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ARTICLE XLIX.—*On certain theories of the formation of mountains.*

No. 1.

The causes of the elevation of mountains above the general contour of the earth whether in the shape of isolated peaks or continuous chains have always been favourite subjects for speculation among physical geologists. In Europe the Alps situated as they are in the very centre of the cradle of civilisation have naturally received the greatest amount of consideration, while in America the origin of the long ranges of the Appalachians has been, ever since the dawn of science upon this continent, the all important problem to be solved. It is principally upon the theories of the elevation of these last mentioned mountains that we shall in this paper make a few observations.

The Appalachian system occupies a belt of mountainous country extending from Cape Gaspé, at the mouth of the St. Lawrence, south-westerly, through eastern Canada to the Province line near Lake Champlain where it enters the State of Vermont and is then continued in the same general direction to the State of Alabama. The total length of the belt is more than one thousand miles and its width from thirty to one hundred and fifty. It consists not o a single line of peaks but of numerous long parallel ridges separated from each other by valleys of variable width and depth. The height of these hills may be stated in a general way as ranging from five hundred to five thousand feet above the level of the sea. They attain their greatest developement in the States of Pennsylvania, Virginia, North Carolina and Tennessee where they have been most successfully studied by the brothers Professors W. B. and H. D. Rogers. The results of the observations of these two eminent geologists are given in a masterly paper read before the American Association for the Advancement of Science in 1842 and recently in a more matured form by H. D. Rogers in his magnificent work on the geology of Pennsylvania.

According to Professor Rogers the Appalachians consist nearly altogether of stratified rocks of palæozoic age including all the American formation from the base of the Silurian up to the top of the carboniferous. These rocks were deposited in nearly horizontal strata on a sea bottom, which in the region now occupied by the mountains in question, kept constantly subsiding during the whole period of their accumulation. South-east there existed in the place of the present Atlantic Ocean a vast continent from the waste of whose shores the material out of which the strata were formed was derived. In consequence of their proximity to the shore the formations on the south-east accumulated more rapidly than they did towards the south-west. For this reason there is now found a much greater thickness of the same rocks in Pennsylvania, Virginia, and other north eastern States than in those which lie further west such as Ohio, Indiana, Illinois and Iowa. The strata remained in their nearly horizontal position, perhaps sloping gently towards the south-west, until the close of the Carboniferous era. Then by some great disturbance of the equilibrium of the forces of nature they were thrown into a series of vast wave like undulations. The profile of these waves immediately after their elevation must have been somewhat similar to the following figure.

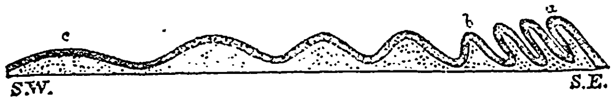

Fig. 1.

Fig. 1.—Ideal section across the Appalachians. The dotted space is intended to represent the rock of the original bottom of the ocean. The black undulated line represents the stratified rocks after having been

plicated or folded by the force, whatever it may have been, which elevated the mountains. The three folds on the right, marked *a*, are of the type of these that Prof. Rogers calls *Folded flexures; b*, is an example of a *Normal flexure*—steeper on one side than on the other; *c*, is a *Symmetrical flexure*, or one which slopes equally in both directions. The hollows are generally called by geologists *synclinal axes* and the ridges *anticlinal axes.*

Prof. Rogers shows that on the south western side of that part of the disturbed region now occupied by the western States the flexures are broad, flat swells not sufficiently abrupt or elevated to constitute mountain chains. But proceeding south easterly or towards the present Atlantic ocean they become more and more lofty and more closely crowded together. The western undulations are symmetrical, that is to say, they exhibit an equal slope on both sides but towards the east they gradually become steeper on one side—then vertical and even overhanging or overthrown. The steep sides are always towards the west and the overthrows are also all in the same direction.

The question to be answered is: what caused this wonderful folding up of the earth's crust? But before proceeding to give an account of the various solutions of the problem that have been proposed, we may state for the benefit of the non-geological reader that although at the present day these mountains consist of long parallel ridges they are not always the original ones. In the process of curvation the strata must have been fractured along the crest of each wave, and the rocks being thus broken up rendered more easily operated upon by atmospheric or aqueous agencies or by the action of both combined than those which formed the bottoms of the valleys. In many instances it can be shown that in consequence of the enormous denudation to which they have been subjected the original mountains have been completely worn away down to their very bases; and further that many of the finest and most fruitful valleys of the South are scooped out of the foundations of the ancient hills. On the other hand the bottoms of the hollows not having been so much fissured have been enabled to withstand the wear and tear of nature's forces until at length they constitute the crests of the ridges of the present day. We have thus mountains where once there were valleys and we have also valleys where of old, the mountains stood. The general aspect of the whole region has been so much changed during the long ages that have passed away since its upheaval that the inexperienced observer may well fail to detect many indications of the systematic regularity represented in the above figure. Yet there remain sufficient of the original foldings of the strata to enable the physical geologist to demonstrate that Roger's elucidation of the structure is upon the whole correct.

The following are the principal theories of the origin of the flexures of the Appalachian Mountains.

PROF. ROGER'S THEORY.

"The wave-like structure of the Appalachians and other undulated zones has been attributed by the author and his brother, Prof. W. B. Rogers, in their communications to the American Association in 1842, and to the British Association in the same year, to an actual undulation of the supposed flexible crust of the earth, exerted in parallel lines, and propagated in the manner of a horizontal pulsation from the liquid interior of the globe. We suppose the strata of such a region to have been subjected to excessive upward tension, arising from the expansion of molten matter and gaseous vapours, the tension relieved by linear fissures, through which much elastic vapour escaped, the sudden release of pressure adjacent to the lines of fracture producing violent pulsations on the surface of the liquid below. This oscillating movement in the fluid mass beneath would communicate a series of temporary flexures to the overlying crust, and these flexures would be rendered permanent (or keyed into the forms they present) by the intrusion of molten matter. If during this oscillation we conceive the whole heaving tract to have been shoved (or floated) bodily forward in the direction of the advancing waves, the union of this tangential with the vertical wave like movement will explain the peculiar steepening of the front side of each flexure, while a repetition of similar operations will account for the folding under or inversion, visible in the more compressed districts. We think that no purely upward or vertical forces exerted either simultaneously or successively along parallel lines, could produce a series of symmetrical flexures, and that a tangential pressure, unaccompanied by a vertical force, would result only in an imperceptible bulging of the whole region, or an irregular plication dependent on local inequalities in the amount of resistance. The alternate upward and downward movement necessary to enable a tangential force to bend the strata into a series of regular parallel subsiding flexures has been we conceive, of the nature of a pulsation, such as would arise from a succession of actual waves rolling in a given direction beneath the earth's crust. It is difficult to account for the phenomena by any hypothesis of a gradual prolonged pressure exerted either vertically or horizontally. And, further, the formation of the grand yet simple flexures so frequently met with cannot be explained by a *repetition* of feeble, tangential movements, since these could not successively accord either in their direction or in their amount; nor can it by a repetition of merely vertical pressures, for it is impossible to suppose that these could without some undulating action, shift their positions through a series of symmetrically disposed parallel lines. We find it equally impossible to understand how, if feeble and often repeated, these vertical pressures should always return to the same lines to produce the conspicuous flexures we behold. The oscillations of the crust to which the undulations of the strata are attributed have been, we conceive, of the nature of the earthquakes of the present day. Earthquakes consist, as we think we have demonstrated, of a true pulsation of the flexible crust of the globe, propelled in parallel low waves of great length and amplitude with prodigious velocity, from lines of fracture, either conspicuous volcanic axes or half-concealed deep-seated fissures, in the outer envelope of the planet" (*H. D. Rogers, in the Geology of Pennsylvania.* Vol. 2, Pt. 2, p. 911.)

2. Sir Charles Lyell's Theory.

Sir Charles Lyell in commenting upon the theory of Prof. Rogers says:—

"That there were great lakes, or seas of lava, retained by volcanic heat for ages, in a liquid state beneath the Alleghanies, is highly probable, for the simultaneous eruptions of distant vents in the Andes leave no doubt of the wide subterranean areas permanently occupied by sheets of fluid lava in our own times. It is also consistent with what we know of the laws governing volcanic action to assume that the force operated in a linear direction, for we see trains of volcanic vents breaking out for hundreds of miles along a straight line, and we behold long parallel fissures, often filled with trap or consolidated lava, holding a straight course for great distances through rocks of all ages. The causes of this peculiar mode of development are as yet obscure and unexplained; but the existence of long narrow ranges of mountains, and of great faults and vertical shifts in the strata prolonged for great distances in certain directions, may all be results of the same kind of action. It also accords well with established facts to assume that the solid crust overlying a region where the subterranean heat is increasing in intensity, becomes gradually upheaved, fractured, and distended, the lower part of the newly opened fissures becoming filled with fused matter, which soon consolidates and crystallizes. These uplifting movements may be propagated along narrow belts, placed side by side, and may have been in progress simultaneously, or in succession, in one narrow zone after another.

"When the expansive force has been locally in operation for a long period, in a given district, there is a tendency in the subterranean heat to diminish;—the volcanic energy is spent, and its position is transferred to some new region. Subsidence then begins, in consequence of the cooling and shrinking of subterranean seas of lava and gaseous matter: and the solid strata collapse in obedience to gravity. If this contraction take place along narrow and parallel zones of country, the incumbent flexible strata would be forced, in proportion as they were let down, to pack themselves into a smaller space, as they conformed to the circumference of a smaller arc. The manner in which undulations may be gradually produced in pliant strata by subsidence is illustrated on a small scale by the creeps in coal-mines; there both the overlying and underlying shales and clays sink down from the ceiling, or rise up from the floor, and fill the galleries which have been left vacant by the abstraction of the fuel. In like manner the failure of support arising from subterranean causes may enable the force of gravity, though originally exerted vertically, to bend and squeeze the rocks as if they had been subjected to lateral pressure.

> "Earthquakes have raised to heaven the humble vale,
> And gulphs the mountain's mighty mass entomb'd,
> And where th' Atlantic rolls, wide continents have bloom'd."

"In applying these lines to the physical revolutions of the territory at present under consideration, we must remember that the continent which bloomed to the eastward, or where the Atlantic now rolls its waves was anterior to the origin of the carboniferous strata which were derived from its ruins; whereas the elevation and subsidence supposed to have given rise to the Appalachian ridges was subsequent to the deposition of the coal-measures. But all these great movements of oscillation were again distinct from the last upheaval which brought up the whole region above the level of the sea, laying dry the horizontal New Red Sandstone, as well as a great part of, if not all, the Appalachian chain." (*Lyell's Travels in North America*, 1*st Visit*. Vol. 1, p. 78.)

Theory of the Contraction of the Sphere of the Earth.

This theory supposes that the earth was originally a fluid mass of great dimensions—that in cooling down it contracted, and that the plications of mountain chains have been produced by the folding of the crust consequent on contraction. This theory originated with Leibnitz and has been adopted by very many of the great physicists who have lived since his day. In America it has been investigated by Professor Dana and applied to the solution of the problem of the plication of the Appalachians. (See Silliman's *Journal*, 2 *series, Vol.* 2, *page* 335, *and Vol.* 3, *page* 94.

Buffon's Theory.

Buffon was of opinion that mountains and mountain chains are of submarine origin or that they are simply huge petrified mud or sand banks originally accumulated on the bottom of the sea, by the action of the waves and currents, and afterwards elevated along with the continents by subterranean forces. Buffon, it is scarcely necessary to state, never applied this idea to the Appalachians, but as it forms part of Professor Hall's theory, we quote it here; we have published it in the 1st Volume of this Journal, page 8.

Sir John Herschel's Theory.

Sir John Herschel is of opinion that the sediment as it accumulates on the bottom of the Ocean must by its weight cause the earth's crust immediately beneath to sink, while the fluid matters below being thrust aside and forced under the adjacent parts elevates tracts of land where there is no such accumulation in progress. In consequence of the swelling up of the surface in those rising regions, the strata are sometimes strained beyond their power of cohesion and cracked asunder, and thus fissures are produced through which the molten rock of the interior boils out upon the surface. Thus volcanoes, great overflows of trap, and mountains may have originated. The fact that nearly all volcanoes are found near the sea shore or near the margins of those regions where we know that beds of sedim ^nt are being formed seems to confirm this view. (*See this Journal*, Vol. 1, pp. 194, 195.

Professor Hall's Theory.

Professor Hall's Theory appears to us to be closely related to those of Rogers, Lyell, Buffon and Herschel. The fundamental fact in the greater accumulation of sediment along the south eastern side of the Appalachians than on the south western, as evidenced by the thinning out of the strata in a westerly direction. This was pointed out by Rogers in 1842 and has also been described at greater length in his recent extensive work. Professor Hall after noticing these accumulations in detail, says:—

"When these are spread along a belt of sea bottom, as originally is the line of the Appalachian chain, the first effect of this great augmentation of matter would be to produce a yielding of the earth's crust beneath, and a gradual subsidence will be the consequence. We have evidence of this subsidence in the gradual amount of material accumulated; for we cannot suppose that the sea has been originally as deep as the thickness of these accumulations. On the contrary, the evidence from ripple-marks, marine plants and other conditions, prove that the sea in which these deposits have been successively made was at all times shallow, or of moderate depth. The accumulation, therefore, could only have been made by a gradual or periodical subsidence of the ocean bed; and we may then inquire, what would be the result of such subsidence upon the accumulated stratified sediments spread over the sea bottom?

