter. The young bird much resembles the old in its winter plumage.

S. Pennsylvannica. Chesnut-sided Warbler.
S. icterocephala of Latham and Audubon !!
Dendroica Pennsylvannica. Baird !

v.s.p. Bill, tarsi, and toes black; irides deep hazel; eggs unknown.

Dorsal aspect. Crown of the head yellow with an olivaceous tinge; dorsal feathers and scapulars black, tipped and edged with olive yellow; greater and smaller wing coverts black, broadly tipped with white tinged with yellow; primaries clove brown, edged with white on the outer and inner vanes; secondaries edged with yellow on the outer vanes, and with white on the inner vanes, and tipped with the same colour; tail subfurcate, clove brown, the three outer feathers have the distal ends of the inner vanes white, the edges of the other feathers minutely and faintly white.

Ventral aspect. A black streak from the angle of the mouth passes above the eye and meets its fellow behind the yellow crown. From the same point another passes downwards and backwards, and terminates at the commencement of the chesnut band; chin, breast, belly, vent, tail and wing coverts white; sides of throat, the breast, and flanks, bright chesnut red.

2nd and 3rd primaries equal and longest; 1st and 4th equal. Length 4½ inches; alar breadth 7¾ inches. The female has the crown and chesnut sides paler, and the young birds resemble her. She also wants the black spot below the eye.

S. maculosa. Spotted Warbler.
S. magnolea of Wilson !
Dendroica maculosa. Baird !

v.s.p. Bill black; tarsi and toes brown; claws horn colour; irides deep hazel; eggs unknown.

Dorsal aspect. Crown, and nape of the neck ashy blue; interscapular region black with yellow tips to the feathers; rump yellow; tail coverts black; scapulars black edged yellow; greater and smaller wing coverts black, with broad white tips and narrow edgings; primaries and secondaries clove brown edged with white,

the white minute on the outer vanes and tinged with brown; tail, all the feathers, except the two centre ones, have a single broad bar of white on the centre of their inner vanes.

Ventral aspect. A white streak passes from the nostril, surrounds the eye, separates the ashy blue crown and nape of neck from the black auriculars, and loses itself on the shoulders; whole lower aspect gamboge yellow, streaked with black along the breast, sides and flanks; tail and wings, with vent, white.

2nd primary longest; 3rd a little longer than 1st. Length $4\frac{1}{3}$ inches; alar breadth 7 inches. The female has the breast whitish and the colours duller.

S. pardalina. Canada Warbler.
Muscicapa Canadensis of Wilson.
Myiodioctes Canadensis. Baird!

V.S.P. Upper mandible brown; lower one pale; tarsi, toes, and claws pale; eggs unknown.

Dorsal aspect. Crown black; nape of neck, interscapulary regions, scapulars, greater and smaller wing coverts, and tail coverts ashy, with an olivaceous tinge in the interscapular space; wings and tail brown, with a minute brownish white edging on the outer vanes of the feathers of the former.

Ventral aspect. Eyelids yellow. A white streak from the angle of the mouth, proceeds backwards below the eye, and including the auriculars, terminates on the sides of the neck. All the inferior surfaces gamboge yellow, with a broad belt of black spots across the breast; wing and tail coverts white.

2nd primary longest. Length $5\frac{1}{3}$ inches; alar breadth, $8\frac{1}{4}$ inches. Does this bird differ in any material respect from the *Setophaga Buonapartii?*

S. Philadelphica. Mourning Warbler.
Geothlypsis Philadelphica. Baird!

V.S.P. Upper mandible black with pale edges; lower one, tarsi, claws, and toes pale flesh colour; eggs unknown.

Dorsal aspect. Head and neck lead colour, darker on the crown of the head, and terminating on the breast in a crescent of black feathers, tipped with greyish white; dorsal region, scapulars, greater and smaller wing coverts, tail coverts and tail olive green, the vanes of the last inclining to brown; primaries and secondaries light brown, with olivaceous green edgings on the outer vane of each feather, except the 1st on which it is white.

Ventral aspect. Lower part of breast, belly, vent, inner tail and

wing coverts, light king's yellow, changing to olivaceous on the flanks.

3rd primary rather longest; 2nd and 3rd subequal. In some cases the 2nd is a little shorter than 3rd, and 1st than 2nd. The female resembles the male in every respect, except that the plumage is duller. Length 5 inches; expanse 8¼ inches.

S. Blackburniæ. Blackburn's Warbler.
Dendroica Blackburniæ. Baird!

v.s.p. Bill, tarsi, toes, and claws black; irides black; eggs unknown.

Dorsal aspect. Crown of head and nape of neck black, the former intersected by a stripe of bright orange, and bounded as well as the latter by a stripe of the same colour, which commences at the nostrils and passes over the eye; dorsal region black, interspersed with a few streaks of brownish-white; tail coverts black, margined with brownish white; tail square, black. The inner vanes of nearly all the lateral feathers white except towards the tips; outer vanes margined with brownish-white; small wing coverts black; greater ones black with white tips to the outer vanes; coverts of the secondaries or scapulars all white. Brownish-white margins on the outer vanes of the quill feathers.

Ventral aspect. An orange spot below the eye; auriculars black, bounded by orange; chin and throat bright orange, bounded by black spots becoming more numerous on the belly and flanks; breast yellow, dull, fading to white on vent and tail feathers, numerously interspersed with black streaks except in the two last positions.

1st primary longest, then the 2nd, and then the 3rd. Length 4¾ inches; alar expanse 8 inches. According to Nuttall the three lateral feathers only have white on their inner webs. In the specimens which I have seen, some five or six, it existed on the inner vanes of all except the two central feathers. This bird is one of the most pretty of the Sylvian genus. On the Island of Montreal it is not plentiful, but is found much more numerously in the groves of St. Remi on the south side of the river.

S. virens. Black-throated Green Warbler.
Dendroica virens. Baird!

v.s.p. Bill, legs, and feet black; irides black; eggs 4, flesh colour, mottled with purple and brown.

Dorsal aspect. Front yellow; crown, nape of neck, and dor-

sal region yellowish-green; tail coverts and scapulars grey with yellowish-green tips; greater and smaller wing coverts black with white outer margins and tips; quill feathers blackish-brown with brownish white margins on the outer vanes, and white on half their inner vanes; tail feathers brownish-black with brownish-white emarginations on the outer vanes, and white spots on the inner vanes of the 3 outer lateral ones.

Ventral aspect. Line over the eye, sides of the neck, and auriculars gamboge yellow; chin and throat black; breast and belly whitish with black spots, most numerous on the sides; inner wing and tail coverts white.

1st and 2nd primaries subequal and longest; 3rd about a line shorter than the 2nd; 4th a line shorter than the 3rd; and 5th about 2 lines shorter than 3rd. Length 5 inches; alar breadth 8 inches. The female is said to have the "chin yellow, and the throat blackish tinged with yellow."

S. striata. Black Poll Warbler.
Dendroica striata. Baird!

V.S.P. Upper mandible black; lower one and legs pale flesh; irides hazel; eggs 4 to 5, whitish mottled with brown.

Dorsal aspect. Crown and nape of neck deep black, bordered by greyish white; interscapular region, back and rump black, the feathers margined with grey; greater and smaller wing coverts tipped with white, causing an appearance of two white bands on the wing; primaries and secondaries brown, the former with the outer vanes edged with greenish-olive, the latter with greenish-white. Two lateral tail feathers with white spots towards the extremities of their inner vanes.

Ventral aspect. Auriculars and cheeks white; throat, breast, belly, and vent white, margined by a continuous line of black spots or streaks, commencing at the brown mandible, and ending on the flanks, and becoming gradually broader and larger from the throat downwards; inner tail coverts white.

1st primary longest. Length 5 inches; alar breadth 9 inches. "Female and young dull yellow olive, streaked with black and grey; breast white; cheeks and sides of the breast tinged with yellow."

S. castanea. Bay-breasted Warbler.
Dendroica castanea. Baird!

V.S.P. Bill black; legs and feet pale; irides deep hazel; eggs unknown.

Dorsal aspect. Forehead and cheeks black, including the eyes and the auriculars; behind the auriculars a spot of buffy white; crown of head bright bay; scapulars, dorsal region and rump brownish-black, with broad margins and tips of olivaceous yellow; greater and smaller wing coverts black, tipped with white, causing an appearance of two white bands; primaries, secondaries, and tail feathers brown, the three lateral tail feathers with white spots on the inner webs near their tips.

Ventral aspect. Chin, throat, breast, and sides, bay; belly, tail, inner tail and wing coverts white, tinged with yellow.

2nd primary longest; 1st and 3rd equal. Length $4\frac{3}{4}$ inches; alar breadth $7\frac{1}{2}$ inches. The female has a paler bay on the breast, and less black on the head.

S. pinus. Pine Warbler.
Dendroica pinus. Baird!

v.s.p. Bill and feet brown; irides hazel; eggs 4, greenish-white, mottled with pale brown and slight purple.

Dorsal aspect. Olive brown interspersed with streaks of a darker hue; tail coverts olive yellow; primaries and secondaries edged with brownish-olive, narrowly on the 1st primary, rather broadly on the 2nd; the tips of all having a whitish worn appearance. A yellow line, from the nostrils over the eye, terminates over the auriculars which are of the dorsal colour.

Ventral aspect. Faint gamboge yellow, interrupted on the breast by olive brown streaks, which are continued along the flanks; tail coverts bright yellow; tail clove brown, outer vanes edged with olive yellow; inner vanes of the two lateral ones white towards their tips.

2nd primary longest; 1st, 3rd and 4th, subequal. Length $4\frac{3}{4}$ inches; alar breadth $7\frac{1}{2}$ inches. According to Nuttall,—"The male is bright olive yellow tinged with green, beneath yellow with obscure spots; vent white; wings with two white bands, and with the tail dusky brown; two lateral tail feathers partly white; lores not black." My description is taken from a female.

Sylvia rubricapilla. Nashville Warbler.
Helminthophaga ruficapilla. Baird!

v.s.m. Bill horn colour, pale beneath at the base; irides dark; legs and feet pale; eggs unknown.

Dorsal aspect. Crown dark chesnut; frontlet, sides of head, lores and occiput, ashy, tinted in the latter situation on the male

with olive yellow. Line from the nostrils to eye yellowish-white; line encircling the eye white; interscapulary region, scapulars, rump, tail and wing coverts olive yellow, brightest on the rump and back: quill feathers and tail dusky, edged on the outer vanes with yellow olive.

Ventral aspect. Chin, throat, breast, flanks, and tail coverts king's yellow, diluted with ash on flanks; belly and vent white; upper femorals white, tinged with ash, brown or yellow. Very rare.

Length about 4½ inches; alar expanse, 7 inches. There is very little difference between the male and female. The feathers on the occiput in the specimen before me are destitute of the olive yellow tint, and the line from the nostrils to the eye is white. The yellow in the ventral aspect is equally as bright as in the male. She has in contradistinction to the observation of Mr. Nuttall the bright chesnut crown, which is however scarcely so large as in the female. A pair of these birds was shot by Sir W. Logan in this vicinity, in the year 1841, from which this description is taken.

Sylvia Canadensis. Black-throated Blue.
Dendroica Canadensis. Baird!

V.S.M. Bill black; legs and feet dusky; irides dark; eggs unknown.

Dorsal aspect. Head, interscapulary region, wing and tail coverts slate blue; quill feathers of wing and tail clove brown; all the primaries except the first, and the two outer tail feathers with a white streak, which on the latter is situated on the inner vanes; outer edges of vanes of primaries and secondaries edged with olive green; of the tail with slate blue.

Ventral aspect. Cheeks, throat, and flanks below the wings, deep black; breast, belly, inner wing, and tail coverts white.

3rd primary longest; 2nd and 4th subequal; 1st shorter than 4th, but considerably longer than 5th. Length 4¾ inches; alar expanse 7 inches. A fine specimen, from which this description is taken, was shot by Sir W. E. Logan in May, 1841. I have not seen either the female or young. According to Nuttall, the black of the female inclines to dusky ash or is wanting?

The foregoing fourteen species of this numerous genus, are the only ones which it has fallen to my lot to observe in this neighbourhood. I have no doubt, however, that the district of Montreal might also furnish us with the S. Auricollis, Autumnalis,

Parus, Americana, Trochilus, Trichas, and probably Azurea. These birds are known to migrate as far North as, and in one or two cases, beyond Canada, and they *are to be* discovered in this District. As the object of this paper is not to speculate upon what might be found, but to give descriptions of what really has been found in this District, I refrain from any further remarks on this tribe at present.

Genus Regulus.

Gen. char. Bill straight, slender, deeper than broad, compressed from the base, narrowed in the middle, with somewhat incurved edges, and furnished with nuchal bristles; upper mandible slightly notched and curved at the tip; nostrils basal, oval, and half closed by a membrane; 3rd primary longest; 1st and 7th equal; tarsus longer than the middle toe; tail notched.

R. calendula. Ruby-crowned Wren.
Sylvia calendula of Wilson!
R. calendula. Baird.

v.s.r. Bill and legs brown; irides black; eggs unknown.

Dorsal aspect. Olive green, darker on the frontlet; on the posterior part of the crown an oval vermilion spot; eyelids pale yellow; tail and wing feathers clove brown, with yellow edgings on the outer vanes of the quills of the former, and primaries of the latter. Inner vanes of all, and outer vanes of the secondaries edged with white; greater and smaller wing coverts tipped with white.

Ventral aspect. Yellowish-white throughout; spureous wing feather nearly an inch long.

3rd and 4th primaries equal; 2nd and 5th equal; 1st a little shorter than the 6th, but longer than the 7th; tail subfurcate. Length 4 inches; alar breadth about 6½ inches. The female and young bird want the vermilion spot, and are otherwise more sombre.

R. cristatus. Golden-crested Wren.
Sylvia regulus of Wilson!
R. satrapa. Baird.

d.c. Bill black; legs brownish-yellow; feet and claws yellow; irides hazel; eggs 6 to 12, yellowish-white spotted with red.

Dorsal aspect. Olive yellow inclining to ash on the nape and sides of neck. A white line from the nostril, proceeds over the eyes, and terminates above the auriculars. Above this passes a broadish stripe of black, both stripes meeting on the frontlet; crown of the head rich flame colour. A black line from mandible

to the auriculars is accompanied by a white one below it; wings and tail dusky edged with yellow oliva; inner vanes of the primaries and secondaries whitish; greater and smaller wing coverts tipped with white, edged in the former with brown, forming two white wing bars; tail long subfurcate. Female much more dusky and dull whitish beneath. Length 4 to 4½ inches; alar breadth 7½ to 8 inches.—(*Condensed from Nuttall.*)

Genus Troglotides.

Gen. char. Bill slender, subulate, not so much compressed as in the last, slightly curved; nostrils basal, oval, half closed by a membrane; tarsus longer than the middle toe; inner toe free; nail of the hind toe longest; wings short and rounded; 4th and 5th primaries subequal and longest.

T. fulvus. House Wren.
T. œdon of Audubon! and Baird!
Sylvia domestica of Wilson!
Sylvia fulva of Latham!
T. œdon, Baird!

v.s.p. Upper mandible brown; lower one, legs and feet pale, inclining to yellow; eggs 10 to 18, white, with a few reddish spots.

Dorsal aspect. Brown, darkest on the head, and except on this place and the neck, barred with dusky; primaries and secondaries clove brown, the latter barred with dusky and rufous brown, the former with clove brown and white on the outer vanes only; tail cuneiform, rufous brown with 9 to 10 dusky bars, white taking the place of brown on the outer vane of the lateral feathers.

Ventral aspect. Brownish-grey, barred on the vent, flanks and tail coverts with blackish and brownish-white. A streak of the ventral colour passes from the nostril over the eye, and terminates behind the auriculars; spurious wing feathers long.

2nd 3rd, and 4th primaries subequal, if anything the 2nd longest. Length 3¾ inches; alar breadth 6 inches.

T. Europœus. Winter Wren.
T. hyemalis of Viellot!
Sylvia troglotides of Wilson!
T. (*anorthura*) *hyemalis.* Baird!

v.s.p. Upper mandible black; lower one, legs and feet pale; irides deep hazel; eggs 10 to 18, white spotted with red.

Dorsal aspect. Rufous brown, darker on head and neck, and numerously barred with dusky except in these two situations. On the sides of the neck, and among the wing coverts, a few white tips to the feathers may be seen; wings and tail like the last.

Ventral aspect. Throat and breast rufous brown, with indications of bars of a deeper tint; belly, vent, and tail feathers deep brown, barred with a lighter shade; spurious wing feathers long.

3rd and 4th primaries equal; 2nd and 5th equal; 1st and 7th equal. Dimensions same as the last.

T. Parkmanni. Parkman's Wren.
T. Parkmanni. Baird.

v.s.p. Bill, upper mandible horn colour, and slightly curved; lower one whitish underneath; irides black; tarsi brownish, coloured with seven distinct scutelæ; eggs unknown.

