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THE CANADIAN Naturalist and Geologist,

AND PROCEEDINGS OF THE NATURAL HISTORY SOCIETY OF MONTREAL.

CONDUCTED BY A COMMITTEE OF THE NATURAL HISTORY SOCIETY.

VOLUME VII.

Montreal:
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1862.

CANADIAN NATURALIST.

This Magazine is published bi-monthly, and is conducted by a Committee of the Natural History Society of Montreal.

CONTENTS OF VOLUME VII.

LIST OF ERRATA.

VOLUME V.

Page 244, line 15 from bottom, for "Environs," read "Emmons."
" " " 3 " " " "1850," read "1858."
" 247, " 11 " top, " "*Thisbe*," read "*Thysbe*."
" " " 3 " bottom, " "*McMurtrici*," read "*McMurtreei*."
" 248, " 6 " " " "*contiqua*," read "*contigua*."
" 249, " 8 " top, after "Spring" insert a full stop, and "Imago in."
" " " 9 " bottom, for "1448," read "1488."
" 251, " 9 " top, insert "on the outerside" after "accompanied."
" " " 18 " bottom, for "cones," read "leaves."
" 253, " 7 " top, for "*lineata*," read "*linea prima*."
" 255, " 6 " " " "incomplete," read "incompletely," and omit the comma after it.
" " " 14 " " " "*pisco*," read "*fusco*."
" " " 19 " " insert "is" after "hue."
" " " 21 " " for "uniform," read "cuneiform."
" 258, " 17 " bottom, for "*tragogoponis*," read "*tragopogonis*."
" 262, " 11 " top, insert a full stop after "White," and supply a capital H to "head."
" 264, " 18 " bottom, for "8," read "6."
" " " 7 " " " "*Cerrino*," read "*Cervino*."

VOLUME VI.

Page 36, line 7 from bottom, for "*denis*," read "*deviis*."
" 39, " 19 " " " "*converzaria*," read "*convergaria*."
" 40, " 18 " top, for "Sugar-bush," read "Round."
" " " 17 " bottom, for "*cosemia*," read "*coremia*."
" " " 16 " " " "*conspersæ*," read "*conspersa*."
" 41, " 16 " top, for "*fusio*," read "*fusco*."
" 121, " 7 " bottom, dele "F. 30th June."
" " " 5 " " for 13th," " read "30th."
" " " 3 " " after "Town" add "Line."
" 122, " 6 " " " "Sphagnum," dele "and."
" 123, " 10 " " for "distinct," read "district."
" 124, " 1 " " add "Limestone" before "rocks."
" 126, " 24 " " for "June," read "September."
" 131, " 16 " " " "pine," read "fine."
" " " 3 " " " "pinging," read "fringing."
" 133, " 4 " top, for "Chip-nambo," read "Chip-munk."
" " " 7 " " " "20th June," read "16th July."
" " after "*Smilacina stellata*," add "*Smilacina bifolia*, *Ker*. Abundant everywhere in woods; F. 20th June."
" 136, line 11 from top, for "30 Tune," read "30th June."
"Sugar-Bush Lake" frequently occurs instead of "Round Lake."
"St. Jean Lake" instead of "Eagle-nest Lake."
"Chain Lake" instead of "Balsam Lake."

VOLUME VII.

Page 81, last line for "*Plectrophanes nivalis*" read "*Fringilla* (*Junco*) *hyemalis*."
" 101, line 4th from bottom, for "those which escape," read "that which escapes"; and line 2nd from bottom, for "render," read "renders."
" 377, line 10 from top for "specimens" read "species.
" 380 " 3 " " after parenthesis, insert "between."
" 381 " 27 " " for "4th" read "3rd."

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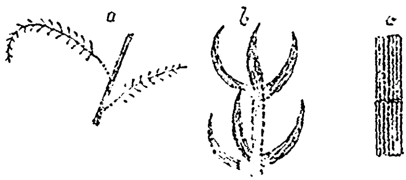
Vol. VII. FEBRUARY 20, 1862. No. 1.



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THE

CANADIAN

NATURALIST AND GEOLOGIST.

VOL. VII. FEBRUARY, 1862. No. 1.

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

(Presented to the Natural History Society.)

Some apology may appear necessary here for the use of a term, regarded by many geologists as calculated to perpetuate false ideas as to the character and origin of the series of rocks which it comprehends. The object of the following paper, however, being merely to point out certain analogies, and possibly, differences, between certain groups of rocks in Norway, and their equivalents in Canada, the name given them is of minor importance; and when it is considered how difficult it is to choose among the various terms which have been proposed and used for designating these formations, the one adopted in the above title may appear excusable, and not perhaps be deemed unserviceable on this occasion.

The groups of rocks, whose equivalents in Norway I propose in some measure to describe, are here known as the Laurentian system, the Huronian and the Metamorphic Silurian series. The first of these is generally designated the Primitive Gneiss formation, (*Urgneiss Formation*) in Germany and Scandinavia, while the two last mentioned groups make up what is termed there the Primitive Slate formation (*Urschiefer Formation*). I propose to describe these groups of rocks as they occur in Norway, principally in regard to their petrographical and economic characters. I shall follow the order in which they are mentioned above, inserting at the end of each description, a few remarks on their development in Canada. The various facts related in the following descriptions are principally derived from such authorities as Naumann and Keilhau; my personal observations of the districts under notice, having only served to imprint on my mind the descriptions of these and other philosophers. The particulars narrated as to the various mining establishments, are to a great extent however, the results of my own experience and observation. As to the various features touched upon with regard to Canada, my principal source of information has of course been the reports of the officers of the Geological Survey.

I. The Primitive Gneiss Formation.

In Keilhau's "First attempt towards a Geological Map of Norway," as yet the only complete geological map of the country published, there are distinguished three geographical divisions, belonging to the Primitive Gneiss formation, separated from each other by groups of rocks, belonging either to the primitive slate, the eruptive granite and syenite, or to the Silurian series. The first of these is situated high up in Finmark, its most northern point being the North Cape. The second stretches from Beiern-fiord, north of Trondhiem, along the whole coast of Norway, southward to Christiansand, and from thence north-eastward to Kragerö. To this division, the gneiss districts of Kongsberg and Modum also belong. The third division is that lying to the eastward of Christiania-fiord and lake Miosen. These three divisions form only the most westerly parts of the great Primitive Gneiss formation, which extends through Sweden to Finland, and which is the characteristic feature of Scandinavian geology. The rocks which constitute this formation are the following:—

1. *Gneiss* in many varieties, the most common being what is called by Keilhau, *characteristic gneiss*, and which he thus describes. "The rock consists of white or reddish white feldspar, (orthoclase), grey quartz and black mica; the feldspar and quartz being combined with each other granularly, and the mica arranged in this mass in parallel layers; so that the structure is more an alternatively granular and slaty one, than a regularly slaty structure, with quite equal distributions of the three con-

stituents. In this way, there is caused a characteristic streaked appearance, sometimes with broad black or dark grey bands, and sometimes with the same streaks, narrower and farther from each other, according as the mica is more plentifully or more sparingly distributed in the rock. The grains of feldspar, quartz and mica, are mostly rather small in this variety of gneiss, so that it seldom becomes coarsely granular." *Gæa Norvegica*, p. 251. Through a gradual disappearance of the feldspar; the gneiss sometimes changes into mica schist, and through a gradual change in the position of the laminæ of mica, from that of parallel layers, to being irregularly distributed, the gneiss often passes into granite. Of the many varieties of gneiss, one deserves special notice; it has been called Porphyroid gneiss, and differs from the characteristic gneiss in containing lenticular-shaped aggregations of feldspar in a fine schistose matrix. It is this variety which has sometimes been called Eye gneiss.

2. *Hornblende gneiss*, differing from the characteristic gneiss in having exchanged the scales of mica for crystals of hornblende, arranged parallel with each other according to their longest axis. Sometimes however, the hornblende has only partially supplanted the mica, in which case intermediate varieties are formed between the hornblendic and common gneiss. Through gradual disappearance of both quartz and feldspar, the hornblende gneiss often changes into hornblende schist, and sometimes through a change in the structure of the rocks from schistose to granular, syenitic and greenstone rocks are formed.

3. *Granite* of the usual composition. It often occurs as a very coarse grained aggregation of dark red orthoclase with sparingly distributed quartz and mica.

4. *Mica schist*, composed of quartz and mica, with a schistose structure, and often containing garnets. It exhibits transitions into hornblendic schist as well as into gneiss, &c.

5. *Hornblendic schist*, forming transitions into greenstone, and when the structure continues coarse grained, into diorite and diabase.

6. *Chlorite schist*, consisting principally of chlorite and a little feldspar; here and there interwoven with fibres of hornblende.

7. *Talc schist*, mostly quartzose.

8. *Quartz*, as granular quartz rock, forming layers and zones; sometimes slaty, forming quartz slate.

9. *Euphotide*, consisting of brown diallage and white feldspar.

Other rocks allied to this, have been discovered in a good many localities, and described as gabbro.

10. *Serpentine*, sometimes occurs in such considerable masses as almost to entitle it to be regarded as a member of the formation. It is generally of a light yellow colour. The well known deposit of noble serpentine, occurring in the parish of Snarum, comes under this head.

11. *Granular limestone*, as marble, in layers and irregular masses.

12. *Conglomerates* and breccia, mostly the latter. One is described as "a granite-like combination of gneiss and granite," another "angular pieces of gneiss united by a gneissoid cement;" a third consists of "a gneissoid or granitic matrix, enclosing small fragments of other gneissoid rocks."

Besides the rocks above enumerated, there occur numberless varieties, forming transitions between these types of rock, some of which have been already adverted to. Sometimes, as Naumann remarks, "within small spaces, one and the same specific composition shews characters so quickly and so frequently changing, than we soon get accustomed to seek what is similar, only in the specific identity of the constituents, and not at all in the way or quantity in which they are combined." *Beiträge zur Kentniss Norwegens*, I. 188.

As the name Primitive Gneiss formation implies, the most widely distributed rock is the gneiss, either in its characteristic form or its varieties. The next most frequently recurring rocks are granite, mica schist and hornblende schist, or rocks related to these types. Some other rocks which I have enumerated, such as chlorite and talc schists, granular limestone and quartzite, occur in comparatively small quantity, while the remainder of those mentioned must be looked upon as uncommon occurrences.

As to the mode in which these rocks are associated with each other, the whole of them are arranged in parallel layers or zones, side by side, underlying or overlying each other. Hitherto no regular succession of rocks has been marked; they appear to be interstratified with each other without rule. The granitic masses are partly conformable with the parallel masses of the schistose rocks, and partly occur irregularly. It has been remarked that when the granite becomes more or less gneissoid, its masses are regularly interstratified with the other schistose rocks; but where the granite is totally free from all traces of gneissoid texture, the form in which it occurs deviates more or less from that of layers or beds. A remarkable instance of this is described by Keilhau, as occurring near Norefield. There he saw a mass of granite, which on the whole, was gneissoid and bedded, gradually change at a certain place into a perfect granite, and then, in complete uninterrupted continuity, pierce the rock in the form of a dyke. Another instance is mentioned of a granite rock occurring in the schistose rocks, "partly in very regular layers, partly as isolated knolls and lumps, and partly as a multitude of veins; which in several places run through large portions of the neighbouring mountain as a close net-work." In spite of this however, this granitic rock showed in many places, a gneissoid structure. The relations of the hornblende schists and greenstones resemble those of the granite. The hornblende schist is regularly interstratified with the gneiss, mica schist and other rocks. Where its texture becomes less slaty, the layers or zones are not so continuous, but form, in the direction of the strike, elongated nuclei, which, with their hard masses, often stand out from the general surface, and thus form well distinguished peaks, such as Johnsknuden near Kongsberg, and Fagerlidknatten south-east in Nedenæs. Instances of crystalline amphibolites cutting the strata, occur in the most northern gneiss district, but these appear to have been formed much later than the gneiss. Mention is also made of a diorite, or feldspathic hornblende rock, occurring in veins in a granular mixture of quartz, feldspar and garnet, which latter rock appeared to form a transition into the gneiss.

One of the most striking features seen in the structure of this group of rocks, is the foldings and contortions, which the strata exhibit in all the divisions of the group. This is observed as well where no granitic masses are seen, as in the neighbourhood of such. On the high roa from Hougsund to Kongsberg, and shortly before reaching the latter place, the traveller can observe, without dismounting, the most wonderful bends and contortions in the structure of the gneissoid rocks occurring there. Scheerer, in describing these contortions, compares them to the windings figured upon marbled paper. Naumann, in remarking on the same phenomena on the north-west coast, expresses himself as follows: "It is usually said of gneiss, that it is always clearly and regularly stratified. This assumes that the parallelism of the masses, of not too great extent, has a relation to one plane; that the positions of the planes of structure within small distances, are only subjected to small, and generally gradual and continuous alterations; that these do not frequently shew sudden faults, or leaps in the most varied directions, within a few paces. If we however examine much of the gneiss of northern Bergenstift, we find exactly the opposite of this. Let one only observe the profiles which the play of the waves keeps so clearly and distinctly exposed on the rocky banks of Evenig-fiord, Outer Dalsfiord, and especially of Söndelvsfiord. In what absolute indefiniteness, in what indescribable confusion is the structure of the masses exhibited! And yet there reigns the most unequivocal parallel structure within those thousand-fold meandering windings of the single zones, in which no rule, no law is evident, for the wonderful windings appear so lost in each other that neither drawing nor description is able to follow them."

In the presence of such contortions, and of local foldings on a larger scale, it is of course difficult to ascertain the general strike of the strata. It seems however, that in all the principal gneiss regions of Norway, the rocks run most generally north and south, or at least N.N.E. and S.S.W., and this, although there are numerous exceptions, appears to be the general strike. It seems also that a generalisation is possible as well with regard to the dip, as to the strike of the rocks constituting this group. The strata are almost always vertical or nearly so. This is the distinguishing character of the formation, and, *en passant*, let me remark the great difficulty hitherto experienced in all theorizings as to its origin. Horizontal and less inclined strata have indeed been remarked in several places, but they must be regarded as exceptional. The dip is almost always over 45°, generally 60° to 80°, while perfectly vertical strata are often observable. These much inclined strata may be traced continuously many miles on the above mentioned north-easterly strike, and taken together, strike and dip, form a remarkable feature in the architecture of these rocks. As Keilhau remarks, " there lies spread out before us an area of many thousand square miles, which shews only in a few places, any other than steeply inclined strata. In a great many, and indeed we may say in the most and greatest portions of this area, we see these steep strata following some law of regular course. We find them stretching away ten, twenty and often many more geographical miles, according to the same lines, and it appears to us that there where new fields of strike begin, it is still the same parallel masses which we have previously observed, and which have only changed the direction of their strike." *Gœa Norvegica* I, 375.

The landscape features in the gneiss region vary much. We find in it sometimes tame hills, flat undulating plateaux, in which only the valleys cut into it, have exposed more rugged forms; but sometimes we find zigzag ridges, sharp peaks, and other remarkable mountain shapes. In the gneiss districts of the south, long-drawn, broad massive mountain ridges are most common, but on the north-west coast, the gneiss rises in rugged and fantastic forms above the surface of the water, in the numerous and intricate fiords of that region.

The mineral deposits of these districts are neither few nor uninteresting. Some of these are worked, and produce silver, copper, cobalt, nickel and iron, while others capable of yielding some of these metals or other minerals, remain unwrought or undeveloped. Foremost among the modes of occurrence of metals in this region, must be noticed the so-called *fahlbands.* These are not exclusively confined to the south of the *Fields* which run north-eastward across Norway at its broadest part, but it is there, and especially in the district of Buskerud, that they have experienced their greatest development. From a point to the west of Kongsberg, and near the junction with the so-called Tellemarken group, afterwards to be described, north-eastward to Tyrifiord, or to where the gneiss formation in Modum is overlaid by Silurian strata, there occurs a series of parallel zones of rock, having the same strike and dip as the rocks enclosing them, but distinguishable from these by the decomposed appearance and reddish-brown color which they present on the surface. This peculiar appearance, to which, according to Bôbert, they owe their distinguishing name (from *fahl* or *faul*, rotten, as the German miners, who first were employed in their exploration, termed them,) is attributable to the metallic sulphurets which they contain, and especially to iron pyrites; the ferric oxide and the sulphates produced in the oxidation of this being the coloring and decomposing agents. The quantity of metallic sulphurets necessary to produce this coloring and decomposing effect, is exceedingly small, and indeed it is sometimes scarcely possible to distinguish them, so finely disseminated are they through the mass of the rock constituting the fahlband. The sulphurets most generally present are common and magnetic iron pyrites, and copper pyrites; although blende and galena have both been mentioned as impregnating materials, they are comparatively rare. Besides these, cobalt glance, cobaltiferous arsenical, and iron pyrites, nickeliferous magnetic pyrites, and argentiferous iron pyrites characterise peculiar localities. The impregnation seems to be altogether independent of the nature of the rock; gneiss, mica schist, hornblende schist, &c., being alike found constituting fahlbands. The continuity of these impregnated zones is frequently astonishing, some of them having been traced in the direction of their strike, nearly north and south, upwards of ten miles. Their course is often marked by depressions in the rocks, caused by their greater proneness to decomposition, and these depressions are frequently occupied by marshes and lakes. The thickness of these bands varies from a few feet to several hundred, and they have been frequently observed to split up and throw off side bands, some of which seem to connect with other similar zones. Although, as in the case of the glance cobalt and cobaltiferous mispickel, the impregnating material is sometimes the object of mining enterprise, it is generally on the veins or irregular masses occurring in these fahlbands, that the mines of the district are situated. Concentrations of metallic sulphurets or other minerals in fissures parallel with or crossing the strata, are by no means uncommon, and in some instances have given rise to very profitable mining. The metallic deposits which I propose to notice in connection with those fahlbands, are the silver mines of Kongsberg, the copper mines of Eker, the cobalt mines of Skuterud, and the nickel mines of Ringerike, all of which are at present being worked.

The rocks in which the fahlbands of Kongsberg occur are gneiss, mica schist and hornblende schist; other rocks, such as granite, talc schist and chlorite-schist, granitic gneiss and greenstones occur also in the immediate neighbourhood. Seven different fahlbands or groups of fahlbands have been recognized as existing in these rocks around Kongsberg, on every one of which, at some time or other since the year 1623, more or less mining has taken place. The two fahlbands which have been most minutely examined, have an average thickness, respectively, of 200 feet and 1100 feet. The impregnating sulphurets are iron pyrites, magnetic and copper pyrites; some of which appear to be argentiferous, since the fahlband itself contains one-eighth of an ounce silver per cwt. These fahlbands are intersected throughout the whole extent, about six miles, by numerous veins containing generally calcspar, fluorspar, quartz and metallic silver, and more sparingly, bitterspar, stilbite, prehnite harmotome, laumontite, anthracite, fibrous pyroxene, chrysotile, asbestus, actinolite, axinite, adularia, and perhaps albite, auriferous silver, metallic gold, horn silver, metallic arsenic, silver glance, red silver ore, galena, blende, magnetic, iron, and copper pyrites. These cross veins are exceedingly well developed within the fahlband, but beyond its limits they exhibit little distinctness or regularity, and moreover are totally destitute of silver. They do not however, while intersecting the fahlband, uniformly contain that valuable metal; on the contrary its occurrence there is almost as uncertain as that of a valuable ore in any other lode, but only within the limits of the fahlband can one expect to find it. The only rule which seems to have been ascertained to exist with regard to its distribution in the vein, within the fahlbands, is this—that where the latter is most strongly charged with the impregnating sulphurets, the vein at that point is richest in silver.

Such are the characters of the Kongsberg silver veins, striking examples of the influence which the wall-rocks exert on the contents of metallic lodes, and little liable to be neglected in theories regarding the filling of such. The connection between the pyritous impregnation of the fahlbands, and the argentiferous contents of the veins, necessitates the deduction that the silver has been derived from the pyrites, and as these have been found to be argentiferous, the deduction assumes the character of a fact itself. As to the mode in which the silver has been secreted various opinions may exist; the most probable appears to me to be the following:—

Through gradual contact with the waters containing oxygen, percolating through the rocks, the sulphurets, especially the iron pyrites, were decomposed, sulphates of protoxide and peroxide of iron, and sulphate of protoxide of silver being the results. The first named salt would be produced in the earlier stages of the decomposition, and removed; the two latter salts, produced towards the end of the process, can exist simultaneously in solution. On reaching the fissure thus, in solution, they were met by some agent capable of precipitating the silver of the sulphate. The agent which seems to me to have accomplished this, is the sulphate of protoxide of iron, already alluded to as a product of the decomposition of the pyrites. The precipitation of silver salts by a solution of copperas, is a well known chemical reaction, the products being metallic silver and sulphate of peroxide of iron.

The number of veins intersecting the fahlbands at Kongsberg is very great indeed. While the mines belonged to the Danish government, almost the whole of them received some share of attention, an extensive but rather desultory system of mining thus resulting. Since the Norwegian government undertook the working of the mines in 1812, a different system has been pursued, rather the other extreme, of working at too few points. Only three veins, those of *Kongen's Grube*, *Armen Grube*, and *Gottes-Hülfe-in-der-Noth*, have been the subject of mining explorations. However this may be, the mining of the last twenty to thirty years has been eminently successful, and a source of considerable revenue to the Norwegian government. On account of the shortness of the veins, their exploration is pursued chiefly downwards, but as yet, in going downwards, no diminution in richness has been observed. On the contrary, large masses of metallic silver, similar to those which obtained for the mines their celebrity in earlier times, have been recently found. These large masses are of course the exception, the most of the silver which is produced being separated from the vein-stone, in breaking it up, after its extraction from the mines. A large portion is also obtained in the stamping and washing of middle and poor ores at the mines, and in the same operations considerable quantities of more or less argentiferous *schlichs* and slimes are produced. The whole of these products are farther treated in the smelting-house in Kongsberg. The poorer slimes and schlichs, containing from $\frac{3}{8}$ to $1\frac{1}{2}$ oz. per cwt., are smelted with about one-and-a-half times their own weight of a basic slag, containing very much ferrous oxide, from a subsequent smelting, and about half their own weight of iron pyrites. The resulting products are a regulus of sulphuret of iron, containing $3\frac{1}{2}$ or 4 oz. of silver per cwt., and slags, containing $\frac{1}{20}$ oz. silver, which are set aside as useless. The raw regulus is roasted in heaps, and then smelted with one-and-a-half times its weight of rich slags from subsequent operations, containing from 8 to 9 oz. of silver. The regulus from this operation, as it is drawn off from the furnace into the crucible outside, is there stirred up with molten lead, poor in silver. From this results argentiferous lead (which is used over again in the same way, until it contains from $8\frac{1}{2}$ to 10 per cent silver,) and a lead regulus (sulphurets of iron, lead and silver), containing of silver, 14 oz., per cwt. The slag from this second operation is what is used in the raw smelting. The lumps of metallic iron formed at the same time, and called iron swine, are worked up with the lead regulus, by being smelted together with the litharge and the hearths from the cupellation of the argentiferous lead. This operation produces lead containing only from 1½ to 2 per cent. silver, which is used in the treatment of the argentiferous regulus, as described above.

The lead regulus from this last smelting, which contains from 6 to 20 oz. of silver per cwt. is again smelted with lead, and its silver content is thus brought down to 4 or 6 ounces. It is then roasted and smelted with its own weight of poor slags containing 6 to 8 oz. of silver, when there results lead containing 4 to 5 lbs. of silver per cwt., which goes to the second operation; together with slags which are used in the first operation; and a copper regulus, containing 1 per cent silver, and 20 to 30 per cent copper. The latter is repeatedly smelted and treated with poor lead, until it contains not more than ½ oz. silver per cwt., when it is roasted and smelted to black copper.