"The line of greatest depression would be along the line of greatest accumulation, and in the direction of the thinning margins of the deposit the depression would be less. By this process of subsidence, as the lower side becomes gradually curved, there must follow as a consequence, rents and fractures upon that side; or the diminished width of surface above, caused by this curving below, will produce wrinkles and foldings of the strata.

"The sinking down of the mass produces a great synclinal axis, and within this axis, whether on a large or small scale, will be produced numerous smaller synclinal and anticlinal axes. And the same is true of every synclinal axis, where the condition of the beds is such as to admit of a careful examination. I hold, therefore, that it is impossible to have any subsidence along a certain line of the earth's crust, from the accumulation of sediments, without producing the phenomena which we observed in the Appalachian and other mountain ranges."—*Introduction to Pal. N. Y. Vol.* 3.

Remarks on the above several Theories.

The theory of Professor Rogers depends upon the action of two forces, an upward pulsating force, and a lateral compressing force. But it appears to us that he does not show how either of these forces was generated. The cause of these forces yet remains unknown, and is it not true that to explain natural phenomena without tracing them to some known cause, is simply not to explain them at all! If this deficiency were supplied the theory might be good enough. The contraction of the mass of the earth would undoubtedly produce plications of the surface and although most physicists do believe in the former fluid condition of the planet, and its contraction during the process of consolidation, yet it remains to be demonstrated that any such contraction has taken place during that period within which the existing mountain chains were elevated. Sir Charles Lyell's theory supposes the plications to have been formed by the subsidence of the disturbed country. He thus refers the phenomena to a known cause, for it is unquestionable that there has been subsidence in the region of the Appalachians. But on the other hand, Rogers contends that the cause assigned could not have produced a plication of any important dimensions, and we have been long since convinced by his reasoning. We shall offer some mathematical proofs on this point in connection with Professor Hall's views.

Sir John Herschel refers the phenomenon of subsidence to a known cause, for we know that matter is constantly being transferred from the land to the sea bottom, or in other words that a force tending to depress the floor of the ocean is constantly accumulating there. If the crust of the earth is only a few miles in thickness, then if we could imagine the continent of America to be taken up bodily to the depth of two miles, and laid down upon Europe it is almost impossible that subsidence should not immediately take place. The molten matter beneath would be forced out and caused to flow under and elevate the ocean's bottom, and perhaps form a ring of volcanic mountains all round the margin of the depressed area. Although no such sudden transfer of matter has ever taken place, yet it can be proved that sheets of matter now converted into solid rock equal in superficial extent to at least half the continent and averaging nearly a mile in thickness, have been gradually thus transferred. The total effect of the weight must be the same, whether accumulated on the region acted upon, gradually during myriads of ages, or during a single age.

Professor Hall's theory simply adds the plication suggested by Sir Charles Lyell to the subsidence theory of Sir John Herschel. We think however that although a minute plication would be the result of subsidence, the grand waves of the Appalachians could never have been formed in that way. In proof of this we shall offer a very simple mathematical demonstration.

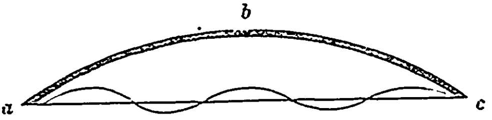

Fig. 2.

Let A. B. C. represent the section of the portion of the earth's crust undergoing subsidence. The straight line A. C. is the chord of the arc A. B. C, and therefore it is shorter than A. B. C. In the process of subsiding towards A. C. the arc A. B. C must be compressed into a shorter space than it occupied before the subsidence commenced, and to accommodate itself to this diminished space it must become more or less undulated. It can be easily shewn than the greatest amount of undulation will take place when A. B. C. sinks to the level of A. C. It must there exhibit one or more undulations. Below that level the undulation will become gradually less in proportion to the amount of subsidence. The difference between the length of A. C. and A. B. C. will give us the measure of the greatest wave that can be produced, and provided we have the diameter of the sphere and the width of the belt undergoing subsidence, that difference can be found.

Let it be granted that the diameter of the earth is 41775500 feet; then this sum multiplied by 3.14159265 would give 131241603.75007500 feet for the circumference and this again divided by 360 would give 364560.01041687 feet as the arc of one degree.

Again multiplying 41775500 or the earth's diameter by

.0087265 (or the sine of 30′) we have 364553.9007500 for the length of the chord of an arc of one degree: Then

Arc of 1°......	364560.01041687
Chord of 1°....	364553.90075000
Difference......	6.10966687

The difference between the lengths of the chord and the arc of 1° is thus only about 6 feet and one inch. Therefore if we take any section across the Appalachians, of about 70 miles in length the greatest amount of plication that could have resulted from subsidence within it, would be a single fold, which at the most could not be three feet in height.

But there is scarcely any section of that length across the disturbed region, commencing from the eastern side, that does not exhibit the remains of four or five folds which before they were obliterated by denudation must have been a mile in height each. Let it be granted that there were originally four of such folds, and that each curve was equal to a semicircle. Then the difference between the length of a line following the surface over the four hills, and down into and across the bottoms of the four valleys, and one drawn straight through their bases, would be 4.5660 miles, or about four miles and a half. In other words to produce these four ridges of hills, the strata must have been shoved or compressed laterally four miles and a half, while by Professor Hall's process, the greatest possible distance could only be six feet and one inch. And further, in addition to this enormous deficiency there is a great deal more to be accounted for. Between and on every one of the principal folds there are very numerous smaller parallel ones. Taking all these together with the principal flexures, the amount of the lateral thrust or compression across the whole belt has been more probably eight or ten miles.

Viewed in this way the theory of plication from subsidence appears to fail altogether. Another objection to this theory is founded on the fact admitted by all parties that at least with one or two interruptions the subsidence has been gradual and the whole amount say 40000 feet distributed throughout the enormous period of time which elapsed during the Silurian Devonian and Carboniferous epochs. No man can give the length of this period, but it must have been very great. Let it be granted at

4000000 years, and the rate of subsidence would then be one foot in 100 years. We know the levelling power of running water. Any small fold that could have been produced by the subsidence of ten feet in the first thousand years would be certainly obliterated by the current of the next ten years. The same would be the result for the second 1000 years and so on to the end, at which time the bottom of the ocean would be quite level. E. B.

ARTICLE L.—*Description of a new Trilobite from the Potsdam Sandstone*; by FRANK H. BRADLEY, with a note by E. BILLINGS.

(*Extracted from Silliman's Journal, 2nd Series, Vol.* 30, *page* 241, *September*, 1860.

[Read before the Am. Assoc. for the Advancement of Science, at Newport.]

CONOCEPHALITES MINUTUS, (n. sp.)

Fig. 1. The head magnified. The dotted lines represent the supposed outlines of the parts not preserved.

Fig. 2. The pygidium magnified.

Fig. 3. A detached cheek, magnified.

Cephalic shield apparently semi-circular, or nearly so; anterior margin as far as preserved with a narrow slightly elevated rim, just within which there is a rather strong groove. Glabella conical, slightly narrowed at the neck segment, three-fourths the whole length of the head, very convex and obtusely carinated along the median line. Neck segment rounded and prominent; neck furrow narrow, but well defined. There are two pairs o deep glabellar furrows which are inclined inwards and backwards at an angle of about 45°; their inner extremities distant from each other rather more than one-third the width of the glabella. The anterior lobe is a little less than one-half the whole length of the glabella, excluding the neck segment; the two posterior pairs are nearly equal to each other. The glabella is distinctly separated from the cheeks by a narrow, deep groove, which extends all round. From the anterior lobe on each side a narrow filiform ridge curves outwards and backwards on the fixed cheek to the edge of the portion preserved. The eyes appear to be situated just where these ridges terminate as represented in figure 1. Judging from the portion of the eye preserved in a detached cheek-plate, its form is semi-annular, and its length at least one-fourth that of the glabella. Caudal shield nearly as large as the head, its width scarcely equal to half its length; the lobes nearly equal; the middle lobe very convex with five sharp transverse grooves; the side lobes somewhat flat, and each with five grooves.

The largest head discovered is exactly two lines in length.

The course of the facial suture has not been ascertained. The surface of the glabella in one of the specimens appears to be smooth, but in none of the others can it be distinguished.

The specimens are mostly in a clayey layer, which is full of fragments of all degrees of perfection; in one specimen I counted ten heads and three tails, all in a fair state of preservation. In two instances, I have found the casts of maxillary plates, showing distinctly the elevated margin; of one of which I give a figure.

The original specimens were collected, (at High Bridge, near Keeseville, N. Y.,) in August, 1856, while on a geological excursion with Col. Jewett of Albany, but were not recognised until July, 1857, when a second visit to the locality secured a few *casts* in the solid sandstone, none of the clay layer being obtained. By the kindness of Professor Dana, the specimens were presented at the Am. Assoc. for Adv. of Sci. at Montreal, but were not recognized as belonging to any known species. Since that time, I have looked for descriptions, but cannot find any to correspond.

At the same locality, I also procured the cast, of a Pleurotomaria, and one of what seems to have been a plate from the stem of a crinoid.

New Haven, June 15th, 1860.

Note by E. Billings.—Mr. Bradley having favored me with a view of his very interesting specimens, I think there can be no doubt but that they belong to the genus *Conocephalites.* If thi reference be correct, then we have at least three, if not four species in North America.

1. *C. antiquatus* (Salter,) described from "a cast in a brown sandstone, said to be a bouldered fragment from Georgia." (See Quart. Jour. Geol. Soc., vol. xv, p. 554.)

2. *C. minutus* (Bradley.) In this species, the form of the glabella and its proportions in relation to the length of the head are almost precisely the same as in *C. antiquatus*, and yet I think the two are not identical, for the following reasons: In the first place, all the specimens of *C. minutus* are of a nearly uniform size, the length of the head being about two lines, and, therefore, it seems probable that they are the remains of adult individuals. The total length would thus be about half an inch, while Mr. Salter's species is full one inch and three-fourths. In the second place, the distance of the eye from the glabella, in *C. antiquatus* is only one-third the width of the glabella, but in *C. minutus* it must be at least one-half the width. These are the only differences that can be well made out, from the imperfect specimens, but they seemed to me sufficient to indicate two species. Mr. Salter says further, that the lobes of the glabella in *C. antiquatus* are very obscure, and that the ocular ridge, if any existed, must have been very slight. His specimen was somewhat abraded. In *C. minutus* the ocular ridge is, for so small a species, very strongly defined, and the glabellar furrows are so deep that it would require a very considerable amount of abrasion to obliterate them.

3. *C. Zenkeri*, (n. sp.) This is a new species recently discovered in the magnesian limestone near Quebec. It will probably be described in the next No. of the Canadian Naturalist and Geologist.

4. There is in the collection of the Geological Survey of Canada, a plaster cast of the surface of a fragment of rock which holds four specimens of a trilobite, each about the size of *C. antiquatus*. They appear to me to belong to the genus *Conocephalites*. The original specimen was collected in Newfoundland, in the same slate that holds *Pradoxides Bennettii* (Salter,) and I am informed that it is in the possession of a gentleman who lives somewhere in the United States, but whose name or place of residence, I have not been able to ascertain.

Of the above four species, Mr. Bradley's is at present the most important as it fixes indisputably, at least one point in the geological range of the genus on this side of the Atlantic. In Europe, *Conocephalites* has not been found out of the *primordial zone* of Barrande, but the Québec and Keeseville specimens show that here it reaches the Lower Silurian.

Montreal, July 22nd, 1860.

(*Additional note in Silliman's Journal, Nov.* 1860.)

Since my note to Mr. Bradley's paper was written, he has collected quite a number of new specimens of *C. minutus* at the same locality. At his request I have examined them and find that they exhibit several of the parts not preserved in those upon which the original description was found.

Fig. 4, (nat. size.)

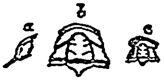

Fig. 4.—*a*, A detached cheek showing the small spine of the posterior angle.
b, *c*, Two specimens of the glabella, showing the spine on the neck segment.

1. The posterior angles of the head are produced into short spines, as we supposed, but these spines, instead of being elongate-triangular are sub-cylindrical or needle-shaped and projected outwards at an angle of 45° or thereabouts, to the longitudinal axis of the body. The cheek does not appear to be striated but rather smooth. These two characters furnish additional grounds for separating the species from *C. antiquatus* (Salter,) which has the cheeks striated and the posterior angles of the head only slightly produced into short broadly triangular terminations.

2. The neck segment bears a short broad-based spine. The first specimens collected do not exhibit this, but on reëxamining them I think I can see traces of it. Some of the specimens of *C. coronatus* (Barrande) lately collected in the Primordial Zone of Spain have a spine on the neck segment of the same form as that of *C. minutus*, while others (according to the figures) have not; and it may be that individuals of our species will yet be discovered in which the absence of the spine can be clearly established. This remark is made here because on comparing the figures of the Bohemian and Spanish specimens of *C. coro-*

natus it would appear that the presence or absence of a spine on the neck segment is not always of specific importance and should some of those from Keeseville turn out to have only a plain neck segment we would not perhaps on that ground alone be authorized to constitute two species.*

3. Mr. Bradley's new specimens also show that there are three pairs of glabellar furrows, the anterior being represented by two small indentations just in advance of the points where the ocular ridges reach the glabella; and further that the course of the facial suture is the same as it is in *C. striatus*, (Emerich). The pygidium is more obtusely rounded than is represented in our Figure 2.