Dorsal aspect. Prevailing tint reddish-brown, the dorsal feathers tipped with white; tail of the same hue, rounded, composed of 12 feathers with 12 bars of dusky black, the outer vanes of the lateral ones with spots of whitish.

Ventral aspect. Prevailing tint on throat and breast greyish, with faint barrings of umber brown; abdomen greyish-white; hinder tail coverts whitish, barred with dusky black.

Length from tip of bill to extremity of tail, 4¼ inches; alar expanse 5 inches. 1st primary half the length of the second, thus giving the wing a rounded appearance. The tail is also rounded.

A specimen of this beautiful wren was shot in the vicinity of this city by Mr. Hunter, Taxidermist to the Natural History Society, during the spring of 1861. It is now a specimen in the cabinet of the Society.

Genus Anthus.

Gen. char. Bill straight, slender, subulate from beyond the nostrils; upper mandible slightly notched near the tip; nostrils half closed by a membrane, basal and lateral; hind claw longer than the toe; 4th primary and 2nd scapular equal; 2nd and 3rd primaries longest.

A. spinoletta. Brown Lark.—Shore Pepit.
A. aquaticus of Audubon!
Alauda rufa of Wilson!
A. Ludovicianus. Baird?

v.s.p. Upper mandible black; lower one pale; legs and feet

brown; irides hazel; eggs 4 to 5, sullied white, mottled with brown.

Dorsal aspect. Dark greyish-brown. Two central tail feathers with margins of a lighter hue; all the lateral feathers clove brown, except the two external ones, the last one of which has its whole outer web, and half its inner web white, and a spot of white towards the distal end of the next one; primaries and secondaries clove brown, with whitish margins to their outer webs; scapulars clove brown with worn edges; 2nd longer than 4th primary, and white on the margin of the outer vane; greater wing coverts margined and tipped with brownish-slate colour; smaller ones tipped with pure white.

Ventral aspect. A streak from the nostrils encircling the eyes, cheeks, sides of neck, and belly and vent light brownish red. On the flanks, breast, and sides of neck, streaks or spots of black; chin white, merging into the reddish-brown of the throat.

1st, 2nd, and 3rd primaries subequal and longest. Length 6½ inches; alar breadth 11 inches. The female differs from the male in being more spotted, and the young bird has an olivaceous blackish-brown dorsal tint.

Genus Ampelis.

Gen. char. Bill short, a little depressed, deeper than broad; trigonous at the base; upper mandible notched and curved at the tip; lower one straight and compressed at the sides; nostrils basal, lateral, subrotund, and half closed by a membrane; tarsus strong, a little shorter than, or as long as the middle toe; inner toe free; hind one longer than the nail; lateral toes united as far as the second joint; 2nd primary longest.

A. sialis. The Blue Robin.
Sialia Wilsonii of Swainson!
Sylvia sialis of Wilson!
Saxicola sialis of Buonaparte!
Sialia arctica
Sialia sialis. Baird!

V.S.P. Bill and legs black; irides bright hazel; eggs 5 to 6, pale blue, unspotted.

Dorsal aspect. Including the wings and tail, bright, glossy azure blue. Towards the tips and edges of the inner vanes of the primaries and secondaries there appears an inclination of the blue to a brown.

Ventral aspect. Ferruginous, deeper on the breast and paler on the throat and vent, the latter almost white; inner tail coverts whitish.

2nd primary longest; 1st and 3rd subequal, and very little shorter than 2nd. Length 6¾ inches; alar breadth 12 inches. The female is duller coloured, and the young bird is dusky, with occasional spots of white, and inferiorly whitish clouded with dusky, but the wings and tail azure blue; hind claw only ⅔ the length of the tarsus including the nail; middle toe and tarsus equal.

Genus Bombycilla.

Gen. char. Head crested; bill short, straight, elevated, as deep as broad at the base; nostrils ovoid, basal, open, concealed by nuchal bristles, projecting forward; upper mandible with a strongly marked tooth, and slightly curved towards its extremity; exterior toe joined to the middle one as far as the 1st joint; 1st and 2nd primaries longest; spurious wing feathers very short; middle toe a little longer than the tarsus.

B. Carolinensis. Cedar Bird—Cherry Bird—Recollet.
Ampelis Americana of Wilson!
Ampelis cedrorum. Baird!

V.S.P. Bill, legs and feet black; eggs 4 to 5, white, spotted black towards their larger end.

Prevailing tint of the dorsal and ventral aspects, fawn, deepening in tint on the back, and changing to a yellow on the abdomen; upper tail coverts black; lower ones white; primaries and secondaries dark ash colour, with brownish-white margins to the outer vanes, and white on the inner vanes; shafts of the secondaries elongated with broad scarlet waxen tips. These tips vary in number; in the specimen before me there are seven, and in others I have seen but one or two existing, and very often none at all. Tail with a terminal broad yellow band, occasionally tipped like the secondaries; frontlet, streak to, and beyond the eye, with the chin velvet black. A white streak on the posterior half of the lower mandible, and on the posterior half of the eyelid; Crest large and conic.

2nd primary longest; 1st larger than the 3rd. Length 7 inches; alar breadth 13½ inches. The young birds are deficient in the waxen tips, and I believe that the same ornaments are not unfrequently met with in old females.

B. garrulus. Waxen Chatterer.

Ampelis garrulus of Linnæus and Baird!

D.C. "Feet and legs black; irides reddish; eggs unknown.

"Anterior part of the head bay, passing posteriorly into a reddish drab, which is the prevailing dorsal tint, as well as of the breast; lower part of the back and rump ochreous; belly and femorals pale ash; vent reddish chesnut; quills dusky, the 1st spotless, all the others with white spots towards the tips of the outer webs; four of the secondaries with red waxen tips; feathers of the bastard wing tipped with white; tail 3 inches, black, broadly terminated with pale yellow."—(*Condensed from Nuttall.*) They are extremely rare visitants and seen chiefly during the early and latter winter months frequently accompanying the Crossbill and Grosbeak.

Genus Turdus.

Gen. char. Bill straight, compressed and curved at the apex; upper mandible notched and furnished with nuchal bristles, pointing forward; nostrils basal, lateral rounded, and half closed by a naked membrane; outer and middle toes connected at the base; 3rd, 4th and 5th primaries longest; scapulars about as long as the secondaries.

T. migratorius. The Robin.—Le Grieve.

T. (Planesticus) migratorius. Baird!

V.S.P. Upper mandible black, with yellow edgings; lower one yellow with a black tip; legs and feet dark brown; eggs 5 bluish green.

Dorsal aspect. Brown; crown of head, occiput and auriculars black; primaries, secondaries, and greater wing coverts dark brown, with edgings of a lighter hue; tail square, black; two, sometimes three of the lateral feathers with white tips.

Ventral aspect. Orbit with three marginal white spots; chin, and throat white streaked with black; breast, belly, sides, and inner wing coverts red, the feathers tipped with white; vent and tail feathers white, the latter with a single broad conical brown spot in the centre of the vanes; wing linings tinged with red.

3rd primary longest; 1st and 5th equal; scapulars half the length of the secondaries. Length 10 inches; alar breadth 16 inches. The female has duller colours.

T. rufus. Ferruginous Thrush or Thrasher.

V.S.P. Upper mandible black, not notched; lower one, legs

and feet pale flesh colour, the lower mandible black towards the tip; irides yellow; eggs 5, greenish-white speckled with brown.

Dorsal aspect. Ferruginous; greater and smaller wing coverts of same colour, succeeded by a deep brown, terminated by a white tip; primaries and secondaries ferruginous on the outer vanes, and inclining to ash on the inner ones, except the three last secondaries which are wholly ferruginous; tail $5\frac{1}{2}$ inches long, cuneiform; the three lateral feathers inclining towards their tips.

Ventral aspect. White, with tear shaped spots of blackish-brown on sides of neck, breast and flanks; tail coverts ferruginous white.

4th primary longest; 2nd of same length as secondaries; 1st very short; in consequence of which relative length of these quills the wing is short and rounded. Length $11\frac{3}{4}$ inches; alar breadth 13 inches. Female scarcely differs from the male.

T. felivox. The Cat Bird.
Mimus Carolinensis. Baird!

v.s.p. Bill black, not notched; legs brown; irides deep hazel; eggs 4 to 5, emerald green.

Dorsal aspect. Slate colour; crown of the head and tail black; primaries and secondaries blackish-slate colour.

Ventral aspect. Pale slate; undertail coverts reddish-brown; tail rounded.

3rd primary longest. Length $8\frac{1}{2}$ inches; alar breadth 10 inches. The female does not differ from the foregoing description. In the young bird of the year the black of the head is not developed, and the reddish-brown of the undertail coverts is paler.

T. minor. The Hermit or Little Thrush.
T. solitarius of Wilson!
Turdus pallasi? Baird!

v.s.p. Upper mandible black; lower one towards the base and the legs pale flesh; irides deep hazel; eggs 4 to 5, greenish-blue, mottled with olive.

Dorsal aspect. Olivaceous, inclining to rufous on the head, according to Nuttall—in the specimen before me, olivaceous; tail ferruginous; primaries and secondaries inclining to ferruginous on the outer webs, and ashy on inner ones.

Ventral aspect. Line round the eye white; chin, throat, and breast yellowish-white, streaked with black on the side of the

throat, and spotted with black on the breast. The spots have an olivaceous tint on the breast, and become blended together on the flanks; abdomen, vent, and tail coverts pure white; inner webs of the secondaries with an oval yellowish-white spot towards the base of their inner webs.

3rd primary longest; 1st a little longer than 5th. Length 7¼ inches; alar breadth 11 inches. Bill slightly notched.

T. mustelinus. The Little Thrush.
T. Wilsonii of Buonaparte!
T. mustelinus. Baird!

V.S.P. Bill blackish-brown, except at the base of the lower one which is pale; legs pale brown; irides deep hazel; eggs 4 to 5 emerald green.

Dorsal aspect. Brownish ferruginous; an oval spot of yellowish-white towards the base of the inner webs of the secondaries.

Ventral aspect. Line round the orbits pale; cheeks, throat, abdomen, vent and tail coverts pure white; breast, and sides of the neck cream colour spotted with brown; sides of the breast and flanks inclining to ash.

2nd primary longest; 1st and 3rd equal. Length 7 inches; alar breadth 11½ inches. Tail square, feathers pointed.

T. melodus. The Wood Thrush.
T. mustelinus of Wilson! Baird!

D.C. Above bright cinnamon brown, brightening into rufous on the head, and inclining to olive on the rump and tail. Beneath whitish, thickly marked with pencil shaped spots; vent pure white; orbits of the eye white; bill dusky brown slightly notched, the lower mandible flesh coloured towards the base; legs and claws very pale flesh colour; iris dark chocolate. Length 8 inches; alar breadth 13 inches.

(To be continued.)

ARTICLE XVIII.—*On the Extraction of Cobalt Oxide from the Iron Pyrites occurring near Brockville, C. W.* By THOMAS MACFARLANE.

About two miles to the north-west of Brockville, in the township of Elizabethtown, C. W., there exists a deposit of iron pyrites of very considerable extent and importance. It belongs to the Laurentian system, but it is not known what rocks immediately adjoin it, as they do not come to the surface. Although an excavation of fifty feet long, and thirty broad, has been made in the deposit, the limit of the minerals in either direction, has not been reached. Two varieties of the pyrites are found here, the one somewhat porous and dull, and the other compact, of a yellowish-white colour, and a very bright lustre. Iron pyrites, as is well known, contains one equivalent of iron and two of sulphur; or 45.77 per cent. of the former, and 54.23 per cent. of the latter element. It is a most important source of sulphur for the manufacture of sulphuric acid. The iron pyrites of the above mentioned locality contains the usual constituents, but in the compact variety especially, a portion of the iron is replaced by a small per centage of cobalt, equal, according to Dr. Hunt's analysis, to 0.52 per cent. of cobalt oxide, and according to my own to 0.50 per cent. The occurrence of cobalt in many pyrites of the Laurentian formation, has been repeatedly remarked by Dr. Hunt, and I have detected its presence in many specimens of pyrites occurring in the Primitive Gneiss formation in Norway. While at the Modum Smalt works, and the Skuterud cobalt mines in that country, I had opportunities of experimenting on these pyrites, and of devising a process for economically extracting the cobalt which they contain. The principal object of the present paper is to describe the manner in which this process might be advantageously applied in treating the Brockville pyrites.

When the compact variety of the cobaltiferous iron pyrites of the above deposit, in fine powder, is mixed with one-tenth of its weight of common salt, also finely divided, and calcined at a low red heat, with free access of air, the following chemical changes take place:—First, the greater part of the sulphur of the pyrites is oxidized, and disengaged as sulphurous acid, the iron also combining with oxygen and forming peroxide of iron. At the same time the small proportion of cobalt present is con-

verted into cobalt oxide. At a later stage of the operation, part of the sulphurous acid formed comes in contact with the peroxide of iron, and is, through its agency, further oxidized into sulphuric acid, which combines with the iron oxide, forming finally a comparatively small quantity of sulphate of peroxide of iron. The cobalt oxide also combines with sulphuric acid, forming sulphate of protoxide of cobalt. These sulphates react on the common salt, producing sulphate of soda, with perchloride of iron and protochloride of cobalt. Air having still access, the perchloride of iron is resolved into peroxide of iron and chlorine gas, which escapes and may be recognized by its odour, so soon as the evolution of sulphurous acid has ceased. Protochloride of cobalt is also decomposable by heating in a current of air, the products being chlorine and cobalt oxide; but this change does not take place until the perchloride of iron has been wholly decomposed. It is at this point that the calcination must be interrupted; that is, as soon as the perchloride of iron is decomposed, but before the decomposition of the protochloride of cobalt commences. When the operation is stopped exactly at this point, the calcined residue yields with water a solution containing no iron oxide, or but a trace, and the whole of the cobalt in the state of protochloride.

I have made many trials of the above process with the Brockville pyrites, all yielding results confirmatory of the above reactions. The following are among the most conclusive of them: 1000 grains of the ore were calcined as above described, with 100 grains of common salt in a common muffle furnace. The materials were withdrawn from the muffle, as soon as strong and pure chlorine commenced to be evolved, and the evolution of chlorine continued until the materials were cooled to a certain point. The calcined residue weighed 780 grains, and contained in 100 parts,

Peroxide of iron.....	85.300.	
Sulphate of soda.... ...	5.700 =	1.28 sulphur.
Protochloride of cobalt,..	1.343 =	0.775 cobalt oxide.
Protochloride of copper..	0.327 =	0.193 cupric oxide.
Perchloride of iron.....	0.059 =	0.029 ferric oxide.
Chloride of sodium.....	7.271	by difference.
	100.000	

The five last mentioned constituents were of course soluble in water. According to these results, the 780 grains of residue must have contained six grains of cobalt oxide; consequently 0.60 per cent. of this substance had been extracted from the pyrites. The

1000 grains of pyrites contained 542.3 grains of sulphur, and the 780 grains of the residue, only 9.98 grains Consequently 98.16 per cent. of the sulphur had escaped as sulphurous acid, and only 1.84 per cent. had been converted into sulphuric acid and combined with soda.

That the iron oxide, as stated above, has considerable influence in converting the sulphurous acid into sulphuric acid, will appear from the following experiment: 59 grains of iron pyrites, 58½ grains of common salt, and 234 grains peroxide of iron, (free from sulphuric acid) were mixed and calcined in a muffle, at a low red heat, until sulphurous acid and chlorine ceased to be evolved. The materials weighed after calcination 336 grains, and contained in 100 parts:

Peroxide of iron.....	79.5	
Sulphate of soda.....	19.2	= 4.31 sulphur.
Chloride of sodium....	1.3	by difference.
	100.0	

The original 59 grains of iron pyrites used, contained 32, and the resulting 336 grains, 14.48 grains of sulphur. Consequently 55 per cent. of the sulphur had escaped as sulphurous acid,* and 45 per cent. were converted into sulphuric acid, instead of 1.84 per cent. as in the experiment above described. That the larger quantity of salt used did not materially contribute to this result, I have proved by a series of experiments, which resulted as follows:—

1. When iron pyrites, mixed with 5 per cent. of its weight of common salt, is calcined as in the last described experiment, 1.24 per cent. of the sulphur contained in it, is converted into sulphuric acid, and combined with the soda.

2. When 10 per cent. of salt is used, 1.84 per cent. of the sulphur is, as we have seen, converted into sulphuric acid.

3. With 50 per cent. of salt, 2.86 per cent. of the sulphur is retained as sulphuric acid.

4. With 100 per cent. of salt, 7.46 of the sulphur is thus retained.

In this last, the proportion of common salt to the pyrites is the same as in the experiment where peroxide of iron was used, but in the latter case five times more sulphur was converted into

* The sulphurous acid was accompanied by chlorine, in almost the proportions necessary for their complete conversion of the two into sulphuric and hydrochloric acids, on being brought into contact with steam. ($SO_2 + Cl + HO = SO_3 + HCl$).

sulphuric acid, than when the pyrites was calcined with salt alone.