The lead from the second operation, containing from 8½ to 10 per cent of silver, is cupelled in a German cupelling hearth, in which operation, hot air is used with great advantage. The resulting silver, and the rich silver ores from the mines, are refined in a furnace somewhat like the English cupelling furnace, the hearth of which rests on a well-arranged carriage, on which, after the operation is completed, the hearth is lowered on the one side, and the silver poured into the moulds standing prepared for it. The sweepings of this refinery, and the furnace hearths, are carefully smelted in a small furnace, and the products worked up, according to their contents in silver, in one or other of the operations already described.

The Eker copper mine consists of an irregular mass of iron and copper pyrites, situated on the strike of a fahlband, part of the impregnated rock of which is found to be so richly impregnated with copper pyrites as to be worth smelting. The ores are brought up by hand-picking at the mines, to about four per cent. They are then carted about four miles to the smelting house, where they are roasted in heaps. The roasted ore, with the addition of a little limestone, is smelted in shaft furnaces. The resulting regulus, of about 16 per cent, is concentrated by being again roasted and smelted, yielding a regulus of from 40 to 50 per cent. This when again roasted and smelted produces black copper, which, being refined on the small hearth to *gahr* copper, is sold in Christiania or Hamburg.

The cobalt mine of Skuterud occurs on a fahlband, which has been traced about five miles, the rock being a quartzose mica schist. Layers of impregnated hornblende and actinolite schists are also of frequent occurrence. The rocks run north and south, and have a dip nearly vertical; sometimes inclined slightly to the east, sometimes to the west. In these rocks the following metallic minerals have been observed; magnetic, iron and copper pyrites, characterising the fahlband; cobalt glance, cobaltine, cobaltiferous mispickel, magnetic iron ore, graphite, and molybdenite are found more sparingly, impregnating the fahlband at certain places. These latter minerals do not occur in veins, but they are sometimes associated with quartz. They seem to form rather a succession of small layers, running parallel with the foliation of the rock. They are by no means generally distributed through the fahlband, and it has only been by taking out the whole mass of this, that the cobaltiferous portions have been got at hitherto. The fahlband itself has a breadth of from one to five fathoms, and it seems, toward the north, to be divided into two different bands, separated from each other by a large mass of dead rock. The mines were discovered in 1772, and have since been uninterruptedly worked, notwithstanding an extraordinary decrease in the value of the products. The treatment of the ores, as at present pursued, is as follows. The rocks are broken and sorted into rich and common ores. In the treatment of the smalls by means of a fall wash-work, washed ore of a very small size is produced, besides the above sorts. The whole of this ore is so finely disseminated, that it can only be advantageously treated by stamping and washing. The stamping mill is of the construction used in Saxony. The resulting stamp meal and slimes are concentrated first on percussion and then on sleeping tables. The rich ore treated in this manner yields per ton 86½ lbs. of *schlich*, containing 17.96 lbs. metallic cobalt. The common ore yields per ton 29 lbs. of schlich, containing 1.88 lbs. of cobalt. The poorer schlichs are further concentrated by being partly roasted, and smelted with an addition of some limestone and slag. The resulting slag is set aside. The regulus (sulpharseniurets of iron, cobalt and copper,) containing about 22 per cent metallic cobalt, is roasted in reverberatory furnaces, and being mixed with the richer schlichs, which have also been calcined in the same way, forms what is called zaffre, containing about 30 per cent cobalt oxide. This is sent to market in England, where it is manufactured into cobalt oxide and smalt. A small quantity of the former product is manufactured on the spot in the humid way, but this quantity does not exceed one sixth of the whole amount of the cobalt oxide here produced in manufactured and unmanufactured products.

The fahlbands in the neighbourhood of Ertelien, and Ringerike, have not been so carefully studied as those of Kongsberg and and Skuterud; nevertheless it admits of no doubt, that the nickel mines of the former locality occur on impregnated zones of rock like the fahlbands. The deposits are irregular masses of magnetic iron pyrites containing two per cent of metallic nickel. Although a definite veinstone is not observable, it appears from the presence of selvages in various places, that the deposits partake of the nature of veins. Besides the nickeliferous pyrites, copper pyrites is produced at the mines in some quantity, but so contaminated with the former, as to be altogether useless as a copper ore. Occasionally, beautiful crystals of iron pyrites (pentagonal dodecahedrons), have been found, containing two per cent of metallic cobalt. The nickeliferous pyrites is sorted out at the mine, very pure, almost entirely free from rock. It is then roasted in heaps, and smelted in a shaft furnace with the addition of a little limestone. The resulting products are a very heavy slag, with is a basic silicate of ferrous oxide; a regulus of sulphuret of iron, containing about six per cent nickel, and iron swine, which collect in the interior of the furnace during the smelting, and interfere very much with its proper working. The regulus is again roasted in heaps and smelted, a more concentrated regulus with thirty per cent of nickel, resulting. The regulus, as well as the iron swine produced in both smeltings, are farther refined on a hearth similar to that used on the continent for refining copper. A farther scorification of iron takes place in this operation, and a regulus with fifty per cent of nickel and fifteen per cent of copper results, which after being ground to powder, is sent to market. It is mostly sent to Hamburg and sold to German nickel refiners. These mines were formerly wrought, and the pyrites roasted for the manufacture of copperas; it is only during the last fourteen years that they have been wrought for nickel.

Besides the four establishments here described, which are in full operation, there are a good many deposits connected with fahlbands, which are either abandoned, or have not as yet been worked. Of these the following may be mentioned—the cobalt mines of Svartefield, very similar in character to those of Skuterud, the copper works in Sognedalen, and on Kobberbergselven. There are also numerous localities of pyrites containing small quantities of nickel or cobalt, or both. The magnetic pyrites from Höiassen contains three per cent of nickel and six tenths per cent of cobalt; that from Rustand, six tenths per cent of nickel and one per cent of cobalt; that from Olafsbye one per cent of cobalt, and the iron pyrites from Sütersberg one per cent of cobalt.

There are however other deposits of pyrites in this formation, whose connection with fahlbands is more uncertain. Such localities for instance are those of Meinkier Grube, containing copper pyrites, nickeliferous magnetic pyrites and cobaltiferous iron pyrites; and Steenstrup's Kiesgrube, on Lyngdalselven, containing the same minerals. Dahll* looks upon these as contact deposits, and connects them with the intrusion of so-called gabbro.

Closely allied in nature to the fahlbands above described are certain other zones of impregnated rock, occuring in this formation. The impregnating material, however, is magnetic iron ore, the bands containing which scarcely possess such a length in the direction of the strike, as the fahlbands. Moreover the magnetic iron ore, besides occurring in this finely divided state, forms considerable beds in the impregnated zones referred to. It is from these deposits that the iron works of Sweden and Norway are supplied with the material from which their celebrated iron is prepared. These deposits are of frequent occurrence in the south of Norway, especially in the neighbourhood of Arendal, where there exist eighteen different beds of ore, which well repay the cost of working them. They are situated in a narrow straight zone, which runs parallel with the coast for a distance of six miles. The prevailing rock is gneiss, which graduates into mica and hornblende slate. The ore is magnetic oxyd, usually without any admixture of ferric oxide. The minerals most frequently accompanying it are augite, hornblende, garnet, epidote, calcspar, and the three essential constituents of the gneiss, especially mica. Besides these, about thirty other minerals have been mentioned as having been found in the deposits, but these are

* Om Kongsberg's Erts District; Christiana, 1860.

of rarer occurrence. The masses of ore appear flattened, almond-shaped, and drawn out parallel with the foliation of the enclosing rock. In the direction of the strike, they thin out, or branch off and disappear. Their average thickness is from two to six yards, but it sometimes reaches twenty yards. The iron works of Ulefoss, Fossum, Fröland, Näs and others, are all more or less dependent on these deposits for their ores. The situations of these iron works seem to have been chosen, less with a view to economically transporting the ore, than to taking advantage of the magnificent water powers, which exist everywhere in Norway. The fuel is charcoal, mostly from pine, and it has also to be carted considerable distances. The blast furnaces used, are partly similar to those used in Sweden, and partly to those used in Germany. They are thirty feet high, from four to four and a half feet wide at top, and from seven to eight at their widest part. The percentage of metallic iron contained in the mixture to be smelted, ranges from 25 to 42 per cent, and the average production of raw iron from a furnace is $2\frac{1}{2}$ tons daily. $1\frac{3}{5}$ tons of charcoal are consumed in the production of one ton of iron. The refining takes place on what are called "frisch hearths," and hammers are used in the further mechanical treatment of the resulting lumps of malleable iron. The iron produced, is like the Swedish, celebrated for its purity. It is shipped to Hamburg, and from thence mostly to America.

Large quantities of titaniferous iron ore occur at Ekersund and Snarum; that from the former locality contains 43 per cent of titanic acid. Phosphate of lime has also been worked and exported from the neighbourhood of Kragerö. With these I must close this sketch of the economical minerals of the primitive gneiss formation of Norway, and turn to compare it in its various features with that of Canada.

The parallelism of the Laurentian formation of Canada with the gneiss of Scandinavia was long ago pointed out by Sir William Logan, and in the more recent reports of the Geological Survey, especially those of 1853–56, we find the features of the Canadian formation fully described. The rocks there occurring are essentially the same as those of Norway. Keilhau's characteristic gneiss corresponds to the granitic or micaceous gneiss of Canada, and the hornblende gneiss of Norway is the syenitic or hornblendic gneiss of the Laurentian formation. Even the *eye gneiss* variety appears to exist here, and from the description, to be synonymous with the reticulated gneiss. In corroboration of this I take the liberty of quoting the following remarks of Sir William Logan:—"In the Reports of the Survey, the Laurentian rocks have been described in general terms, as gneiss, interstratified with important masses of crystalline limestone. The term gneiss, strictly defined, signifies a granite with its elements, quartz, feldspar and mica, arranged in parallel planes, and containing a larger amount of mica than ordinary granite possesses, giving to the rock a schistose or lamellar structure. When hornblende, instead of mica, is associated with quartz and feldspar, the rock is termed syenite, but as there is no distinct specific single name for a rock containing these elements in a lamellar arrangement, it receives the appellation of syenitic gneiss. Gneiss rock then becomes divided into two kinds, granitic and syenitic gneiss, and the word gneiss would thus appear rather to indicate the lamellar arrangement than the mineral composition. Granitic and syenitic gneiss were the terms applied to these rocks in the first Reports; but as granite and syenite are considered rocks of igneous origin, and the epithets derived from them might be supposed to have a theoretical reference to such an origin of the gneiss, while at the same time it appears to me that the Laurentian series are altered sedimentary rocks, the epithets micaceous and hornblendic, have been given to the gneiss in later Reports, as the best mode of designating the mineral composition and lamellar arrangement, without any reference whatever to the supposed origin of the rocks. (Report 1853–56, pp. 49 and 50.)

Further "The space between them (the bands of limestone) is occupied by gneiss, the banded structure of which is visible in a vast number of places, but a large part of the rock is coarse grained; the feldspar being in individuals, frequently attaining an inch and sometimes more in diameter, while the mica and the quartz, often accompanied by hornblende, and the former sometimes replaced by it, are distributed among the feldspar in such a manner as to give a reticulated aspect to the surface. Beds of this character are sometimes thin, but when thick and massive, which they usually are, they might upon a first inspection be mistaken for igneous instead of altered rocks. Upon a careful study of the case, however, it will be perceived that this reticulated structure is accompanied by an obscure arrangement of the meshes of the net-work, into parallel lines, which are found to be conformable with the more distinctly banded portion of the strata." (*Ibid*,, p. 9–10.)

Besides gneiss, the following rocks are mentioned as occurring in the Laurentian system. A crystalline aggregate of feldspar and quartz, granite in veins, mica and hornblende schists, chloritic gneiss, quartz-rock or quartzite, hypersthenite, serpentine, crystalline limestone, greenstone, hornblende rock, besides syenite and porphyry, which latter intrusive rocks however belong to a later period. These rocks are, on the whole, the same as those occurring in the primitive gneiss formation of Norway. Granite however does not seem to occur in masses running parallel with the other rocks, unless we include under this denomination the above mentioned crystalline aggregate of feldspar and quartz. The hypersthene rocks described by Mr. Hunt in his interesting Report 1855, seem to be of a character similar to those occurring in Norway, and there described as gabbro and euphotide, however much the latter rocks, in their true types, differ from hypersthenite. The confusion existing among mineralogists regarding the nature of these rocks seems still to prevail, notwithtanding the able and exhaustive work of Mr. Hunt on the subject. As a proof of this, I may refer to a recent paper by Dahll on the ore district of Kongsberg, where there is a rock described as gabbro, which is composed of "violet or brownish labradorite and dark green hornblende. The color is that of the hornblende, consequently dark. Diallage, which is known by its shining lustre, is perhaps oftener present than has hitherto been demonstrated; ilmenite is characteristic; and magnetic pyrites occurs frequently; with these, a little brown mica is frequently remarked." *Om Kongsberg's Erts District*, p. 16. Gabbro is commonly described as "a crystalline, granular or sometimes schistose mixture of feldspar or saussurite with diallage or smaragdite;" *Cotta: Gesteinslehre*, p. 53. It is difficult to conceive how the above described rock resembles gabbro; unless as Dahl further remarks concerning it, "labradorite is decisive of gabbro."*

(*Editor's note, by* T. STERRY HUNT.)

* The name of gabbro, originally employed by the Italians to designate a diallagic serpentine, is, by most modern authors, applied to a rock composed of a triclinic feldspar (such as labradorite) with pyroxene. When the latter is of the variety called hypersthene, the rock takes the name of hyperite or hypersthenite, but when it assumes the form of diallage or of smaragdite, the name of gabbro is given to the rock. In smar-

The serpentines of the Laurentian formation, are described by Mr. Hunt as of a paler colour than those of the metamorphic series. He failed to detect either nickel or chrome in them, and in his examination of a serpentine said to be from Modum in Norway, (probably that of Snarum, from its being associated with ilmenite), these metals were also absent. This is consequently another point of resemblance between the serpentines of the Laurentian formation and those of the Norwegian gneiss formation, distinguishing both of them from the serpentines of the metamorphic series. The crystalline limestones of the Laurentian formation appear to be much more frequent, and more regularly interstratified than those of the Norwegian gneiss formation, and this is one of the features in which a difference is remarkable between the two formations. In the Laurentian, as in the Norwegian gneiss formation, the gneiss is the prevailing rock, and interstratified with most of the rocks above mentioned. The strike of the strata of the Laurentian formation is most generally N. E. and S. W; or W. N. E. and S. S. W. and the dip much inclined, though perhaps generally less so than those of the Norwegian gneiss formation.

With regard to the economic minerals of the Laurentian formation, the existence of fahlbands similar to those of Norway seems to be uncertain. Still we find in the Geological Reports, descriptions of red-weathering rocks, which bear no slight resemblance to them, and should they be found to possess the character of fahlbands, a search for economic minerals in connection with them, would most likely be successful, because the metalliferous area is limited and well defined. The colour of the rock would assist in tracing it along its strike, and any veins crossing it or occurring in it would be easily recognised. Whether the pyrites of Daillebout occurs in connection with a fahl-

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agdite we have an intimate mixture of pyroxene with hornblende, affording a transition to rocks composed of triclinic feldspars and hornblende; in other words to diorite and diabase. Those rocks which consist of such feldspars, with diallage or hypersthene, I arrange under the generic name of dolerite. When the feldspar in these predominates, and is granular or compact, including masses of diallage, the rock has been incorrectly called euphotide. This name was originally given by Haüy to a mixture of diallage or smaragdite with what he called saussurite, a mineral which by modern lithologists has been strangely confounded with compact feldspar, from which it is distinguished by its much greater gravity and hardness, and is, as I have elsewhere shown, a compact zoisite or epidote. The true epidotic euphotides however sometimes in-band is uncertain; looking to the character of the mineral, which contains nickel and cobalt equivalent to 0·55 per cent of the oxides of these metals, I think it is very probable. The cobaltiferous pyrites of Brockville seems, on the other hand, to be an independent deposit, seeing that it occurs in such extraordinary quantity. I found the compact variety to contain metallic cobalt corresponding to 0.50 per cent cobalt oxide. This result was confirmed by Mr. Hunt, who found 0·52 per cent. In the neighbourhood of the copper mine of Escott, I found no traces of anything resembling fahlbands, so that I am inclined to parallelize this locality with the pyritiferous deposits above described as occurring at Meinkier and Lyngdalselven, independent of the fahlbands. In no particular does the Laurentian formation so much resemble the primitive gneiss formation of Norway, as in containing those enormous deposits of magnetic iron ore, which occur in the townships of Madoc, Marmora, Crosby, Hull, &c. In extent however, the Canadian deposits far surpass the Norwegian. In like manner, the deposits of titaniferous iron of Bay St. Paul far surpass in extent those of Snarum and Ekersund. The phosphate of lime of Burgess and Elmsley, differs from the deposits of the same mineral in Norway, in being associated with crystalline limestone, and in occurring in far greater quantities.

I have thus endeavoured, as far as my knowledge of Canadian geology permits, to parallelize the various features of the Laurentian and primitive gneiss formations. Doubtless many who are more intimately acquainted with the geology of this country will be able to recognize further points of resemblance, and in view of this possibility, I have described the Norwegian formation at greater length. I shall be guided by the same considerations in describing the two other groups of rocks which I have yet to compare with their Canadian equivalents. I cannot however

clude triclinic feldspars, and thus pass into diallagic dolerite or gabbro. The feldspathic rocks of the Laurentian system, above referred to, consist of labradorite, andesine, or some related feldspar, and often include pyroxene, which from a variety like sahlite, passes into hypersthene and diallage, giving rise to hypersthenite, and to the incorrectly named gabbro and euphotide of most modern lithologists. The rock from Kongsberg, as above described by Dahll, except in the substitution of hornblende for pyroxene, agrees closely with a variety of diallagic dolerite common in the Laurentian series. For further illustrations of this subject, see a paper on Euphotide and Saussurite, in Silliman's Journal of Science for March 1859.

leave this division of my subject, without referring to one important difference which exists between Norway and Canada, in regard to the economic minerals of this group.

In the former country, despite its comparative poverty, those deposits are well developed. In Canada they remain dead and unproductive. Why they should be so, it is difficult to say. Canada has the advantage of Norway in having richer mineral deposits, better means of transport by its canals and railways, and a much greater command of capital. With regard to fuel, both charcoal and imported coal, it is equally as well situated as Norway, and although labour is much dearer than in the latter country, there is every prospect of this disadvantage becoming less considerable. The severity of the winter presents no greater hindrances to mining in Canada than in Norway, and Canada is rapidly acquiring the skilled labour essential for successful mining. In view of these considerations therefore, one may hope that the great accumulation of economic minerals in Canada will soon become one of her most important sources of national wealth.

(To be continued.)

ARTICLE II.—*On the Shore Zones and Limits of Marine Plants on the North Eastern Coast of the United States.* By the REV. ALEX. F. KEMP.

(Read before the Botanical Society of Canada, at Kingston.)

While spending a vacation, during the month of August, 1861, at Peak's Island, in the State of Maine, and Bay of Casco, it was a special and very profitable amusement of mine, to note the botanical features of that region of country. The season was too far advanced to find many of the beautiful land plants which have their special home in the Northern United States. The *Kalmia angustifolia* was out of flower, and its branches covered with seed. The fragrant *Myrica cerifera* was in a similar condition. The *Rosa blanda*, though here very abundant, was out of season. *Gerardia maritima* was in fine condition, and in one or two swampy localities near the shore, very abundant. Along with it, but more generally diffused, *Spiranthes gracilis*, grew in beautiful profusion, and shed forth its delicate lily fragrance. In one locality I found the pretty blue *Trichostema dichotomum*, and in another the curious little Pine weed *Hypericum Sarothra.* Other plants common to Canada and the United States flourished in much profusion. I also collected, and figured in my note book, fifty one species of the larger fungi, some of them very beautiful and curious. The chief field of my researches was, however, in the department of marine plants. These were specially interesting to me as I had not before had sufficient opportunity of personally examining their peculiar habits and growth in the United States. I first sought out the best localities in which to collect good specimens; afterwards I made a collection of all the plants that could be found at this season of the year. I was somewhat disappointed at the limited number of species which the coast afforded, and believe that, from some cause or other, there was a short crop that season of many of the more delicate and beautiful forms. The Fuci were, however, in great perfection, and astonishing profusion. The rocks were everywhere clothed with their dark and mottled drapery, and on the shores of every little bay they lay in dense and matted beds, in which were mingled such other species of Algæ, and of animals, as inhabit the rocks of the sea coast.

It occurred to me that it would be a pleasant and an interesting occupation to note the lines or zones upon the rocks and shores at which the various plants found a special *home*, and the limits to which they were accustomed to travel. A very cursory survey convinced me that each plant had its favorite shore region within which it grew to perfection, and beyond which it either ceased to grow, or became dwarfed in its form. I was aware that all the Hand Books on the Algæ had noted the special localities of each species, whether it grew at high or low water mark, at half tide or in deep water; but I was not aware that in any of the books, shore lines and limits of plant growth had been made the subject of special treatment. This subject may be regarded as a minor branch of the important enquiry as to the geographical distribution of plants. It is akin to the phenomena of the vertical distribution of land plants, on the slopes and peaks of mountains. Perhaps, something interesting may come of the observations which leisure and opportunity permitted me to make at Peak's Island. I am far from thinking that my knowledge of the subject is yet so complete as to entitle me to speak with any degree of confidence upon it. All scientific observers know that a first survey of any subject is almost necessarily imperfect in its details, and that these can only be fully worked out by repeated examinations under every variety of circumstance. A beginning must however be made of the induction of particulars, if any satisfactory conclusions are to be reached, in this as in every other branch of scientific enquiry. What I have to say at this time on this subject, imperfect though it must be, may yet, as a beginning, and so far as it goes, be sufficiently accurate to afford reliable information to those who have not made this branch of botany their study; it may also, as a starting point, lead to further observations in the same field on the part of those who are adepts in the sub-kingdom of Sea-Weeds.

The tides along the Atlantic shores of the United States rise about fifteen or twenty feet, and in their range afford a fine field of research for the naturalist. This tidal shore I would divide into six distinct zones.

I. The Drift or beach Zone.
II. The Ulva Zone.
III. The Fucus Zone.
IV. The Laminaria Zone.
V. The Chondrus Zone.
VI. The Deep sea Zone.

I. The Drift Zone.

The first of these is not properly a zone of vegetation. Nothing grows in it, to my knowledge, excepting millions of sea lice. It is however important to the amateur collector. Here the waves drive up masses of all the kinds of sea-weeds which the coast affords. After a storm from the ocean no better field of research can be resorted to for fine specimens of Algæ. Ladies who are in search of "mosses" for ornamental work, need go no farther to find all that they want, than to this line on the beach. Timid collectors too, who fear to wet their feet in the pools, or to hazard their limbs on the slippery rocks of the lower shore, will find enough to fill their wallets at zone number one. I note it chiefly for the benefit of young collectors, and to point out to them, that in prosecuting the study of marine plants, they may, through the potent agencies of the waves and the tides, do so without the least inconvenience to themselves.

II. The *Ulva* Zone.

I call this zone by the name of the beautiful green *Ulva*, because this genus of plants has its chief habitat in the warm pools and on the rocks which are found a little below high water mark. The whole order *Ulvaceæ*, indeed, flourish best in this locality over the wide geographical limits within which it is found. Here almost all its species grow to their greatest perfection, both as to quality and quantity. A reason for this may be that the bright green color which distinguishes most of the species requires a larger amount of sun light for its production than the olive, and red-colored plants require which inhabit lower zones and deeper water. The color of those plants of the order *Ulvaceæ* which travel into deep water, is for the most part of a darker hue than those which grow in shallow places. I have also noted that the color of specimens from the tropical and subtropical regions is more brilliant and permanent than is that of plants in the colder regions of the north. Some of the species of this order have besides a special love for fresh water, either in the shape of land drainage or of shallow streams. *Enteromorpha clathrata* for example may often be seen travelling far up fresh water rivulets.