As to the correctness of the generic reference of this species it may be remarked that Barrande is of opinion that no less than eleven of those which Angelin has figured under the genera *Solenopleura*, *Eryx*, *Conocoryphe*, and *Harpides* should be placed in *Conocephalites*. In this view of Barrande's, Angelin has concurred.† The genus has thus been greatly extended and judging from the form of the head (and more particularly of the glabella) of Angelin's species *C. brachymetopus*, *C. homelotopus* and *C. canaliculatus* I think we are perfectly justified in referring this species to *Conocephalites*. The genus is most closely allied to *Calymene*, having the same number of segments in the thorax —the same number and arrangement of pieces in the head and the same general form and lobation of the glabella, the differences between the genera consisting principally in certain characters of the pleuræ and hypostoma ‡ to which may be added the ocular ridge which although not a constant character in *Conocephalites* may be regarded as of some generic value as it does not occur at all in *Calymene*. I would also state that since examining Mr. Bradley's recent collection, I have been strongly

* Compare the article, *Sur l'existence de la faune primordiale dans la chaine cantabrique*, par M. Casiano de Prado; suivie de la *Description des fossiles*, par MM. de Verneuil et Barrande. Bulletin Geol. Soc. France, 2o Series, vol. xvii, p. 516, (1860). And also Barrande's *Système Silurien*, plate 13.

† See Barrande's "*Parallèle entre les dépôts Siluriens de Bohême et de Scandinavie*, p. 19; and compare the tables on p. 17 and 35 of the same work. See also Angelin's *Palæontologia Scandinavica.*

‡ See Barrande, "*Système Silurien du centre de la Bohême*," p. 417-419.

impressed by the resemblance between the form of the cheek and small needle-shaped posterior spines of *C. minutus* and the same parts of the head of the Quebec species which I have called *Menocephalus globosus*, and it appears to me that *Menocephalus* must be regarded as another closely allied genus. If we except those two genera, *Calymene* and *Menocephalus*, there is no other but *Conocephalites* to which our new trilobite bears any near affinity.

Mr. Bradley has since the publication of the above received a collection of Fossils from the Potsdam sandstone of the western states among which are several specimens of *C. minutus*. They were collected at a place called Black River Falls in Wisconsin where they occur associated with several of the species described by Dale Owen.

E. B.

ARTICLE LI.—*Notes on Birds wintering in and around Montreal.* From observations taken during the winters of 1856–57–58–59–60. By H. G. VENNOR, junr.

Few of our birds can endure the severe winters we generally have in this part of Canada. Soon as the icy breath of that hoary season is felt, and often long before, our feathered songsters hasten to their southern feeding grounds. A few, however, that seem loath to leave their summer haunts, loiter about until winter has come in reality, and then, as if aware that they have been imprudent, haste away in the same direction. These are our loiterers, and must not be confounded with our real winter residents. Others again, bid defiance to the severity of winter, and remain eagerly searching for their food, in the bare, and now apparently lifeless trees. It is to this class of birds, that I have, for the last four winters, turned my attention.

Again, there are a few birds which come from the North every winter, and return thither as soon as the cold weather leaves us. The Pine Grosbeak, Bohemian Wax-wing, and common Snow-bunting, are examples. For this reason, it is difficult to make out an accurate list of the birds which remain here the whole year round, and unless the observations extend over several winters, it is almost impossible. On comparing my notes of the last five winters, I find that the list of birds varies every winter, as the weather has been mild or severe. During severe winters, we always have a good number of northern visitors, and very few loiterers; on the other hand when the winter is rather mild it is the reverse.

One of our smallest, and yet most active winter birds, is the Black-cap Tit (*Parus atricapillus*). They may be seen nearly everywhere during the winter months; sometimes in flocks, and again in pairs. While feeding they utter a sharp chip, and when flying and then suddenly alighting they pipe out their chick-a-dee-dee, from which sound they derive their familiar name.

The Downy Woodpecker (*Picus pubescens*). This little Woodpecker is also very common around Montreal during the winter months. It may often be seen in company with the Black-caps.

The Hairy Woodpecker (*Picus villosus*) is not often seen here during the winter. I have not met with it myself, but have obtained specimens shot in the vicinity.

The Pileated Woodpecker (*Picus pileatus*). This bird is rare in this part of Canada, as it remains in the interior of the woods, both in summer and winter. I have a specimen that was shot a little below the town.

The Arctic Woodpecker (*Picus arcticus*) is seen here now and again during the winter; and I am told by a friend, they often visit our mountain during the summer. I have a specimen which I obtained near the Mile-end quarries in 1858.

The Brown Creeper (*Certhia familiaris*) is not very abundant during winter, yet it winters in Canada. During the month of February, 1857, they were very numerous on Nun's Island, and there have generally been some in a small pine grove on the top of our mountain every winter.

The Brown-bellied Nuthatch (*Sitta Canadensis*) is not very often seen during the winter months. On a mild day, one may see several of them, and then they suddenly disappear for a time. They frequent the same localities as the former bird.

The White-bellied Nuthatch (*Sitta Carolinensis*) is very common during February on Nun's Island; they utter the same note as the other, and are somewhat larger.

The Robin or Migratory Thrush (*Turdus migratorius*). This bird is a loiterer, and often appears late in the winter, and very early in the Spring. One was shot November 1856, and another seen January 1857; and last winter, on the 19th of February, I saw a large one in our garden. It is strange how they manage to live at all, when they loiter here half the winter. Their Spring arrival is in the month of April.

The Pine Grosbeak (*Pyrrhula enucleator*) arrives from the north about December, and remains here until March; they feed on the Mountain Ash berries while here.

The Bohemian Wax-wing (*Bombycilla garrula*). This bird only visits us during the most severe weather, and then it arrives in pretty large flocks. I first observed this bird at the commencement of the winter of 1857. We had some very cold weather at that time, and several large flocks of wax-wings, intermingled with grosbeaks arrived, and frequented the small mountain, and the gardens throughout the island, where there were any berries to be found. The wax-wings remained until April when they disappeared. I have not noted this bird since.*

The Lesser-red-Poll (*Linaria minor*). These birds are numerous throughout the winter, the greatest number may be seen about the beginning of February.

The Blue Jay (*Garrulus cristatus*). One of these birds was shot 25th November near Mile-end road quarries, several others were seen during the winter behind our mountain. They winter at Sorel.

The Canada Jay (*Garrulus Canadensis*). This bird is not very common here, but is often seen by hunters in the thick woods, between this and Ottawa. I obtained some specimens during 1859, in the market: they were shot near the town; last winter I saw another specimen brought to the market. This bird is common at Hudson's Bay.

Shrike (*Lanius Borealis*). This bird is not a winter resident, but a loiterer. A few straggling ones may be seen as late as January. During the cold weather it feeds on mice, and other small animals. It is rare here, both in summer and winter.

Snow Bird (*Niphœa hyemalis*). This bird stays as late as the middle of November, but does not loiter longer.

Snow Bunting (*Plectrophanes nivalis*). Very abundant; large flocks always to be seen on the frozen rivers, and on Nun's Island, and along the country roads.

The Ruffed Grouse (*Tetrao Umbellus*). I have noticed the tracks of this bird, over several places on our mountain during the winter

* Since writing the above, I have been told by Mr. Hunter (cabinet keeper of the Museum of Natural History), that the Bohemian Chatterers were noticed by him the two last winters, although not in such number as during 18 7.

and although I only saw one bird there during the winter of 1859, yet, I am confident they are numerous on some parts of the mountain. They are also found in a swamp near Mile-end road.

Ptarmigan or Arctic Partridge. (*Tetrao mutus*). I bought a fine specimen of this bird from a Canadian in the market; it was shot near Sorel.

Owls. The winter is the owls' summer, yet they stay with us both winter and summer. During the hot weather they retire to the depths of the forests. But in winter they roam over plains, forests and villages, some even taking up their abode in barns to prey upon the mice, &c. I have seen the great Horned Owl (*Strix Virginiana*) sitting on a barn near Sherbrooke street. There are of them more or less every winter for sale in the market.

To commence, we will take the Hawk Owl (*Strix funerea*). This bird is in some respects like an Hawk, and in others like the Owl, but it is an Owl nevertheless. It becomes very abundant in the fall, or rather beginning of December, and generally stays all winter; they fly about by day more than the other species.

The Barred Owl (*Strix nebulosa*). I saw a specimen of this Owl as early as September this year. They have been seen during January and most of the winter on Nun's Island, and sometimes on our mountain. It is also seen on St. Helen's Island, one being shot there January 1857. I have seen it exposed for sale in the market for the last four winters.

The Little Owl (*Strix passerina*) is not very often seen; I have one specimen from our mountain shot several winters ago.

The Short Eared Owl. (*Strix brachyotus*). I obtained a specimen of this owl also from our mountain last winter.

The Long Eared Owl. (*Strix otus*). This owl is very rare here also, it is sometimes seen on the Mile-end race-course, and at Logan's farm.

The Great Horned Owl (*Strix Virginiana*) is common about Montreal during winter, specimens being for sale every winter in the market. I kept one of these birds alive for some time; he ate raw meat voraciously.

The Snowy Owl, (*Strix nyctea*) is rather rare about the immediate neighbourhood of the city, but is generally brought into the market every winter. I have noticed it at Nun's Island and on our mountain. The winter of 1859 brought seven Snowy Owls to the market, last winter (1860) there were only two in the same market; they were all young, none having the pure white plumage of the old birds.

Hawks. The fall is the feasting time for the Hawks, rarely are they to be seen during the winter. The winter Falcon is sometimes shot on our mountain.

The Goshawk (*Falco palumbarius*) however, remains here the whole winter, and is seen more frequently during that season. He generally keeps himself pretty deep in the woods, and unless driven by hunger, will rarely approach the habitation of man; when he is thus driven, woe to the farmers' sheep, ducks, geese, &c !

The Snipe (*Scolopax Wilsonii*). Specimens of this bird have been shot as late as Christmas day, but these are only loitering long after the usual time of their departure.

The birds mentioned in the above are all that have come to my notice, during the winters of 1856–57–58–59–60. Others may have noticed some I have not seen, and by making them known, would thus add to the list already commenced by Mr. D'Urbain, in the Naturalist, vol. 2, p. 138. It was his article that made me think of adding my contribution to the list.

I subjoin a list of all the birds I have noted these last few winters, placing the letter L before the names of the loiterers.

List of birds observed during the winters of 1856–57–58–59–60.

	Black-cap Tit..............	(*Parus atricapillus*).
	Downy Woodpecker........	(*Picus pubescens*).
	Arctic "	(*Picus arcticus*).
	Pileated "	(*Picus pileatus*).
	Brown creeper.............	(*Certhia familiaris*).
L.—	Robin.	(*Turdus migratorius*).
	Blue Jay..................	(*Garrulus cristatus*).
	Canada Jay...............	(*Garrulus Canadensis*).
L.—	Shrike....................	(*Lanius Borealis*).
L.—	Snow bird.................	(*Niphœa hyemalis*).
	Snow bunting..............	(*Plectrophanes nivalis*)
	Pinegrosbeak..............	(*Pyrrhula enucleator*).
	Wax-wing..................	(*Bombycilla garrula*).
	Nuthatch..................	(*Sitta Canadensis*).
	Lesser red Linnet..........	(*Linaria minor*).
	Ruffed grouse..............	(*Tetrao umbellus*).
	Ptarmigan.................	(*Tetrao mutus*).
	Hawk Owl	(*Strix funerea*).

Barred "	(*Strix nebulosa*).
Screech "	(*Strix asio*).
Short-eared Owl	(*Strix brachyotus*).
Long " "	(*Strix virginiana*).
Horned "	(*Strix bubo*).
Snowy-day "	(*Strix nyctea*).
Winter Falcon.......	(*Falco lineatus*).
Goshawk..................	(*Falco palumbarius*).
L.—Snipe.....................	(*Scolopax Wilsonii*).

Making a total of 23 winter residents and 4 loiterers.

The American Crow (*Corvus Americanus*) has been seen here sometimes during November and December.

The Blue Robin (*Sialia Sialis*) is also mentioned by some as remaining here, but it must be very rarely. He arrives early in spring, and his song is the first we hear, welcoming summer; he generally moves southward about November.

Montreal, Nov. 15th, 1860.

ARTICLE LII.—*Notes on Aboriginal Antiquities recently discovered in the Island of Montreal.*

(Read before the Natural History Society of Montreal.)

Toward the end of last month the writer was informed that some workmen employed by Edmond Dorion, Esq., had discovered what were supposed to be Indian remains, near Mansfield street. On application to Mr. Dorion, he kindly gave the specimens in his possession for presentation to the Natural History Society, and instructed his labourers to preserve any other remains that might occur. The specimens obtained from Mr. Dorion consisted of a skull evidently of American type, fragments of a second skull, and portions of earthen vessels similar to those made by the aborigines before the colonization of the country.