Having thus explained the rationale of the process, I proceed to touch upon its application on the large scale. It will be seen from the above experiments that only a very small proportion of the sulphur contained in the pyrites, is necessary for the extraction of the cobalt. There would be abundance of it left in the pyrites for this purpose, even although it were previously roasted in pieces of about the size of an egg. It has been found that the residue from the burning of pyrites in lumps, in the manufacture of sulphuric acid, contains six or seven per cent. of sulphur,* and this would also be the case with the Brockville pyrites, if roasted in heaps or shaft furnaces. A previous roasting would be of advantage, because it would lessen the cost of the subsequent calcination, render the pyrites more easily stamped to powder, and admit of the manufacture of sulphuric acid from the sulphurous acid evolved. After roasting, the pyrites is reduced to powder, and mixed with the salt. The mixture is then brought on to the hearth of a common calcining reverberatory furnace, heated to low redness, raked about, and tested from time to time. So soon as pure chlorine is evolved, and the mass ceases to glow in the furnace, and gives with water a solution containing little or no iron, the mixture is withdrawn from the furnace. When cool, it is brought into a large tub, where it is stirred up with hot water. If the calcination has been properly performed, a solution is obtained having a beautiful rose colour. This is drawn off, or if necessary filtered from the insoluble residue of peroxide of iron which is washed with fresh quantities of water until it no longer yields a solution containing cobalt. The more dilute solutions thus obtained, are used for treating fresh quantities of the calcined material. The rose-coloured solution contains besides the cobalt, a small quantity of copper, and a trace of iron, together with whatever sulphate of soda has been formed, and the common salt which may have been left undecomposed. The copper and iron may be separated from the solution by adding a slight quantity of a dilute solution of carbonate of soda. They are precipitated as carbonates, before the cobalt, and are separated from the solution by filtration. The filtrate is then treated with a further quantity of a solution of carbonate of soda, more con-

* Fabriques de produits chimiques. Rapport à M. le Ministre de l'Interieur, par la Commission d'enquête. Bruxelles, 1856.

centrated than before. Carbonate of oxide of cobalt falls as a peach-blossom colored precipitate. This is washed by subsidence and decantation, collected on a linen filter, dried and ignited in close vessels. The result is pure cobalt oxide, such as is used for imparting a blue colour to porcelain and stone-ware. Its price in the English market, about a year ago, was thirteen shillings sterling the pound, and probably its present value may with safety be assumed to be eleven shillings sterling.

The cost of the process above described, depends of course, much on the locality where it is carried into operation. But even supposing this to be some distance from the mine, I believe the manufacture would be found to be remunerative. The cost of both mining and manufacturing might be estimated as follows:—

Excavation, per ton.....	$3.00
Roasting "	0.25
Freight to factory, say.....	2.50
Stamping.....	0.50
Calcining.....	6.00
Lixiviation, precipitation, &c.....	1.25
Freight to market, agency, &c....	0.50
	$14.00

From one ton of ore there might be produced, making some allowance for occasional failures, at least eight pounds of cobalt oxide, worth eleven shillings sterling the pound, equal to £4 8 0 or $21.12. I think therefore that the treatment of the Brockville pyrites for cobalt might reasonably be expected to yield a profit of, say $7 per ton. Of course, many disadvantages and failures are apt to attend the commencement of any new manufacture, but in the above estimate I have made some allowance for such.

In this calculation, I have reckoned nothing for the sulphur which the pyrites contains. Were the manufacture of sulphuric acid combined with that of the cobalt oxide, there is no doubt but that a very remunerative business might be established. Canada is certainly not a manufacturing country. It is therefore improbable that much sulphuric acid would be used here for manufacturing soda, or in bleaching or dyeing. But Canada contains inexhaustible sources of rock oil or petroleum. Owing to the offensive odour of this substance in its crude state, it is difficult to procure freight for it to Great Britain. This neces-

sitates its purification in Canada, and as is well known, sulphuric acid is the most effective deodorizer that can be employed in refining it. In proportion then as refineries for petroleum are established, the demand for sulphuric acid will increase, and no doubt a manufactory of this acid would be able to dispose of an immense quantity; There are very few chemical manufactures which may be said to be indigenous to Canada, but this one, of the products to be obtained from these pyrites, in conjunction with that of refined oils from crude petroleum, possessing a natural and sound foundation in the province, would flourish rapidly, and doubtless be permanently successful.

Acton Vale, C. E., 13th May, 1862.

ARTICLE XIX.—*List of Entomologists in Canada.* By Rev. Charles J. S. Bethune, B. A., Cobourg, C. W.

The following list of those engaged in the study of Entomology in Canada has been prepared chiefly with the object of making collectors known to each other. It is almost unnecessary to state that the idea was suggested by the lists in Stainton's Entomologists' Annuals. It was at first considered that the great and primary advantage to be derived from it was that collectors in one part of the country would be enabled by its means to find out who are addicted to their favourite pursuit in other places, and thus obtain specimens of those local species in which their own collections are deficient. Since, however, the number of those engaged in this study has proved to be so much larger than was at first anticipated, several of my correspondents have agreed with me in the opinion that it would tend very much to the advancement of Entomology in this country, were a club to be formed, and meetings to be held once or twice a year at some central place, to be decided upon hereafter. We have come to the conclusion that, if this project meets with sufficient encouragement from Entomologists, no better time or place could be selected for the first meeting than that appointed for the next exhibition of the Provincial Agricultural Association, which is to be held at Toronto, during the week commencing September 22nd, 1862. If such a meeting can be held, it is much to be desired that Entomologists should bring to it all their *undetermined* specimens, as well as any duplicates they may have of rare species; by so doing favours could be mutually conferred, and much information diffused with regard to the distribution of species, etc. The Meeting would, doubtless, prove ad-

vantageous in many other respects; and, in addition, such a *réunion* of kindred spirits could not fail to prove exceedingly agreeable. I trust, therefore, that this project may not fall to the ground, but that before long, Canadian Entomologists may have the pleasure of making each other's acquaintance.

In the following list is enumerated every Entomologist in Canada whose name and address I could learn, and who was willing to permit his name to appear; there may be a few others,—if so I trust they will speedily make themselves known either to Mr. Saunders (who has kindly shared with me the trouble of preparing this list) or to myself.

1. Beadle, D. W., St. Catherines, C. W. *Coleoptera and Lepidoptera.*
2. Bell, R., Provincial Geological Survey, Montreal. *All orders; but especially Coleoptera and Lepidoptera.*
3. Bethune, Rev. Charles J. S., B. A., Cobourg, C. W. *Coleoptera and Lepidoptera.*
4. Billings, B., Prescott, C. W. *Coleoptera, Lepidoptera, and Orthoptera.*
5. Billings, E., F.G.S. Provincial Geological Survey, Montreal. *Coleoptera and Lepidoptera.*
6. Bush, Geo., Coldwater, County of Simcoe, C. W. *Insects of all orders; collects also for sale.*
7. Clementi, Rev. Vincent, B. A., Peterboro', C. W. *Coleoptera and Lepidoptera.*
8. Cottle, Thomas, Woodstock, C. W. *Lepidoptera.*
9. Couper, William, National Bank Building, John street, Quebec. "Entered the Entomological fields of Canada in 1843, and still continues his researches. *Collects all the orders,* and studies the geographical distribution of *Coleoptera.*"
10. Cowdry, Thomas, M. D., York Mills, County of York, C. W. *All orders.*
11. Cowdry, Harrington, York Mills, C. W.
12. Croft, Prof. Henry, D.C.L. University College, Toronto. *Collects all orders, but more especially Hymenoptera and Coleoptera.* His collection of Coleoptera is the finest in the Province.
13. Crooks, Miss Kate, Hamilton, C. W.
14. Cummings, Willoughby, Chippawa, C. W. *Coleoptera and Lepidoptera.*
15. Denton, J. M., Dundas Street, London, C. W. *Lepidoptera and Coleoptera.*
16. Devine, Thomas, Crown Lands Department, Quebec.
17. Dewar, Miss, London, C. W. *Coleoptera and Lepidoptera.*
18. Edwards, W., Port Stanley, C. W. *Coleoptera and Lepidoptera.*
19. Gibbon, Miss, St. Mary's, C. W. *Lepidoptera.*
20. Girdwood, G. P., Asst. Surgeon, Grenadier Guards, Montreal.
21. Girdwood, Mrs. G. P., Montreal.

22. GRANT, FRANCIS, Orillia, C. W. *Coleoptera and Lepidoptera.*
23. HILL, REV. GEO. S. J., M. A., Markham, County of York, C. W. *Coleoptera and Diptera.*
24. HINCKS, REV. WILLIAM, F. L. S., PROF. OF NAT. HIST. University College, Toronto. *Studies all orders; but does not collect.*
25. HUBBERT, JAMES, Knox's College, Toronto, and (during Vacations) Grafton, County of Northumberland, C. W. *Diptera, Neuroptera, and, to some extent, Coleoptera.*
26. KREIGHOFF, C., Quebec. *Insects of all orders; pays particular attention to Lepidoptera (Heterocera, and Coleoptera.*
27. LAWFORD, J. M., Toronto. *Lepidoptera and Coleoptera.*
28. LAWRASON, W. L., Dundas Street, London, C. W. *Lepidoptera and Coleoptera.*
29. MORRIS, BEVERLEY R., M.D. Institution for the Deaf and Dumb, and the Blind; 490 Queen street, Toronto. *All orders; but chiefly Coleoptera and Lepidoptera.*
30. PROVANCHER, REV. L., St. Joachim, Montmorency, C. E. *All orders except Aptera; pays especial attention to Lepidoptera and Coleoptera.*
31. REED, E. BAYNES, London, C. W. *Coleoptera and Lepidoptera.*
32. REYNOLDS, T., Financial Director, Great Western Railway; Hamilton, C. W. *Lepidoptera.*
33. ROOKE, CAPT. W. S., Scots Fusilier Guards, Montreal. *Coleoptera and Diurnal Lepidoptera.*
34. SAUNDERS, WILLIAM, Dundas Street, London, C. W. *All orders; chiefly Coleoptera and Lepidoptera.*
35. TURTON, F., Simcoe Street, London, C. W. *All orders; chiefly Coleoptera and Lepidoptera.*
36. ROGERS, ROBT. V., JR., St. James' Parsonage, Kingston.

ARTICLE XX.—*On the Chemistry of the Earth.* By T. STERRY HUNT, M. A., F.R.S.; of the Geological Survey of Canada.

Extract of a letter to Elie de Beaumont, published in the Comptes Rendus of the French Academy of Sciences, June 9th. 1862.

On the 28th of October, 1844, a memoir was deposited with the Academy by the illustrious Cordier. Being in a sealed packet, its contents remained unknown until after his death, when at the request of his widow, the seal was broken, and the paper, which bears the date of October 22, 1844, was first made public in the *Comptes Rendus* of the Academy for February 17, 1862. In this remarkable memoir, which has for its title "On the origin of the calcareous rocks which do not belong to the primordial crust," (*De l'origine des roches calcaires, etc.,*) the author gives his views upon the formation of limestone and dolomite. He rejects Von Buch's theory of dolomitization, which still finds some sup-

porters, and which supposes that the magnesia was introduced subsequent to the deposition of the sediments, by a "certain mysterious action of intrusive pyroxenic rocks," which have been ejected in the vicinity of deposits of pure limestone. Mr. Cordier also combats the idea that these last have been formed entirely of the debris of testacea and zoophytes, which according to him, form but a small proportion of limestone formations. Going back still farther, he finds the source alike of the carbonate of lime of these organic remains, and of the great mass of calcareous rocks, in certain chemical reactions. The pure limestones, according to him, pass into magnesian limestones by an admixture of dolomite, and form thus a transition to the pure dolomites, so that we must admit a common origin for all these rocks. The source of the two carbonates which compose them, according to Mr. Cordier, is to be found in the reaction of carbonate of soda upon the chlorids of calcium and magnesium in sea-water; the carbonate of soda being derived from the decomposition of feldspars, from alkaline springs, and from plutonic emanations. This alkaline salt, reacting upon the salts of sea-water, would give rise to chlorid of sodium and carbonate of lime, and under certain conditions, to calcareo-magnesian precipitates. From this reaction must result a secular variation in the composition of the ocean, which corresponds to the progressive changes in the marine fauna of successive geological epochs.

Such is the theory of Mr. Cordier, which is now published, for the first time, in 1862; and which I have thus noticed in order to call the attention of the Academy to my own published papers, in which I have maintained similar views for the last four years. In The American Journal of Science for January, 1858, I endeavored, in admitting the igneous theory of the earth's origin, to obtain some notion of the chemical conditions of the cooling globe, by supposing the matters which now form the earth's crust to be fused together by an intense heat. From this would result an atmosphere holding, in the state of acid gases, all the carbon, the sulphur, and the chlorine, besides the elements of air and water; while the bases, such as the alkalies, lime, magnesia, oxyd of iron and alumina, in combination with silica, would form the solid crust. This would afterwards be attacked by the acids precipitated, with water, under the pressure of a high atmospheric column, and at an elevated temperature; from which would result the separation of a great amount of silica, and the formation of an ocean, whose waters

would contain in the state of chlorids and sulphates, not only alkalies, but also large portions of lime and magnesia. At a later period, the decomposition of exposed portions of the silicated crust under the influence of water and carbonic acid, would give rise, on the one hand to clays, and on the other to carbonate of soda. This latter, reacting upon the calcareous salts of the sea-water, must produce chlorid of sodium and carbonate of lime. We have here a theory of the source of the quartz, the carbonate of lime, and the argillaceous matters of the earth's crust, explaining at the same time the origin of the chlorid of sodium of the sea, and the fixation of the carbonic acid of the atmosphere in the form of carbonate of lime. In this is seen a great and harmonious series of chemical processes, which have operated, and which continue to operate at the surface of the globe. These notions of the chemistry of the earth has been taught in my public lectures for the last four years, and will also be found in a paper read before the Geological Society of London on the 5th of January, 1859, and published in the Quarterly Journal of the same Society for that year, p. 488. In support of these views will be found the results of a series of investigations published in the Reports of the Geological Survey of Canada, and in the American Journal of Science for 1859, upon the reactions of solutions of bicarbonate of soda with sea-water, and upon the conditions required for the precipitation of carbonate of magnesia and the formation of dolomite. We have there also shown the mutual decomposition at ordinary temperatures, of solutions of bicarbonate of lime and sulphate of magnesia, resulting in the formation of gypsum, and of a soluble bicarbonate of magnesia, which becomes the source of dolomite or of sepiolite. A notice of the first part of these researches will be found in the *Comptes Rendus* for May 23, 1859. In the continuation of them, as cited above, it has been shown that the association of magnesian and pure limestones, establishes the fact that these rocks have both been deposited as sediments, and that the hypothesis which explains the origin of dolomites by a subsequent alteration of pure limestones is inadmissible. It was also shown that great portions of limestone, even in fossiliferous formations, have the characters of precipitates resulting from chemical reactions, and have never formed part of organised beings; which last, moreover, owe their carbonate of lime to similar reactions.

My views upon the composition of the primitive ocean were

farther supported by the analyses of numerous saline waters from Lower Silurian limestones. In these waters, the bases of which are almost wholly in the condition of chlorids, about one-half of the chlorine is combined with sodium, and the other half is nearly equally divided between calcium and magnesium.

The Academy will perceive from the short analysis above given, the extent and the importance of my generalizations, with which the ideas of Mr. Cordier are, for the most part, in perfect accordance. It will farther be observed, that the publication of Mr. Leymerie, in which similar views are, to a certain extent, indicated, (see the *Comptes Rendus* of March 10, 1862,) dates only from 1861, while my own papers appeared in 1858 and 1859.

My researches upon the origin of dolomites and limestones fully justify the previsions of Mr. Cordier. He however, in his theory, excepted the limestones of primitive formations, but these are known to modern geologists to be nothing more than metamorphosed sedimentary formations, and consequently offer no exception to the general view. The different sources of carbonate of soda indicated by Mr. Cordier, may moreover be reduced to a single one, inasmuch as both the salts of alkaline springs, and those of what he calls plutonic emanations, are probably derived from the decomposing feldspathic minerals of sedimentary rocks. The argillaceous rocks, deprived of a large proportion of the alkali which they once contained in the form of feldspars, are the equivalents of the limestones which have been formed at the expense of the chlorid of calcium of the primitive ocean.