In this zone *Ulva latissima* is found in great abundance and beauty. Wherever pools of water are left by the tide this plant finds a happy home; rejoicing in the heat and light of the sun it spreads out its broad ruffled fronds, with a gentle undulating motion in the water. It is often gemmed with glistening globules of eliminated oxygen, thus purifying the water and contributing both to the health and shelter of the innumerable animals which live in the same pools. I did not find *Ulva Linza* here, although it is found abundantly on other parts of the coast. The Ulva passes readily down into deeper water, and may be found on rocks and in the pools of the third zone, but although it grows well there it is yet neither so beautiful nor so luxuriant as it is in its own natural home.

The most abundant genus however of the order Ulvaceæ to be found in this zone is that of *Enteromorpha.* I found the four species, *E. intestinalis*, *E. compressa*, *E. clathrata* and *E. Hopkirkii* with their various forms growing in profusion in the pools, and on the shores on places where fresh water was present. The upper part of their fronds float on the surfaces of the pools, after the manner of fresh water confervæ, and are, like them, inflated by the oxygen which their fronds rapidly eliminate. The apicies of these plants are frequently blanched and much decayed from exposure, their color is also of a lighter and more yellowish tinge than is that of the *Ulva.* The last species *E. Hopkirkii* is rare both in America and in Europe, and is readily known by the confervoid articulation of its ramulæ. Along with these, and firmly adhering to the rocks, clumps of *Cladophora rupestris*, *C. uncialis*, and *C. flexuosa* were found. Masses of the bright green and gelatinous *Hormotrichum Younganum* were also found adhering to the edges of the rocks. These plants have a considerable range of growth and some of the Cladophoræ may be found in fine condition as far down as the lower limits of the third zone, but there they assume a deeper green color and stronger texture. Entangled among other plants, the dark green crisp and tortuous *Chætomorpha litorea* finds also a home. This plant has however a considerable range of growth, and is not specially abundant in any place only it does not grow in very deep water or far down on the shore. Of the *Enteromorpha* it may be remarked that it is very troublesome to the fishermen, as it infests the bottoms of the boats, and greatly retards their progress in sailing. It adheres to them with great tenacity, and in an incredible short space of time, covers them with a perfect forest of long green fronds. The only remedy for this pest is frequent scraping, burning and tarring.

In this second zone there are found, besides, stragglers from the zone beneath.

The chief and most notable of these is a dwarf species of *Fucus*. It grows in the corners aud crevices of the water pools, and travels very little beyond the Ulva Zone. In its dry state it has much the appearance of a *Dictyota*, but in its fresh condition it is thick and leathery as a *Fucus*. It may be a dwarf form of *Fucus vesiculosus*, but in no case did I either find air vessels or terminal receptacles upon it. It had always the same appearance: a plain narrow frond with a slender midrib frequently bifurcating in a dichotomus manner. Its colour is a pale olive. Hervey does not notice this plant in his Nereis Borealis but in his Manual he describes a plant of the same kind as a variety of *Fucus vesiculosus* under the name of *F. Balticus*, stating at the same time that it is probably a depauperised condition of *F. vesiculosus*. It may be so, but I was not able to trace the connection between the two by intermediate forms. I am disposed to think that it is entitled to a specific name, and that it may retain that of *F. Balticus*. Dwarf specimens of *Fucus nodosus* are also found creeping up into this zone, but regarding these no doubt can be entertained. Their linear form and occasionally inflated fronds sufficiently indicate their connection and origin. The rocks are also covered with a soft velvety green substance apparently made up of a species of a confervoid plant and a very small Diatom. These I was not able to examine in their fresh state under a high power of the microscope, and in the dry state I find the confervoid plant altogether broken up and without form.

III. The *Fucus* Zone.

This third zone I would divide into three distinct sub-zones:

(1) *The nodosus.*

(2) *The vesiculosus.*

(3) *The furcatus.*

(1) The first or uppermost of these is almost exclusively occupied with *Fucus nodosus.* This plant grows to great perfection on the Atlantic coast of America. It has a range as far south as New York Bay. Every where it is found within this region fringing the shores and the rocks near high water mark. For its proper growth it requires evidently a measure of dryness, a good deal of light, and showers of rain. It is the hardiest of all the Fuci, and may be found in a depauperised state high up in fresh water creeks, or in rivulets. It is a hard dark olive and ribless plant, easily known by its slightly petioled and club-shaped branchlets, and by the large bladder-like air vessels formed by the inflation of its fronds, with which it is crowded. On this coast it covers a belt of shore of from one to three yards in breadth. It is frequently covered with *Ceramium rubrum.* In many places so densely does this parasite grow upon it, that it gives quite a feature to the plant.

(2) In the next sub-zone *Fucus vesiculosus* grows in great profusion. It seems to retain more water among its fronds than the previous more leathery plant. It is easily known by its broader ribbed frond, its air vessels, occurring frequently in pairs, and by the viscid character of its terminal receptacles. This plant is also infested with *Ceramium, rubrum* in some of its many varieties, with *C. fastigiatum* and sometimes also with the parasitic plants *Elachista fucicola* and *Ectocarpus siliculosus.* It occupies a space on the shore of from one to three yards in breadth, completely covering with its wet and slimy fronds, the rocks upon which it grows.

(3) *Fucus furcatus.*—Occupies the chief place in this sub-zone, and is unquestionably the most beautiful and graceful of the three. Harvey remarks in his Nereis Borealis, that he is unacquainted with this species. We wonder at this, as it is a very abundant and remarkable plant on the coast of Maine. He describes it on

the authority of Aghardh under this name "as having a com-
" pressed stipes expanding into a linear dichotomus ribbed *frond*; " *margin* very entire; air vessels none; *receptacles* elongate, " linear, flattish repeatedly forked, three inches in length, scarcely " thicker than the frond, and tapering towards the apices." This plant is found at the ordinary low water mark and is scarcely ever altogether out of the water. It retains a great deal of water in its meshes, as the fronds, lying flat upon one another, do not permit the water to escape. It is of a lighter olive color in the water than the other plants of the genus. It measures from 1 to 2½ feet in length, and is remarkably strong and firmly attached to the rock by its discoid root. Waving gracefully in the rising or falling tide, or lashed by the angry waves, it presents an interesting and beautiful appearance. Under its folds a variety of *Chondrus*, like that described as *C. Norvegicus* in Hervey's Manual, is found in great abundance, adhering to the rocks. The curious plant called *Gigartina mamillosa*, but which seems in all its features more allied to Chondrus than to Gigartina, finds a secure habitation under its dense folds. On the lower part of its stems *Elachista fucicola* grows in great profusion affording a byssoid ornamentation to that portion of the plant.

There can be no doubt that these three plants occupy always the same relative positions to one another in which they are here found. The line of division may not, it is true, be so well marked as are the lines of garden plots; to some extent indeed they mingle at their boundaries; but there are considerable centres in which they are found in great luxuriance, and in which no other allied species grow. *F. nodosus* is the hardiest of all the Fuci, and from its thicker and more leathery character can best withstand the drying influences of the atmosphere and the sun. These are indeed the conditions in which it grows to its fullest dimensions. *F. vesiculosus* is more liable to be affected by light and heat than *nodosus*, and while it requires a measure of these for its full growth, it can yet do with less than its neighbour. *F. furcatus* again is more tender than either, and is less able to resist the influence of the atmosphere. It is consequently from its position two thirds less time out of the water than *F. nodosus* and one third less than *F. vesiculosus*. In all probability it will also contain fully more iodine than either of these plants, and would form a better manure for the fields.

Within this zone there are, on the Atlantic coast, and wherever rocks abound, frequent pools of water more or less large and deep, in which may be found many of the hardier species of deep sea plants. In the lower belt ot this zone and contiguous to *F. furcatus*, I found *Chondrus crispus*, the well known *Carigeen Moss* growing in much luxuriance, having crept up thus far from its natural home. But the plant which more generally filled these pools was *Halosaccion ramentaceum*. In every variety of form it abounded there, but frequently in so depauperized a state, as to indicate that it was not exactly in its native home. Specimens of the largest size to which this plant attains I did not often find, but in one form or another it was present in great abundance. The curious and pretty plant called *Cystoclonium purpurascens*, together with *Hypnea musciformis*, had here also their natural home and grew in great perfection. They too to some extent are deep sea plants, but for the most part they covet a home in the rocky pools of the shore. *Chordaria flagelliformis* threw out its long filamentous fronds in every pool of this zone, and in many crevices of the rocks left bare by the tide. Here also *Rhodymenia palmata* the dulse of America, with its blood red frond, grew in great beauty and abundance both on the rocks and as a parasite on other Algae. But one of the most striking inhabitants of this zone is *Chaetomorpha melagonium*. Its long pea-green filaments afford a pleasing variety of colour. It grows often solitary but is not unfrequently clustered together in considerable bunches, *Cladophoræ* and *Rhodymenia palmata*, and *Ulva latissima*, commonly growing as parasites on the ends of its fronds. Occasionally a bunch of *Delesseria sinuosa* is found in the deeper and more shady pools. Once only I found a little plant of *D. alata* and *Euthora cristata*, but these are stragglers and seldom flourish out of deep water. The inflated fronds of *Asperococcus sinuosus*, a deep sea plant, were occasionally found. In the more sheltered places, large patches of *Corallina officinalis* grew very luxuriantly. Its horny pinnate branches, with the reddish tinge of its natural state, render it a very pleasing object in the water. This curious calcareous plant has a wide range of growth, but it does not travel higher up on the shore than the second line of the Fucus zone. It is however found at a considerable depth in the sea. I constantly found it attached to the roots of the large deep sea plants, and in some places it grows at the depth of fifty fathoms. A *Gigartina*, probably *G. tenax*, is also found inhabiting these pools in great abundance, and quite at home in them. It is a rigid dark red plant bifurcating twice or thrice. A curious plant called *Furcellaria fastigiatia* is also a characteristic denizen of this zone. Its soft texture and forked apices are its characteristic features. Over the three belts of this zone and attached to the rocks in considerable masses, the very gelatinous *Porphyra lacinata* is found in perfect condition. This is the *laver* of the Scotch shore. It is a most widely diffused plant, but chiefly inhabits the northern waters; in southern latitudes it becomes delicate and small.

The third line of the zone is perhaps the finest field of any on the shore in which to search for growing specimens of the prevailing shore plants, and the more hardy inhabitants of the deep sea. Time and labour spent here will always be rewarded by the discovery of either unknown species, or of new varieties and habitats of those already known.

IV. The fourth zone is that of the *Laminaria*.

This is the largest kind of marine plants. The species never leave the water if they can help it, and are found in the pools which touch upon low water mark. They often grow in the channels and grooves of rock, up which the water, at low tides, is generally flowing at the rise and fall of every wave. The *Laminaria digitata* which grows here, either rooted to the rock or to some large shell, such as *Mytillus edulis*, with its strong fibrous roots, attains sometimes to a great size. Its stem is not generally more than two or three feet in length, sometimes it is much shorter, but the frond which grows upon it is frequently from four to six feet long and split up into numerous laminæ. This is a strong leathery plant, of a dark olive colour, and conspicuous for its size among the drift along the whole northern shore of America. *L. saccharina* is next to it in size, with its variety *latifolia*, but its stem is somewhat shorter, and its frond narrower and longer, and its margin frequently waved and fringed. These long oar-like plants are very abundant, and are remarkable for the density of their structure. When tossed about by the strong waves of the ocean, they lash the shore with great force. When driven ashore they generally bring the piece of rock or the shell to which they are attached with them. They are the favorite haunts of innumerable *Sertulariæ*, *Bryozoæ* and *Sponges*. The beautiful dulse, or *Rodymenia palmata*, very generally grows in luxuriant profusion upon their stems. The smaller species, *L. Phyllitis* and *L. dermatodea*, are also found along with these in all stages of growth. The Sea Colander or *Agarum Turneri* is here, too, a well known plant. It grows sometimes to the size of from ten to twelve feet. For the most part it is a deep water plant, but it yet frequently appears on the shore among the *Laminaria*. Only dwarf specimens are however found here, showing that this is not its natural home. I picked up a small plant of this species which had an anomalous peculiarity in the shape of a trilaminate frond. "From the centre of its laminæ along its whole length there projects a wing, "or additional lamina, making with the two halves of the true "leaf a third lamina" This peculiarity has evidently arisen from the splitting up of one of the laminæ of the frond. I would infer this from the fact that the lamina to which the third one is inclined, and to which it is united at the midrib, is thinner than the lamina on the other side of the midrib. The perforations also on the two associated laminæ correspond in many respects, although the mother lamina seems to have grown considerably since the separation of one half of its substance took place. I am particular in noting this, as I find in Harvey's Nereis Borealis a Laminaria described as *L. trilaminata* on account of a peculiarity of identically the same kind as that which I have noted. The description of that species is taken from Olney's list of the Rhode Island plants, published in the proceedings of the Providence Franklin Society. Harvey is doubtful about it, and had he seen a good specimen of the so called plant, he would at once have detected its origin, and refused it a place as a distinct species. It can be considered as nothing more than an anomalous form. The most interesting and curious of the plants that are found in this belt is the *Alaria esculenta*. It is found on the Atlantic shores of America, from Newfou ·l· nd to Cape Cod, and is abundant on the west coast of Scotland and Ireland. "It has a root of many grasping fibres, a stem naked at the base and cylindrical, from *two* to *four* lines in diameter, and from eight to ten inches in length. On its lower half there are numerous stemless leaflets, above which the stem is winged on each side, and passes gradually into the midrib of a foliaceous frond which is from one to twenty feet or more in length."—*Harv.* It is of a bright olive colour, and covered over with a very adhesive mucous. Unlike most others of the order to which it belongs it adheres closely to paper. Its natural home seems to be about low water mark, among the rocks of the sho' . It is in many respects a beautiful plant, and its bearded stem gives it a striking and characteristic appearance. The whole breadth of this zone does not exceed one yard.

V. The fifth zone is that of the *Chondrus*.

Perhaps this belt is scarcely entitled to a separate place. It blends so much with the preceding as scarcely to be distinguishable from it. Nevertheless *Chondrus* occupies so conspicuous a place here, and drives out of this, its special retreat, almost all other plants, that it appears entitled to be considered as possessing a separate territory or home. I was not aware of the special locality of this plentiful and useful plant, until I had examined the shore at extreme *neap* tide. I then found much to my astonishment that the lowest part of the shore rocks which the tide had left bare, but which were only bare at very low water, were deserted by almost every other species, and that *Chondrus* alone covered every rock with a densely matted carpet. So closely did the plant grow that not a particle of the rock could be seen. Only in the interstices of the rocks did some plants of *Laminaria*, *Alaria*, and *Chondaria* grow, all else was in undisputed possession of *Chondrus*. This region is apparently its central home; here it retains its normal purplish-red colour, and is in all its parts regularly developed. It is however a great traveller. Specimens of it may be found in pools far up on the shore, even among the green Ulva, and it extends its growth far out into the deep water. This is the only really useful plant on the coast. It is very gelatinous, and is considered nourishing as an article of food, it makes very good *blanc mange*, and on being mixed with other materials is said to be capital feed for cattle and pigs. For invalids it is often recommended. The article is imported from Europe to this country, blanched and free from salt, and is kept by most druggists. It grows in such immeasurable abundance along the whole Atlantic coast of America from Nova Scotia to Long Island, that it seems like bringing coals to Newcastle to import it to this country.

VI. The Deep Sea Zone.

Under cover of the deep blue waters of the ocean the finest and most beautiful of the marine plants are generally to be found. Many of the larger plants attain also their largest dimensions in the deep waters. A large number of species belonging to the order *Laminareaceæ* find their natural home in the deep sea. One remarkable plant of this order is found growing only in deep water; and for this locality its structure is specially fitted; I refer to *L. longicrucis.* This is a noble plant. Its stem is frequently eight to twelve feet long, slender at the base as it springs from its root of clasping fibres, it gradually widens upward to an inch in diameter, where it is hollow or tubular, and thence tapering to the apex, terminates in a broadly expanding oblong lanceolate frond, beautifully waved at the margins and obtuse at the termination. The colour of the stem is a pale yellowish brown, and of the lamina a beautiful pale greenish olive. I measured one noble specimen which had attained to the dimension of 32 feet, the stem of which was one inch in diameter at its thickest part, and the lamina about 2 feet in breadth. It is peculiarly a North American species; and although it is found as far south as Cape Cod, it is there much stunted in its growth, and very different in size and texture from specimens that are found on the northern shores. In Europe it is scarcely known to grow beyond the limits of the Arctic Sea, whence water-worn specimens occasionally reach the coasts of Scotland, and the north of Ireland. By the force of the waves it is frequently detached from its place of growth, and its hollow stem enables it to float easily upon the water. The greenish olive of its lamina shows that it requires a good deal of sunlight to bring it to perfection; that therefore it may get as much of this element of its life as possible, its long and hollow stem seems to have been provided. It is generally covered with parasites both vegetable and animal. Some of the more delicate deep sea plants will commonly be found growing upon the lower parts of its stem. At Peak's Island I found upon it the beautiful and delicate *Delessaria alata*, and frequently the stem was fringed along its whole length with *Ectocarpus granulosus.* Amateurs looking for deep sea plants, would do well to direct their attention to the stems of drifted individuals of this plant. The prevailing deep sea plants of this region are *Rodomela subfusca*, *Delesseria sinuosa*, *D. alata*, and *D. denticulata.* The two former in great abundance, the two latter are rather rare. *Enthora cristata*, the analogue of the European *Plocamium coccinium*, is among the most beautiful and common that is driven on shore from the deep. *Phyllophora membranifolia* is also found although by no means common. *Ptilota serrata* and *P. elegans* are frequently cast ashore in abundance. They inhabit the whole northern shore, and abound in the Gulf of St. Lawrence. Growing upon *Zostera marina* I also found *Ectocarpus siliculosus*, *Polysiphonia fibrillosa*, and *Punctaria tenuissima.*

In sandy bays, in water of from 1 to 4 fathoms deep, the curious cord-plant *Chorda filum* grows abundantly, and is from 30 to 40 feet long. It is a hollow and chambered plant, and in its young state is covered with green byssoid fibres. In the same category may also be noted the beautiful *Grinellea Americana*, frequently found on this coast, the analogue of the brilliant *Wormskioldia sanguinea* of Europe. It is peculiarly American, and grows abundantly in Long Island Sound, and New York Harbour.

Other plants might be added to these which we have noted, as inhabiting the various belts of the shore, and the deep waters of the North American coasts. These only occurred to me in my investigations at Peak's Island. Were however these zones of distribution to be permanently maintained, in works on the marine plants, they would greatly facilitate the work of collecting. Further researches would increase the number of plants which make their special homes in each, and would enable us to determine the habits of growth of those species whose special homes we have succeeded in localising. It would further be interesting to trace the *deep sea* limits of the various plants on this coast, after the manner of Forbes' researches in the Mediterranean. Little or nothing has yet been done in this branch of plant distribution in this country. The difficulties attending such investigations, on the boisterous and rocky coast of Eastern America, are very great, but it is to be hoped that some of the zealous botanists of America, with means and leisure at command, may turn their attention to this interesting department as their special study.

To sum up our work, we present the following classification of the plants noted in the several zones.

I. The plants found in the Drift Zone are a collection of all kinds.

II. The plants in the Ulva Zone are:—

Ulva *latissima*.
Enteromorpha *intestinalis*.
" *compressa*.
" *clathrata*.
" *Hopkirkii*.
Cladophora *rupestris*.
" *uncialis*.
" *flexuosa*.

Chætomorpha *litorea.*
Hormotrichum *Younganum.*
Fucus *Balticus.*

III. The plants in the Fucus Zone are:—

(1) Fucus *nodosus.*
(2) " *vesiculosus.*
(3) " *furcatus.*
Asperococcus *sinuosus.*
Chordaria *flagelliformis.*
Ectocarpus *siliculosus.*
Elachista *fucicola.*
Rhodomela *subfusca.*
Corallina *officinalis.*
Rhodymenia *palmata.*
Hypnea *musciformis.*
Cystoclonium *purpurascens.*
Gigartina *tenax?*
" *mamillosa.*
Halosaccion *ramentaceum.*
Furcellaria *fastigiata.*
Ceramium *rubrum.*
" *fastigiatum.*
Porphyra *laciniata.*
Chadophora *rupestris.*
Chætomorpha *melagonium.*

IV. The plants of the Lammaria Zone are:—

Agarum *Turneri.*
Alaria *esculenta.*
Laminaria *digitata.*
" *saccharina.*
" *Fascia.*
" *Phyllitis.*
" *dermatodea.*

V. The plants of the Chondrus Zone are:—

Chondrus *crispus.*
Laminariæ.

VI. The plants of the Deep Sea Zone are:

Laminaria *longicrucis.*
Punctaria *tenuissima.*
Ectocarpus *granulosus.*

Euthora *cristata.*
Ptilota *serrata.*
" *elegans.*
Polysiphonia *fibrillosa.*
Phyllophora *membranifolia.*
Delesseria *sinuosa.*
" *alata.*
" *denticulata.*
Zostera *marina.*

ARTICLE IV.—*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.

The following observations are a continuation of the Annual Report of the results of the observations taken at the Observatory. The means are reduced from tri-daily observations taken at 6 a. m., 2 p. m. and 10 p. m. The whole of the observations are all reduced to the usual standards, and the necessary corrections depending upon any peculiar construction of the instruments have been applied. It may be further stated, that the instruments are in the same position in which they have stood during a long series of years, and they are all subjected, at short intervals of time, to certain manipulations and corrections, so as to secure, as far as possible, accuracy; many of them are self-registering, and every means have been adopted to prevent either terrestrial, zenith or solar radiation on the bulbs of the thermometers; extra hours are set apart for observing any unusual phenomena, and a more particular attention has been directed to every sudden and great fall in the barometric column as indicating any unusual atmospheric wave, and also on the sudden fall of the thermometer indicating any extreme degree of cold as during our "*cold terms,*" for the purpose of comparing observations here with those taken in any distant part of the world, and which may have a bearing on the theory of the formation of storms.

A seismometer has been added to the other instruments for the purpose of ascertaining the direction and amount of elevation of the earthquake wave. The more than usual frequency of late of earthquakes in this neighbourhood has led to the placing of the seismometer, so as to indicate and to estimate any such interesting phenomena.

Barometer.—The highest reading of the barometer during the year occurred at 9.30 p. m. on the evening of the 23rd of January, and indicated 30.687 inches; the lowest reading occurred on the 27th day of May at 1. 45 p. m. and indicated 28.883 inches, giving a yearly range of 1.804 inches; several sudden and great changes occurred during the year both with a rising and with a falling column. The first remarkable wave was on the 4th of March, when a very sudden fall took place; at 6 a.m. the barometer stood at 30.454 inches, and it fell in 24 hours 0.780 of an inch and continued falling until 2 p. m. of the 6th day when it attained a *minimum* of 29.450 inches; it then continued to rise, and at 10. p. m. the 7th day attained a height of 30.398 inches, showing a sudden rise of 0.948 of an inch. On the 15th of March a rise of 0.342 of an inch took place in 8 hours, and a like sudden rise occurred on the 30th day of 1.230 inches in 24 hours. Another sudden rise took place on the 28th of September at 6 a. m ; the mercurial column indicated 29.276 inches, and in 24 hours it rose to 29.999 inches, showing a rise of 0.623 of an inch, and it continued rising until it attained a maximum of 30.315 inches; another sudden depression of 0.200 of an inch in 8 hours occurred on the 22nd of October, and a corresponding rise on the 24th day, also in 8 hours, of 0.409 of an inch. In November the mercury was as usual subjected to several fluctuations; the highest crest of the wave occurred on the 1st, 10th, and 20th days, and a corresponding trough took place on the 3rd, 16th, 24th and 30th days. In December, from the 12th to the 21st day, the mercurial column indicated great fluctuations, falling from 30.341 inches, to 29.746 inches, rising again to 30.137 inches and then again falling to 29.600 inches and again rising to 30.191 inches, again falling to 29.611 inches and attaining on the 21st a maximum of 30.269 inches; a sudden rise occurred on the 27th day, the column rising 0.293 of an inch in 8 hours. The mean barometric pressure for the year was 29.737 inches, showing a decrease of 0.046 of an inch compared with the mean of last year, but an increase of 0.061 of an inch when compared with a series of years. The following tables show the mean reading of each month and also the monthly range of the barometer in inches; the mean yearly range was 1.093 inches.