The place in which the remains were found is immediately below Sherbrooke street, between Mansfield and Metcalfe streets and in the line of Burnside Place. It is a part of the dry sandy knoll or terrace, between the College Brook and that running through Honorable Judge Smith's property, on the level of Sherbrooke street, and sloping rapidly toward the flat in rear of St. Catherine street. The ground has been ploughed, but is at present vacant and used for the excavation of sand for building. The sand is of the Post-

Pliocene deposit which I have elsewhere called the "Saxicava sand,"* and is from two to six feet in thickness, resting on an uneven surface of the, "Leda clay."

On inquiry, I found that the workmen employed in removing sand, have, at several times, found skeletons, and have buried them in the clay below the sand bed, where perhaps at some future time they may lead to the supposition that in Canada man was contemporary with this historically very old though geologically very recent deposit. I record the fact of the transference of these skeletons to the Leda clay, to prevent, if possible, the occurrence of an error so serious.

The skeleton found by Mr. Dorion was in a sitting or crouching posture, but no note had been taken of the precise position. A few days afterward the workmen uncovered another which I saw in situ. It is that of a man perhaps 50 years of age. The body lay in an inclined position, the head toward the west, and the face toward the south or south-west. The knees were bent up close to the chest, and the arms placed in such a position that the hands were opposite the face. The bones were perfect as to their form, but were stained yellow by the oxide of iron in the sand, and had become brittle owing to loss of animal matter. The hair and all the soft parts had entirely disappeared, and the skeleton had evidently been reposing for centuries where it was found. No wrappings of any kind enclosed it, nor could any object of art be found in the surrounding sand. It was about two feet below the surface of the ground. Another skeleton subsequently found, lay with the head toward the east, in the same crouching position. Fragments of an earthen vessel were found near its hands. All the above were remains of aged persons; but the workmen also found the skeleton of a child perhaps 8 or 9 years of age, parts only of which were preserved.

On examining the ground in the vicinity of the excavations, I found that the locality had been the site not merely of a cemetery of the aborigines, but also of a village or encampment. Fragments of pottery and other artificial objects and bones of wild animals are scattered abundantly through the soil, especially in the neighbourhood of spots where ashes and charcoal indicate the position of domestic fires. Some of these fires had been made on the surface, but others in pits about a foot in diameter and of the

* Canadian Naturalist II, p. 402, Fig. 1, E, f.

same depth, and the remains of pottery and other objects were in such quantity in their vicinity as to indicate a long residence of the tribe which had inhabited the spot. These occur abundantly on the S. W. side of Metcalfe street, on the margin of the little brook which separates this site from the similar platform on which the building for the ball in honour of the Prince of Wales was erected, and they extend thence to Mansfield street, and from the margin of the terrace toward St. Catherine street more than half way to Sherbrooke street, or in all a space of rather more than 100 yards in diameter. The removal of a great part of the sand has much changed the natural form of the ground, but it seems to have been a slightly rounded sandy knoll with a little depression running diagonally through it, and the habitations indicated by the sites of fire places seem to have encircled the most elevated part of the ground in which most of the skeletons occur. A considerable part of this space is not yet excavated and may afford many additional remains.

I shall now describe the objects found, beginning with the human remains. Of these we have principally three skulls, one female and two male, nearly perfect. The fragments of the others are not in a condition to afford much information.

1. *Skull of an aged female.*—This is distinctly pyramidal at the vertex, with prominent superciliary ridges, receding but convex forehead and elongated occiput. Its dimensions are as follows, column (1) :

	(1)	(2)	(3)
Longitudinal diameter..	6.75 in.	7.50 in.	7.05 inches.
Parietal diameter*.........	5.25 "	5.75 "	5.50 "
Frontal diameter...........	4.00 "	5.00 "	4.75 "
Vertical diameter...........	5.30 "	5.50 "	5.50 "
Intermastoid arch...........	12.00 "	13.50 "	13.50 "
Occipito-frontal arch.........	13.75 "	14.40 "	14.50 "
Horizontal circumference....	19.25 "	21.00 "	20.75 "

The bones of the face and jaws are very small and delicate compared with those of the male skulls. This skull is in the Museum of the Natural History Society.

2. *Skull of a man*, perhaps aged 50 years. The vertex in this skull is not pyramidal but rounded, the forehead full and the superciliary ridges by no means prominent. The occiput

* Greatest immediately above the squamous suture.

less elongated than in No 1. The bones of the face are strong with prominent zygoma, and the lower jaw is very massive. The dimensions are as above, column (2).

This specimen also, with the rest of the skeleton, is in the Museum of the Natural History Society.

3. *Skull of an aged man.*—This is in general aspect like No. 2. Its dimensions are as above, column (3).

This skull is in the Museum of McGill College. Its form is illustrated in Figs. 1, 2 and 3.†

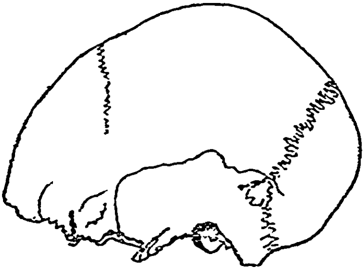

Fig. 1.

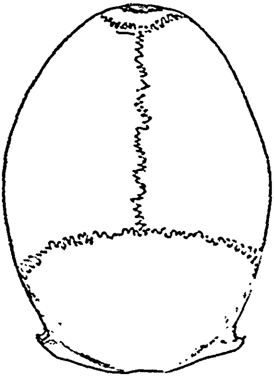

Fig. 2.

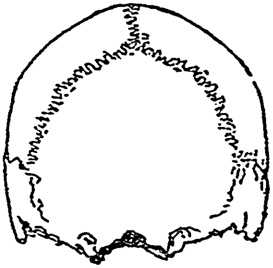

Fig. 3.

Figs. 1, 2, 3, Aboriginal Skull from site of an village at Montreal.

All of the above are dolichokephalic or elongated skulls, a form which Prof. Wilson has shewn to prevail among the Huron tribes, and which Retzius * maintains to be general in the Eastern Americans as distinguished from those of the West coast.

* Smithsonian Report, 1859.

† The forehead in Fig. 2 is incorrectly shaded.

They exhibit a very respectable development of brain, especially in the male skulls, and they show the fallacy of the conclusions hastily adopted by some ethnologists as to the supposed distinctness in form of the American skull from that of the populations of the old world, and its supposed general brachykephalic type. Facts to be stated in the sequel show that these skulls must have belonged to an ancient and unmixed American people. and they are markedly characterised by the American type of face; but the brain case in form and dimensions differs little from types prevalent among European races.

4. *Remains of articles of food.*—In and near the little hearths or ovens above mentioned, are numerous bones of animals, some in a condition sufficiently perfect to permit their determination. Among them are remains of the Bear, Beaver, Deer, Dog, Fox; of several fishes; especially the Cat-fish, Corvina and Sturgeon; and of birds. Shells of Unio gibbosa, the most common fresh water mussel in the St. Lawrence near Montreal, charred grains of Indian Corn and stones of the wild cherry, also occur.

5. *Earthen Vessels.*—These appear to have been of the usual form of those made by the aborigines, rounded below and rising with a graceful double curve toward the mouth, which is either round or square with prominent corners, the latter form giving a very elegant outline. For the general form I may refer to the figure and description of an Indian vase from the Ottawa in this Journal, Vol. 4, p. 188. The sides and bottom of these vessels are usually smooth, but in one or two instances are covered with square indentations giving a sort of netted pattern. (Fig. 4). The

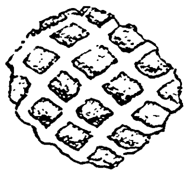

Fig. 4.

mouths and necks are ornamented with depressed lines and notches variously arranged, with circles stamped on the clay, and with prints made by the point of the finger. The patterns are various and often very tasteful. A few of them are represented of half the actual dimensions in figs. 5 to 10. The material is clay mixed with sand, often well smoothed and finished, but without any glazing. Some pieces are well burned, and most of the fragments are

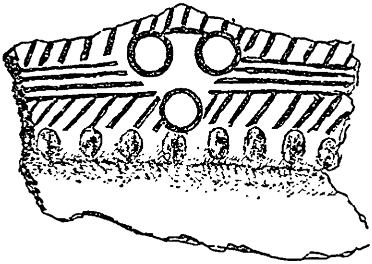

Fig. 5.

Fig. 6.

blackened by long use, though some others seem quite fresh, as if not used at least for culinary purposes.

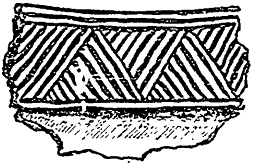

Fig. 7.

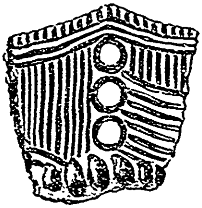

Fig. 8.

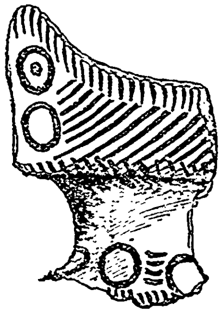

Fig. 9.

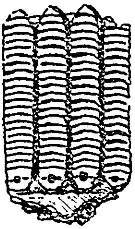

Fig. 10.

6. *Tobacco Pipes.*—Many fragments of these occur, all of clay well baked and often of fine quality. The patterns are various and some of them very elegant: one of the most perfect is represented in Fig. 11.

7. *Other earthen objects.*—One of these is a portion of a disk of baked clay, ornamented on one side, and perhaps used in some

game, (Fig. 12). Another is a fragment of earthenware ground into a circular form and possibly used for a similar purpose. Another is a conical body of unknown use, roughly shaped.

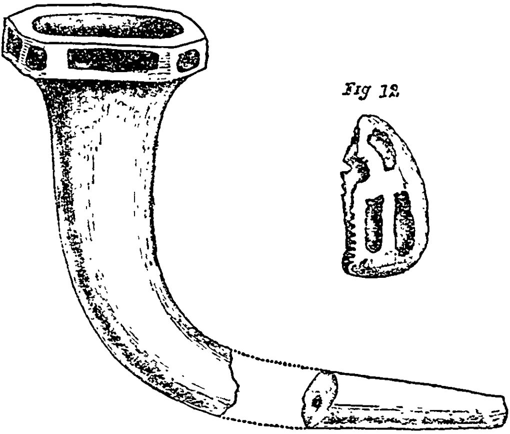

Fig 12.

Fig. 11, Clay Pipe, half actual size.

Another fragment is apparently the handle of a flat earthen vessel. (Fig. 13.)

Fig. 13.

8. *Bone Implements.*—The most interesting of these is a conical bodkin with a circular stamp at the larger end, neatly made, and which was evidently used in ornamenting the pottery found with it, the circular stamp fitting into the circles on some of the vessels, and the point being very suitable for making the lines or scratches (Fig. 14). It is cut out of solid bone from the leg of some animal, the thicker end being from the cancellated bone near the joint. Other bone skewers or bodkins of ruder form were also found.

9. *Stone implements.*—Many oval and sharp edged stones, which

may have been used for hammers and knives, were found, but none of them artificially shaped. There are also numerous stones showing marks of fire and probably used for supporting pots or for heating water or for baking. One regularly oval piece of trap about five inches in its longest diameter, has evidently been shaped by art and ground flat on one of its sides. It may have been used as a pestle for grinding, or perhaps may have been heated in the fire for baking cakes in the manner described by Cartier. Another of triangular form has been perforated by a Saxicava in the tertiary period, as is the case with many of the loose fragments of limestone near the mountain of Montreal, and has perhaps been used by the Indians as a sinker. No arrow heads or other weapons of stone have as yet been found; but I have a fragment of an arrow head of greenish jasper which was found in my garden, at no great distance from the site in question.

10. *Iron implements.*—Two small pieces of iron were found with two bone bodkins near one of the fire places, and probably belong to the Indian relics. One of them is apparently a small knife or oblique edged chisel about three inches in length, and such as the Indians themselves may have made from a scrap of foreign iron obtained from some of their early European visitors (Fig. 15). The other is a square piece of flat iron, perhaps a portion of an iron hoop or of a large knife.

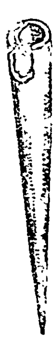

Fig. 14.

Fig. 15.

Fig. 14, Bodkin, half actual size. Fig. 14, Iron knive, half actual size

The historical importance of these relics depends to a great extent on the answer to the question, whether they belong to the aborigines who inhabited Hochelaga at the time of its discovery by Cartier, or to any previous or subsequent occupancy of the Island of Montreal by Indians.