The waters of certain rivers contain alkaline carbonates, in some cases with notable proportions of silica and potash; an example of this is found in the water of the Ottawa. The presence of silica and potash in river waters appears to be in great part due to the soluble matters derived from the decomposing vegetation of peat bogs, for in the waters of deep-seated springs, both neutral and alkaline, the salts of potash are generally found in very minute quantities. This is not surprising when we consider the great stability of potash-feldspar, and also the power which aluminous soils possess of removing silica and potash from infiltrating waters, and of replacing the latter by soda. Atmospheric waters thus dissolve from sediments only the soda, lime and magnesia which these contain, and, with the intervention of organic matters, oxyd of iron, and sometimes oxyd of manganese. It results from these affinities that the sediments which are most silicious, and conse-

quently most porous, retain at last little more than silica, alumina and potash; while the more or less impalpable and impermeable sediments, which include large proportions of clay and marl, retain their soda, lime, magnesia and oxyd of iron, and yield, when metamorphosed, triclinic feldspars, pyroxene, hornblende, and other minerals of basic rocks. The alteration of the more silicious and thoroughly lixiviated rocks, on the contrary, will yield, chiefly orthoclase, mica and quartz. In this way is explained the origin of the two great classes of rocks, the granitic or trachytic, and the pyroxenic types. These two types appear alike among the metamorphic strata, and the intrusive masses, which last we have distinguished by the title of *exotic rocks*, regarding them as displaced metamorphosed sediments, while the metamorphic strata *in situ* are *indigenous rocks*. It follows as a consequence of the principles above defined, that the composition of aluminous sediments must vary in the different geologic epochs. In the Laurentian, which is the oldest known system, rocks, having a base of triclinic feldspars, which contain much soda, abound, while argillaceous rocks, like argillites, are unknown. These however become abundant in more recent formations, where natriferous anorthites, like those of the Laurentian system, are comparatively rare. (See farther Quar. Jour., Geological Society, 1859, p. 488, and Am. Jour. of Science.)

ARTICLE XXI.—*Description of a new Enaliosaurian from the Coal Measures of Nova Scotia. By O. C. Marsh, B. A.*

(*Abridged from Silliman's Journal.*)

The Reptilian remains from the Coal-measures, hitherto described, are few in number, and have nearly all been regarded as Batrachian, or Amphibian. Previous to the year 1844, the existence of even this low form of reptilian life during the Carboniferous period was unsuspected by most geologists, and its first appearance upon the earth confidently referred to the Permian epoch. In that year Herman von Meyer announced the discovery in the Rhenish Bavarian Coal-measures of a reptile allied to the Salamanders, which he described under the name *Apateon pedestris*;* and about the same time Dr. King published an account of the footprints of a large Batrachian, which he had

* Leonhard and Bronn, *Neues Jahrbuch für Mineralogie*, etc., 1844, page 336.

observed in the coal strata at Greensburg, Penn.* In 1852 Sir Charles Lyell and Prof. J. W. Dawson obtained in the Coal-measures of Nova Scotia the bones of the *Dendrerpeton Acadianum* (Wyman and Owen), which were the first reptilian osseous remains described from the Carboniferous rocks of America.†

Since these discoveries were made, the Coal-fields of England and Nova Scotia, as well as those of Ohio and Pennsylvania, have afforded additional Batrachian, or Amphibian, bones and foot-prints, so that at the present time the prevalence of this type of reptilian life during the Carboniferous period is generally admitted. The more recent researches of Prof. Dawson in the Coal formation of Nova Scotia have been rewarded by the important discovery of a new genus (*Hylonomus*) of very small reptiles, which, he considers, had affinities to the Lacertians, and possibly belonged to that family, rather than to the Batrachians.‡

The remains which form the subject of the following description are of great interest, since they indicate the existence during the Palæozoic period of a group of highly organized marine reptiles of large size, which have previously been found only in Secondary strata. These remains consist of two vertebræ, or more strictly two centra or bodies of vertebræ. The vertebræ was discovered by the writer in August, 1855, while examining the Coal-measures of Nova Scotia in company with his friend, Mr. William E. Park, of Andover, Mass. Their resemblance in form and appearance to the vertebræ of an *Ichthyosaurus* was so marked, that at the time of the discovery the writer referred them to that genus, and made a careful exploration in the vicinity for further remains, but without success. As soon as an opportunity occurred, the fossils were compared with the vertebræ of *Ichthyosauri* from the Lias, and, although some points of difference were noticed, the Enaliosaurian characters seemed to be equally well marked in each. Wishing to obtain, if possible, some additional remains, the writer for some time deferred publishing a description of the vertebræ; but a careful re-

* Description of fossil footmarks (of *Thenaropus heterodactylum*) found in the Carboniferous series in Westmoreland County, Penn.; by Alfred T. King, M.D., Am. Journal of Science. vol. xlviii, page 343. Also in vol. i, new series, page 268.

† On the remains of a reptile (*Dendrerpeton Acadianum*, Wyman and Owen), and of a land shell discovered in the interior of an erect fossil tree in the Coal-measures of Nova Scotia; by Sir Charles Lyell, F.R.S., &c., and J. W. Dawson, Esq. Quarterly Journal of the Geological Society, London, May, 1853, vol. ix, p. 58.

‡ Proceedings of the Geological Soc. of London, 1859. Also Supplement to Acadian Geology, page 33.

examination of the locality during the past summer afforded nothing of a similar nature, and there seemed to be no reason for longer delay in announcing so important a discovery. The remains were, accordingly, briefly noticed by the writer in the last number of the American Journal of Science; and, as they appeared to be generically distinct from any hitherto described, he then proposed for the species the name *Eosaurus Acadianus*, in allusion to the early appearance on the earth of this higher type of reptilian life.*

The locality which furnished these fossils is at the South Joggins Coal formation, in Nova Scotia, on the southern shore of the Chiegnecto channel, a branch of the Bay of Fundy. The Coal-measures at this place, according to Sir W. E. Logan, have† a vertical thickness of 14,570 feet, or nearly three miles; and contain seventy-six distinct seams of coal, with erect trees and plants at twenty-two different levels. The strata dip to the south at an angle of about 25°; and the destructive tides of the bay are constantly undermining the high cliffs, and exposing for miles along the coast fresh sections, rich in fossil treasures of vegetable and animal life.

The present remains were imbedded in a stratum of argillaceous chocolate-colored shale, which forms part of group XXVI. in the elaborate section of the formation made in 1852 by Sir Charles Lyell and Prof. J. W. Dawson.‡ The position of this group is a little more than 10,000 feet above the lower limits of these Coal-measures, and beneath nearly 5,000 feet of coal strata, containing at least twenty separate veins of coal. It is about 800 feet above the locality which afforded the remains of the *Dendrerpeton* and *Hylonomus*.

This group is sixty-six feet in thickness; and consists of chocolate and gray shales, containing ironstone nodules, and interstratified with bands of gray sandstone, in which may occasionally be observed ripple marks, and carbonized land plants. Erect *Sigillariæ*, often of large size, occur at one level, and erect *Calamites* at another. Prof. Dawson considers these deposits estuary or fluviatile sediments, covering flats, which were at times dry, or near-

* From ἠώς the dawn, and σαῦρος, a lizard. The specific appellation is from Acadia, a former name of Nova Scotia.

† First Report on the Geology of Canada, 1845.

‡ Transactions Geological Society of London, 1853.

ly so, and at others inundated. On one of the rippled sandstones he noticed a series of footprints, which he supposes might have been made by a large *Dendrerpeton.*

Group XXV., immediately beneath the locality of the vertebræ is about twenty feet in thickness; and consists of a series of underclays, or fossil soils, with *Stigmaria*, and small seams of coal, in which may be seen *Sigillariæ* and *Lepidodendra.* Two feet below group XXVI. there is a stratum of bituminous limestone, which contains the scales of ganoid fishes (*Palœoniscus*), coprolites, bivalve shells of the genus *Naiadites* and *Spirorbis carbonarius* attached to plants and trunks of *Sigillariæ.*

The vertebræ, as already stated, are two in number: and when discovered were attached to each other. Their uniformity in size and appearance, as well as their collocation when found, would indicate that they belonged to the same animal, and were contiguous in the vertebral column. They are remarkably well preserved; and this results from their complete ossification in their natural state, as well as from the peculiar matrix which has since contained them, and furnished the material for their mineralization. The posterior vertebra, in fact, with the exception of a small fracture, seems to be nearly as perfect as in its original condition; and from it the description and measurements which follow are mainly taken.

A close examination of the fossils shows, that subsequent to the death of the animal, and before being imbeded in the shale, they were subjected to considerable violence. One of them has been pushed aside from its original position about one-third of its diameter, and also turned on its axis about 90°, so as to leave its superior surface in apposition with the lateral surface of its fellow. Through the center of the anterior vertebra an irregular cavity has been made, and a wide fissure separates a segment from the rest of the centrum. The edges of each of the fossils are somewhat abraded, apparently from having been rolled about by water: this, however, could not have been long continued; as the delicate reticulate texture of the non-articular surfaces, being protected by their slight concavity, is perfectly preserved These injuries were evidently received before the entombment of the vertebræ; and, as no similar remains could be found in the vicinity when these were discovered, it is quite probable that the same force, which caused the injuries, also widely separated the different parts of the skeleton.

The general form of the vertebræ is cylindrical, but their sides, are somewhat compressed obliquely, which gives to the contour of the center a sub-hexagonal appearance. They are much flattened in the direction of the antero-posterior diameter, which has to the transverse diameter about the proportion of 1 to 3. Both the articular terminal facets are deeply and equally concave; but from the center to the margin, the surfaces are convex, and this convexity is greatest near the center. The cavities for the reception of the intervertebral matter begin immediately from the margin; and are considerably deeper than in the corresponding arts of the *Ichthyosaurus*, indicating a greater degree of flexibility in the spinal column. The margins of the vertebræ are somewhat raised, as if they had yielded to a forcible compression applied longtiudinally and hence the lateral surfaces of the centers are concave in an antero-posterior direction. This concavity is greater in the upper half of the vertebra, and was undoubtedly more marked originally than at present, since the appearance of the margins indicates considerable abrasion. The non-articular surfaces of the centra are smooth and regular; and the external fibres of the osseous tissue are singularly reticulated.

The neurapophyses are not anchylosed to the centrum, as in the mammalia, nor connected to it by sutures, as in the crocodiles; but their union with the vertebra is indicated by two pits, which served for their articulating surfaces. These depressions are situated on the superior surfaces of the centrum, intermediate between the anterior and posterior margins of the extremities. They are circular in form, and sink directly into the body of the vertebra; instead of being elongated longitudinally, and raised on ridges, as in the *Ichthyosauri*. The pits are about a line in depth, and in the more perfect of the fossils are not in their original position; as a fracture in the upper part of the centrum has pushed them obliquely apart, so that a line passing through their centers would form an angle of about 30° with the transverse diameter of the vertebra. The depressions occupy about one-third of the distance between the margins of the articular extremities, indicating that the base of the neural arch was of less antero-posterior extent than the centrum. The floor of the spinal canal is narrow, being but five lines in breadth; and its surface in the posterior vertebra is broken by the fracture previously mentioned, which passes lengthwise through its center. No neurapophyses were found with these fossils, but the nature of the superior arch

is indicated by the articular surfaces which served for its attachment. Without doubt its ossification was complete, since the neurapophyses are never inferior in this respect to the body of the vertebra. It is also probable that in the present case these parts were anchylosed to each other and to their spine, as in the neural arch of the *Ichthyosaurus*.

A rudimentary transverse process, or exogenous tubercle, is sent off from each lateral surface of the centrum, at points equidistant from the extremities of the vertical diameter. Their position is near the margin of the anterior articular surface, and the edges of these parapophyses make the transverse diameter of this extremity somewhat greater than that of the corresponding facet. At the surface of the vertebra, each of these tubercles is about six lines in diameter, but they rapidly diminish in size as they extend outward, and at a distance of one and a half lines from the centrum terminate in obtuse points. They present no indications of articular surfaces; but externally appear to be composed of radiating fibres of osseous tissue, and without doubt served for the attachment of muscles. These elevations resemble in form and position the rudimentary transverse processes on the caudal vertebræ of the *Ichthyosaurus tenuirostris*, and this similarity affords some ground for referring these fossils to the same part of the vertebral column. That their true position is in the anterior or central caudal region, is further indicated by the absence from the centrum of true costal surfaces, or articular depressions for the attachment of ribs, which we should expect to find present in the cervical or dorsal part of the spinal column; and also by the absence of a lateral compression of the centers, which, in the *Ichthyosauri*, marks the posterior caudal vertebræ. Both of the fossils are somewhat injured on their inferior surfaces, and hence it is impossible to ascertain from the specimens themselves whether hæmapophyses originally existed.

A microscopic examination of the osseous structure of these vertebræ of the *Eosaurus* exhibits well-marked reptilian characters. The Haversian canals are few in number, but large in size, as is usual in this class. The lacunæ, although somewhat irregular in shape, are much elongated, and show very little resemblance to the quadrate or stellate form of the bone cells in fishes. They are frequently arranged concentrically around the Haversian canals, and their walls are almost invariably well defined. The canaliculi, as in the *Ichthyosaurus* and *Plesiosaurus*, are not numerous, but appear to be finer than those in most saurians. They

do not taper off and ramify, as in the bones of fishes, nor anastomose with the corresponding tubes from the neighboring cells, although in one of the longitudinal sections there are a few indications of such a connection. Some of the other sections examined show a larger number of canaliculi; but generally there are only a few of these tubes attached to each lacuna, and in some cases they appear to be entirely wanting. As the canaliculi vary much in number in different saurians, and also with the age of the animal, their paucity in this case is not remarkable. It is possible, however, that the method employed in preparing the sections was not well adapted to rendering these minute tubes visible. In a part of the transverse section a structure is seen, which is quite different from the surrounding osseous substance. This may be due to the presence of a small cavity in the bone before the introduction of the mineral matter, or to an imperfect ossification at that point: more probably the latter, as these vertebræ, like those of the *Plesiosaurus*, show in their interior structure a degree of ossification somewhat inferior to that at the articular terminal surfaces.

It will readily be seen from the previous description, that a very close resemblance exists between these vertebræ and those of the *Ichthyosaurus*. This is especially noticeable in their flattened and sub-hexagonal form, in their deep and regular terminal concavities, and in the separate state of the neural arch. The differences which exist, however, although of much less importance, must not be disregarded. The most marked of these have already been alluded to; and may be seen in the absence from the sides of the centrum of costal articular surfaces, in the deeper concavities at the vertebral extremities, and in the form and dimensions of the superior arch. The first of these differences would alone be deemed sufficient, by the highest authority, to establish a distinction between these remains and the vertebræ of the *Ichthyosaurus;* for in that genus, according to the statement of Prof. Owen, which is peculiarly applicable to the present case,—"The lower tubercle for the attachment of the rib never wholly quits the centrum: any detached vertebral centrum therefore that might be discovered, which had no lateral tubercle or articular surface for a rib, might be safely pronounced, whatever the form of its anterior and posterior articular surfaces, not to have belonged to a true *Ichthyosaurus*, provided it was not compressed laterally, as in the small terminal ribless caudal vertebræ which supported the caudal

fin in the *Ichthyosaurus*."* The absence of any lateral compression in the present remains, together with their size and proportions, prove conclusively that they cannot be brought under the exception which Prof. Owen makes of the terminal caudal vertebræ of the *Ichthyosaurus;* and hence the application of his rule would separate them from that genus.

The points of similarity, then, between these vertebræ of the *Eosaurus*, and those of the *Ichthyosaurus*, which they most resemble, clearly indicate that they belong to the same natural group of marine reptiles, and to the same order; while the differences which exist between them seem to be sufficiently numerous and important to authorize the conclusion that they are generically distinct; as might naturally be expected from the vast periods of time that separated their existence.

Since the genera of Enaliosaurians from the secondary formations, although contemporaneous, differed so widely in form and structure, analogy would lead us to infer that a Palæozoic representative of the family would present still more marked peculiarities in these respects. It is, therefore, particularly interesting to find indications of so strong a resemblance between this primitive saurian and the more recent *Ichthyosaurus*. These fossils, however, present some features of a lower and more ichthyic type of structure than that genus possessed, and it is not unlikely that other parts of the skeleton would show a wider divergence.

These vertebræ of the *Eosaurus*, although the only remains of the genus at present known, are so characteristic and well preserved that they afford considerable evidence in regard to the structure and habits of the animal to which they belonged. They indicate that this reptile, like the later Enaliosaurians, was of great size,* air-breathing, cold-blooded, and carnivorous; that it was aquatic, and probably marine, inhabiting the sea or estuaries; or possibly, as might be inferred from the place of its entombment, the mouths of rivers flowing into the sea.† The

* Report on British Fossil Reptiles, Part I, page 102.

* If we suppose the number of vertebræ and the relative length of the head of this saurian to have been the same as the *Ichthyosaurus*, its entire length must have been between twelve and fifteen feet, which is at least three times the extent of any reptile hitherto found in Palæozoic strata.

† Although the strata which contained the vertebræ are probably fluviatile or estuary deposits, this would not preclude the possibility of their containing marine remains; as the waters from which they were precipitated were undoubtedly so connected with the sea that an occasional transfer of the inhabitants from one to the other might readily be made. Analogous cases are not uncommon at the present time.

flattened form of the vertebræ; the great depth of their terminal concavities; the separate condition of the neural arch; and its short longitudinal extent at the base,—all are consistent with the conclusion that the *Eosaurus* was capable of rapid progress through the water in pursuit of its prey, which was probably fishes; and since it had then, according to our present knowledge, no superior in point of size, it must have reigned supreme in the waters of the Carboniferous era.