Monthly Means.

	Inches.		Inches.		Inches.
January.....	29.983	May........	29.721	September..	29.849
February...	29.750	June.......	29.720	October....	29.876
March.....	29.878	July.......	29.734	November...	29.714
April......	29.882	August.....	29.353	December...	29.892

Monthly Range.

	Inches.		Inches.		Inches.
January....	1.350	May.......	1.349	September..	1.023
February...	1.484	June.......	0.815	October....	1.014
March.....	1.401	July.......	0.637	November..	0.902
April......	1.381	August.....	0.770	December..	0.994

The lowest range (or the least difference) was in July, and this has held good for a series of years. January for a long period shows the greatest range, but the month of February 1861 shows a greater range than January; the mean range for a series of years has been found to be 1.032 inches, which is 0.060 of an inch less than the yearly range of 1861. January shows the highest mean of the year and June the lowest. The mean reading of the barometer for the Winter Quarter was 29.883 inches, for the Spring Quarter 29.827 inches, for the Summer Quarter 29.769 inches, and for the Autumnal Quarter 29.813 inches.

Thermometer.—The mean temperature of the air for this year varies but very slightly from the mean temperature of a series of years, but the mean temperature indicated 1°89 degrees less than the mean temperature of last year (1860), and 0°16 of a degree only more than the mean annual temperature of a long series of years; the mean temperature for the year 1861 being 41°72. The highest reading was on the 9th of June at 3 p.m. and indicated 99°7 degrees; the lowest reading was at 6 a.m. on the morning of the 8th of February, and indicated—37°1 degrees (below zero), giving a yearly range or climatic difference of 136°8 degrees.

The warmest day of the year was the 10th of June, the mean temperature of the day was 81°1 degrees; at 11 a.m. the thermometer stood at 87°8 degrees, and at 3 p.m. 96°0 degrees, and at 4 p.m. 95°8 degrees; at 10 p.m. it stood at 76°7 degrees and it fell to 60°3 in the night, which was clear and calm, the terrestrial radiator indicated 57° degrees. The coldest day of the year was the 8th of February, the mean temperature indicated—28°5 degrees (below zero); below is a record of the cold term of January and February.

January 11, 1861.	6 a. m.	—23°.1	(below zero.)
	8 "	—23°.0	"
	9 "	—19°.1	"
	Noon	—17°.0	"
	2 p. m.	—10°.6	"
	4 "	—14°.8	"
	6 p. m.	—17°.0	"
	8 "	—20°.4	"
	10 "	—20°.6	"
January 12, 1861.	6 a. m.	—34°.9	"
	8 "	—34°.7	"
	10 "	—24°.6	"
	Noon,	—14°.4	"
	2 p. m.	— 5°.1	"
	4 "	— 7°.3	"
	6 "	—14°.9	"
	8 "	—17°.4	"
	10 p. m	—17°.9	"
	Midnight	—20°.4	"
January 13, 1861.	6 a. m.	—26°.6	"
	8 "	—20°.8	"
	10 "	—12°.5	"
	Noon	— 5°.1	"
	2 p. m.	— 1°.6	"
	4 "	— 1°.0	"
	6 "	—11°.2	"
	8 "	—14°.3	"
	10 "	—16°.9	"
	Midnight	—19°.2	"
January 14, 1861.	6 a. m.	—13°.8	"
	8 "	—10°.4	"
	10 "	— 3°.1	"
	Noon	+ 2°.0	(above zero.)

The thermometer was 81 hours and 45 minutes below zero. The February cold term exceeded somewhat the above temperature, and was as follows :—

February 8, 1861.	10 p. m.	—21°.3	(below zero.)
	Midnight	—34°.6	"
	6 a. m	—37°.1	"
	9 "	—32°.1	"

Noon —22°.2 (below zero.)
2 p. m.—14°.1 "
4 " —19°.0 "
6 " —20°.9 "
8 " —19°.8 "
10 " —19°.5 "
Midnight—20°.4 "
6 a. m.—24°.0 "
9 " —20°.1 "
Noon +1°1 "

The thermometer was for 56 hours below zero.

The following table shows the Mean Temperature for each month.

January....	10°.43	May.......	51°.86	September.	58°.06
February...	18°.25	June.......	65°.83	October.....	46°.64
March.....	21°.94	July.......	67°.66	November...	33°.60
April......	38°.99	August.....	66°.84	December...	20°.54

July was the warmest month, but was 6°92 degrees colder than the mean temperature of July for a series of years.

The temperature of the Winter Quarter was 12°28 degrees, for the Spring Quarter 34°29 degrees, for the Summer Quarter 66°77 degrees, and for the Autumn Quarter 46°10 degrees; the temperature for the same period of last year (1860) was Winter Quarter 12°59 degrees, Spring Quarter 45°55 degrees, Summer Quarter 67°63 degrees, and Autumn Quarter 46°49 degrees. A thermometer sunk 18 inches in the ground showed a temperature of, in May 49°9, in June 59°8, in July 60°0, in August 66°0, in September 58°0, in October 53°0, and in November 47°4. The range of temperature or climatic difference exceeded by 19°2 degrees the range of 1860; below is a table of the climatic difference for each month of 1861:—

January.....	66°.5	May........	42°.9	September...	44°.6
February.....	90°.3	June	59°.6	October......	42°.4
March	65°.5	July........	51°.8	November....	28°.6
April.......	55°.3	August......	43°.3	December ...	56°.9

February shows an excessive range of temperature; this was owing to the excessive *cold term* of that month; November shows the least climatic change, and this is rather unusual for November; the range for November 1860 was 59°4 degrees, the mean range for November for a series of years being 61°1 degrees; the 1st frost of the Autumn occurred on the 5th of September; a sudden fall of temperature took place in March, at 2 p.m. on the 16th day the thermometer stood at 36°7 degrees, and in 24 hours it fell to—5°0 degrees below zero, showing a difference of 41°7 degrees in that short period; this sudden change was accompanied by a rise in the barometer and a high wind from the west; December showed a *cold term* but of *short duration*; the following table shows the temperature :—

Dec. 20th, at 9 p.m.—	0.0	
Midnight—	10.0	(below zero)
21st, 6 a.m.—	10.1	"
11 " —	3.2	"
Noon—	0.5	"
0.20	0.0	"

This was the 1st cold term of the winter 1861-2.

Humidity of the Atmosphere.—The mean relative humidity for the year was 0.774, saturation being equal to 1.000. The following table shows the relative humidity for each month :

January......	.752	May.........	.770	September...	.904
February....	.755	June........	.735	October.....	.843
March	.768	July.........	.765	November...	.787
April.......	.780	August......	.736	December ...	.796

June was the driest month of the year, but July has been the driest for a series of years. Complete saturation occurred only once during the year.

Rain.—Fell on 106 days, amounting to 46.701 inches; it was raining 531 hours and 14 minutes, and was accompanied by thunder on 16 days; the number of days on which rain fell exceeded by 13 the number of days of rain of 1860, and by 112 hours 14 minutes, but was 5 days less than the number of rainy days in 1859, but exceeded by 33 days the amount of days of rain compared with a series of years; the amount of rain which fell in 1859 was 50.035 inches, and in 1860 was 48.132 inches, and the amount of rain in 1861 exceeded by 3.697 inches the average amount compared with a series of years; a very heavy rain storm occurred on the 27th May, it began at 4.25 p.m. from

	h.m.		Inches.	
the E.N.E. and at	4.45	the fall registered	1.700	
	4.50	(*wind veered to W.*)	2.066	
	4.53		2.333	
	4.55		2.433	
	5.00		2.483	
and ceased at	5.10	and equalled	2.486	inches,

which fell in 45 minutes. The Rivière des Prairies, a branch of the Ottawa, rose very high during May, and a like rise has not been witnessed since 1848.

The following table shows the monthly amount and the duration of fall:

	Amount.	Time.		Amount.	Time.
	Inches.	h. m.		Inches.	h. m.
January........	0.100	4.10	July...........	10.188	79.49
February.......	0.761	17.25	August.........	1.950	12.31
March.........	1.756	52.35	September......	4.816	66.50
April..........	2.921	60.42	October........	5.370	69.30
May...........	8.642	49.32	November......	1.023	32.52
June..........	4.868	56.18	December......	1.306	31.00

July shows a very large amount of rain but is not the greatest amount on record here for July, but exceeds by 4.456 inches the amount of last July (1860), but is less by 2.026 inches the amount of rain which fell in July 1859, which was the most rainy July on record here; this was accompanied by a very heavy storm and showed an amount of rain equal to 6.374 inches, and the rivers in this neighbourhood rose at this time nearly 2 feet; the rain storm lasted 45 hours and 40 minutes.

Thunder and lightning occurred on 16 days, the yearly mean for a series of years is 14; last year (1860) thunder only occurred on 11 days; there were 43 cloudless days only during the year 1861, the average for a series of years being 57. The prevailing clouds were *Cumuli Stratus* and a rather larger amount of *Cirri Stratus*, giving rise to haloes; and there were but 123 nights suitable for astronomical purposes; this is less by 20 than the number of nights in the year 1860. *Snow* fell on 45 days amounting to 99.53 inches; it was snowing 365 hours and 54 minutes, which is less by 1.77 inches the average amount for a series of years, but is 38.26 inches less than the amount of snow which fell in 1860, and is 40.57 inches less than the amount which fell in 1859. The last snow of the winter 1860-1 fell on the 17th of April, and the 1st snow of the autumn fell on the 24th October. Winter did not fairly set in until the 23rd of December.

Evaporation.—The amount of evaporation from the surface of water during the 6 months which are recorded is 16.90 inches, which is nearly 1 inch less than the mean amount; the amount of evaporation also from the surface of ice was somewhat less than the average.

The greatest intensity of the Sun's rays was 104°3 degrees, which is less by 6°3 degrees than the intensity for the year 1860, and is 12°7 degrees less than the intensity for the year 1859. *The lowest point of the terrestrial radiation,* was—39°4 degrees (below zero.)

Dew.—The yearly amount of dew was below the usual mean or average; an apparatus has been used for a short time for the purpose of ascertaining the hour at which dew begins to fall and when it ends, and also the amount, and it is believed will lead to some interesting results in this department of research; the apparatus is self-regi· ·ring and leaves a permanent impression.

Wind.—The most prevalent wind during the year was the N. E. by E. and the least so E. by N.; the next in frequency was the W. and W. S. W. and a good deal of S. E. winds prevailed; below is a table of the amount of horizontal miles of wind for each month:

	Miles.		Miles.		Miles.
January...	6380.10	May......	4989.20	September.	3447.48
February..	5549.95	June......	5067.93	October...	3664.29
March....	5437.69	July......	4499.68	November.	4142.30
April.....	3565.12	August....	2736.05	December..	5816.99

giving a total for the year of 55296.78 miles linear, *which* is 11083.26 miles more than the amount for the year 1860; the mean velocity for the year was 6.312 miles per hour, which shows an increased velocity of 1.270 miles per hour for 1861 over that of 1860. June was the calmest month last year and indicated only 2905.36 miles; a tornado passed over Montreal on the 9th of July, but was little felt here; on the 10th of August a very heavy hail storm passed near this place over St. Laurent and Montreal, doing considerable damage to crops and buildings; there were several storms of wind during the year preceded by rain and a low barometer.

The Aurora Borealis, was visible at observation hour on 42 nights; a bright display with considerable magnetic disturbance occurred on the night of the 1st of September, the same period that the splendid display which caused so much sensation over the world occurred last year.

The Zodiacal Light was frequently seen; it was generally bright and well defined.

Solar and Lunar Halos have been more than usually frequent during the year. A remarkable solar halo occurred on the 12th of August, when the temperature had fallen considerably during the night. The thermometer at 6 A.M. stood at 46°07 degrees. The terrestrial radiator had indicated a temperature of 41°03 degrees. The wind at 10 A.M., (mean local time) was from the N.E. by E., with a clear sky, from which time light *cirrus* clouds began to form in the higher region of the atmosphere, passing from W. to W.S.W., in a direction contrary to the lower current of wind (N.E. by E.) At 10h. 38m. a slight halo was *seen round* the sun, and at 10h. 45m. it presented a very rare and beautiful spectacle. The sun, bright and *white*, was in the centre of a halo or circle of 44 degrees in diameter, its lower or southern limb being about 37 degrees above the horizon; this circle was a bright halo of light, white and bright at its outer edge, and which was shaded inwardly and towards the sun of a pale orange colour, and an occasional tint of blue and red ray nearly 2 degrees in breadth. Both the lower limbs of this halo on the edge next the sun were more broad than elsewhere, giving the appearance of a crescent on each side. This halo or bright circle was filled in as it were with a dark ground, consisting of *cirrus* clouds, which passed quickly and constantly across from a westerly direction.

Another circle of a white colour and less bright, was also seen. The circumference of the wheel was in the centre of the bright halo, or more properly in the sun itself; the ring extended beyond the zenith, and exceeded the brighter one considerably in diameter. Another smaller circle was enclosed between the bright northern limb of the halo and the last mentioned circle, which on approaching its periphery separated somewhat, and crossed each other from right to left, extending east and west for a short distance, and the breadth of these circles were from 1½ to 2 degrees.

Lower down, nearer the horizon, on either side of the halo, were arcs or broken portions of an imperfect circle, somewhat resembling inverted rainbows, with distinct prismatic colours which varied both in brightness and extent. These appearances decreased and ceased at 12h. 40m. P.M. The wind veered into the S.E. by E. with an increase of temperature and a cloudy sky. The following day at 11 A.M., another halo appeared round the sun, but unattended with any of the peculiar appearances as above noticed.

The other solar and lunar halos and coronæ, although more frequent than usual, offered no peculiarities.

Observations on the *Solar Spots* still form a part of the records at this place.

Ozone.—The observations have been continued by means of the calico ozoneometer, which is kept moving by clock work, so as to indicate the variable amount, and has furnished very interesting results, as also the action of the coloured rays of light and polarized light and its development.

Atmospheric Electricity.—The tri-daily observations have been taken with Pelletier's and Ramerhausen's apparatus as heretofore, but these observations are far too extended for a short notice.

Comets were seen, Thatcher's in May; a bright one 30th June, and a smaller one, October.

Earthquakes.—A smart shock was felt on the 11th of July at 9 hours 3 minutes P.M., local time, it lasted for 20 seconds. The wave passed from N.N.W. to E., and another slight shock was felt in October. A register will for the future be kept in connexion with the seismometer.

The Lunar Eclipse of the 17th December was not seen, being obscured by clouds.

Crows (*Corvus corona*), first seen on the 27th of February. The song sparrow (*Fringilla melodia*), first heard 4th of April. Wild geese (*Anser Canadensis*), first seen flying W. on the 29th April. Swallows (*Hirundo rufa*), first seen 23rd April. Frogs (*Rana fontanalis*), first heard the 24th day. Shad (*Alosa prostabilis*), first caught 30th May. Fire flies (*Lampyris corusca*), first seen 19th June. Snow birds (*Plectrophanes nivalis*), first seen 17th of November. Crows left on the 7th day of November.

Currants and gooseberries in leaf on the 16th May. Wild strawberries in flower, 24th. Dandelion in flower, 23rd. Currants and gooseberries in blossom on the 24th. Lilac in blossom on the 3rd of June. Apples on the 4th. Chokecherries in blossom on the 6th of June.

The magnetic observations carried on at this Observatory, will form a separate paper for future publication.

Observatory, Isle Jesus, 22nd January, 1862.

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

(*Continued from page* 309, *Vol. VI.*)

BIRDS.

Species that winter in the district of Montreal, or that during that period visit it.

Falco Palumbarius.	Pyrrhula Enucleator.
Strix Virginianus.	Strix Funerea.
" Cinerea.	" Nyctea.
" Nebulosa.	" Otus.
Parus Palustris.	" Tengmalmi.
Corvus Corax.	Emberiza Nivalis.
" Corone.	Picus Villosus.
" Canadensis.	" Pileatus.
Picus Pubescens.	Tetrao Umbellus.
" Tridactylus.	" Lagopus.
Tetrao Canadensis.	Bombycilla Garrula.
Emberiza Lapponica.	Linaria Minor, probably.

Table giving a comparative view of the number and colour of the eggs of the species that incubate in the district of Montreal as far as ascertained.

Genus.	Species.	Colour of Eggs.
Falco	F. Sparverius	4 to 5 brownish yellow, mottled brown.
	F. Columbarius	2 to 4 white, mottled with red.
Aquila	F. Chrysaetos	2 to 3 dirty white, spotted red.
Halietos	F. Leucocephalus	1 to 2 white.
	F. Halietos	2 to 4 cream yellow, blotched with red.
Astur	F. Palumbarius	2 to 4 blueish white, mottled with brown.
	F. Fuscus	4 dirty white, blotched with red.
	F. Cooperii	Unknown.
Buteo	F. Lagopus	4 white, mottled with red.
	F. Buteodis	2 to 4 waved with green, spotted with yellow on a white ground.
	F. Borealis	Unknown.
	F. Hyemalis	Unknown.
	F. Cyaneus	3 to 5 plain blueish white.
Surnia	Strix Funerea	2 white.
	" Nyctea	2 white.
	" Nævia	4 to 6 white.
Bubo	" Virginianus	2 to 4 white.
	" Cinerea	2 white, mottled with blackish brown.
Ulula	" Otus	4 to 5 white.
	" Brachyotus	2 to 4 white.
	" Nebulosa	4 to 5 white.
	" Tengmalmi	2 white.
	" Acadica	Unknown.
	" Dalhousii	Unknown.
Lanius	Lanius Excubitor	6 cinereous white, mottled at the larger end with rufous.

Genus.	Species.	Colour of Eggs.
Muscicapa	Muscicapa Tyrannus	5 yellowish white, blotched with brown.
	" Crinata	4 dull white blotched and mottled with purple.
Muscipeta	Musicipeta Nunceola	5 pure white.
	" Virens	3 to 4 cream colour, spotted and blotched at larger end with lilac and brown.
	" Querula	5 white.
Setophaga	Setophaga Ruticilla	3 to 4 cream white, mottled with yellowish brown.
Vireo	Vireo Flavifrons	4 white, mottled with light and dark brown at larger end.
	" Olivaceus	3 to 4 white, mottled with light and dark brown.
	" Gilvus	3 to 4 white, spotted blackish purple at the larger end.
Sylvia	Sylvia Citrinella	4 dull white, mottled with brown.
	" Varia	5 " " "
	" Coronata	Unknown.
	" Pennsylvanica	"
	" Maculosa	"
	" Pardulina	"
	" Philadelphica	"
	" Blackburnica	"
	" Virens	4 flesh colour, mottled with purple and brown.
	" Striata	4 to 5 white, mottled with brown.
	" Castanea	Unknown.
	" Pinus	4 greenish white, mottled with pale brown and light purple.
Regulus	Regulus Calendulus	Unknown.
	" Cristatus	6 to 12 yellowish white, spotted with red.
Troglotides	Troglotides Fulvus	10 to 18 white, with a few reddish spots.
	" Europæus	10 to 18 white, spotted with red.
Anthus	Anthus Spinoletta	4 to 5 sullied white, mottled with brown.
Ampelis	Ampelis Sialia	5 to 6 pale blue.
Bombycilla	Bombycilla Garrula	Unknown.
	" Carolinensis	4 to 5 white, spotted black at the larger end.
Turdus	Turdus Migratorius	5 blueish green.
	" Rufus	5 greenish white, spotted brown.
	" Felivox	4 to 5 emerald green.
	" Minor	4 to 5 greenish blue.
	" Mustelinus	4 to 5 emerald green.
	" Melodius	4 to 5 greenish blue.
	" Noveboracensis	4 to 5 flesh colour, spotted dark at larger end.
	" Aurocapillus	4 to 5 white, mottled reddish brown.
Tanagra	Tanagra Rubra	3 to 4 dull blue, mottled brownish purple at larger end.

Genus.	Species.	Colour of Eggs.
Quisculus	Quisculus Versicolor	5 to 6 dull green, spotted with dark olive.
	" Baritus	5 dark coloured, spotted dusky.
	" Ferrugineus	5 dusky, spotted black.
Oreolus	Oreolus Baltimorus.	4 to 5 blueish white spotted and streaked with dark brown.
Hirundo	Hirundo Purpurea..	4 to 6 white.
	" Rufa	4 white, spotted brown.
	" Bicolor ...	4 to 5 white.
	" Fulva	4 white, spotted dusky brown.
Cypsilus	Cypsilus Pelasgius.	4 white.
Caprimulgus ..	Caprimu's Vociferus	2 blueish white, blotched with dark olive.
	" Virginianus.	2 blueish white, mottled with umber brown.
Alauda..........	Alauda Alpestris*..	Unknown.
Parus	Parus Palustris	6 to 12 white, spotted reddish brown.
Emberiza	Emberiza Nivalis...	5 whitish, mottled brown & grey.
	" Lapponica*	5 to 6 yellowish rusty, clouded with brown.
Fringilla	Fringilla Cyanea...	5 greenish white.
	" Nivalis	3 to 5 pale green, spotted cinereous.
	" Pennsylvanica.	Unknown.
	" Melodia	4 to 5 greenish white, mottled brown.
	" Canadensis ...	5 pale brown, mottled with dark brown.
	" Leucophrys ...	4 to 5 chocolate or dusky colour.
	" Vocalis	4 to 5 greenish blue, mottled with dark and light brown.
	" Graminea	4 to 5 whitish, mottled and blotched with reddish brown at larger end.
	" Tristis	3 to 5 white, mottled lavender, purple and yellowish brown at larger end.
	" Pinus	Unknown.
	" Linaria	5 blueish white, spotted red.
	" Iliaca	5 mountain green, mottled brown
	" Ludoviciana ..	4 to 5 white, spotted brown.
	" Purpurea	Unknown.
Pyrrhula........	Pyrrhula Enucleator	4 to 5 white?
Icterus	Icterus Phœniceus..	3 to 5 blueish white, streaked purple and dark brown.
	" Agripennis ..	5 to 6 olivaceous white, blotched with lilac and rufous brown at larger end.
	" Pecoris.....	3 to 5 greenish white, spotted olive brown.
Sturnus	Stur'usLudoviciana*	4 to 5 white, tinged with blue, spotted reddish brown.

* It is doubtful if those marked with au asteric breed in the district. It is not improbable that they do so occasionally.