On the 3rd of October, 1535, Cartier landed on the Island of Montreal, and visited an Indian village which he calls Hochelaga, a name apparently referring rather to the district than to the town itself. In 1540, in his third voyage, of which unfortunately only imperfect records remain, he mentions apparently at the same place a village which he calls Tutonaguy; and as he had learned in the meantime to apply the name Hochelaga to a region or district of country, it is probable that this is the same place previously named Hochelaga. In 1603, Champlain appears to have found that the village of Hochelaga had dwindled away or disappeared, and we hear no more of its site until in 1642, when Montreal was founded by the French under the Sieur Maisonneuve. On this occasion some very interesting statements are made in the Jesuits' memoirs, respecting the fate of Hochelaga. (1642, chap. 9) We are informed that at this date no trace of Cartier's Hochelaga was known, except a name which the Indians had given to the island, importing that it had been the site of a village or fort. Further two aged Indians who accompanied some of the new colonists to the mountain top, stated that they were descendants of the original inhabitants; that their tribe had at one time inhabited all the surrounding region, even to the south of the river, possessing many populous villages; that the Hurons, who at that time were hostile to them, had expelled them; that some of them had taken refuge among the Abenaquis, others among the Iroquois, others among the Hurons themselves. One of them farther stated that his grandfather had cultivated the very place before them, and expatiated on the excellence of its soil and climate for the cultivation of Indian corn; but the incursions of the Iroquois were too much dreaded to permit the re-occupation of the island. The missionaries farther remark that these people once sedentary and cultivators of the soil, had become migratory, owing to the dangers to which they were exposed, a very important fact as we shall perceive in the sequel. One of the men above referred to was named Atcheast, and other statements show that he was one of a band regarded as Algonquins by the missionaries. These people were invited by the French to return to the Island of Montreal, and were promised protection from the Iroquois, but their fears do not seem to have been overcome until the conclusion of peace in 1646, when a number of families, including as we are informed some of the descendants of the original inhabitants, formed a settlement, which appears to have subsisted only for a short time, when renewed fears of the Iròquois took possession of them. Some remained, however, sufficiently long to plant some Indian corn. We have at this time the important statement that those who regarded themselves as original Montrealers spoke the Algonquin tongue, and that their tribal name was Onontchataranons or Iroquet. Their chief at this time was Taouichkaron. This is the last historical notice I have found of this people, and they appear to have been dispersed and to have disappeared from Montreal on the renewal of the war with the Iroquois in the following year.

It appears from the preceding statements that if, as seems almost certain, the remains recently found indicate the site of an Indian village, they may have belonged either to the Hochelaga of Cartier, or to the later settlement in 1646, unless indeed this second settlement took place on the precise site of the old village, in which case it might be difficult to distinguish the remains of the later from those of the earlier. With respect to the second and third of these alternatives, it seems probable that after the French occupation of the island, and at a time when the missionaries were labouring successfully among these people, the site of their village would present more traces of European intercourse than occur at the place in question. Afraid as they were of the Iroquois, it also seems probable that they would settle as near as possible to their allies, whose abodes were close to the river. Farther it appears impossible that so much broken pottery and other rejectamenta could result from the residence of a few families for one year. The remains rather indicate a place long occupied. For these reasons I am disposed to regard it as the most probable alternative, that the site in question is that of the original village seen by Cartier in 1535, unless on consulting his narrative we should find reason to reject this view also. That the reader may judge for himself, I reproduce here the original statements of the observant old voyager, in Hakluyt's excellent English version, with some emendations suggested by Prof. Darey of McGill College, who has kindly compared it with the French, as given in the edition of the Quebec Natural History Society. Between these copies several differences occur, which no doubt in part arise from Hakluyt's translation having been made from the earlier texts now lost, but some of them are pretty evidently errors of translation. Our extracts refer to the day following Cartier's arrival at the Island of Montreal, and his landing as is believed below the Current.

"The Captaine the next day very earely in the morning, having attired himselfe, caused all his company to be set in order to go to see the towne and habitation of those people, and a certaine mountaine that is neere the citie; with whom went also five gentlemen, and twentie Mariners, leaving the rest to keepe and looke to our boates: we tooke with us three men of Hochelaga to bring us to the place. All along as we went we found the way as well beaten and frequented as can be, the fairest and best country that possibly can be seene, full of as goodly great okes as are in any wood in France, under which the ground was all covered over with faire akornes. After we had gone about foure or five miles, we met by the way one of the chiefest lords of the citie, accompanied with many moe, who so soone as he sawe us beckned and made signes upon us, that we must rest us in that place where they had a great fire, and so we did. Then the said lord began to make a long discourse, even as we have saide above, they are accustomed to doe in signe of mirth and friendship, shewing our Captaine and all his company a joyfull countenance, and good will; who gave him two hatchets, a paire of knives and a crucifix which he made him to kisse, and then put it about his necke, for which he gave our Captaine heartie thankes. This done, we went along, and about a mile and a halfe farther, we began to finde goodly and large cultivated fieldes, full of such corne as the countrie yeeldeth. It is even as the Millet of Bresil, as great and some what bigger then small peason, wherewith they live even as we doe with our wheat. In the midst of those fields is the citie of Hochelaga, placed neere, and as it were joyned to a great mountaine* that is tilled round about, very fertill, on the top of which you may see very farre, we named it Mount Roiall. The citie of Hochelaga is round, compassed about with timber, with three course of Rampires, one within another framed like a sharpe spire, or pyramid, but laid acrosse above. The middle most of them is perpendicular. The Rampires are framed and fashioned with pieces of timber, layd along very well and cunningly joyned togither after their fashion. This enclosure is in height about two rods.† It hath but one gate or entrie thereat, which is shut

* Literally—"which surrounds it, well cultivated and very fertile."
† French,—"deux lances." The drawing in Ramusio's translation would give a height of about 16 feet.

with piles, stakes, and barres. Over it, and also in many places of the wall, there is a kind of gallery to runne along, and ladders to get up, all full of stones and pebbles for the defence of it There are in the towne about fiftie houses, at the utmost about fiftie paces long, and twelve or fifteen broad, built all of wood, covered over with the barke of the wood as broad as any boord, very finely and cunningly joyned togither according to there fashion. Within the said houses, there are many roomes. In the midest of every one, there is a great hall, in the middle whereof they make their fire. They live in common togither: then doe the husbands, wives and children each one retire themselves to their chambers. They have also on the top of their houses certaine granaries,* wherein they keepe their corne to make their bread withall; they call it Caracony, which they make as hereafter shall follow. They have certaine peeces of wood, like those whereon we beat our hempe, and with certain beetles of wood they beat their corne to powder; then they make paste of it, and of the paste, cakes or wreathes, then they lay them on a broad and hote stone, and then cover it with hote pebbles and so they bake their bread instead of ovens. They make also sundry sorts of pottage with the said corne and also of pease and of beanes, whereof they have great store, as also with other fruits, great cowcumbers and other fruits. They have also in their houses certaine vessels as bigge as any But or Tun, wherein they keepe their fish, causing the same in sommer to be dried in the smoke and live therewith in winter, whereof they make great provision, as we by experience have seene. All their viands and meates are without any taste or savour of salt at all. They sleepe upon barkes of trees laide all along upon the ground being over-spread with the skinnes of certaine wilde Beastes, wherewith they also clothe and cover themselves, namely of the Dormouse,† Beaver, Martin, Fox, Wild Cat, Deer, Stag, and other wild beasts, but the greater part of them go almost naked (during the summer). The thing most precious that they have in all the world they call Esurgny; which is white and which they take in the said river in Cornibots,‡ in the manner following.

* Corn-cribs.

† ? Musk-rat.

‡ This word seems to have puzzled the translators. It is probably a vulgar local name for some shell supposed to resemble that of which these Indians made their wampum. I would suggest that it may be derived

When any one hath deserved death, or that they take any of their enemies in warres, first they kill him, then with certain knives they give great slashes and strokes upon their buttocks, flankes, thighs and shoulders; then they cast the same bodie so mangled downe to the bottome of the river, in a place where the said Esurgny is, and there leave it ten or twelve houres, then they take it up againe, and in the cuts find the said Esurgny or Cornibots. Of them they make beads, and use them even as we doe gold and silver, accounting it the preciousest thing in the world. They have this vertue in them, they will stop or stanch bleeding at the nose, for we prooved it. These people are given to no other exercise, but onely to husbandrie and fishing for their sustenance: they have no care of any other wealth or commoditie in this world, for they have no knowledge of it, and never travell and go out of their country, as those of Canada and Saguenay doe, albeit the Canadians with eight or nine Villages more alongst that river be subjects unto them.

So soone as we were come neere the towne, a great number of the inhabitants thereof came to present themselves before us, after their fashion, making very much of us: we were by our guides brought into the middest of the towne. They have in the middlemost part of their town a large square place, being from side to side a good stone cast, whither we were brought, and there with signes were commanded to stay and so we did: then suddenly all the women and maidens of the towne gathered themselves together, part of which had their armes full of young children, and as many as could came to kiss our faces, our armes, and what part of the bodie soever they could touch, weeping for very joy that they saw us, shewing us the best countenance that possibly they could, desiring us with their signes, that it would please us to touch their children. That done, the men caused the women to withdraw themselves backe, then they every one

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from *cornet*, which is used by old French writers as a name for the shells of the genus *Voluta*, and is also a technical term in conchology. In this case it is likely that the Esurgny was made of the shells of some of our species of Melania or Paludina, just as the Indians on the coast used for beads and ornaments the shells of Purpura lapillus and of Dentalium, &c. It is just possible that Cartier may have misunderstood the mode of procuring these shells, and that the statement may refer to some practice of making criminals and prisoners *dive* for them in the deeper parts of the river.

sate downe on the ground round about us, as if we would have shewen and rehearsed some comedie or other shew: then presently came the women, againe, every one bringing a fouresquare matte in manner of carpets, and spreading them abroad on the ground in that place, they caused us to sit upon them. That done, the Lord and King of the country was brought upon 9 or 10 men's shoulders, (whom in their tongue they call Agouhanna) sitting upon a great stagges skinne, and they laide him downe upon the foresaid mats neere to the capitaine, every one beckning unto us that hee was their Lord. This Agouhanna was a man about fiftie yeeres old: he was no whit better apparelled then any of the rest, onely excepted. that he had a certain thing around his head made of the skinnes of Hedgehogs * like a red wreath. He was full of the palsie and his members shronke together. After he had with certaine signes saluted our captaine and all his companie, and by manifest tokens bid all welcome, he shewed his legges and armes to our capitaine, and with signes desired him to touch them, and so he did, rubbing them with his owne hands: then did Agouhanna take the wreath or crowne he had about his head, and gave it unto our capitaine, that done they brought before him diverse diseased men, some blinde, some criple, some lame and impotent, and some so old that the haire of their eyelids came downe and covered their cheekes, and layd them all along before our capitaine, to the end they might of him be touched; for it seemed unto them that God was descended and come down from heaven to heale them. Our capitaine seeing the misery and devotion of this poore people, recited the Gospel of St. John, that is to say, "In the beginning was the Word," making the sign of the cross upon the poor sick ones, praying to God that it would please him to open the hearts of this poore people, and to make them know our holy faith, and that they might receive baptisme and christendome, that done, he tooke a service-booke in his hand, and with a loud voice read all the passion of Christ, word by word, that all the standers by might heare him, all which while this poore people kept silence, and were marvellously attentive, looking up to heaven, and imitating us in gestures. Then he caused the men all orderly to be set on one side, the women on another, and likewise the children on another, and to the chiefest of them he gave hatchets, to the other knives, and to the

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* Porcupines.

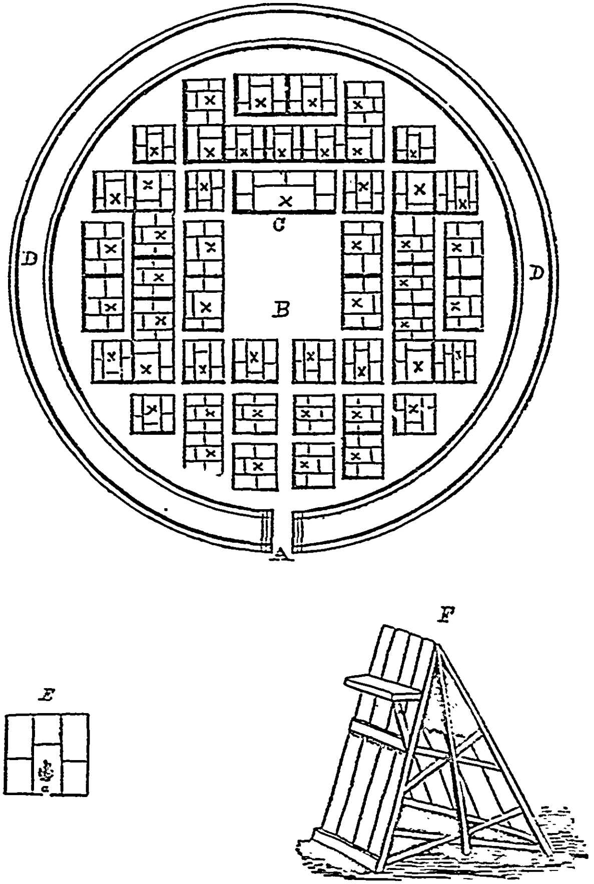
women beads and such other small trifles. Then where y children were, he cast rings, counters, and broaches made of tin, whereat they seemed to be very glad. That done, our capitaine commanded trumpets and other musicall instruments to be sounded, which when they heard, they were very merie. Then we tooke our leave and went away; the women seeing that, put them selves before to stay us, and brought us out of their meates that they had made readie for us, as fish, pottage, beanes, and such other things, thinking to make us eate, and dine in that place; but because the meates were not to our taste we liked them not, but thanked them, and with signes gave to understand that we had no neede to eate. When we were out of the towne, diverse of the men and women followed us, and brought us to the toppe of the foresaid mountaine, which wee named Mount Roial, it is about a quarter of a league from the towne. When as we were on the toppe of it, we might discerne and plainly see thirtie leagues about. On the northside of it there are many hilles to be seene running west and east, and as many more on the south, amongst and betweene the which the countrey is as faire and as pleasant as possibly can be seene, being levell, smooth, and very plaine, fit to be husbanded and tilled, and in the middest of those fieldes we saw the river further up a great way then where we had left our boates; where was the greatest and the swiftest fall of water that any where hath beene seene which we could not pass, and the said river as great wide and large as our sight might discerne, going southwest along three faire and round mountaines that we sawe, as we judged about fifteene leagues from us. Those which brought us thither tolde and shewed us, that in the sayd river there were three such falles of water more, as that was where we had left our boates; but we could not understand how farre they were one from another. Moreover they shewed us with signes, that the said three fals being past, a man might sayle the space of three monethes more alongst that river, and that along the hilles that are on the north side there is a great river, which (even as the other) cometh from the west, we thought it to be the river that runneth through the countrey of Saguenay, and without any signe or question mooved or asked of them, they tooke the chayne of our capitaines whistle, which was of silver, and the dagger-haft of one of our fellow mariners, hanging on his side being of yellow copper guilt, and shewed us that such stuffe came from the said river, and that there be Agojudas, that is as much to say, an evill people, who goe all armed even to their fingers' ends. Also they shewed us the manner of their armour, they are made of cordes and wood, finely and cunningly wrought together. They gave us also to understande that those Agojudas doe continually warre one against another, but because we did not understand them well, we could not perceive how farre it was to that country. Our capitaine shewed them redde copper, which in their language they call Caquedaze, and looking towarde that countrey, with signes asked them if any came from thence, they shaking their heads answered no; but they shewed us that it came from Saguenay, and that lyeth cleane contrary to the other. After we had heard and seene these things of them we drewe to our boates accompanied with a great multitude of those people; some of them when as they sawe any of our fellowes weary, would take them up on their shoulders, and carry them as on horseback."