As the vertebræ which have been described in this paper were discovered in 1855, they are, consequently, so far as the writer is aware, the first osseous remains of a true air-breathing Saurian from the Coal formation; and the only *Enaliosaurian* remains yet obtained from below the Upper Triassic. Occurring as they they do in Palæozoic strata, they add another to the arguments (have been brought against the so-called "Development Theory;" and they show with how great caution we should receive the assertions, so frequently and confidently made on negative evidence alone, of the exact date of the creation or destruction of any form of animal or vegetable life. They prove, moreover, that during the deposition of the Coal-measures the atmosphere was sufficiently free from the destructive gases, which, many suppose were contained in it, to permit the existence of a high type of air-breathing reptiles. This period was, in fact, the foreshadowing of an age, then far in the future, when reptilian life should hold undisputed sway upon the earth, until in turn supplanted by a higher and a nobler form of existence.

REVIEWS AND NOTICES OF BOOKS.

Fourth Report of the Geology of Kentucky, by Owen and others.

Report of the Geological Survey of Wisconsin, by Hall and Whitney.

Report on the Colorado River of the West, by Ives, Newberry, and others.

Report of the Geological Survey of Maine, by Hitchcock.

It is not a little creditable to the people of the United States, that while engaged in the costly and bloody strife for their national existence, they do not wholly intermit their public exertions on behalf of natural science. Each of the above mentioned works

is a bulky volume, and some of them are expensively printed and illustrated, while all are replete with interesting and important scientific facts.

The Kentucky report possesses a melancholy interest in containing the obituary of the head of the survey, Dr. Owen, who closed his useful course in November 1860. It contains an immense amount of valuable local geology by Owen, Lesley and Lyon, and a great number of analyses of ores and soils by Dr. Peter, chemist to the survey. One of its principal features, at least to geologists at a distance, is the palæontological report by Lesquereux, in which he enters into an elaborate investigation of the flora of the several coal seams, with the view of ascertaining their peculiarities, and of obtaining evidence for the determination of the different seams from their fossil plants. We doubt if this last end can be attained to the extent that Mr. Lesquereux anticipates, since our experience has so far led to the belief, that in the middle coal measures the flora is very uniform, and varies rather in consequence of local differences of soil and moisture than from any general cause. The differences, however, in the upper and lower members of this great series are in some respects quite marked; and such investigations as those of Mr. Lesquereux are most praiseworthy and valuable.

The Wisconsin report is occupied in great part with a detailed account of the remarkable deposits of lead, in the form of galena, occurring in the older silurian limestones of Wisconsin and other regions in the West. Prof. Hall contributes the introductory chapter on general geology, and a palæontological report, accompanied with a systematic list, which is in many respects one of the most useful forms in which to present such information. In this list appears the unfortunate little *Lingula*, whose appearance in the report of 1861 has excited some controversy in this Journal. It is proper to state with respect to this, that Prof. Hall explains the misapprehension, as he regards it, in respect to the date of his notice of this species, by the delay which has occurred in the publication of operations stated to have been made long previously. It is one of the misfortunes of the rapid progress of palæontology that it should occasion such interference of workers in this field, and raise suspicions very unpleasant to all parties.

The Colorado report includes the results of the exploration of the largest stream but one flowing from the United States terri-

tory into the Pacific. The physical features of the region are remarkable, presenting a series of deep ravines or "canons" in which the Colorado and its tributaries flow at depths amounting in some cases to two or three thousand feet below the level of the neighbouring table-lands. The scenery presented in these deep cuts is of the most magnificent description, apalling the visitor with its gloomy grandeur. In the lofty precipices the whole palæozoic series of rocks may be seen in regular and undisturbed succession, and resting on older metamorphic rocks; while in the higher table-lands cretaceous and triassic rocks appear, the whole apparently constituting a continuous undisturbed series. Dr. Newberry, the geologist of the expedition, has well availed himself of these magnificent exposures. He attributes the present irregular features of the country entirely to aqueous erosion, and this by running water. It is indeed the long prevalence of river action in an undisturbed country that can alone produce such effects.

The survey of Maine, at the opposite extremity of the Union, from the Colorado river, was commenced last year by Mr. Hitchcock, and his report shows a most praiseworthy diligence, and an excellent combination of effort with others working in neighbouring fields, along with great capacity for such work. The observations made and fossils collected enable us for the first time to form just ideas of the parallelism of large portions of the rocks of Maine with those of New York, Canada and Nova Scotia. The lower silurian rocks are represented by clay slates, holding a few fossils regarded as primordial in their type. Other deposits occurring in several places are regarded as upper silurian, and correspond very nearly with the "Arisiag series" of Nova Scotia. There are extensive deposits of Devonian rocks, in one member of which, exposed at Perry, we have three remarkable plant-beds, some of the fossils of which have been noticed in this journal. The drift deposits have also been carefully sketched, and with the aid of Mr. Fowler of Portland, a list of these fossils has been prepared, and comparisons instituted between them and those of the similar deposits in Canada, with which they correspond very closely in their arrangement and fauna. The indications are those of a marine fauna similar to those of the present coast, but with a prevalence of more northern forms indicating a somewhat colder climate. J. W. D.

Descriptive Catalogue of the Economic Minerals of Canada and of its Crystalline Rocks, by Sir W. E. Logan and T. Sterry Hunt.

This catalogue, prepared for the Great Exhibition in London, is an instance of that thoroughness which characterises everything attempted by Sir W. E. Logan. It is in truth a descriptive list of everything known to be of economic value in Canadian mineralogy; and must be of immense service to the industrial interests of the province; more especially when practical men in England can compare its clear and accurate statement of facts with actual specimens of the products themselves, as exhibited in London. Mr. Hunt adds a similarly descriptive catalogue of rocks; which with the specimens exhibited, will present to European geologists a better exposition of the lithology of Canada than, in so far as we are aware, any other region on this side of the Atlantic can boast, and one quite equal, to say the least, to anything of the kind afforded by European rock collections.

We copy, as specimens, the notices of a few of the more important of the newer mining localities and their products.

"Ramsay Mines, Ramsay, lot 3, range 6...*Foley & Co., Montreal.*"

"A vein cutting nearly horizontal beds of grey, geodiferous, brown-weathering dolomite. The vein is composed of calcspar, and has a breadth varying from two and a half to five feet, in which the galena is disseminated in a width of from eight to twenty-four inches. In some portions the vein is almost dead ground, while in others, judging by the eye, it would yield nearly two tons of eighty per cent. per fathom. The bearing of the lode is about N.W., and its underlie to the north-eastward, about a foot in a fathom. A trial shaft has been sunk on the lode to the depth of thirty-seven feet, and the working of seventy-five fathoms of ground, in 1858, yielded twenty-six tons of ore of eighty per cent. A smelting furnace was erected to reduce the ore, and a ten horse-power engine used to give blast to the furnace and dry the shaft, but a considerable spring of water having been struck, it became necessary to erect a more powerful engine, and one of fifty horse-power has just been completed. The dolomite is underlaid conformably by sandstone, which crops out about a mile from the mine, and is unconformably supported by crystalline limestone and gneiss of Laurentian age. About 105 fathoms south-eastward from the main shaft, a counter-lode joins the main one, at an angle of about 20°; its course being nearly N.N.E. and S.S.W. At the junction of the two lodes a shaft has been sunk in sand-

stone, to a depth of 21 feet, and in the excavation of the pit, in which the united lodes have a breadth of ten feet, there have been obtained about seven tons of ore of twenty per cent.—*Calciferous formation, Lower Silurian.*"

"Lansdowne, lot 3, range 8.....*Geological Survey.*"

"Ore from a vein cutting crystalline limestone, and running N. 60° W. The vein has a thickness of from six to twelve inches, and is composed of calcspar, in which the galena is disseminated in lumps, which, in a trial shaft of about fifty feet, sunk in 1854, on the land of Mr. Buel, were sufficient to pay the expenses. The largest of these lumps may have been five or six inches in width. A counter-lode diverges from the main one near the shaft, and in this neighbourhood, there occur four additional lead-bearing veins, running parallel with the main one, all contained in a breadth of about 1000 feet. They run obliquely across the lots, and thus intersect the lands of several proprietors. On lot four of the same range, Messrs. Foley and Co., of Montreal, have sunk a small shaft on one of the lodes.—*Laurentian.*"

"Bedford, lot 19, range 7.....*Geological Survey.*"

"Ore from one of five nearly parallel lodes cutting crystalline limestone, in a breadth of about a quarter of a mile, on the property of Mr. Weston Hunt, of Quebec. The gangue of the lode is a mixture of heavy spar and calcspar. About a mile to the eastward of these, are other nearly parallel lodes, also cutting crystalline limestone, on land belonging to the same proprietor. Shallow trial shafts were many years ago sunk on some of these, but what quantity of lead-ore was obtained in them is not known. On lot 13, range 5, of Bedford, Messrs. Foley & Co., of Montreal, have sunk a trial shaft to a depth of fourteen feet, on a lead-bearing lode of six inches, of which the gangue is heavy spar. It cuts crystalline limestone, and reaches gneiss, and in both rocks shows good bunches of ore. This lode is about three miles south-west from those first mentioned, and runs parallel with them.—*Laurentian.*"

"N.B.—The distance between the Lansdowne and Bedford lodes is about twenty-five miles; they bear for one another, and it appears not at all improbable that the veins in the two localities may be identical, or belong to one group. If a line from the Bedford to the Lansdowne lodes were continued twenty-five miles farther, it would cross the St. Lawrence, and strike Rossie in St. Lawrence County, New York, where a well known group

of veins of lead ore intersects Laurentian gneiss. Though just now abandoned, some of these are supposed to be still unexhausted, and two of them are known, at one period, to have yielded a great quantity of ore; one of them as much as $142 worth to a fathom. The Ramsay lode belongs to a series of veins which run parallel with those of Bedford, at a distance of about forty miles to the north-eastward, and although the two groups cut different rocks, both are probably of one age, which would not be older than that of the *Calciferous formation* of the *Lower Silurian* series."

" Bruce Mines, Lake Huron,.....*Montreal Mining Co.*"

" At the Bruce mines, a group of lodes traverses the location in a north-westward direction, intersecting a thick mass of interstratified greenstone trap. The strata here present an anticlinal form, the lodes running along the crown of it. All of the lodes contain more or less copper ore, which is disseminated in a gangue of quartz. The main lode, which is worked with another of about the same thickness, is, on an average, from two to four feet wide. In a careful examination made in 1848, about 3000 square fathoms of these lodes were computed to contain about 6½ per cent. of copper. The quantity of ore obtained from the mine, from its opening in 1847, was 472 tons of seventeen per cent The deepest working is fifty fathoms from the surface. The number of men employed is thirty-four. Smelting furnaces, on the reverberatory principle, were erected at the mine in 1853; the fuel used in these was bituminous coal imported from Cleaveland; but after a trial of three years, the Company themselves ceased smelting, and subsequently leased their smelting works to Mr. H. R. Fletcher. At present, the ores are in part sent to the Baltimore market, and in part to the United Kingdom.—*Huronian.*"

" Wellington Mine, Lake Huron,..... *West Canada Mining Co.*"

" The lodes of the Wellington Mines are probably a north-westward continuation of those of the Bruce Mine. They are of the same general character, some of them occasionally reaching a thickness of ten feet. They occur on the ground of the Montreal Mining Company, from whom they are leased by the West Canada Mining Company at a royalty, and continue in the adjoining lot called the Huron Copper Bay location, where they are worked by the same Company. The quantity of ore obtained by this Company, from the Wellington mine, since 1857, is a little over 6000 tons of twenty per cent. In 1861, the quantity was 1175 tons of

nineteen per cent., and from the Huron Copper Bay mine, probably about 1300 tons; making the total quantity obtained by the two mining companies in that year about 3000 tons. The deepest working on the West Canada Company's ground is about twenty fathoms. The number of men employed on the Wellington and Copper Bay mines is supposed to be about 260. All of the ore raised by this Company is sent to the United Kingdom.—*Huronian.*"

"Acton Mine, Acton, lot 32, range 3,

W. H. A. Davies and C. Dunkin, Montreal."

"The ore of the Acton mine occurs in masses subordinate to the stratification, at the summit of a band of greyish white and reddish grey compact sub-crystalline dolomite, from 200 to 300 feet thick, belonging to the base of the Quebec group. The dolomite is divided into two massive beds; it is associated with a good deal of chert, and encloses mammillated fibrous concretionary forms, resembling those of travertine. At the summit, the dolomite often terminates in a breccia or conglomerate, with angular and rounded masses of limestone, intermingled with ragged, irregular masses of chert. In many places the dolomite is marked by the occurrence of the yellow, variegated and vitreous sulphurets of copper, which are in patches, running with the stratification. In the neighbourhood of these, many veins, and strings and veins of quartz interset the rock, in various directions, and hold portions of the sulphurets of copper. The copper ores which often contain native silver, appear to be more abundant in the upper part of the rock. At Acton the conglomerate is separated from the main body of the dolomite by between eighty and ninety feet of dark grey or black slates, intermixed with diorite; in these the conglomerate lies in large isolated masses, running parallel with the summit of the main body of the dolomite. On the opening of the mine, the sulphurets, where most abundant, appeared partially to surround them; in some parts constituting the paste of the conglomerate. As the work proceeded, many slips and dislocations, of no great magnitude, where found to cut the strata. Some of them appear to run with the strike, and others in two parallel series, oblique to one another. These disturb the regular continuity of the copper-bearing bed, producing apparent undulations in the dip, and causing the diorite and the limestone to protrude into the copper ore, or unexpectedly to interrupt one another. The ores were found to be concentrated in three large masses,

occurring in a length of about 120 fathoms. Proceeding south-westwardly, the space occupied by the most northern mass, from a breadth of a few inches, gradually widened out to about ten fathoms, in a length of about forty fathoms; beyond which it appeared to be thrown about fourteen fathoms, obliquely to the westward. The general bearing of the succeeding two masses was still to the south-west. They were about fifteen fathoms; apart, and the larger or more southward one swelled to a breadth of more than fifteen fathoms. The depth to which the ground has been worked on the general slope of the bed, is about ten fathoms. The cupriferous rock at this depth has a breadth of about twelve feet in a shaft on the northern mass, and shows rich ore in the floor and the parts adjacent; but with the exception of what is called Pike's pit, in the most southern part, the floors of the other masses do not at present exhibit that same abundance of ore which characterized the upper part. The working of the mine however up to the present time, has been confined to the extraction of the rich ore which was in sight. Little or nothing has been done for discovery, and it cannot be said how near to the present floor of the mine, may be found other masses, similar to those that have been excavated. Beyond these masses in opposite directions on the surface, the ore becomes more scattered in the strata; but there is evidence of its continuance for several hundred feet, in spots and patches occasionally aggregated into masses of much less importance than the three principal ones. In the first few weeks' work in 1859, about 300 tons of ore, containing nearly thirty per cent. of copper, were quarried in open cuttings, from two of the masses, without making much apparent impression on the quantity in sight. The total quantity sent from the mine up to the end of 1861, is said to be nearly 6000 tons; holding on the average about seventeen per cent., of copper.—*Quebec group, Lower Silurian.*"

The catalogue gives similar details respecting our deposits of iron, nickel, silver, gold, chromic iron, petroleum, plumbago, building stones, marbles, slates, clays, &c., and should be in the hands of every one interested in the economic geology of the country. It is, we believe, on sale at the bookstores. J. W. D.

MISCELLANEOUS.

NOTICE OF THE NATURAL HISTORY COLLECTIONS OF THE MCGILL UNIVERSITY,

The collections of the University in Natural History, which have been accumulating under the care of Dr. Dawson, are now placed in the new rooms provided by the liberality of Mr. Molson, though the naming of the specimens has not been quite completed, and will still require much time.

The principle of arrangement adopted has been that of disposing in flat and wall glass cases, suites of specimens illustrative of the subjects of the lectures in Natural History, in the order in which they are taken up in the lecture room. Geographical collections, and duplicate and extra specimens are placed in drawers under the cases in which objects of similar character are arranged. The greatest possible facilities will thus be afforded to the elementary student, while there will also be opportunity for farther and more detailed study.

The whole collection numbers about 10,000 specimens, of which about 2000 have been collected by Principal Dawson, or contributed from his private collection. The remainder have been procured by purchase or exchange, or by donations from friends of the University. The specimens may be grouped under the following heads:

1. *Mineralogy.*—The basis of this department is the collection of about 2000 Canadian and foreign minerals acquired from the late Dr. Holmes. To this have been added several species and varieties by donation and purchase.

2. *Geology and Palæontology.*—In this department are the fossils of the Holmes collection; the collections of rocks and fossils presented by Sir W. E. Logan, and numbering 475 specimens; collections of British fossils presented by H. Chapman, Esq., G. Evans, Esq., and others; collections of tertiary and carboniferous fossils, and local collections from the Azores, Murray Bay, Lake Superior, Lake Huron, &c., contributed by the Principal; with a great number of miscellaneous specimens, donations from friends and students. This collection is still very incomplete in Permian, Triassic, and Tertiary rocks and fossils.