Genus.	Species.	Colour of Eggs.
Corvus	Corvus Corax	5 to 6 muddy blueish green, spotted with olive brown.
	" Corone	2 white.
	" Cristatus	5 dull olive, spotted brown.
	" Canadensis.	3 to 4 blue.
Certhia	Certhia Familiaris	5 dull white, spotted brown.
		Unknown.
Sitta	Sitta Carolinensis	7 or more cinereous spotted reddish yellow, and streaked dark brown.
	" Canadensis	
Trochilus	Trochilus Colubris.	2 white.
Alcedo	Alcedo Alcyon	6 white.
Picus	Picus Auratus	6 white.
	" Erythrocephalus	6 white, spotted red?
	" Varius	4 white.
	" Villosus	5 white.
	" Pubescens	6 white.
	" Pileatus	6 white.
	" Tridactylus	4 to 5 white.
Cuculus	Cuculus Dominicus.	3 to 5 blueish green.
Tetrao	Tetrao Umbellus	10 to 15 dull yellow.
	" Canadensis	5 white, varied yellow & black.
Lagopus	" Lagopus	7 to 15 rufous yellow, spotted with reddish black.
Columba	Columba Migratoria	2 white, "one of them abortive." Wilson.
	" Carolinensis*	2 white, breeds in the Southern States.
Charadrius	Charadrius Vociferus	4 yellowish cream colour, spotted black.
	" Pluvialis*	4 to 5 pale olive, spotted with black.
	" Semipalmatus*	4 dark coloured, spotted with black.
Vanellus	Vanellus Helveticus	4 cream colour, spotted and blotched with light and purplish brown.
Ardea	Ardea Herodias	4 greenish blue.
Botaurus	" Discors	4 greenish blue.
	" Lentiginosa	4 cinereous green.
	" Exilis	Unknown, but if resembling the European species—white.
Calidris	Calidris Arenaria*	4 dusky, spotted with black.
Strepsilus	Strepsilus Interpres*	4 olive green, spotted with brown.
Numenius	Numenius Borealis*	4 greenish spotted with light umber brown.
	" Longirostris	4 cream colour, spotted brown?
	" Hudsonius	4 dark blueish grey, spotted with black or dark brown.
Scolopax	Scolopax Grisea	Unknown.
	" Wilsonii	4 olivaceous, spotted with brown.
	" Minor	4 olivaceous white, blotched with yellowish brown.
Limosa	Limosa Fedoa*	Unknown.
	" Hudsonica*	4 dark olive, spotted with pale brown.

Genus.	Species.	Colour of Eggs.
Phaleropus	Phalc. Hyperboreus*	3 to 4 olivaceous, thickly spotted with blackish brown.
Tringa	Tringa Alpina*	4 oil green, spotted liver brown
	" Pectoralis	Unknown.
	" Rufescens	Unknown.
	" Pusilla	Unknown.
	" Rufa*	4 dun colour, spotted red.
	" Semipalmata*	4 to 5 white spotted with black.
Totanus	Totanus Vociferus	Uncertain or unknown, (4 dark colour, spotted black. "Hutchins.")
	" Flavipes	Unknown.
	" Chloropygius	Unknown.
	" Macularius	4 greyish yellow, speckled with dark brown.
Rallus	Rallus Virginianus	6 to 10 cream colour, sprinkled with brownish red, and pale purple.
	" Carolinus	Uncertain.
	" Noveboracensis	10 to 16 white.
Fulica	Fulica Americana	Uncertain.
Colymbus	Colymbus Glacialis*	3 to 4 smokey olive, blotched with umber brown.
	" Septemtrionalis*	2 pale oil green colour.
Podiceps	Podiceps Cornutus	3 to 4 white, spotted brown.
	" Cristatus	3 to 4 greenish white, waved with dark brown.
	" Minor	5 to 6 dirty white.
	" Rubricollis	3 to 4 greenish white, sullied with yellowish brown.
	" Carolinensis	Unknown.
Sterna	Sterna Hirundo	3 to 4 dull yellowish, or pale whitish olive, blotched with dark brown.
	" Arctica*	2 to 3 light yellowish brown, or bluish grey, spotted with brown.
	" Nigra	3 to 4 olive brown, mottled brown and black.
Larus	Larus Atricilla	3 olive grey, spotted pale purple and dilute brown.
	" Tridactylus	3 olivaceous white, spotted light and dark grey.
	" Canus*	3 "bluish ochraceous," spotted cinereous and blackish.
	" Fuscus	2 olive brown or grey, blotched with dusky.
	" Argentatus*	2 to 3 olivaceous, spotted with dark cinereous.
	" Glaucus*	3 pale purplish grey, spotted with umber brown, and pale purple.
Anser	Anser Canadensis	6 to 7 greenish white.
	" Hyperboreus*	yellowish white.
	" Leucopsis*	Uncertain as to this country.
	" Bernicla*	Uncertain.

Genus.	Species.	Colour of eggs.
Cygnus Ferus....	Cygnus Ferus.....	5 to 7 olivaceous green & rough.
Anas.........	Anas Boschas......	10 to 18 blueish white.
	" Clypeata.....	12 to 14 pale greenish yellow.
	" Strepera.....	8 to 9 greenish grey.
	" Obscura.....	8 to 15 white.
	" Discors......	dirty white, spotted with brown.
	" Crecca......	
	" Americana...	6 to 8.
	" Acuta.......	8 to 9 greenish blue.
	" Sponsa......	12 to 13 yellowish white.
Clangula.....	" Albeola......	Unknown.
	" Clangula....	7 to 10 white.
	" Hystrionica ..	12 to 14 white.
Oidemia......	" Perspicillata*.	4 to 6 white.
	" Fusca*......	8 to 10 white.
Harilda.........	" Glacialis.....	5 pale greenish grey.
Fuligula......	" Ferina........	12 to 13 greenish white.
	" Marila........	Unknown.
	" Rufitorquis...	Unknown.
Mergus.......	Mergus Serrator.....	8 to 13 blueish white.
	" Cucullatus.	6 white.
	" Merganser..	10 to 14 white.

TABLE shewing the species met with in the District of Montreal, their extreme Northern range, whether migratory or resident in the District, their winter quarters, and the month of their arrival at, and departure from the District.

No.	Specific names.		Extr. of N. Lat.	Resid. or Migrat'ry	Winter quarters.	Date of arrival	Date of depart.
1	Falco Sparverius...	Common.	56	Migr'y	W. I. Mex. &c	Mar.	Sep.
2	" Columbarius .	Scarce.	66	Migr'y	Mexico.	April	Sep.
3	" Chrysaetos ...	Scarce.	66	Migr'y	....	April	Nov.
4	" Leucocephalus	Scarce.	62	Migr'y	South. States.	April	Nov.
5	" Halietos	Common.	60	Migr'y	Tropics.	April	Nov.
6	" Palumbarius .	Common:	68	Resid.	Fur Countries		
7	" Insignatus ...	Rare.		Migr'y			
8	" Fuscus	Common.	49	Migr'y	South. States.	April	Nov.
9	" Cooperii.....	Rare.	68	Migr'y			
10	" Lagopus	Common.	58	Migr'y	Mid. States.	Mar.	Dec.
11	" Buteodis	Common.	55	Migr'y	S. California	Mar.	Nov.
12	" Borealis	Common.		Migr'y	South. States.	Mar.	Nov.
13	" Hyemalis	Scarce.	68	Migr'y	South. States.	May.	Oct.
14	" Cyaneus	Rare.	68	Resid.	South. States.		
15	Strix Funerea	Common.	75	Resid.	....		
16	" Nyctea	Common.		Migr'y			
17	" Nævia........	Scarce.	68	Resid.	....	April	Nov.
18	" Virginianus....	Common.	68	Resid.			
19	" Cinerea.......	Common.	60	Resid.			
20	" Otus	Common.	67	Migr'y			
21	" Brachyotus....	Common.	53	Resid.	....	Mar.	Dec.
22	" Nebulosa	Common.	60	Resid.			
23	" Tengmalmi ...	Scarce.	50	Migr'y			
24	" Acadica	Scarce.		Migr'y	North. States.	Mar.	Dec.
25	" Dalhousii......	Rare.	54	Migr'y	North. States.	Mar.	Dec.
26	Lanius Excubitor ..	Common.	57	Migr'y	....	April	Nov.
27	Muscicapa Tyrannus	Common.		Migr'y	Tropics.	June.	Sep.
28	" Crinata .	Common.		Migr'y	Tropics.	June.	Sep.
29	Muscipeta Nunciola.	Common.		Migr'y	South. States.	May.	Oct.
30	" Virens ...	Common.		Migr'y	South. States.	May.	Oct.
31	" Querula .	Scarce.	58	Migr'y	South. States.	May.	Oct.
32	Setophaga Ruticilia.	Common.		Migr'y	United States.	May.	Sep.
33	Vireo Flavifrons ...	Scarce.	55	Migr'y	Tropics.	May.	Sep.
34	" Olivaceus....	Common.		Migr'y	South. States.	May.	Sep.
35	" Gilvus	Rare.	68	Migr'y	South. States.	June.	Sep.
36	Sylvia Citrinella...	Common.		Migr'y	Tropics.	May.	Sep.
37	" Varia	Common.	56	Migr'y	"	May.	Sep.
38	" Coronata ...	Common.		Migr'y	South. States.	June.	Sep.
39	" Pennsylvanica	Common.	55	Migr'y	South. States.	May.	Sep.
40	" Maculosa	Common.		Migr'y	Tropics.	June.	Sep.
41	" Pardulina ...	Common.		Migr'y	"	June.	Sep.
42	" Philadelphica.	Scarce.		Migr'y	"	June.	Sep.
43	" Blackburnica.	Rare.		Migr'y	"	June.	Sep.
44	" Virens	Scarce.	54	Migr'y	"	June.	Sep.
45	" Striata	Common.		Migr'y	"	May.	Sep.
46	" Castanea	Scarce.		Migr'y	"	May.	Sep.
47	" Pinus	Common.		Migr'y	"	May.	Sep.
48	" Rubricapilla .	Rare.		Migr'y	South. States.	June.	Sep.

No.	Specific names.		Extr of N. Lat.	Resid. or Migrat'ry	Winter quarters.	Date of arrival	Date of depart
49	Regulus Calendulus	Scarce.		Migr' y	Tropics.	May.	Oct.
50	Regulus Cristatus..	Scarce.		Migr' y	"	May.	Oct.
51	Troglotides Fulvus.	Common.		Migr' y	South. States.	May.	Aug.
52	" Europæus	Scarce.		Migr' y	South. States.	May.	Aug.
53	Anthus Spinoletta..	Scarce.	60	Migr' y	South. States.	Sep.	Nov.
54	Coccyzus America's	Scarce.		Migr' y	South. States.	June.	Sep.
55	" Canadensis.	Scarce.		Migr' y	South. States.	June.	Sep.
56	Ampelis Sialia.....	Common.	65	Migr' y	South. States.	May.	Sep.
57	Bombycilla Garrula	Scarce.	67	Migr' y	Mex., Tropics	Jan.	Feb.
58	" Carolinensis	Common.	56	Migr' y	Mex., Tropics	A&M	Sep.
59	Turdus Migratorius.	Common.	67	Migr' y	South. States.	May.	Oct.
60	" Rufus......	Common.	54	Migr' y	South. States.	June.	Sep.
61	" Felivox....	Common.	54	Migr' y	Florida.	May.	Oct.
62	" Minor......	Common.	54	Migr' y	South. States.	May.	Sep.
63	" Mustelinus..	Scarce.		Migr' y	....	May.	Oct.
64	" Melodius...	Common.		Migr' y	....	May.	Sep.
65	" Noveboracensis	Rare.		Migr' y	....	May.	Sep.
66	" Aurocapillus..	Rare.		Migr' y	....	May.	Sep.
67	Tanagra Rubra.....	Common.	49	Migr' y	....	June.	Sep.
68	Quisculus Versicolor	Common.	57	Migr' y	Flor., Brazil.	June.	Sep.
69	" Barilus..	Common.		Migr' y	South. States.	May.	Oct.
70	" Ferrugineus	Scarce.	68	Migr' y	South. States.	June.	Sep.
71	Oreolus Baltimorus.	Common.	55	Migr' y	Tropics.	May.	Sep.
72	Hirundo Purpurea..	Common.	67	Migr' y	Brazil.	May.	Aug.
73	" Rufa......	Common.	68	Migr' y	Tropics.	May.	Sep.
74	" Bicolor....	Common.	60	Migr' y	Louisiana.	April	Aug.
75	" Fulva.....	Common.	67	Migr' y	....	May.	Aug.
76	Cypsilus Pelasgius.	Common.	49	Migr' y	....	May.	Sep.
77	Caprimul's Vociferus	Common.	48	Migr' y	S. America.	May.	Sep.
78	" Virginianus.	Scarce.	68	Migr' y	S. America.	May.	Sep.
79	Alauda Alpestris...	Scarce.	69	Migr' y	....	Sep.	Nov.
80	Parus Palustris....	Common.	65	Resid.	....		
81	Emberiza Nivalis...	Common.	76	M. & R	....	Nov.	May.
82	" Lapponica	Rare.	70	Migr' y	....	April	
83	Fringilla Cyanea...	Common.		Migr' y	Mexico.	June.	Sep.
84	" Nivalis...	Common.			....	April	Oct.
85	" Pennsylvanicus	Common.	57	Migr' y	....	Sep.	Nov.
86	" Melodia.......	Common.		Migr' y	South. States.	April	Sep.
87	" Canadensis...	Common.	60	Migr' y	California	May.	Sep.
88	" Leucophrys...	Rare.	68	Migr' y	North. States.	June.	Sep.
89	" Graminea.....	Common.	57	Migr' y	M. & S. States	April	Oct.
90	" Tristis........	Common.	60	Migr' y	Mexico.	May.	Nov.
91	" Pinus........	Rare.		Migr' y	....	May.	Sep.
92	" Linaria.......	Scarce.	68	M. & R	Fur Countries	May.	Sep.
93	" Iliaca.........	Rare.	68	Migr' y	M. & S. States	May.	Sep.
94	" Ludoviciana..	Scarce.	55	Migr' y	M. & S. States	May.	Sep.
95	" Purpurea.....	Common.	55	Migr' y	South. States.	April	Sep.
96	" Socialis.......	Common.	60	Migr' y	Fur Countries	Dec.	Mar.
97	Pyrrhula Enucleator	Common.	57	Migr' y	Mexico, &c.	May.	Sep.
98	Icterus Phœniceus..	Common.		Migr' y	South. States.	April	Sep.
99	" Agripennis..	Common.	54	Migr' y	Mexico.	May.	Sep.
100	" Pecoris....	Scarce.	56	Migr' y	Mexico.	May.	Sep.

* Observed only in cold winters, when a scarcity of food drives them south.

No.	Specific names.		Extr of N. Lat.	Resid. or Migrat'ry	Winter quarters.	Date of arrival	Date of depart
101	Sturnus Ludoviciana	Rare.	56	Migr'y	South. States.	May.	Sep.
102	Corvus Corax.....	Rare.	75	Resid.	Fur Countries		
103	" Corone* ...	Common.	55	M. & R	Fur Countries		
104	" Cristatus...	Common.	56	Migr'y	M. & S. States	May.	Oct.
105	Corvus Canadensis*	Common.	65	Resid.	Fur Countries		
106	Certhia Familiaris..	Scarce.		Migr'y	South. States.	May.	Sep.
107	Sitta Carolinensis,.	Scarce.		Migr'y	Mexico.	April	Sep.
108	" Canadensis ..	Common.		Migr'y	South. States.	April	Sep.
109	Trochilus Colubris.	Common.	57	Migr'y	Mexico.	May.	Aug.
110	Alcedo Alcyon....	Common.	67	Migr'y	Mex., Tropics	May.	Sep.
111	Picus Auratus.....	Common.	61	Migr'y	South. States.	May.	Sep.
112	" Erythrocephalus	Common.	50	Migr'y	South. States.	May.	Sep.
113	" Varius	Scarce.	61	Migr'y	S. States, Mex	May.	Oct.
114	" Villosus	Common.	63	Resid.			
115	" Pubescens	Common.	58	Resid.			
116	" Pileatus	Scarce.	63	Resid.			
117	" Tridactylus	Scarce.	68	Resid.			
118	Cuculus Dominicus.	Scarce.		Migr'y	Tropical Am.	May.	Aug.
119	Tetrao Umbellus...	Common.	56	Resid.			
120	" Canadensis .	Common.	68	Resid.			
121	" Lagopus ...	Rare.	70	Resid.			
122	Columba Migratoria	Common.	62	Migr'y	South. States.	May.	Sep.
123	" Carolinensis†	Rare.		Migr'y			
124	Charadrius Pluvialis	Common.	75	Migr'y	Tropics. .	May.	Nov.
125	" Vociferus	Scarce.	56	Migr'y	California.	May.	Nov.
126	" Semipalmatus	Scarce.	70	Migr'y	South. States.	May.	Nov.
127	Vanellus Helveticus	Rare.	70	Migr'y	South. States.	April	Nov.
128	Ardea Herodias....	Scarce.	50	Migr'y	M. & S. States	May.	Sep.
129	" Discors	Common.		Migr'y	South. States.	May.	Oct.
130	" Lentiginosa .	Common.	58	Migr'y	South. States.	May.	Oct.
131	" Exilis	Rare.		Migr'y	....	May.	Sep.
132	Calidris Arenaria..	Common.	60	Migr'y	M. & S. States	May.	Sep.
133	Strepsilus Interpres.	Scarce.	75	Migr'y	Tropics.	May.	Oct.
134	Numenius Borealis.	Scarce.	70	Migr'y	"	May.	Nov.
135	" Longirostris	Rare.	52	Migr'y	"	May.	Nov.
136	" Hudsonius .	Scarce.	60	Migr'y	"	May.	Nov.
137	Scolopax Grisea...	Rare.		Migr'y	S. States, Tr's	May.	Sep.
138	" Wilsonii..	Common.	55	Migr'y	South. States.	April	Nov.
139	" Minor‡..	Common.		Migr'y	South. States.	Mar.	Oct.
140	Limosa Fedoa.....	Rare.	68	Migr'y	S. States, Tr's	May.	Nov.
141	" Hudsonica.	Scarce.	68	Migr'y	S. States, Tr's	May.	Nov.
142	Phaleropus Hyperbo.	Scarce.	75	Migr'y	....	A.,M.	Nov.
143	Tringa Alpina.....	Common.	75	Migr'y	South. States.	April	Nov.
144	" Pectoralis ..	Scarce.		Migr'y	....	April	Oct.
145	" Rufescens ..	Rare.		Migr'y	....	April	Oct.
146	" Pusilla.....	Common.	68	Migr'y	S. States, Tr's	A.,M.	Nov.
147	" Rufa.......	Common.	75	Migr'y	S. States, Tr's	A.,M.	Nov.
148	" Semipalmata	Common.	60	Migr'y	....	April	Nov.
149	Phalacrocorax Dilop	Scarce.	68	Migr'y	Mid. States.	April	Dec.

* Has been frequently observed wintering in the District.
† One specimen killed in June, 1838.
‡ Leave about the 20th October, but have been seen in mild autumns as late as the 10th of December.

No.	Specific Names.		Extr of N. Lat.	Resid. or Migrat'ry	Winter quarters.	Date of arrival	Date of depart
150	Totanus Vociferus..	Common.	60	Migr'y	S. States, Tr's	April	Oct.
151	" Flavipes ..	Common.	70	Migr'y	S. States, Tr's	A.,M.	Oct.
152	" Chloropygius	Scarce.	68	Migr'y	United States	A.,M.	Oct.
153	" Macularius..	Common.		Migr'y	United States	April	Oct.
154	Rallus Virginianus.	Common.		Migr'y	South. States.	May.	Sep.
155	Rallus Carolinus...	Common.	62	Migr'y	Tropics.	May.	Sep.
156	" Noveboracensis	Rare.	57	Migr'y	Tropics.	May.	Sep.
157	Fulica Americana..	Scarce.	55	Migr'y	California.	May.	Sep.
158	Colymbus Glacialis.	Common.	70	Migr'y	Mid'le States.	April	Dec.
159	" Septemtrionalis.	Rare.	74	Migr'y	United States.	April	Dec.
160	Podiceps Cornutus.	Scarce.	68	Migr'y	Mid'le States.	May.	Sep.
161	" Cristatus.	Common.	68	Migr'y	South. States.	May.	Sep.
162	" Minor....	Rare.		Migr'y	South. States.	May.	Sep.
163	" Rubicollis	Scarce.	68	Migr'y	South. States.	May.	Sep.
164	" Carolinensis	Scarce.	62	Migr'y	South. States.	May.	Sep.
165	Sterna Hirundo....	Common.	57	Migr'y	Tropics.	April	Nov.
166	" Arctica	Common.	75	Migr'y	M. & S. States	April	Nov.
167	" Nigra......	Scarce.	60	Migr'y	M. & S. States	May.	Nov.
168	Larus Atricilla.....	Scarce.		Migr'y	Tropics.	April	Nov.
169	" Tridactylus..	Common.	74	Migr'y	United States.	April	Nov.
170	" Canus......	Common.	71	Migr'y	Mid'le States.	May.	Sep.
171	" Fuscus......	Scarce.		Migr'y	Mid'le States.	May.	Sep.
172	" Argentatus..	Scarce.	75	Migr'y	Mid'le States.	May.	Oct.
173	" Glaucus.....	Common.	75	Migr'y	Mid'le States.	April	Oct.
174	Anser Canadensis..	Common.	70	Migr'y	Mid'le States.	April	Nov.
175	" Hyperboreus.	Scarce.	73	Migr'y	United States.	April	Nov.
176	" Leucopsis...	Rare.		Migr'y	....	April	Nov.
177	" Bernicla	Rare.	73	Migr'y	South. States.	April	Nov.
178	Cygnus Ferus......	Rare.		Migr'y	....	April	Nov.
179	Anas Boschas	Common.	68	Migr'y	California.	April	Nov.
180	" Clypeata	Scarce.	70	Migr'y	Mexico.	April	Nov.
181	" Strepera	Rare.	68	Migr'y	Mexico.	April	Oct.
182	" Obscura	Common.		Migr'y	Mid'le States.	April	Nov.
183	" Discors	Common.	58	Migr'y	Mexico.	April	Nov.
184	" Crecca	Common.	70	Migr'y	Tropics.	April	Nov.
185	" Americana....	Scarce.	68	Migr'y	M. & S. States	May.	Oct.
186	" Acuta	Common.	70	Migr'y	Mexico.	April	Oct.
187	" Sponsa	Common.	54	Migr'y	Mexico.	April	Oct.
188	" Albeola......	Common.	68	Migr'y	Mexico.	April	Nov.
189	" Clangula	Common.	68	Migr'y	M. & S. States	April	Nov.
190	" Histrionica...	Rare.	68	Migr'y	Mid'le States.	May.	Oct.
191	" Perspicillata..	Rare.	72	Migr'y	United States.	May.	Dec.
192	" Fusca	Common.	72	Migr'y	Mid'le States.	April	Nov.
193	Harelda Glacialis ..	Common.	75	Migr'y	Mid'le States.	April	Nov.
194	Fuligula Ferina....	Scarce.	68	Migr'y	M. & S. States	May.	Oct.
195	" Marila	Scarce.	68	Migr'y	M. & S. States	May.	Oct.
196	" Rufitorquis...	Rare.	68	Migr'y	M. & S. States	May.	Oct.
197	Mergus Serrator ...	Common.	68	Migr'y	South. States.	May.	Oct.
198	" Cucullatus.	Scarce.	68	Migr'y	South. States.	April	Oct.
199	" Merganser..	Common.	68	Migr'y	United States	May.	Nov.

BIRDS.

Fam. Accipitres.—Genus Falco.

Gen. char. Beak more or less hooked, furnished with a cere which is more or less hairy, and usually coloured; mandibles frequently dentated; nostrils lateral, rounded or oval, open, and surrounded by the cere; tarsus feathered or naked, in the latter event always scaly; toes four—3 before, and 1 behind; anterior middle one longest, and the exterior usually connected with it by a membrane as far as the first joint; talons sharp, more or less curved and retractile; tail of 12 feathers; wings long.

Sub- gen. Falco.

Sub gen, char, Beak short, incurved; upper mandible with one or two teeth; legs robust; tarsi short, toes long; talons sharp and hooked; 1st and 3rd primaries subequal, 2nd longest. The 1st and 2nd have an abrupt emargination of their inner web towards their extremities.

F. sparverius. Sparrow hawk.

Falco (Tinnunculus) sparverius. Linnæus and Baird!