The original edition of Cartier's voyages seems to have been illustrated with maps or plans, one of which, representing Hochelaga is extant in the Italian translation by Ramusio, published at Venice, in 1560.* It is a sort of ideal birds-eye view, either taken on the spot, or from subsequent recollection. A reduced copy of the more important parts is given in Fig. 16. It shows the construction of the wooden wall of defence and the form and arrangement of the houses, and gives a rude representation of the character of the surrounding country. It enables us to understand the dimensions of the houses given by Cartier, which evidently refer not to the individual dwellings, which are square, but to rows or blocks of four or five houses. Further it gives as the diameter of the circular enclosure, about 120 yards, and for each side of the square in the centre, about 30 yards. It also shows that the village was situated near to the base of the mountain, which, however, from the point of view being from the south, does not appear in the sketch; and that it had a small stream to the west, and apparently another at a greater distance to the east.

Taking these descriptions of Cartier in connection with the subsequent statements of the Jesuit missionaries, we may I think arrive at the following conclusions respecting the site of Hochelaga.

* For an opportunity of consulting this work I am indebted to Rev. H. Verreau, Principal of the Jacques Cartier Normal School.

It was not only distant four or five miles from the place at the foot of the current where Cartier landed, but was at some distance from the river, and on the elevated sandy terrace at the base of the mountain, which is more suitable both to the growth of



Plan of Hochelaga—(Reduced from Ramusio's translation of Cartier.)

a, Gate. *b*, Square. *c*, Chief's House. *d*, Wall of defence. *e*, Plan of a single house, (a) doorway and fire-place. *f*, Section of part of the wall of defence.

oaks, and to the culture of Indian corn as practised by the Indians, than any other part of the island. It was distant about a quarter of a league from the brow of the mountain, and consisted of a dense cluster of cabins about 120 yards in diameter, situated near the eastern side of a small stream or rivulet flowing from the mountain, and in sight of another similar stream lying to the north-east.

All these indications correspond with the site to which these remarks relate; and if the village was destroyed before 1603, and the wooden structures of which it consisted consumed by fire, no trace of it might remain in 1642, and the ground would probably at that time be overgrown with shrubs and young trees. But the Indian tradition would preserve the memory of the place, and if as there is no reason to doubt, the point of view to which the statement of the Jesuit missionaries relates, was the front of the escarpment of the mountain, their Indian informants would have at their very feet the old residence of their fathers, and their remarks as to the soil and exposure would be specially appropriate, and almost necessarily called forth by the view before them.

I do not maintain that this evidence is sufficient certainly to identify the site, but it is enough when taken in connection with the remains actually found, to induce us to regard this as the most probable site, until better evidence can be found in favour of some other.

The only objection of any weight that occurs to me at present, is the small number of skeletons exhumed. If this spot had been long inhabited, and if the people were in the habit of burying their dead near their dwellings, we might expect to find a more extensive cemetery. But we do not know how long Hochelaga had been in existence in Cartier's time, nor have the excavations made been sufficient to ascertain the actual number of burials. Further, these people may have practised the custom ascribed by Charlevoix to other tribes, of disinterring their dead at intervals of 8 or 10 years, and after a solemn feast for the departed, transferring their remains to a general place of sepulture, often at a distance from their habitations. It is also to be observed that the bodies have been buried in the primitive Indian manner, and are in a condition which would indicate an antiquity quite sufficient to accord with the supposition that they were interred as early as Cartier's visit.

I cannot conclude this article without noticing some general conclusions as to the pre-historic annals of Montreal, which flow from the facts above stated.

1. The aborigines of Montreal were of the Algonquin race.* Cartier evidently represents the languages spoken at Stadacona or Quebec and Hochelaga as identical. Many words which he mentions incidentally are the same or only slightly varied, and he gives one vocabulary for the language of both places. This accords perfectly with the direct statement of the Jesuits' memoirs, that the tribe whose tradition maintained that their ancestors had inhabited Montreal, spoke the Algonquin language both in the time of Cartier and in 1642. These people were also politically and socially connected with the Algonquins of the lower St. Lawrence. Farther the people of Hochelaga informed Cartier that the country to the south-west was inhabited by hostile people, formidable to them in war. These must have been the Hurons or Iroquois, or both. In agreement with this, the Jesuits were informed in 1642, that the Hurons had destroyed the village: that people having formerly been hostile to the Algonquins though then at peace with them.

2. In the time of Cartier the Algonquins of Montreal and its vicinity, were giving way before the Iroquois and Hurons, and shortly after lost possession finally of the island of Montreal. The statement of the two Indians in 1642, implies that at a more ancient period the Algonquins had extended themselves far to the south and west of Montreal. This tradition strikingly resembles that of the Delawares,† that their ancestors allied with the Iroquois had driven before them the Alligewe, a people dwelling like the Algonquins in wooden-walled villages, though the Iroquois had subsequently quarrelled with the Delawares as with the Hurons. The two histories are strictly parallel, if not parts of the same great movement of population. We further learn from the Jesuit Missionaries, that portions of the displaced Algonquin population were absorbed by the Hurons and Iroquois, an important fact to students of the relative physical and social traits of these races.

3. The displacement of the Algonquins tended to reduce them to a lower state of barbarism. Cartier evidently regards the people of Hochelaga as more stationary and agricultural than those farther to the east; and it is natural that a semi-civilized

* They have usually been regarded as Hurons or Iroquois, apparently for no other reason than their settled and agricultural habits.

† The Delawares are themselves regarded as allied to the Algonquin, rather than to the Iroquois race.

people when unable to live in security and driven into a less favourable climate, should betake themselves to a ruder and more migratory life, as the descendants of these people are recorded by the Jesuits to have actually done. If Hochelaga with its well cultivated fields, and stationary and apparently unwarlike population, was only a remnant of multitudes of similar villages once scattered through the great plain of Lower Canada, but destroyed long before the occupation of the country by the French, then we have here an actual historical instance of that displacement of settled and peaceful tribes, which is supposed to have taken place so extensively in America. Our primitive Algonquins of Montreal may thus claim to have been a remnant of one of those old semi-civilized races, whose remains scattered over various parts of North America, have excited so much speculation. Had Cartier arrived a few years later, he would have found no Hochelaga. Had he arrived a century earlier, he might have seen many similar villages scattered over a country occupied in his time by hostile races.

These views are perhaps little more than mere speculation, but they open up paths of profitable inquiry. To what extent was the civilization of the Iroquois and Hurons derived from the races they displaced? What are the actual differences between such remains as those found at Montreal, and those of the Hurons in Upper Canada? Are there any remains of villages in Lower Canada, which might confirm the statements of the two old Indians in 1642?

Into these questions I do not purpose to enter, contenting myself with directing attention to the remains recently discovered in my own vicinity, and which I trust will be collected and preserved with that care which their interest as historical memorials demands. My belief of their importance in this respect, and the desire to rescue from oblivion the last relics of an extinct tribe, must be my excuse for entering on a subject not closely connected with my ordinary studies, but which as an ethnological inquiry, is quite within the sphere of this Journal. J. W. D.

NOTE.—With respect to the great cucumbers and beans mentioned by Cartier, it may be remarked that in the opinion of the late Dr. Harris and of Professor Gray, both of whom have given attention to this subject, the aborigines of Eastern America certainly possessed and cultivated the common pumpkin, some species of squash, and probably two species of beans (*Phaseolus communis and lunatus*), though these plants are not indigenous north of Mexico. Their culture like that of corn and tobacco must have been transmitted to the northern regions from the south.

REVIEWS AND NOTICES OF BOOKS.

*Acadian Geology and a Supplementary Chapter thereto**.

The first of the works mentioned in the note at the foot of this page contains the only comprehensive account yet published of the highly interesting and difficult geology of Nova Scotia and the neighbouring regions. This book is too widely known to the geologists of all countries to need any critical examination at the present time. Since its publication the author has removed from the field of his former labours among the carboniferous and New Red sandstone works of Nova Scotia, to the great Silurian plain of Lower Canada. He still labours (as we hope he may long continue to do) to "carry forward" to completion some of the subjects left unfinished in 1855. The results, up to the present time are now published is a neat pamphlet with the title of "Supplementary Chapter to Acadian Geology." It contains a series of condensed articles giving us the recent discoveries and investigations of the author on various points connected with the geology of the Acadian Provinces, such as the Modern and Post Pliocene formations,—and the minerals and fossils of the carboniferous, Devonian and Silurian rocks. We extract an account of some investigations made by Professor How.

"Professor How's paper announces the discovery, in the great bed of gypsum quarried at Windsor, of a rare boracic-acid mineral hitherto found only in Peru.† Its formula, according to Professor How, is—

$$NaO\,2BO_3 + 2CaO, 3BO_3 + 15HO.$$

"With respect to the geological conditions of its occurrence, Professor How quotes from Professor Anderson of Glasgow the

* 1. Acadian Geology.—An account of the Geological Structure and mineral resources of Nova Scotia and portions of the neighbouring Provinces of British North America. Edinburgh, 1855, 8vo., with a map and illustrations.

2. Supplementary Chapter to Acadian Geology.—12mo. pp. 70. Wood engravings of fossils. By Dr. J. W. Dawson, LL.D., F.G.S. Principal of McGill College, Montreal. Author of Archaia, &c. Edinburgh, 1860.

† Professor How has still more recently discovered a second boracic-acid mineral in the gypsum. It consists of borate and sulphate of lime, soda, and magnesia, and Professor H. proposes to name it Cryptomorphite.

statement that, at Tarapaca in Peru, the mineral is found in a district supposed to be volcanic, and imbedded in the nitrate of soda deposits. He then remarks that, with a very few exceptions, boracic acid is found 'either in directly volcanic regions, most abundantly as such, or as borax: and a well-marked case of actual sublimation of the acid from a volcano in the island of Vulcano, near Sicily, has been studied by Warrington; or in smaller amount, in minerals the products of recent or extinct volcanoes, as Humboldtite from ejected blocks of Vesuvius, and zeolites and datholite from trap of Salisbury Crags, New Jersey, and other places; or in minerals of purely plutonic or metamorphic rocks, as tourmaline, the rhodozite of Roze, and axinite—the species which contain it at all being few in number. It may be noticed also, that traces of this acid have lately been met with in the Kochbrunnen of Wiesbaden and in the waters of Aachen.

"If we may reason from the character of the majority of its situations, we may almost consider the volcanic or at least igneous origin of boracic acid so well established as to lead us, by its occurrence in the gypsiferous strata, to seek for some volcanic agency as the cause of their production. Such an origin has I find already been assigned to the gypsum of Nova Scotia by Mr. Dawson. This formation has been shown to be a member of the Lower Carboniferous series, and is assumed to have arisen from the action of rivers of sulphuric acid more or less dilute, such as are known to exist in various parts of the world, issuing from then active volcanoes and flowing over the calcareous reefs and bed of the sea."'

"This is an interesting confirmation of the views formerly expressed as to the origin of the gypsum; and though Professor Hunt has ably shown, in his recent papers on Chemical Geology,* that gypsum may be produced in stratified masses in aqueous deposits by other processes, I am still inclined, in consequence of the great thickness and local character of the deposits, and the apparent absence of magnesian limestone, as well as the presence of boracic acid, to adhere to the view above stated, in so far as the great gypsum beds of Nova Scotia are concerned."

The following are some of the results of Dr. Dawson's re-

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* Report of Canadian Survey for 1858; Canadian Naturalist; Silliman's Journal, &c.

searches into the origin and composition of the "mineral charcoal," and "compact coal" of the carboniferous system.