3. *Zoology.*—In this department there are about 300 specimens of Vertebrate animals, selected as far as possible with a view

to illustrate orders and families. Many of these specimens have been acquired by purchase, a few have been collected for the College, and there are valuable donations from J. Barnston, Esq., and others. In Articulates we have the Couper collection of 2400 specimens of Canadian insects, the Coleoptera of which, numbering nearly 700 species, have been catalogued by Le Conte; a miscellaneous collection of insects arranged by Mr. D'Urban to illustrate the orders and families; and a collection of British Hymenoptera presented by the same gentleman. In Arachnida, Crustacea, and Annelida, the collection is still incomplete, though there are a number of valuable specimens, collected by the Principal, or contributed by Mr. R. J. Fowler and other friends. In Mollusks the basis of the collection consists of specimens presented by H. Chapman, Esq.; the valuable collection of South Sea shells presented by Sir Wm. Dennison; 100 species of fresh-water shells acquired from Mr. Anthony, and duplicates from the Principal's collection. There are also a valuable collection of Norway shells presented by R. McAndrew, Esq., the commencement of a local Canadian collection, some rare and specially interesting species obtained by purchase, and donations from several friends. The collection of Radiates consists of specimens procured by the Principal, with donations from the Smithsonian Institute, Mrs. J. Redpath, Miss Carey, Rev. C. C. Carpenter, Mr. Fowler, Mr. Packard, and other friends. It is more full in Echinoderms than in any other class, and is still very incomplete in corals and their allies.

4. *Botany.*—The principal part of this collection is the Holmes Herbarium of 500 Canadian plants, exclusive of the grasses and carices, which though named and revised by Col. Munro, have not yet been catalogued. There is also a collection of sixty specimens of Canadian woods collected by the late Dr. Barnston; a collection of Canadian woods presented by D. Davidson, Esq.; a collection of Australian woods presented by Sir Wm. Dennison, and collections of mosses, lichens, fungi and algæ. The whole of these are now very conveniently arranged in a separate room. Only the commencement of a collection of exotic plants has as yet been made.

5. *Ethnology, &c.*—In this department there are a number of Indian relics from Montreal, presented by the Principal, several valuable casts of antiques presented by Mr. Blackwell, and a number of miscellaneous objects. It is not intended however to de-

velop the collection much in this direction, as the available space is not more than sufficient for the specimens required in Natural History proper.

Measures are now in progress which it is hoped will tend to supply some of the principal deficiencies, and add useful geographical collections, so as to make the Museum all that it is intended to be, a small but thoroughly serviceable collection for the purpose of instructing students, and facilitating the research of local naturalists, for which purposes it will be in constant use. No attempt will be made to amass a large general collection like that of the Natural History Society, or to rival either that institution or the Geological Survey in the departments in which they are eminent. After securing a sufficient general collection of types for educational purposes, any farther additions will be made as far as possible in objects not adequately represented in the other collections in the city. Its arrangement in the new building will much facilitate the labours of the professors of Natural History and Mineralogy, and it is hoped, add new interest to the subject in the minds of students.

It is intended that every specimen shall be labelled with its name, locality, and donor, and this work has been already in great part accomplished, so that it is hoped that the Museum may be opened to students at the commencement of next session on the 6th September.

"*On the Land Flora of the Devonian Period in North-Eastern America.*" By J. W. Dawson, LL.D., F.R.S.

(*From Abstracts of the Proceedings of the Geological Society of London.*)

First noticing what was formerly known of the Devonian Plant-remains in these states of New York and Pennsylvania (Hall, Vanuxem, and Rogers), in Gaspé (Logan), in New Brunswick and Main (Gesner, Robb, Bennet, Hartt, Matthew, and Hitchcock), the author stated that with Messrs. Hartt, Matthew, and others at St. John's, he had lately examined the productive localities near that city, and is now enabled to add largely to the account of the Devonian plants he had already published in the 'Canadian Naturalist,' vol. vi. 1861. He now enumerates about 70 species (32 genera) of plants as occurring in Upper Devonian of Pennsylvania, New Brunswick, Maine, New York, and Gaspé, in the Middle Devonian of New York and Gaspé, and in the Lower Devonian of Gaspé. Of these 70 species, two (*Psilophyton princeps* and *Cordaites angustifolia*) are referred also to the Upper Silurian

of Gaspé; and 10 (not including these two) reappear in the Carboniferous strata. The Devonian Flora is less perfectly preserved than that of the Coal-measures, and is probably yet very imperfectly known. It presents more resemblance to the floras of the Mesozoic period and of modern tropical and austral islands than the coal-plants. The facies of the Devonian Flora in North America is very similar to that of the same period in Europe.

NATURAL HISTORY SOCIETY OF MONTREAL.

The Annual Meeting of this Society was held in their rooms yesterday evening, the President, the Most Reverend the Lord Bishop of Montreal and Metropolitan in the chair. A large attendance of the members was present. The Recording Secretary, Mr. John Leeming, read the minutes of the last meeting; after which his Lordship the President said:

Gentlemen,—It becomes my duty once more, on this occasion of the Annual Meeting of our Society to give some account of our proceedings during the past year. I confess that it is with no small consciousness of my own unworthiness for the post I occupy, that I now again address you as your President; because I cannot but feel that I have myself been able to do so very little for the advancement of those objects, which it is the business of such a Society to investigate and illustrate. I can however, most truly lay claim to a warm interest in its success, to an anxious desire to encourage in every way I can, the learned and useful labours of others; and I do most sincerely rejoice in being able to congratulate you on the success of those labours, and the steady advance which the Society is making in general usefulness, and in the estimation of the public. The more direct and systematic work of the Society is that which is done at the regular monthly meetings of the members; where papers are presented and read upon any of those subjects which come at all within the purview of this Institution; and discussions and conversations take place respecting them. As will necessarily be the case, where science of any kind is the subject matter, these may not always be equally interesting to the million, but are sometimes, as Hamlet says, "caviare to the general;" yet they have been valuable, as contributions to the cause of Natural Science, in almost every department, and have been afterwards preserved and widely disseminated in the bi-monthly numbers of the *Canadian Naturalist*.

edited in this city by some of our members. These may be classed under seven different heads, numbering altogether about 35 original papers, exclusive of Dr. Smallwood's valuable meteorological tables; viz:—Geology, 13; Zoology, 12; Botany, 5; Ethnology, 1; Meteorology, 1; Philology, 1; Chemistry, 2.

List of original papers read before and presented to the Natural History Society of Montreal, from May, 1861, to May, 1862:—

On the Pre-carboniferous Flora of New Brunswick, Maine, and Eastern Canada. By J. W. Dawson, LL.D., F.G.S.

On the origin of some Magnesian and Aluminous Rocks. By T. Sterry Hunt, M.A., F.R.S.

Considerations relating to the Quebec Group, and the Upper Copper-bearing rocks of Lake Superior. By Sir W. E. Logan, F.R.S.

Notes on the History of Petroleum or Rock Oil. By T. Sterry Hunt, M.A., F.R.S.

List of recent Land and Fresh-water Shells collected around Lakes Superior and Huron in 1859-60. By Mr. Robt. Bell.

Catalogue of Birds collected and observed around Lakes Superior and Huron in 1860. By Mr. Robert Bell.

On the Mammals and Birds of the District of Montreal. By Archibald Hall, M.D., L.R.C.S.E. (A paper for which a silver medal was awarded by the Society to its author in 1839, but never before printed; it is now in course of publication).

On some of the Rocks and Fossils occurring near Phillipsburgh, Canada East. By E. Billings, F.G.S.

Recollections of the Swans and Geese of Hudson's Bay. By Geo. Barnston, Esq.

On the occurrence of Graptolites in the base of the Lower Silurian. By E. Billings, F.G.S.

A short review of the Sylviadæ or Wood-warblers found in the vicinity of Montreal. By H. G. Vennor.

Additional Notes on Aboriginal Antiquities found at Montreal. J. W. Dawson, LL.D., F.G.S.

Mr. Barrande on the Primordial Zone in North America, and on the Taconic System of Emmons. By T. Sterry Hunt, M.A., F.R.S.

List of Coleopterous Insects collected in the County of Lincoln, C. W. By D. W. Beadle.

On the recent discoveries of Gold in Nova Scotia. By J. W. Dawson, LL.D., F.G.S.

On the origin of the name "Canada." By Rev. B. Davies, LL.D., Member of the Council of the Philological Society of London.

An account of the Animals useful in an economic point of view to the various Chippewyan Tribes. By B. R. Ross, H.B.C.S.

On the Land and Fresh-water Mollusca of Lower Canada, with thoughts on the general geographical distribution of Animals and Plants throughout Canada. By J. F. Whiteaves, F.G.S., Honorary member of the Ashmolean Society of Oxford, &c., &c.

On the Primitive Formations in Norway and in Canada, and their Mineral Wealth. By Thomas Macfarlane.

On the Shore Zones and Limits of Marine Plants on the North-Eastern Coast of the United States. By the Rev. Alex. F. Kemp.

Contributions to Meteorology for the year 1861 from observations taken at Isle-Jesus, Canada East. By Charles Smallwood, M.D., LL.D., Professor of Meteorology in the University of McGill College, Montreal.

Note on the Taconic System of Emmons. By T. Sterry Hunt, M.A., F.R.S.

Notes on the Flora of the White Mountains, in its Geographical and Geological relations. By J. W. Dawson, LL.D., F.G.S.

On the failure of the Apple Trees in the neighbourhood of Montreal.—A communication to the Committee of the Natural History Society of Montreal. By John Archbold.

On an Erect Sigillaria and a Carpolite from the Joggins, Nova Scotia. By J. W. Dawson, LL.D., F.G.S.

The New Spectrum discoveries. By Professor Robbins.

List of Diurnal Lepidoptera collected (unless otherwise specified) in the immediate vicinity of London, Canada West. By W. Saunders.

An account of the Botanical and Mineral products, useful to the Chippewyan Tribes of Indians, inhabiting the McKenzie River District. By Bernard R. Ross, H.B.C.S.

List of Mammals, Birds, and Eggs, observed in the McKenzie River District, with Notices. By Bernard R. Ross, Corresponding Member, Nat. Hist. Soc., Montreal.

Notes on Chemical Subjects. By Professor S. P. Robbins, McGill Normal School.

On the date of the Report on the Geology of Wisconsin, noticed in this Journal, Vol. VI, p. 465.

Many of these papers combine great practical utility, with the scientific knowledge displayed in the manner in which the subjects have been handled. For example:—"Considerations relating to the Quebec Group, and the Upper Copper-bearing rocks of Lake Superior," by Sir W. E. Logan. "Notes on the History of Petroleum or Rock Oil," by Professor Hunt. "On the recent discoveries of Gold in Nova Scotia," by Principal Dawson. "On the Primitive Formations in Norway and in Canada, and their Mineral Wealth," by Mr. T. Macfarlane. (A series of exceedingly valuable papers.) "On the failure of the Apple Trees in the neighbourhood of Montreal," by Mr. John Archbold.—While others were of such a nature as to be of general interest to all Canadians; such as "Additional Notes on Aboriginal Antiquities found at Montreal," by Principal Dawson. "On the origin of the name of Canada," by Rev. Dr. Davies; and some others. But whatever may be the estimate formed, by those amongst whom we live, of the labours of this Society, and the proverb too often holds good that "a prophet hath no honour in his own country;" yet the *Natural History Society* of Montreal, is now a known and honoured Institution, not only on this Continent, but in England, in all parts of the Continent of Europe, and elsewhere. Besides its regular circulation, 50 copies of the *Canadian Naturalist* are distributed, on every issue of the Bi-monthly Numbers, amongst as many of the principal Scientific Societies throughout the world; and extracts therefrom are constantly being republished by them, in their own Journals and Periodicals, with most honourable mention of our contributions to the cause of Natural Science in general, and the illustration of Canadian Natural History and Geology in particular. I wish, also, to direct attention to our Museum, which, in its Zoological Department, and indeed I believe I may say, as a general collection, is second to none now existing in the Province; and which we are anxious to see made useful, both as a means of assisting the labours of students, and creating a taste for Natural Science in the public at large. There is one department of which I would make special mention, both on account of its own value, and also because it is only very recently that it has been placed in a condition to be at all easily accessible by those

seeking information from its stores. I allude to the *Herbarium*, respecting which I have received an interesting account from the Rev. A. F. Kemp, than whom there is no one amongst us better qualified to judge of its value, or describe its contents.

Some account of the Herbarium of the Natural History Society of Montreal.

"A Committee has been appointed to put this valuable Herbarium into such order as to render it henceforth more useful for the promotion of botanical research. Some progress has already been made in the work. It has been put into the hands of a gentleman well acquainted with the method adopted by the Botanical Society of Edinburgh in the preparation and arrangement of specimens. Less is known about the collection of dried plants, and less attention has been directed to it than its extent and value merit. It is understood that the late Dr. Holmes, whose Herbarium is one of the treasures of the McGill Museum, presented duplicates of most of his specimens, many years ago, to the Natural History Society. These form the original nucleus of our Herbarium. Additions have from time to time been made to it by other friends of the Society. Lady Dalhousie, who, while in Canada, was an enthusiastic botanist, presented a large collection of well prepared specimens of Canadian Flora, which it is understood forms part of the collection. The chief and by far the most valuable portion of the Herbarium, as well as the case in which it is preserved, was however bequeathed to the Society by the late Mr. Macrae, who devoted some years to the study and collection of North American Flora. For this purpose he travelled extensively in the Northern States of America and in Canada East. He devoted much time and care to the preparation of his collections, and has left them in admirable condition and preservation. They have all been determined in accordance with the system of the latest American botanists; and comprise several valuable specimens from the Herbaria of Carey and Gray. Mr. Macrae fell into ill health and was long an invalid. An enthusiast in the science of botany, he deserves honourable mention and remembrance. Although he published nothing to attract attention, he yet is entitled, considering the extent and beauty of his collection, to be named along with the distinguished Botanists of America. The collection should be entitled the *Macrae Herbarium*. If properly labelled and catalogued, it would form a good

basis for a complete illustration of North American Botany. It is hoped that before long, by the exertions of the Committee to whose care the Herbarium has been entrusted, it will be rendered easy of reference to the members of the Society, and that by a system of exchanges its lacunæ will be filled up."

"It is also worthy of notice that the Society has a considerable collection of Marine Algæ, carefully catalogued and determined, which might be useful to the Students of this department of Botany. The Society will be happy to receive additions to these collections from scientific friends."

The usual course of *Somerville* lectures were delivered during the last winter; as will be more fully noticed in the report of the Council, which will be read to you by-and-bye. I was only able to be present at two out of the six, having been absent from town when the rest were delivered, or else prevented by some unavoidable engagement elsewhere. But if the others were as interesting as those I heard, which I have every reason to believe they were, they will well have kept up the good name which the Society has earned in former years.

The first lecture, at which I was present, was that delivered by Rev. A. F. Kemp, "On minute forms of life, especially addressed to the young." And it was matter of much regret to me and many others, that he so rigidly confined himself as to time, that he could not make use of half the very beautiful diagrams, which he had so carefully prepared to illustrate his subject. The other lecture was by the Rev. E. Wood, "A popular account of the Durham Coal-fields, with a brief narrative of a visit underground." This was, I should think, one of the most popular of the whole course; both from the graphic description given of those subterraneous regions—which, however, I own seem to me much pleasanter to hear of than to explore—and also from the circumstance that just at the time of its delivery we had received from England the heart-rending intelligence of the terrible catastrophe at the Hartley Colliery; the nature of which the lecturer most fully explained with appropriate diagrams. I think then that in various ways the Society is endeavouring faithfully to accomplish the objects for which it was incorporated, and to aid in which it receives an annual grant from the Legislature. And some indication that it is at length beginning to be better appreciated by the citizens of Montreal, may be gathered from the fact that 87 new members have joined us during the last year, more than one-third as

many as our whole previous numbers. When I look back upon the state of the Society some ten years ago, at the time of my first becoming a member of it, when I think of the feeble efforts it was then making for the mere preservation of its actual existence, when I contemplate the names now on our list, both as to numbers, and, in so many instances, as to standing and well earned reputation, as men of science and learning, the good results of whose labours are acknowledged far and wide, wherever natural science is valued and cultivated, when I look at our present place of meeting with its well arranged museum, laboratory, library, and lecture room, when I see how and by whom I am now surrounded and supported, I begin with some confidence to realize the truth of the motto which the Society has adopted, and I feel that it is indeed becoming no idle boast to assert, "Tandem fit surculus arbor." And though our usefulness and progress are still very much crippled by the remaining debt due by the Society, incurred by erection of this building in which we are now assembled; yet I cannot but entertain a strong hope that, by the increasing support of our fellow-citizens, which it is our endeavour to merit by our labours, we shall, at no distant day be entirely relieved from this incumbrance.

Report of Council.

The period having arrived when it becomes the duty of your Council to lay before you the usual Annual Report, they have now the pleasure of presenting you their Report of progress during the past year, and such a statement of the affairs of the Society as they hope will meet with your entire approval.