V.S.P. Cere yellow; legs and feet yellow; bill bluish black: irides hazel; eggs 4 to 5, brownish yellow, mottled brown. Male plumage, dorsal aspect.—A black streak from each angle of the mandibles; crown of head reddish brown, surrounded by a coronet of ashy blue; auriculars white, a narrow white line forms the base of the frontlet, and is continued over the eye; the back and nearly the whole tail, light reddish brown; interscapular region dotted with black. Ventral aspect.—Chin, throat, breast, belly, and vent dirty white, with oval black spots across the body, and continued thence to the wings as far as the primaries; secondaries ash blue above, with black oval spots; primaries black, with their inner webs barred with white; inferiorly the inner webs of both are barred with faint black lines on a white ground, the outer webs being wholly black. The outer lateral tail feather barred with black and white, the bars continued to the outer web of the 2nd; all the other tail feathers of the dorsal tint; a broad black bar terminates the reddish brown, which is itself terminated, except in the two central feathers, by a white tip. The same distribution of colour marks the under surface of the tail, only fainter. Length from the bill to the extremity of the tail fourteen inches; alar expanse twenty-six inches. The female presents the same characters about the head as the male. On the occiput, however, the ash blue ceases, and the whole remaining dorsal region presents a *uniform* series of deep reddish brown, and brownish black bars; on the tail these bars are 10 or 12 in number. The ventral aspect is white with longitudinal brown streaks.

F. columbarius. Pigeon hawk.

Falco (Hypotriorchis) columbarius. Linn! Baird!

V.S.P. Bill light blueish gray, tipped with black; eyelids and cere greenish yellow; tarsi yellow; eggs 2 to 4 mottled with red.

Dorsal aspect. Feathers on the head and back of the neck, black with brown edges; a light brown streak from the cere proceeds backwards over the eyes, which are prominent, and is lost on the neck. From this part downwards the colour is deep chocolate brown. The primaries and secondaries have this colour relieved by whitish brown oval spots, tipped with the same. The tail with 4 interrupted whitish brown bars, with *a terminal* one of same colour.

Ventral aspect. Chin, throat, auriculars, breast, belly, and vent, with the femorals, yellowish, streaked chocolate brown. On the chin and throat these streaks are little more than confined to the shafts of the feathers, but on the breast and belly they are large, and of a lanceolate shape. The under tail coverts are streaked like the femorals; under surface of the tail chocolate brown, barred with white; the wing linings yellowish brown, spotted with white, and the inner surface of the primaries banded like the tail.

The bill is compressed, hooked, deeply toothed, with a corresponding groove in the lower mandible; nostrils round; 3rd primary longest; 2nd about a line shorter, and 1st about a line shorter than 4th; tail square, the feathers *angled off* at their tips; toes with cushions at the joint; middle toe longest, more than twice the length of the hind toe. Length of a specimen in the author's possession, 12¼ inches; alar expanse 25 inches.

Sub. genus Aquila.

Sub. gen. char. Bill strong, of considerable length, hooked towards the apex and straight at the base; eyes sunk; nostrils subcircular; cere hispid; 4th and 5th primaries longest: legs strong, feathered to the toes; toes strong; talons incurved, and channelled inferiorly.

F. chrysaetos. Golden eagle.

F. fulvus of Temminck!

F. Canadensis of Gmelin!
Aquila fulva of Meyer!
Aquila Canadensis. Linn.! Baird!

V.S.P. Cere and feet yellow; irides orange brown; beak blue at the base, brown at tip; eggs 2 to 3 impure white, spotted red.

Dorsal aspect. Crown of head and nape of neck with acuminate feathers of a bright rufous orange tinge. The rest of this aspect dark brown, more or less inclined to black, according to the age of the bird.

Ventral aspect. Dark brown verging to black; tail dark grey, banded irregularly with blackish brown, and terminated by a broad band of the same colour; scapulars invariably brown. "The young is uniformly of a ferruginous brown, and with the feathers nearly all white towards the base; tail white, with a broad terminal brown and mottled band and no bars. (Nuttall.) Length about 3 feet; alar expanse 6 feet. Female about 6 inches longer than the male.

Sub genus Haliaetos.

Sub. gen. char. Ridge of the beak convex and compressed; nostrils luneiform; cere slightly hispid; wings long; tarsi feathered on their upper half with short close set feathers, and scutellated on the anterior inferior portion; talons of equal length, much bent and grooved internally.

F. leucocephalus. Bald or White headed eagle.
Haliaetos leucocephalus. Linn.! Baird!

V.S.P. ET V. Bill, cere, irides and tarsi, yellow. The young bird with a black bill and pale brown irides.

Ventral and dorsal aspects. Head, upper part of neck, tail and coverts, pure white; body and wings chocolate brown; the margins a shade or two lighter; quill feathers brownish black with paler shafts; 4th primary longest; 3rd subequal; outer webs of the primaries sinuate; inner webs abruptly emarginate towards their ends; tail round; tarsi feathered for more than half their length; the anterior naked part strongly scutellated; hind toe very long, and its talon longer and stouter than the others; middle toe longest, with the shortest talon and grooved on its inner surface. Length 38 inches; alar expanse 61 inches.

This bird does not assume its adult plumage until the 4th year, during which time its plumage varies considerably according to its age. Young bird. Feathers of the head and neck acuminate, internally white, then umber brown, and tipped with whitish brown. Whole dorsal aspect except the wings pure brown; tail black with minute whitish brown mottlings on the outer vanes of the feathers and blotched with pure white on all the inner vanes except the two centre feathers. Ventral aspect. Feathers of the chin and throat like the head, the white however more apparent; breast, belly and vent, brown; inner wing coverts white tipped with brown; primaries white, 2nd mottled with whitish brown on both vanes; tertiaries white, mottled with brown and brown tips; tail round, blotched with white about the centre of each inner vane; femorals blackish brown, with whitish brown tips to the end of the shafts; tarsi yellow, very strong, feathered on the upper half; toes stout, thickly cushioned; claws long, much curved, deeply grooved and compressed along their inferior margin; claws of the inner and hind toes equal in length; bill $2\frac{1}{8}$ inches long from the eye; the curve commencing at the extremity of the cere which projects half the distance; nostrils oval diagonal and naked; upper mandible lobed near the end, beyond which the inner surface drops perpendicularly to form the apex; there is another rudimentary lobe a little posterior to the front one; lower mandible not notched, but rather compressed at its sides; the wings extend to about $2\frac{1}{2}$ inches of the extremity of the tail. Length 38 inches; alar expanse 72 inches.

Another specimen, a younger bird probably, or perhaps of a different sex, presented throughout the same essential characters, but differed slightly in the colour, which was lighter and more rusty. It measured 40 inches with an alar expanse of 76 inches.

The young of this species has often been confounded with that of the *F. chrysaetos.* The distinguishing characteristic is, that in the latter the tarsi are completely feathered, while in the former they are only feathered on their upper half, the lower half being naked and scaly. The young of the *F. albicilla*, an European species, resembles our present bird more than any other. Temminck has suggested that the tail of the European species is larger than that of ours; Richardson suggests another characteristic, that the upper mandible of the former has two lobes, while that of the *F. leucocephalus* has but one. From what I have seen there seems to be a mistake here, for the two specimens alluded to, which have furnished me my description, have very evidently two—a large very obtuse one near the curve, and a 2nd one not so large, but perfectly distinct behind it, and a little anteriorly to the base of the cere. It is the case also in another specimen which I have since examined.

F. haliaetos. Fish hawk or Osprey.
Aquila haliætus of Meyer!
Type of sub gen. Pandion of Cuvier!
Pandion Carolinensis. Gmelin! Baird!

V.S.P. Cere and bill bluish black; claws pale blue; irides orange and yellow; eggs 2 to 4 cream yellow, with red blotches; tarsi strong, about 2 inches long, feathered down their anterior surface, and scutellated on their other parts, the scales being rounded and tiled; soles and inner surface of the claws shagreened; talons curved, tapering, rounded beneath.

Crown of the head white on each side, with a central streak of black continued to the neck, these feathers occasionally edged with yellow, and erectile; a dark brown stripe includes the orbit and is lost upon the shoulders. Dorsal aspect generally umber brown verging to black; tail brown and barred with a deeper brown; the inner vanes of the feathers barred with dusky brown and brownish white; wing feathers with the outer vanes black, and their inner ones barred similarly to the tail. Ventral aspect generally white, with yellowish delineations on the breast; anterior and lateral femorals streaked with brown; inner and posterior ones white. The female is two inches longer than the male, and is spotted with brown on the breast. The young birds have the feathers on the dorsal aspect tipped with yellowish white, have a fawn coloured spot on the breast, and blue feet. Length of an old male 23 inches; alar expanse 54 inches.

Sub genus Astur.

Sub gen. char. Bill strong; tooth well defined; nostrils rounded; middle toe longest, and connected to the adjoining outer one; 4th primary longest.

F. palumbarius. Goshawk.
F. atricapillus of Wilson!
F. regalis of Temminck!
Type of sub genus Astur of Bechstein!
Type of sub genus Dædelion of Savigny!
F. gallinarius, Young, Gmelin and Frisch!
Astur atricapillus, (Wils.)! Bonap.! Baird!

V.S.P. Bill blackish blue, whitish below the cere, with a corresponding spot on the lower mandible; cere and legs yellow;

irides orange yellow; eggs 2 to 4 blue white, mottled with brown.

Dorsal aspect. Crown of the head, nape of the neck, cheeks and auriculars black, with the white bases of the feathers appearing. A white stripe, with the shafts of the feathers black, crosses over the eyes, from the base of the bill on each side, and loses itself upon the neck; back, wing coverts, interscapulary regions as far as the rump blueish gray with black shafts; primaries and secondaries with their coverts brown, with lighter edges; rump white, with two perfect brown bars, and occasionally an imperfect third: tail, two centre feathers blueish grey, with 4 dark brown bars, and an imperfect fifth; four next lighter brown, with five distinct bars, imperfectly continued to the inner vane of the last feather; primaries dark brown, mottled white towards their insertion.

Ventral aspect including the femorals and wing linings of short wavy lines of greyish black on a white ground, with dark grey shafts; tail dirty white with brown bars, indistinct on the two outer feathers; tail coverts white, a few of them mottled grey.

Tarsi half feathered; toes strong; talons curved, long, grooved inferiorly, the middle one with a salient inner edge; upper mandible compressed, toothed; lower one rounded near the apex; nostrils oval, clothed with stiff hairs presenting a stellated appearance a little over the commissure of the mouth. The upper hairs meet over the nostrils, all closely appressed; 4th primary longest; 3rd about a line shorter; 2nd, 3 lines shorter than the 3rd; 1st about half an inch longer than 6th, and shorter than the 5th. Length 26½ inches; alar expanse 42 inches. The female is met with about 5 inches longer than the male. Her dorsal aspect is brown, slightly tipped with white, and a white relieves the place of the mottled ventral aspect of the male with occasional patches of brown of an oblong shape on the breast and throat, and oval on the belly. In both male and female the tail is much rounded, the outer feathers being 1½ inches shorter than the centre ones.

F. fuscus. Slate coloured hawk.
F. Pennsylvanicus of Wilson! Adult male.
F. velox of Bonaparte! Young female.
Accipiter fringilloides of Vigors!
Accipiter Pennsylvanicus of Swainson!
Buteo Pennsylvanicus. Wilson! Bonap.! Baird!

V.S.P. Bill blueish black; cere geenish yellow; irides reddish orange; tarsi bright yellow; claws black; eggs 4, dirty white blotched with red.

Dorsal aspect. Crown and nape of the neck blackish, soon changing to a blueish grey, which invests the whole dorsal region, including the wings and tail; the shafts of the primaries, secondaries and tail feathers brown; the shafts of all the other feathers black. Towards the primaries and tail, the blueish grey changes to a brown, which in the former is barred with a deep brown mottled with white, and in the latter is intersected by 4 broad bars of a deep brown colour, and tipped with white. The 1st band is imperfect,the three next are very distinct, and gradually increase in breadth. The last one is very broad, and bounded by the terminal white tip.

Ventral aspect. Chin and throat white, with black shafts; breast, belly, and vent reddish brown, barred with white, and black shafts; femorals like the belly with white shafts; wing surfaces white barred with brown, the white changing to an ashy blue towards the extremities of the primaries and secondaries; tail coverts white; the bars on the under surfaces of the wings and tail very distinct.

Legs long; scales on the anterior surface of the tarsi minute; toes long; middle one longest, and twice the length of the hind toe; claws long, curved, sharp, and grooved beneath; nostrils oval, placed longitudinally; 1st primary equal to the secondaries; 2nd about two lines longer than 1st; 3rd and 6th subequal; 4th longest, and 5th about a line shorter; tail square. Length of a male in the author's possession 11½ inches; alar expanse 21 inches. Nuttal says that "the feathers on the breast and sides of a young female were marked with broadish transverse pale brown bars, terminated by oblong, oblanceolate spots."

F. Cooperii. Cooper's Hawk.
Accipiter Cooperii. Bonap! Baird!

D.C. This bird I have not yet met with, but have no doubt, in consequence of its range, that it is an occasional visitant in this section of Canada.

"Tail rounded, with 4 blackish bands, and tipped with white, wings extending when folded to the second band. 2nd quill nearly equal in length to the 6th, and the 3rd to the 5th. Length 18 or more inches. Young, dusky brown, skirted with ferrugineous, beneath white, with oblanceolate dusky brown spots." (Nuttal).

Sub genus Buteo.

Sub gen. chàr. Bill short, curved from its base; lobe blunt; sides of the lower mandible in-curved; wings long; 1st primary shortest; four first primaries indented in their inner web. The tarsi of some are feathered the whole length, distinguished from the eagles by their bill curving from the base, and from the goshawks by the naked space between the eyes and bill.

F. lagopus. Booted hawk. Rough legged falcon.
F. Sclavonicus. Latham!
F. spadicius of Idem!
Archibuteo lagopus. Brünnich! Gray! Baird!

V.S.P. ET M. Cere and irides light drab; tarsi yellow; bill and claws black; eggs 4, white, mottled with red.

Dorsal aspect. Head and neck light yellowish brown, streaked with umber brown, and black shafts; dorsal region as far as the rump umber brown, the feathers edged with light yellowish brown, these tips disappearing towards the rump; wing coverts umber brown, tipped with rufous; four first primaries indented in their inner webs, white near their quills, and dark chocolate brown towards their extremities; shafts white, edged with brown along the quills, the remainder brown; the basal half of the tail is brownish white, terminated by umber brown, tipped with greyish white.

Ventral aspect. Throat, breast and belly, like the upper surface, but with narrower streaks; on the breast the streaks are broader; then comes an apparent interruption, which is followed by a broad belt of umber brown across the belly; the feathers here being, except in the centre, not edged with white; wing coverts and vent feathers brownish white, with white shafts; tail yellowish white at the base, with a terminal slate grey border; inner shafts of all the wing feathers white, the quills themselves white towards their base, with their distal halves shining blackish brown; shoulders white; tarsi feathered to the toes; femorals very long reaching to the toes, yellowish brown, streaked with chocolate, in the form of an oval spot at the extremity of each feather.

Toes stout, cushioned; middle toe longest; claws long, strong, not much curved, grooved beneath, the middle one with a salient inner edge. Length 24 inches; alar expanse 50 inches; 1st and 7th primaries equal; 2nd about 1½ inch longer than 6th; 3rd and 5th equal; 4th longest; 2nd two lines longer than the 3rd; tail square. "The female is generally lighter on the back, but browner on the sides and belly. The young bird has the belt only indicated by large brown spots on the side, with the feathers of the thighs transversely barred. The tail with three broad bands towards its extremity, and with the iris brownish yellow." (Nuttall).

F. Sancti Johannis. Black hawk.

F. niger. Wilson!

Archibuteo Sancti Johannis. Gmelin! Gray! Baird!

V.S.P. The only specimen of this species which has fallen under my notice is a young bird shot this spring (1838) at the Priests' Farm, Montreal, of which the following is a description. I have little doubt but that this species and the former have frequently been confounded by naturalists.

"Bill black; cere, angles of the mouth, and tarsi yellow; eggs unknown; irides yellow; whole dorsal and ventral aspects uniform blackish brown, with the white under surface of the feathers appearing on crown and throat; primaries, secondaries, and the tail white, with their distal halves clove brown; 3rd, 4th and 5th primaries indented on their outer vanes; tail with brownish white tips to the feathers and not barred, and with brownish white shafts; femorals long reaching nearly to the toes, with light brown emarginations to the feathers; tarsal feathers brown tipped like the femorals; 3rd primary longest; 2nd shorter than 4th; 1st and 7th equal; hind claw longest; anterior middle claw with an inner salient edge. Length 23 inches; alar expanse 43 inches. The bill, legs and claws more slender than in the *F. lagopus.* Audubon considers the variety as the result of age. He told me so in 1842, when in this city.

F. Dawsonis. Dawson's Falcon. (New Species, Hall!)

I have only seen two specimens of this beautiful Falcon, the one in the Museum of the Natural History Society, and evidently from its dimensions, as well as fact, a female; the other a young male belonging to Mr. Hunter, the taxidermist of the Society. The first was bought in the market of Montreal a few years ago, and the second was shot at Lachine this autumn (1861) by a relation of Mr. Hunter. It bears some resemblance to Prof. Cassin's Hierofalco sacer, especially his description of the young bird, but differs from it in having the claws black; and the under part of the claws are not greenish yellow, but of the same hue as the tarsus; and the general tint of the dark parts of the plumage is not brown, but emphatically slate color. It also somewhat resembles the description given by the same gentleman of the F. atricapillus or plumbarius but differs in having greenish blue tarsi, and a bluish cere. with black irides. I believe this bird to be a new species, and have taken the liberty of calling it after Dr. Dawson the esteemed principal of McGill College.

V.S.P. Bill stout, strongly toothed in upper mandible, the tooth corresponding with a notch in the lower one, of a bluish color, terminating in a black tip, which is the color of the cere and irides. Tarsi feathered half way to toes, of a dark greenish blue. Toes long, moderately strong, claws black and much curved. Eyelids dirty white this color forming a complete circle round the eyes.

Dorsal aspect. The prevailing tint is dark slate color tipped with cinereous on the back of the neck, interscapulars and secondaries, and with rufous on the back, the upper tail coverts tipped with dirty rufous white. Many ot the secondaries have a rufous white rounded *spot near the end of their* outer vanes. Tint of the upper part of the tail of a brownish slate color, with about 11 to 14 bars of light rufous terminating in rufous white near the tip, the tail tipped with the same color. The tail consists of about 11 feathers, the extremities of which are all rounded.

Ventral aspect. Chin and upper part of throat whitish, each feather having a narrow streak along its shaft of slate color. The prevailing tint, like that of the back is slate color, but differing from the back in that each feather has the outer vane white, with an irregular long white spot on the inner vane, leaving the central portion of the prevailing color. Femorals as long as the tarsals, the white on the feathers here assuming almost a banded or barred appearance, which in the female is distinctly so. Under tail coverts of alternate rufous white and slate colored bars. The under surface of the tail exhibits a rufous tint, while the bars are more distinctly seen.

2nd. Primary longest; 1st shorter than the 3rd, but longer than the 4th; inner vanes of the primaries barred with white.

The female which resembles the male in every respect except the bars on the femorals, had its bill a good deal worn, thus indicating it to be an old bird. Length of the male 28½ inches. Alar expanse 38 inches. That of the female 27½ inchest with an alar expanse of of 42 inches.

F. buteoides. Short winged buzzard.
F. buteo of Pennant!

V.S.P. ET V. Bill and claws black; tarsi yellow; irides ("dark brown," Nuttall,) bright yellow; eggs 2 to 4 whitish, waved with green and spotted yellowish.

Dorsal aspect. Feathers of the head, neck, and dorsal regions blackish brown edged with ferruginous, least so on the back and head, and broadly so on the neck; scapulars brown, with indications of white bars on the inner vanes below the surface; a ferruginous tint predominating on the outer vanes, and a white on the inner vanes; wing coverts ferruginous brown, tipped with ferruginous white, and indications of white bars on the inner vanes of the greater coverts; rump brown; tail coverts, centre ones white on the outer vanes, barred with white on the inner vanes, on a blackish brown ground, and tipped with white: tail round, ferruginous near the base, soon changing to a pale brown, tipped with soiled white, and with 9 to 11 bars of dark blackish brown. Primaries clove brown; the quill halves of inner vanes ferruginous white, spotted with clove brown spots; the ferruginous white continued to the outer vane of the 2nd, 3rd, 4th and 5th; secondaries paler brown, with half of the inner vanes white barred with the brown.

Ventral aspect. Chin, throat, breast, belly, tail and wing coverts white, tinged with ferruginous, with oval and oblanceolate brown spots at the end of each feather; vent ferruginous white; femorals the same colour with a lanceolate spot of brown.

Legs long, feathered for one-third their length, scutellated on the remaining portion. 4th primary longest; 3rd a little shorter than 5th; 2nd about 4 lines longer than 6th; 1st and 8th equal.

F. borealis. Red tailed hawk.
F. levorianus young bird.
Buteo (Poecilopternis) borealis. Gmelin! Vieill.! Baird!

D.C. "Bill greyish black; cere, sides of the mouth, and tarsi yellow; upper parts dark brown touched with ferruginous; scapulars barred beneath the surface; the lateral tail coverts white, barred with rusty; middle ones dark; tail rounded, extending two inches beyond the wings, of a reddish brown or brick colour, with a single band of black near the end, and tipped with brownish white; the breast rust coloured, streaked with dark brown; chin white; vent and femorals pale ochreous, the latter with a few small heart shaped spots of brown; iris yellow. Length 22 inches; alar expanse 45 inches." (Nuttall). I have not met with a male bird as above described, but the following description is from a young female in a state of moult, probably her first. It differs somewhat from a description of an old female by Richardson.

v.s.p. Bill and claws blueish; cere and legs greenish yellow; feathers on head and back with streaks of chocolate brown, narrow on the head, and streaked with white, except on the shoulders, where a rufous tinge terminates them. Vanes of the primaries yellowish brown towards the base, with indication of bars, changing to brown on their distal halves; upper tail coverts barred with brown; the last bar on each feather heart shaped. Tail dark chocolate brown, tipped with dirty white, and having 8 bars of a reddish brown, the red line gradually disappearing towards the extremity where it changes to a light brown. Basal ends of the primaries and secondaries, white or yellowish white, soon changing to slate colour with bars. Femorals, yellowish white, with minute brown spots near the extremity of the shafts. Tarsi feathered anteriorly for an inch, and thence protected by 12 tiled scales; length, 22 inches; alar expanse, 44 inches.

F. hyemalis, Winter falcon or red shouldered hawk.

F. hyemalis, adult male of Audubon and Wilson.

F. lineatus, young male of Audubon.

Buteo (*Poecilopternis*) *lineatus*. Gmelin? Jardine!

v.s.p. Bill blackish, cere and legs yellow; irides reddish hazel.

Dorsal aspect. Feathers on the head and neck acuminate brown, edged with ferruginous and black shafts; on the back and rump dark brown, edged with lighter brown; small wing coverts reddish brown, with a black stripe down their centres. Greater wing coverts brown, with reddish brown tips; primaries and secondaries, dark brown, barred and tipped with white; scapulars of a lighter hue, barred also. Tail, umber brown, with 6 white bars, and tipped with white.

Ventral aspect. Chin and throat like the head; prevailing hue of breast and belly, femorals and wing linings, bright rufous barred with white and shining brown shafts; vent and tail coverts cream white; wing and tail surfaces brownish white, barred with slate colour.

1st primary about two lines longer than the secondaries; 2nd, two lines longer than the 6th; 3rd and 5th, equal; 4th, longest;

wings about one inch shorter than the tail. This elegant bird measures 22 inches, and has an alar expanse of 44 inches. The above description is from a very perfect specimen in the author's possession. Young "brown and ferruginous, beneath rusty slightly varied with faint bars; wings dusky and barred; tail black, crossed and tipped with 5 bands of white." (Nuttal.)

Buteo insignatus. (Cassin! Baird!) McCulloch's or the Canada Buzzard.

D.C. Form robust; wings rather long, 3rd quill longer, secondaries emarginate at their tips; quills unusually broad; tail rather short, slightly rounded; tarsi feathered in front below joint; naked behind, having in front 10 transverse scales; under wing and tail coverts white, the former striped longitudinally with pale ferruginous, and some of the transversal with dark brown; the latter with transverse slips of pale reddish brown.