"A consideration of the decay of vegetable matter in modern swamps and forests shows that all kinds of tissues are not under ordinary circumstances susceptible of the sort of carbonization which we find in the mineral charcoal. Succulent and lax parenchymatous tissues decay too rapidly and completely. The bark of trees very long resists decay, and, where any deposition is proceeding, is likely to be imbedded unchanged. It is the woody structure, and especially the harder and more durable wood, that, becoming carbonized and splitting along the medullary rays and lines of growth, affords such fragments as those which we find scattered over the surfaces of the coal. These facts would lead us to infer that mineral charcoal represents the woody debris of trees subjected to subaerial decay, and that the bark of these trees should appear as compact coal along with such woody or herbaceous matters as might be imbedded or submerged before decay had time to take place.

"The method of preparing the mineral charcoal for examination was an improvement on the "nitric-acid" process of previous observers, and the results gave very perfect examples of the disc-bearing tissue restricted in the modern world to conifers and cycads, but which existed also in the Sigillariæ of the coal period. With this were scalariform vessels, like those of ferns and club mosses, and several other kinds of woody tissue. On careful comparison it was found that all these tissues might be referred to the following genera of plants common in the coal measures: Sigillaria including Stigmaria, Calamites, Dadoxylon and other conifers, Lepidodendron, Ulodendron, ferns, and possibly some other less known plants.

"Another form of tissue observed was a large spiral vessel, possibly belonging to some endogenous plant.

"The structures preserved in the layers of shining compact coal are more obscure, and I therefore present a somewhat more full summary of the facts known in respect to them:—

"The compact coal, constituting a far larger proportion of the mass than the "mineral charcoal" does, consists either of lustrous conchoidal *cherry* or *pitch coal*,—of less lustrous *slate coal*, with flat fracture,—or of coarse coal, containing much earthy matter. All of these are arranged in thin interrupted laminæ. They consist of vegetable matter which has not been altered by subaerial decay, but which has undergone the bituminous putrefaction, and has thereby been resolved into a nearly homogeneous mass, which still, however, retains traces of structure and of the forms of the individual flattened plants composing it. As these last are sometimes more distinct than the minute structures, and are necessary for their comprehension, I shall, under the following heads notice both as I have observed them in the coals in question.

"1. The laminæ of pitch or cherry coal, when carefully traced over the surfaces of accumulation, are found to present the outline of flattened trunks. This is also true, to a certain extent, of the finer varieties of slate coal; but the coarse coal appears to consist of extensive laminæ of disintegrated vegetable matter mixed with mud.

"2. When the coal (especially the more shaly varieties) is held obliquely under a strong light, in the manner recommended by Goeppert, the surfaces of the laminæ present the forms of many well-known coal-plants, as Sigillaria, Stigmaria, Poacites or Cordaites, Lepidodendron, Ulodendron, and rough bark, perhaps of conifers.

"3. When the coal is traced upward into the roof-shales, we often find the laminæ of compact coal represented by flattened coaly trunks and leaves, now rendered distinct by being separated by clay.

"4. In these flattened trunks it is the outer cortical layer that alone constitutes the coal. This is very manifest when the upper and under bark are separated by a film of clay or of mineral charcoal, occupying the place of the wood. In this condition the bark of a large Sigillaria gives only one or two lines in thickness of coal; Stigmaria, Lepidodendron, and Ulodendron give still less. In the shales these flattened trunks are often so crushed together that it is difficult to separate them. In the coal they are, so to speak, fused into a homogeneous mass.

"5. The phenomena of erect forests explain, to some extent, the manner in which layers of compact coal and mineral charcoal may result from the accumulation of trunks of trees *in situ*. In the sections at the south Joggins, the usual state of preservation of erect Sigillariæ is that of casts in sandstone, enclosed by a thin layer of bark converted into compact, caking, bituminous coal, while the remains of the woody matter may be found in the bottom of the cast in the state of mineral charcoal. In other cases the bark has fallen in, and all that remains to indicate the place of a tree is a little pile of mineral charcoal, with strips of bark converted into compact coal. Lastly, a series of such remains of tumps, with flattened bark of prostrate trunks, may constitute as rudimentary bed of coal, many of which exists in the Joggins section. In short, a single trunk of Sigillaria in an erect forest presents an epitome of a coal-seam. Its roots represent the Stigmaria underclay; its bark the compact coal; its woody axis the mineral charcoal; its fallen leaves, with remains of herbaceous plants growing in its shade, mixed with a little earthy matter, the layers of coarse coal. The condition the durable outer bark of erect trees concurs with the chemical theory of coal, in showing the especial suitableness of this kind of tissue for the production of the purer compact coals. It is also probable that the comparative impermeability of bark to mineral infiltration is of importance in this respect, enabling this material to remain unaffected by causes which have filled those layers consisting of herbaceous materials and decayed wood, with earthy matter, pyrites, &c.

"6. The miscroscopic structure of the purer varieties of compact coal accords with that of the bark of Sigillaria. The compact coals are capable of affording very little true structure. Their cell-walls have been pressed close together; and pseudo-cellular structures have arisen from molecular action and the segregation of bituminous matter. Most of the structures which have been figured by microscopists are of this last character, or at the utmost are cell-structures masked by concretionary action, pressure, and decay. Hutton, however, appears to have ascertained a truly cellular tissue in this kind of coal. Goeppert also has figured parenchymatous and perhaps bast-tissues obtained from its incineration. By acting on it with nitric acid, I have found that the structures remaining both in the lustrous compact coals and in the bark of Sigillariæ are parenchymatous cells and fibrous cells, probably bast-fibres.

"7. *I by no means desire to maintain that all portions of the* coal-seams not in the state of mineral charcoal consist of cortical tissues. Quantities of herbaceous plants, leaves, &c, are also present, especially in the coarser coals; and some small seams appear to consist entirely of such material,—for instance, of the leaves of Cordaites or Poacites. I would also observe that, though in the roof-shales and other associated beds it is usually only the cortical layer of trees that appears as compact bituminous coal, yet I have found specimens which show that in the coal-seams themselves true woody tissues have sometimes been imbedded unchanged, and converted into structureless coal, forming like the coniferous trees converted into jet in more modern formations, thin bands of very pure bituminous material. The proportion of woody matter in this state differs in different coals, and is probably greatest in those which show the least mineral charcoal; but the alteration which it has undergone renders it almost impossible to distinguish it from the flattened bark, which in all ordinary cases is much more abundant."

Along the Atlantic coast there is a vast series of slates and quartzites which Dr. Dawson thinks may be a continuation of the Primordial zone of Newfoundland. We are strongly inclined to the belief that this supposition will yet turn out to be well founded. This tract being composed of intensely plicated rocks will be difficult to work, but the discovery of a *Paradoxides* or a *Pulaeopyge* would amply repay the observer for any amount of search. Just now when Darwin's theory is attracting so much attention, any organic thing that can be exhumed from such a vastly ancient resting place must possess an extraordinary interest.

E. B.

Elements of Chemical Physics; by J. P. Cooke, Jr., Irving Professor of Chemistry and Mineralogy in Harvard University. Little, Brown & Co., Boston. 1860.

This work demands commendation for its superiority to the generality of American text books on science. It does not come up to our ideal of a scientific exposition of the subjects on which it treats, and yet it is far in advance of any work upon the same or kindred topics published on this side the Atlantic, and merits and we trust will have large success. Its defects are so to speak necessary. The author has not felt warranted in assuming any more extended acquaintance with mathematics, on the part of his readers, than is implied in a knowledge of the methods of solving simple equations, and a familiarity with the rudiments of geometry. It is obvious that many demonstrations in physics are thereby rendered prolix, and some impossible, so that in this work principles, the legitimate consequences of others previously assumed or demonstrated, have to be established by an appeal to experiment, the process of deduction being too tedious—if not altogether impracticable—without the aid of more abstruse mathematical processes.

The present volume is the first of a promised series forming a course on the Philosophy of Chemistry. In this volume the author aims to give a complete development of the theory of weighing and measuring. In the rough these operations are simple enough, and intelligible enough; but when as in many chemical investigations, an error of a hundred thousandth is important, minute sources of error have to be guarded against which demand for their elimination a knowledge of physical laws not always possessed by the tyro. When it is remembered that the chemist must correct his first approximation to the weight or volume of the substance with which he experiments for errors arising from the buoyancy of the air, its ever varying pressure, its different degrees of humidity, from changes of temperature of the mass to be computed, as well as of the vessel that contains it, and from many other more refined and occult influences, it is easy to conceive that an extended acquaintance with the laws of motion, with the nature of matter, with hydrostatics, with pneumatics, with thermotics and with other branches of Natural Philosophy is necessary.

The author in the development of the subject has adopted a simple natural arrangement. First he gives a chapter of introductory observations in which, by the way, he attempts with indifferent success to distinguish between chemical and physical changes. The second chapter treats of the general properties of matter and the laws of motion. The third chapter treating of molecular forces, first between homogeneous, and then between heterogeneous molecules, we consider to be the best chapter of the work, giving most valuable information in a clear concise style. The fourth chapter, on heat, contains a large amount of well digested information; we cannot however avoid expressing our surprise that the author of a work like the present should enumerate but "two theories" of the nature of heat as "current among philosophers"—the material theory and the undulatory theory—making no reference to the remarkable dynamical theory of heat that has deservedly attracted so much attention in the last few years. If the fifteen or twenty pages devoted to a description of the steam-engine were compressed into two, and the space thus saved devoted to a discussion of the nature of vapours and gases as illustrated by that theory, we think this portion of the work would have been much better performed. The fifth chapter is on weighing and measuring.

The individual portions of the whole are generally well elaborated. The author is everywhere clear but not always concise· He is sometimes tempted to expatiate unduly on topics not immediately connected with his subject. It must, however, be said that his digressions are usually both pleasing and instructive, and cannot be regretted except for their interference with the unity of his design. The work is one that will well repay perusal, and we trust will be studied and mastered by every student of chemistry. We anticipate with pleasure the appearance of the succeeding volume on Stoichiometry and Chemical Classification. S. P. R.

Salmon Fishing in Canada by a Resident. Edited by COL. SIR JAMES E. ALEXANDER, with Illustrations. London: Longman's. Montreal: B. Dawson & Son.

Those who delight in the pastime of Salmon Fishing in the fine tributaries of the St. Lawrence will find in this Book much, both to instruct and interest them. It is written in a very chaste and pleasing style, and as it abounds in good stories it may be read with interest by all classes of persons. The author is evidently an adept in the piscatory art, and knows how to go about and to enjoy a vacation ramble in the solitary wilds of the Lower St. Lawrence. His descriptions of the natural scenery of the country are good and likely to awaken desires in the reader to escape from the civilized and settled place in which he may live and enjoy the freedom of the waters and the woods.

Were we disposed to be critical we should say that the Sermon with which the Chaplain favours the tourists is rather long, and would be improved by a reduction of its bulk. The latter part might be judiciously left out both for the reputation of the author's divinity, and the comfort of the reader. We quite agree with the Baron in thinking this part to be rather "fishy." The vignettes which are interspersed through the work are sketched with remarkable spirit; and although not very artistic are yet very clever and amusing. The Appendix contains several valuable papers on the natural history of the Salmon, and on its peculiar habits in the Canadian waters and elsewhere. We trust that the publication of this Book by its excellent and obliging author, indicates the beginning of a new era in the treatment of the game Fishes of our Rivers and Lakes. A good Act has been passed by the Provincial Parliament for their protection; and the Commissioner of Crown Lands is a zealous coadjutor in this praiseworthy object. It is only now necessary that the provisions of the Act be faithfully and vigorously enforced—that farmers and others resident on our Salmon and Trouting Streams should both discourage and denounce all poaching. The inspector of the Salmon and Trout fisheries of the Province has wisely taken steps during the past season to put an end to the wholesale distruction of fish out of season at their spawning beds. It is for the interest of the Province and for every dealer in and lover of these noble fish that these valuable products of our waters should be conserved at seasons where their flesh is really almost poisonous, and they are engaged in multiplying their species at so immense a ratio, as, unless hindered, they are known to do.

For a Winter evening or a Summer holiday this book will be found a most pleasing companion, and we trust that it will meet with many readers. A. F. K.

The Glaciers of the Alps: being a narrative of Excursions and Ascents, an Account of the Origin and Phenomena of Glaciers, and an Exposition of the Physical principles to which then are related. By J. Tyndall, F.R.S., Professor of Natural Philosophy, Royal Institution of Great Britain, with Illustrations. Boston: Ticknor and Fields. Montreal: B. Dawson & Son.

This Book is divided into two parts; the *first* chiefly narrative, and the *second* chiefly scientific. In Part I. the author seeks to convey some notion of the life of an Alpine explorer, and of the means by which his knowledge is acquired. In Part II. an attempt is made to classify such knowledge and to refer the observed phenomena to their Physical causes. This part of the work is written with an evident desire to interest intelligent persons who may not possess any special scientific culture. For their sakes the author dwells more fully on principles than he would have done were he addressing purely scientific readers.

The learned author was led into the investigations which this book contains from the study of slaty cleavage in the Silurian Rocks of Wales. The crystalline theory of Sedgwick and others did not appear to him adequately to account for the phenomena.