The Society during the past year has steadily advanced and prospered. Many valuable and interesting papers have been read, the monthly meetings have been well attended, and the Somerville Course of Lectures delivered to large audiences. Important additions have been made to the Museum and the Library, the list of members has largely increased, and the amount of dues received from this source has improved the finances of the Society. The publication of the "Canadian Naturalist and Geologist" has been continued with increased efficiency, and its circulation much extended.

LECTURES.

The following Annual Free Course of Somerville Lectures was delivered under the auspices of the Society:

February 6th, 1862.—On the harmony resulting from apparent discords and anomalies in nature.—CHARLES ROBB, Esq., C.E.

February 13th, 1862.—On the utility of birds to agriculture, and the desirability of endeavoring to prevent their destruction on the Island of Montreal.—ALFRED RIMMER, Esq.

February 20th, 1862.—On minute forms of life, especially addressed to the young.—REV. A. F. KEMP.

February 29th, 1862.—"A popular account of the Durham coal fields, with a brief narrative of a visit underground."
REV. EDMOND WOOD, M.A.

March 6th, 1862.—On some relations of the mineral, vegetable and animal kingdoms.—DR. T. S. HUNT.

March 20th, 1862.—On the Geological History of a lump of coal.—DR. DAWSON.

MEMBERSHIP.

This department has been under the charge of a Committee of the Council of four members, whose labors have been most praiseworthy and successful.

The list of members compared with that of last year is as follows:—

	1860–61	1861–62
Life members, - - - - -	36	38
Ordinary members, - - - -	180	261

Eighty-seven ordinary members having been elected during the year, and two only having resigned, and two died. Two corresponding members only were elected. Two ordinary members of the Society, C. Dunkin, Esq., M.P.P., and H. J. Ibbotson, Esq., have been elected life members on account of very munificent donations of books to the library.

PAPERS READ.

During the year twenty-eight papers have been read at the monthly meetings, and the more important of them published in the "Naturalist." These papers have been more fully noticed in the President's address.

PUBLICATION OF THE "NATURALIST."

In connection with the system of exchanges with scientific journals of other countries, your Council have to remark that the papers published in the "Naturalist" have been extensively reproduced in other journals, and the reputation of this society, and

its journal extended and increased, and the "Naturalist" obtained a wider and larger circulation and a foremost place as one of the representatives of Canadian science, very many valuable exchanges have thereby been added to our library, which when carefully preserved and bound will largely increase the number of volumes in charge of the librarian.

To D. A. Poe, Esq., of the Editing Committee, to whom was entrusted the editorial supervision, as well as the members of the Editing Committee, the Society is indebted for their exertions and labors in connection with the "Naturalist."

MUSEUM AND LIBRARY.

The Reports of the Library Committee and of the Curator are herewith submitted. Very many valuable donations have been presented to the Society during the past year, both to the museum and to the library. There is still much to be done in the labelling and arrangement of the specimens in the museum; and it is hoped that this work will be pushed forward by our successors. The cabinet-keeper, Mr. Hunter, has assiduously attended to his duties, the interests of the Society and the care of the museum. The numerous additions to the latter have been carefully prepared and preserved by him.

GENERAL AFFAIRS.

The Council have to acknowledge with pleasure the receipt of the annual grant of $1000 cy., from the Government in aid of the Society. The financial affairs as detailed in the annexed Treasurer's Report are highly gratifying. The actual debt of the Society has been lessened about $300 cy., and all interest on the loans and the old accounts fully paid up. Negotiations to transfer the debt in mortgage, with a lesser rate of interest, are now nearly completed. There is every reason to hope that, by increased exertion, the burdensome debt now crippling the Society may in the coming year be decreased.

The notification of the monthly meetings is now made by circular to each member, and the charge for advertisements in the newspapers, which from the number of meetings formerly reached to a large sum, entirely done away with, and the attendance of members secured at little expense.

Petitions have been forwarded to the Legislature for legislative enactment for the protection of the smaller birds, similar to that which exists in other countries, and should action be therein taken

by the Legislature, great benefit will be conferred on the farmer and gardener. An act for the amendment of the constitution is now under the consideration of parliament, and, if passed, the efficiency of the Society will be thereby increased.

A committee of the members is now on deliberation concerning the "disease of the apple trees on the Island of Montreal," a subject of great and practical importance, and their report will be of great value to horticulturalists and to the Society.

From a review of the events of the past year, and the progress of the Society, your Council have every reason to believe that their ardent wishes for the increase of the prosperity and usefulness of the Society will be realized, and that the Society may meet with still greater success, and obtain that support from its members and the public to which it is justly entitled, much, very much depends upon the zeal and activity of the members, and if they would see the Society rank more prominently as a public institution, its debt liquidated, and its membership augmented, they too must assist. It is upon the subscription that we are to depend in a great measure for funds not only to meet the current expenses, but to pay the old debts, and enable the Society to engage in furthering the study of Natural History. Let the members feel that a certain amount of responsibility rests upon them. The Council acting in conjunction would find additional motives for zeal and activity, and in promoting the legitimate objects of the Society. They should feel that the members are auxiliaries in their labors, and that their valuable counsel and assistance is afforded. The Society then will surely realize its important position.

Montreal, 15th May, 1862.

LIST OF DONATIONS TO THE MUSEUM.

DONORS' NAMES.	DONATIONS.
John Leeming, Esq.....	Specimen of a Bill-fish, (*Lepidosteus Huronensis.*)
James Ferrier, Jr., Esq..	Do. do.
Stanley C. Bagg, Esq...	Snuff-box of a Mandarin.
	Map of the Seceding States of America.
	Piece of Christ Church Cathedral Bell.
	Piece of Magnetic Wire from Sebastopol.
	Rock Specimen from Cape Diamond, C. E.
	Do. Sault-aux-Recollets.
Mr. William Hunter.....	Male Canada Porcupine, (*Hystrix dorsata.*)
	Nest of Indigo Bird, (*Spyzia Cyanea,*) 4 eggs.

List of Donations to the Museum.

Donors' Names.	Donations.
Mr. William Nivin.....	Rice Bunting, (*Dolichonyx oryzevora.*)
	Baltimore Creole, (*Icterus Baltimore.*)
	Red-winged Starling, (*Aglaius Phœniceus.*)
	Tyrant Fly-catcher, male and female, (*Muscicapa tyrannus.*)
	Yellow-billed Woodpecker, male and female, (*Picus varius.*)
	Common Blue-bird, female, (*Sialia Wilsonii.*)
John Leeming, Esq.....	Three Purple Grakles, two males and one female, (*Quiscalus versicolor.*)
	Red-winged Starling, (*Aglaius Phœniceus.*)
	Rice Bunting, (*Dolychonyx oryzivora.*)
	Purple Finch, (*Erythrospiza purpurea.*)
	Nest of Young King-fishers (7,) (*Alcedo alcyon.*)
	Common Crow, (*Corvus Americanus.*)
S. J. Lyman, Esq.	A pair of live Turtles for the Aquarium.
Alfred Baynes, Esq.....	A young female Fox, (*Vulpes fulvus.*)
Mr. John C. Struthers...	Common Tree Frog, (*Hyla versicolor,*) from Darlington, C. W.
	Specimens of Conglomerate from Hamilton, C. W.
Mr. Atcheson.....	Egg of the Great Northern Diver, or Loon, (*Colymbus glacialis.*)
	White-breasted Nest-hatch, (*Sitta Carolinensis.*)
F. D. Fulford, Esq.....	Specimen of Garter Snake, (*Coluber sirtalis.*)
Mr. David.....	Female Gos-Hawk, (*Falco palumbarius,*) from Three Rivers.
Mrs. Col. Denny.....	kin of a Flamingo fro m Carthage.
Mrs. Harvey.....	A species of Lizard.
H. G. Vennor, Esq.....	A species of Turtle from Constantinople.
George Barnston, Esq...	Three Eggs of the Spotted Sandpiper.
	Four Eggs of the White-throated Sparrow.
John D. McCord, Esq...	Garter-Snake and young, (*Coluber sirtalis.*)
Mr. William Hagar.....	Piece of the Cap of a Bell burnt by Confederates at Harper's Ferry.
Mr. J. C. Swanston.....	Coin of the reign of Queen Anne, 1703.
Mr. Rowe.....	Great Blue Heron, (*Ardea Herodias,*) from Norton Creek, C. E.
Mr. Thomas Swanston...	Specimen of Horned Frog.
Peter Redpath, Esq.....	" *Gorgonia pinnata* from California.
	" Cray-fish from Mammoth Cave, Virginia.
Mr. Charles Robb.....	Copper Beads and Shells of Purpura; Indian relics found near Brockville, C. W., with explanatory notice.
Thos. Savage, Esq.....	Great Horned Owl, (*Bubo Virginiana,*) from Shefford, C. E.
A. F. Brown, Esq.....	Specimen of Fruit.
Mr. James Hempstead...	Collection of New Zealand War Implements.
Mr. G. H. Vennor.....	Salmon Trout from Lake Magog, C. E.
Dr. J. A. Crevier.....	A Turtle from Constantinople.
Mr. James Thomson.....	Pair of Gold Fishes for Aquarium.

List of Donations to the Museum.

Donors' Names.	Donations.
Mr. John Sheppard	Specimen of Scrub Pine.
"	" Fungus.
John Leeming, Esq.	Nine Busts and Statuettes.
	Three Porcelain Jugs and Vases.
Dr. Dawson	Collection of Plants from Mount Washington

List of Donations to the Library.

Donors' Names.	Names of Books.	
Official	Canada Gazette.	Received regularly.
"	Journal of Education.	
The Publishers	Canadian Naturalist and Geologist.	
Exchange for Naturalist.	Canadian Journal, Toronto.	
	Annals of Botanical Society of Canada.	
	Proceedings of Lit. and Hist. Soc. Quebec.	
	Silliman's American Journal.	
	Journal Franklin Institute.	
	Proceedings of Essex Institute.	
	" Entomological Soc. of Phila.	
The Publishers	London Geologist.	
	" Technologist.	
	" Phytologist.	
	Journal of Society of Arts.	
	British American Journal.	
	Scientific American.	
	Academy of Arts and Sciences, Philadelphia, 5 volumes, and Nos. 329 to 884.	
Official	Statutes of Canada, in English and French.	
	Historical Magazine, June, 1861.	
	Explication du Zodiaque, Caen, 1861.	
The Author	Les Oiseaux du Canada, par J. M. Lemoine.	
	Dundas, or Early Canadian History, by James Croil, Esq.	
	Pamphlets on *Sanguinaria Canadensis*, by Dr. Gibb.	
J. A. Perkins, Jr.	Smithsonian Contributions for 1856.	
Smithsonian Ins., Washington	Do. do.	
Mr. Hammond	Pamphlets on Nat. Hist. Konigsberg.	
Royal Academy, Stockholm	Entomologiska Bidrag, P. III, 1859.	
Dr. Dawson	Calendar of McGill University.	
U. S. Patent Office, Washington	United States Patent Laws and Directions, 2 vols.	
	California Agricultural Soc. Jour., March to May, 1861.	

LIST OF DONATIONS TO THE LIBRARY.

DONORS' NAMES.	NAMES OF BOOKS.
C. Dunkin, Esq., M.P.P.	19 vols. Natural History of State of New York, with the accompanying maps.
	Ray's Natural History.
S. L. Goodale, Esq.....	Report of Maine Board of Agriculture, 1860.
Dr. Gibb, London.....	Addresses of Presidents Geol. Soc. of London, 3 copies.
Jules Marcou, Esq.....	Pamphlets on Taconic and Lower Silurian Rocks.
University of Norway...	Scientific Pamphlets, 1 book and 16 pamphlets.
Hon. East India Co., London.....	Magnetical and Meteorological Observations for 1859, Bombay Observatories, 9 pamphlets.
Geological Soc., Berlin..	8 pamphlets on Scientific Subjects.
John Leeming, Esq.....	Taylor's Statistics of Coal, 1 vol. 8vo.
	Bituminous Substances employed in arts, Philadelphia, 1855.
	Waddington's Visit to Ethiopia, London, 1822.
	Antiquities, &c., in St. Peter's, Westminster.
	6 vols. Statistique Général de la France.
	2 vols. Bibliothèque des Mémoires.
	1 vol. Algebra, M. Bourbon.
	5 vols. Chimie, Thenard.
	1 vol. Histoire des Etats Européens.
	1 " " de Moyen Age.
	2 vols. Œuvres de Me. la Duchesse de Duras.
	1 vol. Littérature et des Arts.
	4 vols. Mulray's Chemistry.
	2 vols. Wilkinson on Galvanism.
	2 vols. Outlines of Mineralogy and Geology.
	4 quarto vols. Life of James the First of England.

THE CANADIAN NATURALIST.

The *Canadian Naturalist* is sent to the following Institutions, and Societies:—

CANADA, ETC.

University College,.....Toronto.
Trinity College,..... "
Canadian Institute..... "
Knox College..... "
Victoria College,.....Cobourg.
Queen's College,.....Kingston.
Botanical Society,..... "
McGill College,.....Montreal.
Bishop's College,.....Lennoxville.
Laval University,.....Quebec.
Literary and Historical Society..... "
Natural History Society.....St. John, N. B.

UNITED STATES.

Harvard College..... Cambridge, Mass.
Amherst College.....Amherst.
Yale College,.....New Haven.
Natural History Society,.....Boston.
American Acad. Sciences..... "
Essex Institute,.....Salem.
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Franklin Institute..... "
American Philosophical Society..... "
Smithsonian Institute,.....Washington.
Academy of Science,.....St. Louis.
University of Nashville,.....Tennessee.

GREAT BRITAIN.

Geological Society,.....London.
Linnean Society,..... "
Royal Society,..... "
Entomological Society,.....London.
Zoological Society,..... "
Society of Arts,..... "
Chemical Society..... "
Geological Survey of Great Britain..... "
Botanical Society,.....Edinburgh.
Royal Physical Society,..... "
Royal Society,..... "
Royal Scottish Society of Arts,..... "
Geological Society,.....Dublin.
Royal Irish Academy,..... "
Royal Society,..... "
Literary and Philosophical Society,.....Manchester.
Natural History Society,.....Newcastle upon Tyne

CONTINENT OF EUROPE.

Société Géologique de France,.....Paris, France.
Academy of Sciences..... "
Académie des Sciences, Arts, &c.,.....Dijon. "
L'Académie Royale des Sciences, etc.....Lyons. "
Academia Car. Leop.,.....Jena, Saxe Weimar.

Kaiserlichen Academie,.....Vienna, Austria.
Im. Geological Institute..... "
Deutsches Geolog. Gesellschafft, ...Berlin, Prussia.
Koniglichen Akademie der Wissenschaften. " "
Koninklijke Akademie van Wetenschappen. Amsterdam.
Konigl. Gesellschaft der Wissenschaften...Gottingen.
Société Hollandaise des Sciences.....Haarlem.
Konigl. Sachs. Gesellschaft der Wissenschaften.....Leipzig.
Société Imperiale des Naturalistes.....Moscou.
Konigl. Bayerischen Akademie der Wissenchaften.....Munich.

And to the following Periodicals:—

CANADA.

The Medical Journal,.....Montreal.
Journal of the Board of Arts.....Toronto.

UNITED STATES.

Silliman's Journal,.....New Haven.

GREAT BRITAIN.

Annals and Magazine of Natural History,..London.
The Geologist,..... "
The Phytologist,..... "
The Zoologist,..... "
The Ibis,..... "
The Technologist,..... "
London, E. and D. Philosophical Magazine. "
Natural History Review,..... "
Microscopical Journal,..... "
Chemical News,..... "
The Builder,..... "
The Engineer,..... "
The Gardeners' Chronicle,..... "
Edinburgh New Philosophical Journal,...Edinburgh.

CONTINENT OF EUROPE.

Annales des Sciences Naturelles,.....Paris, France.
Archives de Musée,..... " "
Allgemeine Deutsches Naturh. Zeitung,...Dresden, Saxony.

Archiv. fur Naturgeschichte by Weigman,. Berlin, Prussia.
Leopoldina,.....Jena, Saxe Weimar.
Leonhard und Brohn Jahrbuch,.....Stutgardt, Wurtemburg.
Flora,.....Ratisbon, Bavaria.

OFFICERS FOR 1862-3.

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THE NATURAL HISTORY SOCIETY OF MONTREAL IN ACCOUNT WITH JAMES FERRIER, JUNR., TREASURER.

DR.

1861. May 1.	RECAPITULATION.	
Balance due the Treasurer,		$173 25
Cash paid, Mr. Hunter's salary,		200 00
" J. A. Perkins, Jr.		100 00
" C. McCormick		46 20
" Interest		318 00
" for Fuel,		122 00
" City Assessments		111 10
" Water Rent		81 75
" Gas Account		24 60
" Insurance		38 00
" Books and Binding		252 30
" Advertising and Printing		148 16
" Repairs and fixtures		67 48
" Incidental expenses		35 90
Balance in Treasurer's hands		16 26
		$1735 00

Montreal, 1st May, 1862.