Plumage of the tibia dark ferruginous mixed with brown; throat and a few feathers in front white, with narrow lines of black; entire other plumage above and below, dark brown, nearly every feather having a darker or nearly black line on its shaft; quills above brown with a purple lustre, beneath pale ashy with their shafts white, and irregularly barred with white near their bases; tail above dark brown, with an ashy or hazy tinge, and having about 10 obscure bands of a darker shade of the same colour beneath nearly white, with conspicuous bands of brown, the widest of which is next the tip which is paler; tarsi and feet yellow.—Sex unknown. Dimensions. Total length, (of skin) 17 inches; wing 14¾, making an alar expanse of 29½ inches; length of tail, 7½.

Hab. Canada, Dr. McCulloch and Dr. Hall.—Specimen in the private collection of the late Dr. McCulloch, now possessed by Mrs. McCulloch.

Frequently after having examined this bird, the late Dr. McCulloch and myself considered it new, but we had no means of verifying our opinion, until the visit of Prof. Cassin, of Philadelphia, in 1854. Dr. McCulloch fell a victim to the cholera during its epidemic of that year, and the following spring it was forwarded to Mr. Cassin, in Philadelphia who identified it as a new species. Only one specimen has as yet been obtained in this country, although Mr. Cassin has had the good fortune to secure a second specimen, which now constitutes the representative of this Buteo in the museum of the Academy of Natural Sciences, Philadelphia.

In colour it resembles, in some respects, the young of the Circus Hudsonius or ferrugineus. The specimen above described was shot in the vicinity, I believe, of Terrebonne, and was brought to the late Dr. McCulloch, by one of the farmers residing in that neighborhood. It is evidently a very rare species, as this is the only specimen of it which has been seen here. The foregoing description I have taken from Prof. Cassin, who has described the bird under its present name, "Buteo insignatus", in his valuable work, "Illustrations of the birds of California, Texas, Oregon, British and Russian America." In memory of the late Dr. McCulloch, and his promotion of the study of the natural sciences in this city, it should receive the name of McCulloch's Buzzard, although Mr. Cassin has attached to it the name of "Canada Buzzard."

F. Cyaneus, Hen harrier.

F. uliginosus. Wilson and Buonaparte!!

D.C. I have never met with a specimen of this bird, but from its extensive geographical range, it ought to be an occasional visitant with us. The following description is from Nuttal's "Ornithology of the United States and Canada."

"In the old male, the upper parts are of a blueish gray. The quill feathers are white at their origin, and black the rest of their length; the internal part of the base of the wings, rump, belly, sides, thighs, abdomen and beneath the tail is white without spots; upper part of the tail of a cinereous gray, with the ends of the feathers whitish; iris and feet yellow; length 20 and 21 inches."

We desire only to add to our list of the Falconidæ, which we have endeavoured, with every care, to render as perfect and complete as possible, that with the varying names given to the species by authors, together with the differences in plumage, (sometimes remarkable) between the male and female bird, and also between that of the young bird and its parents, the greatest of difficulties has originated and has unquestionably caused, in our opinion, some mistakes in the nomenclature. With the exception of the Gull and Tern tribes, to which we might add one or two other genera, we know of none more difficult of study, or identification than the Hawks.

Genus Strix.

Gen. char. Bill compressed and curved from the base. Cere more or less covered by stiff, erect hairs; head large, feathered; nostrils lateral, rounded, open, and concealed by the hair of the cere; eyes large, orbits surrounded by feathers which are erect, or in a stellated form around them, giving the appearance of a flattened disk; tarsi feathered, often as far as the talons; feet 4-dactyle, three before and one behind; outer toe versatile; 3rd primary longest.

Sub-gen. Surnia.

Sub-gen. char. External auditory apertures oval—of moderate size—naked—facial disk small and composed of slender feathers which are repressed along the cheeks. This genus forms a connecting link between the hawks and true owls.

1st. Subdivision.

Heads without ears or tufts.

S. funerea. Hawk owl.
S. Hudsonia of Wilson.
Surnia ulula. Lemm.! Bonap.! Baird!

v.s.p. Ridge of the upper mandible yellow; its inferior portion, with the lower mandible black; claws black; irides bright yellow; eggs two, white.

Dorsal aspect. Hair-like feathers of the cere gray, with black mucronate shafts; facial disk composed of grayish white stiff feathers, bounded by black posteriorly; upper surface of head and neck deep blackish brown, with numerous white spots. Dorsal region; scapulars, wing coverts and rump, brown, with less numerous white spots, except on the scapulars which appear almost barred with white; tail rounded, brown, with seven imperfect white bars.

Ventral aspect. Chin grayish black; the black line bounding the facial disk, continued to the fore part of the neck; behind this a white streak, the feathers composing which are tipped with black; this again is bounded by another black line; the two black lines meeting behind the ear, and thence diverging to the neck; breast, belly, and vent grayish white, intersected by numerous narrow rusty brown bars; under the wings, these bars assume a darker tint, which is continued to the inner wing cover's; femorals and tarsals silky, of a dirty yellow colour and faintly barred, the feathers continued to the extremities of the toes; tail itself brownish slate colour with distinct white bars; primaries and secondaries barred internally; the bars composed of white spots on the vanes of all the feathers; the outer vane of the 1st. primary has its barbs slightly recurved.

3rd. primary longest; length 16 inches; alar expanse 28 inches. The female has the tints less clear, and the young bird has the plumage of a rusty brown.

S. nyctea. Snowy owl.
S. candida of Latham!
Nyctea nivea. Gray! Baird!

V.S.P. ET V. Bill and claws blueish black; irides bright yellow; eggs 2 white.

Dorsal aspect. Facial disk white; head, neck and whole dorsal region pure white, with more or less distinct umber brown, in some instances, blackish bars; rump and tail coverts white; tail white with three imperfect terminal blackish bars; primaries and secondaries white, with bars on the vanes of the former, and black spots on the inner webs of the latter.

Ventral aspect. Throat, vent, tail coverts, wing linings, and tail white; breast and belly white barred like the back.

Nostrils large, oval, obliquely situated at the margin of the cere; femorals as long as the tarsus; tarsus feathered to the talons, the feathers here being long and soiled; claws black, long, curved, and very sharp; 3rd primary longest; 2nd, 3rd and 4th have their outer vanes abruptly notched; barbs of the outer vane of the 1st primary have their points reverted and open. Length 25 inches; alar expanse 54 inches. The female is a little larger than the male, and more spotted. The old males are nearly altogether pure white.

2ND SUBDIVISION.

Heads furnished with ears.

S. nœvia. Mottled owl, or screech owl.
S. asio, male. Audubon!
S. asio of Linnœus!
S. nœvia of Wilson! Adult.
Scops asio. Bonaparte! Baird!

V.S.P. Bill and claws white bone colour, the latter tipped with black; irides bright yellow; at a distance the prevailing hue of the bird is gray.

Dorsal aspect. A near approach defines the facial disk to be of a gray white colour, with a pale brown line on the upper eyelid; the disk bounded by a black line meeting in the throat, and terminating below the ears; hair-like feathers of the cere, very long; anterior ones projecting considerably beyond the bill; upper part of the head and neck gray and brown, streaked with blackish brown—the streaks fading on the lower part of the neck; dorsal region, rump, scapulars, (except the outer vanes of the outer feathers which are white tipped with black,) and greater wing coverts, coloured like the head; inner vanes of the primaries and secondaries, light brown, with umber brown bars; outer vanes of the primaries ferruginous next the shaft, with white edges, and barred like the inner vanes; outer vanes of the secondaries, mottled and barred with brown, gray, and white; tail dark brown, with 7 or 8 bars of a reddish brown; the bars being indistinct on the distal end, which is also mottled with brown.

Ventral aspect. Above and below the black streak on the throat, white prevails; breast and belly, gray white, with light brown bars, and blackish brown streaks; these streaks are very large on the breast, and become narrower towards the vent; vent feathers white; tail coverts generally white, with indications of brown bars; the lateral feathers white and very silky; wing coverts present the same characters; quills slate colour, with gray bars; femorals and tarsals silky, 4 or 5 inches long, and slightly tipped with rufous superiorly; toes feathered only to the last joint; ears composed of 8 to 10 feathers coloured like those on the head.

4th primary about a line longer than 3rd; 3rd equal to 5th and 2d to 6th; 1st primary not longer than the secondaries. "Outer and inner vanes of the 2nd, 3rd, and 4th primaries notched." 5th notched on the outer vane. The barbs of the outer vanes of 1st and 2d primaries revolute. Claws long, much curved; inner edge of the middle toe, salient, and very sharp, outer toe versatile. Hind toe very short, shorter than the outer one. Middle toe longest. Length 13 inches; alar breadth 20 inches. I must observe that the colours of this bird are much blended with one another, and render the description of it no easy task. The female has a prevailing reddish brown tint, streaked and barred with ash and brown; face whitish; breast and belly whitish, with bars and streaks of black and brown; femorals and tarsals pale brown; irides yellow, bill and claws greyish horn color. She lays 4 to 6 eggs, which are white and nearly round. The young bird is tawny red, with narrow dark spots along the shafts of the feather.

Sub-genus Bubo.

Sub-gen. char. Beak strongly inclined from its base, nostrils large, concealed; ears of moderate size. Facial disk tolerably distinct.

1st. Subdivision.

Heads with ears.

'*S. Virginianus.* Great Horned Owl,

Bubo Virginianus. Gmelin! Bonap! Baird!

v.s.p. & v. Upper mandible black; lower one horn colour; claws pale at their insertion, changing to black towards their tips, irides bright yellow. Eggs 2 to 4, white, large.

Dorsal aspect:—Facial disk immediately round and in front of the orbits greyish black, bordered with reddish brown—the shafts of the feathers being continued beyond the vanes, and forming a kind of fringe. This fringe is bounded by a black border. Above the eye the facial circle is incomplete. Ear-tufts of 10 to 12 feathers, black on the outer vanes, and mottled brown on the inner vanes, the smaller posterior ones being wholly brown. Crown, neck, back, rump, scapulars, and wing coverts black, mottled with grey and brown, the light brown bases of the feathers appearing often through the black tips: the grey white on the back having an undulatory appearance. Primaries and secondaries mottled and barred, the inner vanes presenting on their quill halves a fine reddish brown colour, barred with dark brown. These vanes have a peculiar velvety feel, caused by a fine fringe projecting from the superior outer margin of each barb. The reddish brown almost changes to an orange on the secondaries. Tail banded with six blackish brown bars; the bars most distinct on the inner vanes, which are reddish brown, while the outer vanes, besides the bars, are much mottled with grey and brown.

Ventral aspect. Chin white, succeeded by a belt, which is continuous with the black border of the facial disk. This belt is succeeded by a crescentic spot of pure white, situated at the lower part of the throat. A little below the crescent, and separated from it by an irregular line of black and brown, commences a mesial line of pure white, broad at its commencement, gradually contracting and terminating at the vent. On either side of this line the feathers are white, barred with numerous fine zigzag delineations of umber brown, with lighter edgings, the yellow bases of the feathers appearing through them; flank feathers about 6½ inches long, enveloping the thighs and forming a kind of fringe underneath the tail; they are much barred; inner wing coverts white, barred with umber brown; tail light reddish brown, distinctly barred; femorals yellowish brown; tarsal feathers whitish, barred with brown: of toes whitish and short with faint delineations of darker brown bars; toes feathered as far as the last joint, the feathers projecting over it.

3rd primary longest; 4th a little shorter; barb of outer vane of 1st primary revolute; length, 26½ inches; alar expanse 46½ inches.

2ND SUBDIVISION.

Heads without ears.

S. cinerea. Great Grey or Cinereous owl.

S. Lapponica of Temmink.

Syrnium cinereum. Gmelin! Audubon! Baird.

V.S.P. Bill pale horn colour, thickly embedded in the cere feather; claws black; irides yellow. Eggs 2, mottled with blackish brown.

Dorsal aspect. Facial disk large and well developed, black for a short space, immediately anterior to the orbits; all the rest grey, barred with a blackish brown; the bars concentric, 6 to 7 in number; disk bounded posteriorly by a circle of feathers, the front ones of which are velvety and of a deep liver brown colour; posterior ones white, with a deep brown streak along the shaft. Dorsal region, except the quill feathers of the wing and tail, blackish brown, mottled and barred with white, more or less pure. Quill feathers of the wing and tail blackish brown, barred with a lighter brown and mottled with dirty white, 5 to 6 bars; on the tail there is the same number of bars, but not well defined, composed of alternate deep clove brown and white streaks, with mottled whitish brown interstices. These motlings are most distinct on the two centre feathers.

Ventral aspect. Liver brown and white distributed in about equal proportions, without regularity; flank feathers brown, barred with white; wing and tail coverts dirty white, barred with brown; tail and wings brownish slate colour, mottled and streaked like the upper surface; tarsal feathers long, impure white, barred with brown; toes feathered as far as the origin of the claws; claws long, not much curved, sharp and compressed beneath with indications of a groove.

In the specimen before me the 6th primary is longest; 4th and 5th equal; 3rd about 2 lines shorter; 2nd about an inch shorter than 3rd, and the 1st equal to the secondaries, in consequence of which the wing when expanded has a rounded appearance; tail rounded. Length 30 inches, alar expanse 56 inches. I believe it to be a female. The distinctive character between the sexes is rifling.

Sub-genus Ulula.

Sub-gen. char. Concha large, with a membranous operculum; facial disk well developed.

1st Subdivision.

Head with ears.

S. otus. Long eared owl.

Otus Willsonianus. Lessen! Baird.

v.s.p. Bill and claws black; irides orange yellow; eggs 4 to 5, white and subrotund.

Dorsal aspect. Facial disk black, immediately in front of, above and below the orbits; the black margin succeeded by grey; posterior parts ferruginous brown, inferiorly and posteriorly margined with white, the feathers tipped with black; auricular ring composed of velvety white feathers, mottled and tipped with liver brown, the line thus formed meeting on the anterior part of the throat, where the white predominates; dorsal region deep brown, mottled and barred with white; outer vanes of the scapulars and greater wing coverts, with white spots and a single bar of brown; the quill half of the primaries, yellowish brown, with brown bars; distal ends deep brown, with whitish bars, mottled with brown; tail like the primaries; the yellowish brown less distinct, and traversed by 11 bars of the dorsal colour, with intermediate bars of a fainter tint bordered with dirty white; tail tipped with white.

Ventral aspect. White with clove brown streaks, mottles and bars; wing and tail coverts yellowish white; quill half of primaries and secondaries, yellowish white; distal half, slate brown, with broad white bars; tail, yellowish white, verging to slate at its distal end and barred with deep slate brown; femorals and tarsals, yellowish brown; toes feathered to the last joint.

2nd primary longest; 3rd next; 1st next; 4th next. Ears long, composed of 8 to 10 feathers, black on the outer vanes, white mottled with brown on the inner vanes; barb of *outer vanes of* 1st primary revolute, of 3rd and 4th a good deal inflexed. Length 16½ inches; alar expanse, 34 inches.

S. brachyotos. Short eared owl.

S. brachyota of Latham!

Brachyotus Cassinii. Brewer! Baird!

D.C. This is one of our most common owls, but unfortunately at the time of writing, I cannot lay my hands on a specimen. The following is from Nuttall: "Ear-like tufts inconspicuous, of 2 or 3 very short feathers; general colour, ochreous, spotted with blackish brown; face round the eyes blackish; tail without 5 bands, not extending beyond the tips of the wings; female with the general tints paler. In the young the face is blackish. Length 13 to 15 inches. Head of old bird small; tail ochreous, with small bands, and tipped with white; beneath Isabella yellow, with longitudinal spots of blackish brown; bill black; feet and toes feathered: iris of a bright yellow."

2ND SUBDIVISION.

Heads without ears.
S. nebulosa. Barred owl.
Syrnium nebulòsum. Gray! Baird.

V.S.P. ET V. Upper mandible yellow; lower one blueish black, except where it closes against the upper one; claws blueish black. Eggs 4 to 5, white; irides deep blue, verging to black.

Dorsal aspect. Facial disk in front of the orbits black, bounded by greyish white; all the other parts brownish grey, posteriorly barred and tipped with brown. A line of brown feathers, tipped and barred with white, bounds the facial disk and meets on the throat. Head, neck, back, rump, tail, scapulars, coverts, primaries and secondaries, liver brown, barred with white, which has a yellow tinge. These bars are most numerous on the neck, and most distinct on the back; those of the wings and tail have a brownish tinge, about 5 in number on the latter, and tipped with the same colour, and 5 or 6 on the wings composed of spots which are darker on the outer vanes.

Vental aspect. Chin brown; neck below the brown line continued from the facial disk, white, succeeded by white barred with liver brown. A single bar occurs on each feather, which is also tipped with the same. The bars change to streaks on the breast and belly; vent and tail coverts and wing coverts yellowish white, the second and last with narrow, brown specks; tail slate colour, with 5 bars; wings same, barred; femorals and tarsals short, yellowish white, with a faint barring; toes feathered to the last joint.

Claws long, not much curved but very sharp; claw of the middle toe longest, with a salient sharp inner ridge; hind toe compressed; 4th and 5th primaries equal, if anything 5th longest;

3rd and 6th equal; 2nd and 7th equal; 1st shorter than the secondaries; barbs of the outer vanes of 1st and 2nd primaries revolute; barbs of the outer vanes of 3rd, 4th, 5th, and 6th revolute at their tips; inner vanes of 2nd and 3rd, and outer vanes of 2nd, 3rd, 4th, 5th and 6th notched; tail rounded. Length 24 inches; alar expanse 42 inches. The female and young scarcely differ from the male.

In Richardson's description of the comparative lengths of the primaries of this bird, there appears to me to be an error. I have verified mine in several specimens, and find it differing substantially from his. And so far from the toes being "only half covered with feathers," in all the specimens that I have seen, they are distinctly covered to the last joint, the feathers thence protruding over the talons, and but 4 transverse scales appearing beyond this line, instead of 7 as mentioned by our author. I am inclined to the belief, that the remarks made by him at the end of his description of this bird in his Fauna, must have been derived from an imperfect specimen.

S. Tengmalmi. Tengmalm's owl.
S. Passerina? Wilson!

v.s.p. Upper and lower mandibles black, with the ridge of the former white; claws black; irides yellow; eggs 2, white.

Dorsal aspect. Facial disk, black in front of and below the orbits; below and posteriorly white, bordered by blackish grey, bounded by a line of deep velvety brown, mottled with white, and meeting on the anterior part of the throat, where the white predominates, and thence continued upwards to the chin, separated by a mæsial line of brown, and downwards for a little distance to the breast; crown and occiput liver brown, with white spots—these latter most numerous on the crown, and larger and more distinct on the occiput and nape of neck. The dorsal region liver brown, variegated with white spots, which are largest on the scapulars, on some of which a pair may be seen, but most generally, a single one is met with on the outer vane, of a round shape. Primaries marked by 5 rounded white spots on their outer vanes, and 5 correspondent linear bars on the inner ones; bars broadest on the secondaries; tail with 5 imperfect white bars, made up of oval spots on their outer, and of lines on their inner vanes.

Ventral aspect. Below the throat the prevailing tint is liver brown, mixed with nearly an equal quantity of white—the former colour predominating on the sides, and the latter on the middle parts; wing linings and tail coverts dead white, with imperfect brown marks; wings and tail slate colour, with white spots corresponding to those on the upper surface; femorals and tarsals yellow white, with dark brown bars, the tarsals continued to toes as far as the insertion of the talons.

3rd primary longest; 2nd, 4th and 5th subequal; 1st and 7th equal; outer barb of the 1st primary revolute; tail square. Length 12 inches; alar breadth 20 inches.

Richardson refers the *S. Passerina* to the *S. Tengmalmi*, on no other grounds than a similarity in the plumage of the head. The two birds, however, are totally distinct; the *S. Passerina* not only being much smaller than the *S. Tengmalmi*, but differs also from it in its ventral plumage, which is wholly brown, and moreover, has but three white bars on the tail, whereas the *S. Tengmalmi* has five. A greater difficulty, however, occurs in the distinctive characters between the *S. Dalhousii*, *S. Passerina*, and *S. Acadica*, which resemble one another in nearly all their essential points. Might not the trifling varieties which are found to exist between them be the result of age? Nuttal refers the *S. Passerina* to the *S. Acadica*, to which I feel also much inclined to refer the *S. Dalhousii*. A degree of uncertainty, however, at the best, hangs over these species, which it would require a comparative examination of numerous specimens of different ages and sexes to clear up. The two following species agree with the plates of the respective birds, as figured in Wilson and Buonaparte's splendid work. The descriptions of both of them are taken from prepared specimens, shot in the vicinity of Montreal in 1837.

S. Acadica. Acadian owl.
S. passerina? Wilson!
S. Dalhousii? Audubon!
S. Acadica of Bonaparte;
Nyctale Acadica, Gmelin! Bonap.! Baird!

V.S.P. Bill and claws black; the former tipped with white at the apex of the upper mandible; irides pale yellow.

Dorsal aspect. Facial disk, white superiorly, and black anteriorly and posteriorly, with a few white feathers inferiorly; bounded posteriorly by brown feathers, tipped with white, forming a line which meets immediately below the chin; frontlet yellowish white; crown and nape of neck liver brown, (which is the prevailing dorsal tint) with indications of, or imperfect, white streaks especially on the nape of neck. A white spot tinged with yellow on the outer vanes of the scapulars and wing coverts; 3 or 4 white spots on, the outer vanes of the primaries, which are rudimentary on the 1st, and form bars on the inner vanes; tail with two white bands, tipped with white; the bars made up like those on the wings.

Ventral aspect. Breast and throat liver brown, distinctly defined; lower part of the breast and belly, reddish brown; tail and wing coverts whitish; quills of both slate coloured, barred with white; femorals and tarsals yellowish white, short, and continued almost like hair along the toes, as far as the talons.

Toes long and slender; middle toe, with the claw, 8 lines long; claws long, slender, very slightly grooved, except on middle toe, which has a salient sharp inner edge. Inferior surface of the talons compressed; wings much rounded when extended; 3rd and 4th primaries equal; 2nd and 5th equal; 1st and 8th equal; tail square. Length 8½ inches; alar expanse 16 inches. (Probably a female.)

S. Dalhousii. Dalhousie's owl.

V.S.P. The whole appearance very much resembling the former species.

Dorsal aspect. Facial disk dirty white round the orbit, except anteriorly, where it is blackish; extremities of the facial disk brown; auricular ring like that of the former; crown and nape of neck liver brown, streaked with white, the white streak being along the centre of each feather; scapulars, wing coverts, wings and tail, like the *S. Acadica;* the spots on the inner vanes of the primaries, however differing from those on the *S. Acadica,* in being oval, and scarcely presenting the appearance of bars.

Ventral aspect. Breast and belly streaked with reddish brown and white, instead of being wholly brown as in the former.

3rd primary longest; 2nd and 4th equal; 1st and 8th equal; resmbles the former in all its other characters.

S. Kirtlandii. Kirtland's Owl.

Nyctale Kirtlandica. Hog! Cassin!

This rare, beautiful, and diminutive of the owl tribe was caught alive in a grain store in this city a few years ago by Mr; Hunter, Taxidermist to the Natural History Society. It was identified through the instrumentality of Prof. Cassin's work on "The birds of California, Texas, Oregon, and British and Russian America." It is there mentioned as an inhabitant of the State of Wisconsin, by Dr. Hog, who first described it, having obtained his specimens four in number, in the neighbourhood of Racine in that State. I am happy to have had it in my power to add it to the list of Owls.

V.S.P. Bill black and nearly concealed by small feathers and black bristles arising from its base. Irides yellow. Above eyes and on each side of bill a dirty white line; remainder of the front composed of chocolate brown feathers edged with dirty white, their tips causing at the edge of the front a dirty white line. Feathers behind eyes darkest. Tarsi feathered to extremities of toes with fine appressed ochrey colored feathers. Toes and claws long.

Dorsal aspect. Prevailing tint chocolate brown, relieved on the scapulars, secondaries and primaries by whitish spots, on the latter the spots existing on both the outer and inner veins, forming 3 or 4 imperfect bars. Tail with three bars of white and faintly tipped with the same color.

Ventral aspect. Chin and throat chocolate brown changing on the abdomen, flanks, and inferior tail coverts, to an ochry color. Under wing coverts whitish.

3rd primary longest, 2 and 4 subequal, 1 and 7 being about equal. Wings rounded when expanded. Length from crown of head to tip of tail $7\frac{1}{2}$ inches. Alar expance 15 inches. The whole plumage is peculiarly velvety to the feel.

(To be continued.)

ARTICLE V.—*Note on the Taconic System of Emmons;* by T. Sterry Hunt, M.A., F.R.S.

In a notice of the Taconic rocks in the last volume of this Journal, (p. 379,) it was explained that Emmons asserts that in going eastward from the line of fault which brings up the Taconic group to overlie the Trenton and Loraine formations, we meet successively with lower rocks, all dipping eastward, until in the Green Mountain gneiss we have a rock which is older than the Taconic group; so that the newest rocks appear to be at the base, and the oldest at the summit of the series. It was however maintained, in opposition to this view, that the apparent order of superposition from the great fault, going eastward to the Green Mountains is in the main, the true one, and that the black slates of Emmons, which he regards as the newest rock of his series, are really the oldest; while the Green Mountain gneiss is a rock higher in the series than any of those to the west of it.

These propositions we still maintain, but in explaining what we conceive to be Mr. Emmons' error, we have said that in order to explain this supposed inversion in the succession of the rocks, he imagines a great overturn of the whole series in question. In this we have been misled by the language of Mr. Emmons, which has caused him to be misinterpreted by others as well. In speaking of the succession of rocks, he uses the term "inverted strata," and Mr. Barrande has spoken of the "overturn (*renversement*) of the whole system." Mr. Marcou, apparently as the interpreter of Emmons, speaks of the strata in question as having been "overturned (*renversées*) on each side of the crystalline and eruptive rocks which occupy the centre of the chain, presenting thus a fan-shaped structure, and all the accidents which accompany a complete overturn of a whole system of strata," so that in going eastward towards the centre of the chain, we find that the most recent strata appear to be placed beneath the most ancient, "in consequence of an overturn (*renversement*)." *Comptes Rendus de l'Acad.* xliii. 804.

Now in justice to Mr. Emmons it should be said, that despite his use of the expression "inverted strata," he has never maintained any inversion or overturn, as a careful examination of his descriptions will show. (*Taconic System.* p. 17). He supposes that during the accumulation of the Taconic rocks, the gneiss which formed the eastern limit of the basin was progressively elevated, so as to successively bring the older members above the ocean from which the sediments were being deposited; and that the upper parts of the formation, such as the black slates, were thus confined to a narrow basin, and never extended far eastward; at the same time he conceives that denudation may have removed large portions of the upper beds. At a subsequent period a series of parallel faults, with upthrows to the eastward, is supposed to have broken the strata, given them their eastward dip, and caused the older beds to overlap the inner; thus giving rise not to an inversion of the strata, but to an apparent inverted succession. Now we find in Canada abundant evidence that the slates which Emmons regards as the newest, are really near the base of the series, and cannot consequently admit his hypothesis to explain an order of things which we conceive to have no existence.

The careful study of the region in question shows, that although such a great upthrow and overlap does bring the Quebec group to the surface from beneath the higher rocks, to the east of this fault undulations, overturns, and downthrows to the eastward, diversify, with eastern upthrows, the structure of this complicated region. The gneiss of the Green Mountains, like that of the Scottish Highlands and like the granite of the summits of the Alps, is the newest rock of the chain, the structure of all these mountain regions being synclinal, as we have endeavoured to show in the case of the Alps, (*Silliman's Journal* (2) xxix. 118,) and as Sir Roderick Murchison has beautifully represented in his late section across the Scottish Highlands. (See his new Geol. Map of Scotland).

MISCELLANEOUS.

CHROMIC IRON ORE AND ASBESTUS.

We copy from a late number of the *Chemical News*, the following notice of the chromic iron and asbestus from the vicinity of Baltimore, lately imported into England. It is known to many of our readers that the Geological Survey has already shewn the existence in several parts of the Eastern Townships, and in Gaspé, of large deposits of this valuable ore, equal in richness to the samples from the United States:—"The amount of sesqui-oxide of chromium in the present ore, as determined by Dr. Genth, is stated to be equivalent to 63 per cent. of *chromic acid*—a mode of expressing the value of the ore by the quantity of chromic acid produced on fusion with an alkali, and not that of the green sesqui-oxide actually contained therein. Ore of this superior description may be obtained in casks ready for shipment, at the rate of about one dollar for each one per cent. of chromic acid per ton, and in quantities of about 200 tons annually. It is, however, considered more judicious to work this ore in admixture with other qualities which are produced in greater abundance,—1500 tons annually,—the average composition of such samples furnishing usually about 50 per cent of chromic acid. The ore last described was accompanied by specimens of asbestus, and of paper containing about one-third proportion of the same. This mineral may be procured at the rate of 1½ cents per pound,—a low price considering the high quality of the article offered. The specimen sent is beautifully white, and the fibres are long and delicate. It has been tried in America for paper-making and for the manufacture of steam-packing, in both of which applications it is said to be very serviceable. Its property of resisting heat, and its bad conducting power, would render this material particularly valuable in connection with steam machinery. The sheet of paper sent is a portion of an experimental manufacture; it burns with flame, leaving a white incombustible residue, which, with careful management, retains the form of the original sheet; the weight of ash amounting precisely to 29 per cent."

MONTHLY METEOROLOGICAL REGISTER, ST. MARTINS, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF DECEMBER, 1861.

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.) 6 a. m.	2 p. m.	10 p. m.	Temperature of the Air.—F. 6 a. m.	2 p. m.	10 p. m.	Tension of Aqueous Vapour. 6 a. m.	2 p. m.	10 p. m.	Humidity of the Atmosphere. 6 a. m.	2 p. m.	10 p. m.
1	29.774	29.670	29.514	16.4	28.1	25.4	.068	.120	.117	.75	.80	.87
2	561	617	719	19.6	26.2	16.5	.093	.105	.063	.92	.75	.75
3	784	862	30.147	7.6	22.2	8.3	.034	.084	.050	.88	.71	.82
4	933	962	29.874	— 3.2	24.0	24.2	.030	.083	.100	.80	.66	.80
5	952	30.147	30.030	20.0	34.0	29.2	.091	.162	.140	.85	.84	.86
6	30.329	244	256	21.2	31.6	32.0	.096	.149	.162	.87	.84	.89
7	039	29.917	29.824	36.2	39.2	30.0	.101	.216	.223	[illegible]	.91	.98
8	29.681	754	815	39.1	46.9	37.8	.220	.262	.211	.92	.84	.94
9	891	900	857	34.6	39.0	25.2	.169	.195	.182	.84	.82	.89
10	800	744	594	34.0	36.0	36.1	.182	.177	.191	.95	.85	.90
11	747	30.000	30.259	34.2	33.0	15.0	.175	.079	.061	.89	.65	.76
12	30.341	331	372	15.2	26.0	19.1	.069	.128	.071	.71	.87	.69
13	149	137	101	28.9	37.3	31.1	.123	.192	.155	.77	.88	.89
14	29.870	29.746	29.749	27.1	42.2	37.6	.129	.199	.171	.88	.74	.76
15	30.137	30.101	30.051	16.4	26.0	25.6	.074	.111	.111	.83	.81	.81
16	29.600	29.714	29.820	24.1	30.1	29.1	.110	.130	.129	.86	.78	.82
17	30.191	30.100	847	10.7	25.7	26.0	.048	.110	.123	.69	.80	.87
18	29.654	29.863	30.114	30.0	33.0	15.1	.136	.150	.161	.83	.80	.73
19	987	684	29.611	9.0	19.8	26.3	.051	.081	.118	.77	.77	.83
20	667	914	30.054	20.0	10.0	0.0	.191	.089	.052	.85	.57	.70
21	30.199	30.224	269	—10.0	4.1	8.1	.022	.041	.051	.78	.74	.77
22	257	162	114	12.0	28.0	21.0	.051	.123	.096	.70	.81	.95
23	29.714	29.437	29.378	17.0	20.9	23.0	.078	.091	.112	.83	.85	.93
24	514	669	868	14.1	16.6	0.5	.070	.053	.036	.82	.58	.84
25	30.026	30.079	30.220	— 7.3	10.0	0.6	.020	.045	.036	.64	.68	.84
26	220	045	000	— 9.1	11.0	26.3	.024	.042	.123	.79	.59	.87
27	29.502	29.560	29.984	34.0	25.0	9.1	.175	.100	.051	.74	.77	.83
28	30.277	30.179	30.210	— 4.0	9.0	1.0	.031	.051	.038	.83	.77	.85
29	181	29.924	29.944	— 1.0	15.1	10.0	.028	.016	.084	.63	.55	.78
30	29.736	953	30.054	8.1	22.2	5.0	.048	.084	.041	.77	.71	.74
31	894	737	29.891	8.1	21.0	14.1	.048	.080	.067	.77	.71	.81

Day of Month.	Direction of Wind. 6 a. m.	2 p. m.	10 p. m.	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.
1	S. S. E.	N. E. by E.	N. E. by E.	122.60	4.0	....	1.60	Slight Snow.	Snow.	Snow.
2	W. S. W.	W. S. W.	W. S. W.	338.50	3.0	....	0.57	Cu. Str. 8.	C. C. Str. 10.	Clear.
3	W. S. W.	W.	S. W. W.	151.30	3.0	....	....	C. C. Str. 10.	Clear.	"
4	W. S W.	S. W. by S.	S. by W.	27.30	2.5	....	....	Clear.	C. C. Str. 4.	Cu. Str. 10.
5	W. by S.	W.	S.	16.20	3.5	....	....	Cu. Str. 10.	Cirr. Str. 10.	" 10.
6	N. E. by E.	N. E. by E.	E. S. E.	154.70	4.0	Inapp.	....	" 10.	" 10.	" 10.
7	S. by W.	S. S. E.	S.	18.50	3.5	....	....	Cirr. Str. 4.	" 10.	Rain.
8	S. W.	W. S. W.	N.	71.70	5.5	0.600	....	Fog.	Hazy.	Cu. Str. 10.
9	E.	S. W.	S. E. E.	23.20	5.5	....	....	Cu. Str. 10.	Cu. Str. 10.	" 10.
10	N. E. by N.	N. E. by E.	S. W.	121.40	3.5	0.126	....	" 10.	" 10.	Cir. Cu. Str, 8.
11	N. by W.	W. N. W.	N. W.	651.90	5.0	0.380	....	Rain.	Clear.	Clear.
12	S by E.	S. S. W.	S.	60.10	3.0	....	Inapp.	Cu. Str. 10.	Cu. Str. 10.	Clear.
13	S. S. W.	W. S. W.	S. S. W.	47.00	4.0	....	....	" 4.	" 8.	Cirr. Str. Lunar Halo.
14	S. S. W.	W. S. W.	W.	119.20	2.0	....	....	C. C. Str. 8.	Cu. Cir. 4.	Clear. Inapp. halo Aurora Boreal.
15	N. W.	N. by W.	W.	473.20	2.5	....	....	Cirr. Str. 4.	Clear.	C. C. Str. 10.
16	S. W.	W.	N. N. E.	224.40	2.5	....	....	Cu. Str. 10.	C. C. Str. 6. S. H.	Clear.
17	S. E. by E.	S. W. by S.	E. by S.	74.70	3.5	....	....	Clear.	Cirr. Cu. 4. Ip. H.	Cirr. 4. and Halo.
18	S. W. by W	N. by W.	N. E. by E.	221.50	3.0	....	....	Cu. Str. 10.	Clear.	Clear.
19	E. S. E.	N. E. by E.	S. S. E.	49.70	3.5	....	Inapp.	" 10.	Snow.	Sleet.
20	W. by N.	W. N. W.	W.	247.20	4.8	....	....	" 4.	Cu. Str. 4.	Clear. Faint Aurora Borealis.
21	W.	S. W.	S. S. W.	845.89	2.0	....	....	Clear.	Clear.	Cu. Str. 8.
22	S. S. W.	S. S. W.	E. S. E.	85.80	3.0	....	....	Str. 2.	Cu. Str. 9.	" 4.
23	N. E. by E.	N. E. by E.	N. E. by E.	240.50	5.5	....	2.50	Snow.	Snow.	Snow.
24	W.	W. by S.	W. by S.	563.70	4.5	....	....	Cu. Str. 10.	Cu. Str. 10.	Cu. Str. 10.
25	W. by S.	W. S. W.	S. S. E.	69.90	2.0	....	....	Clear.	" 4.	Clear.
26	N. E. by E.	N. E. by E.	S. by E.	55.80	4.0	....	....	C. C. Str. 4.	C. C. Str. 10. F. halo.	Sleet.
27	S. S. W.	W.	W.	582.10	4.5	0.210	....	Rain.	" 10.	Cu. Str. 10.
28	W. S. W.	W. S. W.	S. W. by W	420.90	2.0	....	....	Clear.	Clear.	Clear.
29	S. E.	E. by S.	S. by W.	17.40	2.0	....	....	C. C. Str. 8.	Cu. Str. 8.	Cu. Str. 10.
30	W. S. W.	W.	S. S. W.	162.60	2.0	....	0.50	Cu. Str. 10.	" 10.	" 10.
31	S. by E.	S. E.	N. N. E.	6.10	4.0	....	3.10	" 10.	Snow.	Snow.

REPORT FOR THE MONTH OF JANUARY, 1862.

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.) 6 a. m.	2 p. m.	10 p. m.	Temperature of the Air.—F. 6 a. m.	2 p. m.	10 p. m.	Tension of Aqueous Vapour. 6 a. m.	2 p. m.	10 p. m.	Humidity of the Atmosphere. 6 a. m.	2 p. m.	10 p. m.
1	29.482	28.863	29.268	19.1	26.0	10.0	.08[illegible]	.123	.045	.84	.87	.68
2	747	29.799	944	— 6.5	6.1	— 1.6	[illegible]	.035	.034	.80	.61	.84
3	998	985	997	—11.4	2.3	— 7.0	.014	.034	.022	.53	.71	.69
4	903	840	913	—16.1	— 1.0	— 6.6	.009	.028	.026	.43	.68	.80
5	953	917	917	—11.5	3.0	— 2.9	.020	.042	.032	.76	.86	.83
6	765	779	784	—10.5	4.7	3.7	.021	.044	.046	.77	.84	.87
7	870	931	30.186	8.0	24.0	7.0	.018	.100	.018	.77	.79	.77
8	30.317	30.101	29.824	— 8.0	22.2	24.4	.020	.084	.111	.66	.71	.86
9	29.804	29.797	811	30.0	37.0	36.0	.148	.184	.177	.89	.85	.85
10	752	450	319	19.2	21.1	36.2	.087	.096	.191	.84	.85	.90
11	30.088	30.028	30.007	— 9.4	1.3	— 3.6	.022	.036	.031	.76	.72	.83
12	29.510	29.328	29.376	— 1.0	14.2	18.4	.034	.065	.093	.84	.79	.92
13	925	30.188	30.410	— 1.0	— 1.2	—10.3	.036	.028	.015	.84	.63	.55
14	30.561	565	568	—27.7	0.0	— 5.0	.009	.026	.025	.89	.56	.80
15	651	29.774	29.510	— 2.0	15.4	17.0	.030	.065	.073	.80	.74	.83
16	29.698	749	30.025	19.0	17.4	— 0.6	.082	.072	.036	.84	.75	.84
17	30.367	30.278	296	— 2 0	17.4	12.3	.034	.072	.060	.84	.75	.80
18	228	054	036	15.1	21.2	16.1	.070	.093	.074	.81	.80	.83
19	29.995	29.884	29.927	3.0	20.1	19.2	.041	.081	.087	.74	.77	.84
20	894	851	967	17.1	20.1	19.1	.098	.091	.091	.83	.85	.85
21	30.119	30.176	30.097	15.4	13.0	10.1	.070	.063	.054	.80	.81	.78
22	089	151	114	8.4	18.1	17.1	.018	.082	.078	.77	.84	.83
23	094	052	139	17.4	33.6	25.0	.074	.143	.117	.80	.79	.87
24	241	019	174	8.4	22.1	10.6	.049	.094	.048	.77	.71	.69
25	29.946	29.741	29.618	14.1	24.1	18.2	.067	.111	.082	.81	.86	.84
26	571	647	867	20.0	25.2	17.2	.091	.117	.068	.85	.86	.75
27	30.184	30.314	30.666	12.1	12.8	0.6	.060	.054	.038	.80	.71	.85
28	414	274	253	—15.5	12.1	0.0	.014	.045	.032	.70	.60	.70
29	29.886	29.814	29.874	3.0	17.1	16.0	.036	.078	.074	.72	.83	.85
30	954	967	30.050	16.1	32.1	23.2	.074	.143	.089	.85	.79	.72
31	30.315	30.331	345	2.0	16.1	1.0	.032	.059	.032	.70	.65	.70

Day of Month.	Direction of Wind. 6 a. m.	2 p. m.	10 p. m.	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.
1	N. E. by E.	N. W. by W.	W.	230.80	4.0	Inapp.	1.79	Snow.	Rain.	Cirr. Str. 10.
2	W. by N.	W. N. W.	W. N. W.	184.80	3.0	....	....	Clear.	Clear.	Clear. Faint Aurora Borealis.
3	W. N. W.	W. by N.	W. by N.	136.80	2.0	....	....	"	"	"
4	W. by N.	W. by N.	W. by N.	111.80	2.0	....	....	"	"	"
5	W. by S.	W. by N.	W. S. W.	95.30	2.0	....	....	"	"	"
6	N. E. by E.	N. E. by E.	S. S. E.	0.00	3.0	....	....	Cu. Str. 6.	Cu. Str. 4.	Cu. Str. 8.
7	W. by S.	W.	W.	1.00	4.0	....	0.75	Snow.	Clear.	Clear.
8	W.	S. S. E.	S S. W.	37.00	4.5	....	....	Hoar Frost.	Cu Str. 10.	Cu. Str. 10.
9	S. S. W.	W. by S.	W. by S.	83.10	3.0	....	0.75	Cu. Str. 10.	"	" 10.
10	E. by S.	N. E. by E.	W.	177.90	3.5	Inapp.	....	" 10.	Rain.	" 10.
11	W. by N.	N. E.	N. E. by E.	147.30	2.0	....	....	Clear.	C. C. Str. 4.	C. C. Str. 8.
12	N. E. by E.	N. E. by E.	S. W.	139.20	4.0	Inapp.	3.90	Snow.	Snow.	Cu. Str. 10.
13	W. N. W.	N. W. by W	W.	429.00	3.0	....	....	Clear.	Clear.	Clear. Aurora Borealis.
14	N. E. by E.	N. E. by E.	N. E. by E.	3.90	3.0	....	....	"	"	C. C. Str. 6. Lunar Halo.
15	N. E. by E.	N. E. by E.	N. E. by E.	202.80	4.5	Inapp.	7.15	Snow.	Snow.	Cu. Str. 10.
16	W.	W.	W.	225.80	4.5	....	....	Cu. Str. 4.	Cu. Str. 4.	Clear.
17	S. S. W.	S.	S. by W.	0.00	3.5	....	Inapp.	" 10.	" 4.	C. Cum. 4.
18	S. S. E.	N. E. by E.	N. E. by E.	13.10	5.0	....	6.14	" 10.	Snow.	Cu. Str. 10
19	N. E. by E.	N. E. by E.	N. E. by E.	205.40	5.5	....	1.01	" 10.	Cu. Str. 10.	" 10.
20	N. E. by E.	N. E. by E.	N. E. by E.	366.10	5.5	....	7.00	Snow.	Snow.	Snow.
21	N. E. by E.	N. E. by E.	N. E. by E.	194.20	1.5	....	....	Clear.	Clear.	Clear.
22	N. E. by E.	N. E. by E.	N. E. by E.	48.40	3.0	....	0.75	C. C. Str. 10.	Snow.	Snow.
23	S. S. W.	S. S. W.	N. E. by N.	1.00	2.5	....	....	Cu. Str. 10.	C. C. Str. 4.	Cu. Str. 10.
24	S. S. E.	N. E. by E.	N. E. by E.	0.00	1.5	....	....	Hazy.	Clear.	" 4. Faint A. Bor.
25	N. E. by E.	N. E. by E.	N. E. by E.	91.40	3.0	....	6.14	Cu. Str. 10.	Snow.	Snow.
26	W. by S.	W. N. W.	W.	223.40	3.5	....	1.47	Snow.	Cu. Str. 4.	Clear.
27	W. N. W.	W. N. W.	W. N. W.	476.44	1.0	....	....	Cu. Str. 4.	Clear.	"
28	W. by N.	W.	W.	100.80	1.0	....	....	Hoar Frost.	"	Cu. Str. 10.
29	N. E. by E.	N. W. by W.	W. N. by W	133.70	1.8	....	Inapp.	Snow.	Sleet.	" 19.
30	S. S. W.	W. S. W.	W. N. W.	1.30	1.5	....	....	Cu. Str. 10.	Clear.	" 10.
31	W. N. W.	W. N. W.	W. N. W.	39.60	1.5	....	....	Clear.	"	Clear. Zodiacal light bright.

REMARKS FOR DECEMBER, 1861.

Barometer....... { Highest, the 12th day, 30·372 inches.
Lowest, the 23rd day. 29.378 "
Monthly Mean, 29.892 "
" Range, 0.994 " }

Thermometer... { Highest, the 8th day, 46°9.
Lowest, the 21st day,—10°0.
Monthly Mean, 20°54.
Monthly Range, 56°9. }

Greatest intensity of the Sun's rays, 69°8.
Lowest point of Terrestrial radiation,—11°7.
Mean of Humidity, .796.
Rain fell on 5 days, amounting to 1.306 inches; it was raining 31 hours and was accompanied by Thunder on 1 day.

Snow fell on 7 days to 8.27 inches; it was snowing 80 hours 55 minutes.
Most prevalent wind, W. S. W.
Least prevalent wind, the N.
Most windy day the 11th day, mean miles per hour, 27.18.
Least windy day the 31st day, mean miles per hour, 0.25.
Aurora Borealis visible on 3 nights.
Solar Halo visible on 3 days.
Lunar Halo visible on 3 nights.
The Electrical state of the Atmosphere has indicated high intensity.
Winter fairly set in on the 23rd day.

REMARKS FOR JANUARY, 1862.

Barometer. ...... { Highest, the 27th day, 30.666 inches.
Lowest, the 1st day, 28.863 "
Monthly Mean, 29.845 "
Monthly Range, 1.803 " }

Thermometer. { Highest, the 9th day, 37°0.
Lowest, the 14th day,—27°7.
Monthly Mean, 9°48.
Monthly Range, 64°7. }

Greatest intensity of the Sun's rays, 45°1.
Lowest point of Terrestrial radiation,—29°2.
Mean of humidity, ·788.
Rain fell on 4 days, inappreciable.

Snow fell on 13 days amounting to 36·85 inches. It was snowing 95 hours and 28 minutes.
Most prevalent wind, N. E. by E.
Least prevalent wind, S.
Most windy day, the 27th day; mean miles per hour, 19,85.
Least windy day, the 17th day; Calm.
Aurora Borealis visible on 3 nights.
Lunar Halo very bright on 1 night.
Zodiacal light bright (but Venus presents an early and well defined view.)
Encke's comet was visible.
The Electrical state of the Atmosphere has indicated high intensity.

CONTENTS OF NUMBER I.

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