CR.

1862. May. 1.	RECAPITULATION.	
By cash received for subscriptions and diplomas		$715 00
By cash received for admission fees to museum		20 00
By cash received for annual govern. grant		1000 00
		$1735 00

JAMES FERRIER, JUNR.,
Treasurer N. H. S.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTINS, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF APRIL, 1862.

Latitude, 45 degrees 32 minutes North. Longitude, 73 degrees 36 minutes West. Height above the level of the Sea, 118 feet.

BY CHARLES SMALLWOOD, M.D., LL.D.

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE. Mean amount of, in tenths.	RAIN. Amount of, in inches.	SNOW. Amount of, in inches.	WEATHER, CLOUDS, REMARKS, &c. &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.					6 a. m.	2 p. m.	10 p. m.
1	30.149	30.179	30.254	36.2	43.9	34.1	.177	.218	.155	.85	.76	.79	E. S. E.	S. S. E.	S. S. W.	0.30	1.5			Cirr. Str. 4.	Cu. Str. 10.	Cu. Str. 9. Hail & rain 7.10 pm.
2	290	114	29.927	32.1	51.4	33.1	.143	.296	.168	.79	.78	.89	S. S. E.	S. S. E.	S. by W.	118.10	3.0	Inapp.		Fog.	" 4.	Clear.
3	29.779	29.824	909	40.1	47.2	35.8	.203	.298	.177	.82	.92	.84	W. S. W.	W. S. W.	W.	409.90	2.5	0.014		Cirr. Str. 10.	Rain.	Rain.
4	30.210	30.158	30.251	22.0	43.2	27.0	.084	.177	.111	.71	.66	.75	W.	S. by W.	S. W.	233.60	1.0			Clear.	Clear.	Clear. Zodiacal Light Bright.
5	109	29.779	29.770	17.1	29.2	27.4	.063	.142	.129	.67	.88	.88	N. E. by E.	S. S. E.	W. S. W.	255.60	2.5			Clear.	Snow.	Cu. Str. 10.
6	29.861	897	30.104	30.1	34.6	26.2	.130	.126	.111	.78	.65	.81	S. S. W.	W. by N.	W. N. W.	122.70	1.5			C. C. Str. 8.	Clear.	C. Cum. 4.
7	30.228	30.221	235	11.6	36.4	15.4	.051	.149	.055	.72	.71	.64	W. S. W.	W. S. W.	S. S. E.	214.80	0.5			Clear.	"	Clear.
8	196	144	135	5.1	44.3	16.7	.041	.196	.053	.74	.68	.75	N. E.	E.	S. S. W.	42.20	0.5			"	Cirr. Cum. 4.	"
9	103	009	101	10.4	41.1	24.3	.054	.190	.094	.78	.74	.73	E.	N. N. E.	N. N. E.	105.90	1.6			Clear.	Clear.	"
10	145	345	277	14.7	52.4	36.7	.042	.282	.184	.62	.73	.85	N. E. by E.	S. E. by E.	S. E.	172.00	1.5			"	" Inp. S. H. 9.30.	C. C. Str. 6.
11	319	400	407	22.5	54.0	31.0	.095	.308	.126	.78	.74	.76	N. E. by E.	S. E. by E.	S. E. by E.	86.50	0.8			"	"	Clear.
12	379	367	344	26.2	56.0	35.2	.111	.342	.177	.81	.78	.85	N. E.	S. W.	S. by W.	118.40	0.5			"	"	"
13	250	241	227	30.9	56.3	35.6	.134	.315	.177	.82	.71	.85	N. E. by E.	S. S. E.	S. S. E.	0.20	0.5			"	"	"
14	201	199	241	24.1	57.4	38.9	.100	.331	.188	.79	.81	.87	N. E. by E.	S. E.	S. E. by E.	2.00	1.0			"	Cu. Str. 4.	C. C. Str. 8.
15	398	524	351	37.2	51.7	39.9	.199	.296	.210	.90	.79	.86	S. S. E.	S. E.	S. E. by E.	1.10	1.0	Inapp.		Slight Rain.	C. C. Str. 4.	Clear. Faint Au. Bor.
16	279	183	110	36.5	61.2	44.2	.191	.442	.265	.90	.83	.92	E. by S.	S. E. by E.	E. S. E.	5.11	1.5			Clear.	Cirr. 4.	Cu. Str. 9.
17	001	048	29.998	48.6	66.4	48.1	.303	.502	.310	.89	.78	.92	E. S. E.	S. S. W.	S. by W.	56.90	0.5			C. C. Str. 6.	" 4.	Cirr. 2. Zodiacal Light.
18	29.997	29.893	750	40.5	66.1	42.0	.219	.219	.244	.88	.87	.91	W. by N.	W. by N.	S. W. by S.	30.80	1.5	0.161		Fog.	C. C. Str. 4.	Rain.
19	824	954	30.002	41.1	46.1	39.9	.212	.258	.210	.82	.81	.86	W.	W.	W.	344.50	2.0			C. Cum. 6.	Cu. Str. 8.	Cu. Str. 10.
20	30.007	30.075	151	38.4	50.0	39.7	.186	.290	.195	.81	.82	.82	W. by S.	S. W.	S. by W.	66.30	0.5			Clear.	Clear.	Clear. Zodiacal Light Bright.
21	097	29.924	29.960	34.1	52.9	41.2	.162	.308	.235	.84	.79	.91	E. S. E.	S. E.	S. E.	45.20	0.5			"	Cu. Str. 10.	Rain.
22	29.698	498	458	38.0	49.9	44.6	.214	.297	.282	.95	.92	.96	N. N. E.	N. E. by E.	S. E.	139.20	2.5	0.220		Cu. Str. 10.	C. C. Str. 10.	Cu. Str. 10.
23	464	620	820	40.1	43.1	29.0	.210	.222	.129	.86	.83	.84	W. S. W.	S. W.	W. by N.	317.00	1.0			" 8.	C. Cirr. 4.	C. C. Str. 8.
24	861	937	30.042	26.1	32.3	32.0	.111	.143	.149	.81	.79	.84	N. W.	W. S. W.	W. by N.	456.80	0.5			" 4.	Cu. Str. 10.	Clear.
25	30.164	30.130	186	24.7	50.1	33.6	.105	.290	.149	.81	.80	.84	W. N. W.	S. S. W.	S. S. W.	122.90	1.0			Clear.	Clear.	"
26	340	323	364	31.1	57.6	39.9	.158	.372	.195	.89	.78	.82	N. E. by E.	E. S. E.	S. E. by E.	32.90	1.5			C. Cu. 4.	"	
27	391	301	260	32.1	62.7	42.1	.149	.422	.244	.84	.75	.91	N. E. by E.	N. E. by E.	N. E. by E.	16.80	1.0			Clear.	C. C. Str. 4.	Cu. Str. 10.
28	101	050	060	44.6	45.9	43.6	.282	.275	.271	.96	.92	.96	E. S. E.	S. S. E.	E. N. E.	112.90	2.5	Inapp.		Rain.	Cu. Str. 10.	Rain.
29	070	020	021	40.1	59.2	40.1	.225	.380	.210	.91	.76	.86	E. S. E.	S. by E.	S. W.	53.70	2.0			Cu. Str. 10.	" 4.	Clear. Faint Aur. Bor.
30	098	021	142	42.1	65.2	47.0	.228	.490	.305	.87	.81	.96	S.	S. W. by S.	S. E.	75.90	1.0			C. C. Str. 4.	Clear.	"
...																						

REPORT FOR THE MONTH OF MAY, 1862.

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE. Mean amount of	RAIN. Amount of, in inches.	SNOW. Amount of, in inches.	WEATHER, CLOUDS, REMARKS, &C., &C. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.					6 a. m.	2. p. m.	10 p. m.
1	30.061	30.127	30.091	42.6	50.0	43.7	.237	.302	.248	.87	.82	.88	N. E. by E.	N. E. by E.	N. E. by E.	107.60	2.0	0.133		C. C. Str. 4.	Rain.	Rain.
2	29.954	29.821	29.818	40.4	49.1	45.3	.225	.322	.300	.90	.92	1.00	N. E. by E.	N. E. by E.	N. E. by E.	185.90	5.0	1.576		Rain.	"	"
3	819	829	845	44.2	64.2	52.1	.248	.464	.334	.96	.77	.86	S. S. E.	S. W.	S. E.	89.20	3.0	Inapp.		Cu. Str. 10.	C. C. Str. 8.	C. C. Str. 4.
4	795	733	772	46.2	56.8	46.7	.262	.385	.280	.84	.84	.88	S. W.	S. W.	S. S. W.	147.50	1.0			C. C. Str. 4.	Cu. Str. 8.	Cu. Str. 2.
5	694	701	783	42.1	58.4	50.2	.244	.246	.309	.91	.91	.85	S. by W.	S. W.	S. W.	125.80	1.0	Inapp.		Rain.	" 4.	C. C. Str. 4.
6	600	343	454	39.7	61.0	46.5	.210	.436	.262	.86	.80	.84	W.	W.	N. by W.	196.00	2.0			Clear.	C. C. Str. 4.	Clear. Faint Aurora Borealis.
7	487	550	672	31.1	40.0	39.1	.155	.235	.195	.89	.91	.82	N. E. by E.	N. N. E.	N. N. W.	112.30	4.0		.291	Snow.	Thaw.	Cu. Str. 6.
8	770	774	680	36.1	55.7	51.1	.177	.370	.315	.85	.84	.89	N. N. E.	N. N. E.	S. by E.	102.80	2.0			Cu. Str. 10.	Cirr. 4.	Clear.
9	601	394	807	46.3	67.1	56.9	.269	.556	.370	.88	.84	.84	W. S. W.	S. S. W.	W.	241.40	1.5			" 10. dis.thu.	C. Cirr. 4.	C. C. Str. 4.
10	434	549	754	49.7	56.2	43.0	.290	.288	.209	.82	.65	.75	N. N. W.	S. by W.	N. W.	347.40	1.5			Clear.	Cu. Str. 8.	Clear.
11	885	885	972	34.1	66.4	48.2	.156	.438	.242	.80	.68	.74	W. by N.	N. by W.	S. S. W.	297.70	1.5			"	Clear.	Cu. Str. 4.
12	884	710	712	46.4	73.6	59.8	.262	.351	.403	.84	.44	.79	S. S. W.	N. N. E.	S. W.	165.10	2.0			Cu. Str. 10.	Hazy.	Hazy.
13	752	744	836	46.4	60.1	47.0	.262	.374	.256	.84	.73	.81	S. W.	S. by W.	S. by W.	60.50	2.0	Inapp.		" 10.	Clear.	Clear.
14	834	862	876	47.4	60.1	57.0	.232	.262	.378	.73	.51	.81	N. E.	E. S. E.	S. S. E.	53.60	1.5			Clear.	"	Cu. Str. 4.
15	918	850	903	51.1	84.3	64.0	.296	.923	.471	.80	.79	.81	S.	S.	S.	71.60	1.0			"	"	" Meteor S. 8 p. m.
16	917	892	800	69.1	87.4	64.8	.462	.928	.433	.82	.72	.75	S.	S.	S. by E.	107.30	1.0			"	"	C. Cum. 4.
17	892	736	648	58.2	88.1	67.4	.423	.915	.556	.88	.69	.83	S.	S.	S. by W.	59.10	1.0			"	"	Clear.
18	593	572	438	60.4	91.0	69.1	.345	1.039	.599	.78	.75	.85	S. by W.	S. by W.	S. by W.	181.00	1.5			"	Cu. Str. 4.	Cu. Str. 2.
19	414	464	602	47.2	58.3	49.0	.280	.416	.253	.88	.85	.74	W. S. W.	W. S. W.	W. S. W.	478.10	2.5	Inapp.		Cu. Str. 10. dis.thu.	" 4.	" 8.
20	694	856	906	40.1	63.2	48.2	.160	.446	.260	.74	.77	.78	N. W.	W. by S.	W. S. W.	80.72	1.0			Clear.	Clear.	Clear.
21	30.001	916	710	44.7	60.5	84.2	.202	.338	.362	.71	.65	.87	S. S. E.	S. E.	S. E.	118.90	3.5	0.680		C. C. Str. 6.	Rain.	Cu. Str. 10.
22	29.628	782	780	41.1	58.4	52.1	.235	.353	.334	.91	.73	.86	S. S. W.	S. S. W.	W. S. W.	376.90	3.0	0.336		C. C. Str. 10.	Cu. Str. 10.	Clear.
23	601	748	899	56.1	62.9	47.0	.391	.363	.249	.87	.64	.77	W. S. W.	W. N. W.	N. by W.	130.11	1.5	Inapp.		Cu. Str. 10.	Clear.	"
24	980	876	899	38.2	55.9	58 3	.165	.288	.334	.72	.65	.82	N. W. by W.	W.	S.	162.20	1.5			Clear Frost.	Str. 4.	"
25	856	827	816	47.2	65.0	54.0	.197	.427	.315	.78	.71	.83	S. by W.	W. by S.	W. S. W.	152.00	1.5			"	Cu. Str. 4.	C. C. Str. 4.
26	866	840	747	47.0	67.1	55.3	.256	.425	.328	.81	.64	.77	N. E. by E.	S. S. W.	N. E. by E.	162.40	1.5			C. C. Str. 6.	C. C. Str. 4.	Cu. Str. 10.
27	621	582	521	50.0	80.0	60.9	.309	.634	.419	.85	.67	.80	E. S. E.	S. E. by E.	E. S. E.	225.50	2.0	Inapp.		Cu. Cirr. 10.	C. Cirr. 4.	" 10.
28	630	606	617	54.2	61.3	48.8	.362	.383	.229	.87	.71	.69	S. S. E.	S. W.	W. S. W.	298.20	1.0			C. C. Str. 10.	Cu. Str. 4.	Clear.
29	660	689	714	44.4	67.2	55.3	.215	.425	.321	.79	.64	.74	W. N. W.	W. by N.	W. by N.	243.30	1.0			Clear.	Clear.	"
30	451	580	751	39.1	70.4	50.2	.180	.449	.309	.77	.61	.85	S. S. E.	S. S. E.	S. S. E.	0.30	1.0			"	"	" Au. Borealis.
31	702	667	704	46.0	77.9	57.9	.238	.658	.372	.77	.67	.78	E. S. E.	S. S. W.	S. S. E.	0.00	1.5			"	"	"

REMARKS FOR APRIL, 1862.

Barometer ..... Highest, the 11th day, 30·407 inches. Lowest, the 23rd day, 29.465 " Monthly Mean, 30.074 day, " Range, 0.943 "

Thermometer ... Highest, the 17th day, 66°4. Lowest, the 8th day,—5°1. Monthly Mean, 39°06. Monthly Range, 61°3.

Greatest intensity of the Sun's rays, 82°2.
Lowest point of Terrestrial radiation,—5°0.
Mean of Humidity, .816.
Snow fell on 1 day, amounting to 3.70 inches, it was snowing 6 hours 0 minutes.
Rain fell on 6 days amounting to 0.395 inches it was raining 12 hours 13 minutes.
Most prevalent wind, E. S. E.
Least prevalent wind, the S.
Most windy day the 24th day, mean miles per hour, 19.03.
Least windy day the 13th day, mean miles per hour, 0.00.
Aurora Borealis visible on 21 nights.
Zodiacal Light bright and well defined.
The Electrical state of the Atmosphere has indicated very feeble intensity.
Fringilla Melodia. Song Sparrow. (*Rossignol* French) first heard on 6 day.
Swallows. *Hirundo Rufa* 1st seen 20th day.
Wild geese. *Anser Canadensis*, 1st seen flying N. 26th day.
Frogs *Rana fontinalis*, 1st heard 29th day.
Thermometer in ground 18 inch deep 44°.

REMARKS FOR MAY, 1862.

Barometer. ..... Highest, the 1st day, 30.129 inches. Lowest, the 6th day, 29.343 " Monthly Mean, 29.738 " Monthly Range, 0.784 "

Thermometer. Highest, the 8th day, 91°0. Lowest, the 24th day, 28°2. Monthly Mean, 54°61. Monthly Range, 62°9.

Greatest intensity of the Sun's rays, 98°2.
Lowest point of Terrestrial radiation,—24°7.
Mean of humidity, .786.—Amount of Evaporation, 3.61 inches.
Rain fell on 11 days, amounting to 2.725 inches; it was raining 34 hours and 45 minutes and was accompanied by thunder on 2 days.
Amount of Evaporation 3·61 inches.
Snow fell on 1 day amounting to 2·91 inches; it was snowing 5 hours and 20 minutes.
Most prevalent wind, S. W.
Least prevalent wind, N. by W.
Most windy day, the day; mean miles per hour, 19,97.
Least windy day, the day; Calm.
Aurora Borealis visible on 2 nights.
The Electrical state of the Atmosphere has indicated moderate intensity.
Temperature of the ground 18 inches deep 31.°0.

Errata in last No. Reports of January, February and March, for 1861, *read* 1862.

CONTENTS OF NUMBER III.

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