He was led in the course of his enquiries, to the study of Forbes's famous work on the Alpine Glaciers. The phenomena observable in these masses of moveable ice led him to suppose that possibly they might afford a solution of the problem of slaty cleavage in rocks. This he endeavours with singular clearness and force to show. The conclusions to which he arrives are, that cleavage in the glaciers at angles to the planes of their surfaces is due to the immense lateral pressure to which they are subjected. This ascertainable fact he applies to the cleavage of stratified rocks at angles to the planes of stratification. The attention of other observers has been directed to the same subject and from experiments and observed facts we are in a fair way of arriving at certain conclusions regarding the nature and causes of slaty cleavage.

This book is written in a fine, frank, manly style. With great simplicity and beauty it combines in a successful manner the popular and scientific in the treatment of its topics. To our youth, and to those of riper years, furnished with the education which our schools and colleges afford, we can recommend this book with confidence that they will find it most interesting and profitable reading. A. F. K.

What may be Learned from a Tree. By HARLAND COULTAS. New York: D. Appleton & Co. Montreal: B. Dawson & Son.

This book is respectfully dedicated to all lovers and friends of nature. The author's intention is to show what may be learned from a tree physically and analogically. He traces its life-history from the first manifestations of vitality in the germinating seed until the period of puberty when it puts forth flowers and fruit; he also considers its phenomena after it has passed its prime; and shows its appointed limits, in virtue of the physiological law which governs the development of its organisms in common with those of all other plants.

The author aims at writing a popular book; he addresses himself to the people,—those who feel life to be one continued struggle for existence. The style is rather popular and eloquent for our taste, we would prefer greater clearness and simplicity and less diffuseness of style and treatment. The object of the work is creditable, the author's acquaintance with vegetable physiology seems accurate and considerable, and his treatise may be read with much interest and profit.

Unity in Variety, as deduced from the Vegetable Kingdom, being an attempt at developing that oneness which is discoverable in the habits, mode of growth, and principle of construction of all plants. By Christopher Dresser, lecturer on botany &c., South Kensington Museum. London: J. S. Virtue. Montreal: B. Dawson & Son.

This work is the result of a somewhat protracted study of the modes in which vegetable structures increase themselves by growth; the external appearances of plants during their enlargement being carefully considered, as well as the principles upon which their enlargement is dependent. The author's aim is to trace out the oneness of principle which pervades all the works of the floral creation. He deems that this view of the vegetable kingdom greatly simplifies the study of scientific botany in all its branches. The book is not intended for mere beginners but for those who have acquired some knowledge of the elements of botany; and it is believed that the consideration of its contents will conduce to the rapid progress of the student. The author very justly says, that, in order to the prosecution of any branch of botany, nature as well as, and even more than books, must be resorted to. The botanist must live among plants, and daily study their forms, and the principle upon which their growth depends. The book is a fine specimen of typography, and is most copiously illustrated, and that, too, with an artistic skill and beauty never before attempted in an elementary work on botany. We have seen no wood-cut representations of botanical subjects at all equal to these. They are most pleasing to look upon and leave nothing further, in their own department, to be desired. For artists and those who wish to study flower-drawing this book will be invaluable, and to all students of botany, even although they may not agree with the authors speculations, it will yet be of interest.

A. F. K.

MISCELLANEOUS.

"*On an undescribed Fossil Fern from the Lower Coal-measures of Nova Scotia.*" *By Dr. J. W. Dawson, F.G.S.* (*Abstract of a paper read at the meeting of the Geological Society of London, Nov.* 7, 1860.)

In a paper on the Lower Carboniferous rocks of British America, published in the 15th volume of the Geological Society's Journal, Dr. Dawson noticed some fragmentary plant-remains which he referred with some doubt, the one to *Schizopteris* (Brongn.) and the other to *Sphæreda* (L. and H.) With these were also fragments of a fern resembling *Sphenopteris* (*Cyclopteris*) *adiantoides* of Lindley and Hutton. Since 1858 the author has received a large series of better-preserved specimens from Mr. C. F. Hart; and from these he finds that what he doubtfully termed the frond of *Schizopteris* is a flattened stipe, and that the leaflets which he referred to *Sphenopteris adiantoides* really belonged to the same plant. Mr. Hart's specimens also show that what Dr. Dawson thought to be *Sphæredæ* were attached to the subdivisions of these stipes, and are the remains of fertile pinnæ, borne on the lower part of the stipe, as in some modern ferns. This structure is something like what obtains in the Cuban *Aneimia adiantifolia*, as pointed out to the author by Professor Eaton, of Yale College. No sporangia are seen in the fossil specimens.

Dr. Dawson offers some remarks on the difficulties of arranging this fern among the fossil *Cyclopterides*, *Nœggerathiæ*, and *Adiantites*; and, placing it in the genus *Cyclopteris*, he suggests that it be recognized as a subgenus (*Aneimites*) with the specific name *Acadica*.

The regularly striated and gracefully branching stipes, terminated by groups of pinnules on slender petioles, must have given to this fern a very elegant appearance. It attained a great size. One stipe is 2 inches in diameter, where it expands to unite with the stem; and it attains a length of 21 inches before it branches. The frond must have been at least 3 feet broad. The specimens are extremely numerous at Horton.

The author then notices that the long slender leaves so common in the Coal-measures of Nova Scotia, and hitherto called *Poacites*, though sometimes like the stipes of *Aneimites*, are probably leaves of *Cordaites*.

On some specimens of *Aneimites Acadica*, markings like those made by insects have been observed; also a specimen of the *Spirorbis carbonarius*.

Note on a specimen of Neaera, *Collected by Mr. R. S. Fowler, and Exhibited to the Natural History Society.*

This specimen was obtained from the stomach of a Flounder at

Portland. It is of the size of the *Neaera cuspidata* of Great Britain and much resembles it in form, but is less gibbous and thinner and has the teeth less developed. Still these differences are hardly more than sufficient to constitute a well marked variety. The *N. pellucida* obtained by Stimpson in 40 fathoms off Long Island, is probably the young of the species to which Mr. F's shell belongs; and as Stimpson's specimen is the only one heretofore recorded as found on the American coast, the present specimen is of much interest.*

J. W. D.

Note on Relics of the Red Indians of Newfoundland, Collected by Mr. Smith McKay, and Exhibited to the Natural History Society.

These objects were found in a sepulchral cave in the southern part of Newfoundland, with the remains of a body wrapped in birch bark and stated by the modern Indians to have been probably a "Medicine Man." They consist of a portion of a walrus tusk, cut across by a sharp instrument, three flat pendants of elongated triangular form of the same material, and ornamented with lines and dots forming various patterns, shell wampum finished and in various stages of manufacture, with portions of the unformed shells, small univalve shells perforated so as to be strung as beads or attached to wearing apparel, portions of an iron knife or dagger and of a hatchet completely oxidised, and the wooden stem of an arrow, with a stone head very rudely formed These relics must belong to the earlier portion of the intercourse of the Red Indians with Europeans. They resemble the objects found in graves of other tribes, the principal peculiarities being the use of the ivory of the walrus tusk, and the circumstance that the wampum is made of the shell of a large *Mactra* probably *M. solidissima.*

J. W. D.

KINGSTON BOTANICAL SOCIETY.

It is with much pleasure that we notice the formation of a vigorous Botanical Society in Kingston, in connection with

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* Since the above was written, Mr. Stimpson has seen the specimen and regards it as the adult of *N. pellucida*, and distinct from *N. cuspidata.*

Queen's College under the auspices of the Principal and Professors. Professor Lawson, whose name as a botanist is already widely known, has evidently been the initiator of this movement, and will we doubt not prove the soul of the Society itself. His practical knowledge of botanical subjects and his genuine scientific enthusiasm, will we hope be the means of carrying on the society's affairs with efficiency, and of infusing into the minds of its younger members a zeal for the prosecution of this noble department of science. We hope from time to time to be able to report good work done in the way of original research and discovery in the fine region of country which lies around Kingson. Among other departments we trust that this Society will draw attention to the fine array of forest trees which our country contains, not so much for purposes of commerce as for purposes of preservation and economical use at home. The Canadian farmer has not yet learned the wisdom of planting as he has of cutting down trees, and the time seems not far distant when in many of the finest parts of the country the famous forestry of Canada will have disappeared from our sight. This Society has much work before it which we trust it will not only begin but carry out with effect. Our readers will be interested in the following extracts from Professor Lawson's admirable address.

"Dr. Lawson pointed out the peculiar sphere in which the botanist is called to labour, the range of his studies, and the means acquired for their pursuit. It is of great importance that at the outset the real object of our proposed Society should be understood. The establishment of a Botanical Garden and other appliances must be regarded as secondary to the great object of the Society, the prosecution of scientific botany. Botany is at a low ebb in Canada, at a lower ebb than in most civilized or half civilized countries on the face of the earth. At the close of the eighteenth century, only five dissertations, on botanical subjects had been published by the whole medical graduates of the great Continent of America. Since then the indefatigable labours of such men as Michaux, Pursh, Torrey, Harvey, Curtis, Boott, Englemann, Tuckermann Sullivant, Lesquereux, and especially of one whose name and fame rise above all the rest, Asa Gray, have brought our knowledge, of the botany of the United States on a level with that of the best botanized countries of Europe. The Flora of Canada has also been elaborated since then by one who still presides over the destinies of botanical science, not in England alone, for his authority is recognised wherever the science is pursued. But during a period of nearly thirty years very little has been added to our published knowledge of Canadian botany. Information respecting our indigenous plants must still be sought in the work of Sir William Hooker, issued from the Colonial office in England in 1833. That work founded as it necessarily was, on dried specimens carried home by passing travellers, afforded to the botanical world an admirable example of how much could be made out of slender material when in good hands. Unimpeachable as a work of science, unsurpassed in the whole range of botanical literature in the accuracy and beauty of its illustrations, the *Flora Boreali-Americana* afforded the means of developing still more fully a knowledge of the Canadian Flora. The North American Flora of Torrey and Gray and the Manual of the Botany of the Northern States, offered additional temptations, to the pursuit; but advances have not been made commensurate with the advantages that were offered; we have still, therefore, the singular anomaly of a country distinguished by its liberal patronage to science, dependent for its information respecting its native plants on the descriptions of specimens culled by early travellers. What was thirty years ago, and is now, of the highest value, can only in a partial manner meet the wants of the country in these days, when new manufactures and new forms of industry, seeking new products to work upon, are daily springing up around us. We desire to place the science of Botany on a more satisfactory footing in Canada than that which it now holds; we desire to increase the existing stock of knowledge; we desire to diffuse a taste for the study, so as to add to the number of laborers now in the field; and we desire to place on record new observations and discoveries, as they arise. The Botanical Society is designed as a means for carrying out purposes such as these. Extensive circulation was given sometime ago by Canadian newspapers to a report that Sir William Hooker was on his way to Canada with a staff of assistants to explore the botany of the country. I have the best authority for stating that that report was without foundation. It probably originated in certain proposals that were made to the Colonial office regarding the publication of a series of popular Manuals of Colonial Botany; but no expedition was ever contemplated by Sir Wm. Hooker, or any one else, at the instance of the Government. On the contrary, recent communications from the botanical advisers of the Home Government indicate that

Canada must follow the salutary example of other old established British Colonies, and conduct for herself investigations into the nature and distribution of her indigenous productions. We already possess in Canada several important scientific societies in active operation. While the Canadian Institute is of a comprehensive character, embracing all branches of science, literature and philosophy, the special department of geology is amply cultivated by the Natural History Society of Montreal, which has also, however, made valuable contributions to zoology and botany. In addition to such institutions as these, we have, of still more special character, the Government Geological Survey, which has been instrumental in carrying out investigations of the greatest importance to the country, whether their results be viewed as intellectual achievements, or as contributions to material industry. It is proposed that our Society shall have for its object the advancement of Botanical Science in all its departments—Structural, Physiological, Systematic and Geographical; and the application of Botany to the useful and ornamental arts of life. The means by which this object may be accomplished are various, and will come before us for discussion from time to time. In the meantime, it is proposed that there shall be monthly evening meetings in Kingston, during the winter for the reading of papers, receiving botanical intelligence, examining specimens, and discussing matters of scientific interest in relation to the science; also that there shall be field meetings during the summer in distant localities in Canada, as well as in the other British Provinces of North America, and occasionally also in the adjoining States, whereby our members may have an opportunity, of investigating the botany of districts that have been imperfectly examined. By the above and similar means, much important information may be brought together. Such facts and results, new to science, as are laid before the Society, from time to time, will afford materials for the publication of "Transactions," whereby our stores may be rendered available to the public in Canada, and to botanists in other parts of the world. In addition to such means, the Society may greatly promote its objects by correspondence with botanists in other countries, and especially with those who are located beside the extensive public herbaria, botanical libraries, and gardens, in various parts of the United States and Europe. By correspondence with such persons, many doubtful points on nomenclature may be set at rest, while the existence of information relating to Canadian Botany, may be ascertained that might otherwise remain unknown. Botanists distinguished in certain branches of the science may be called upon to furnish reports on their special subjects, for which materials may be brought together by the members. Such aid will be of the greatest value to the Society, and I have, therefore, gratification in informing you that communications, have already been received from some of the most active Botanists, in the United States, England, Scotland, and Prussia promising cordial co-operation. So soon as preliminary operations enable us to proceed to the discussion of scientific business you will also have an opportunity of ascertaining that we already have observers throughout the length and breadth of Canada, as well as in the other North American Provinces, from the Red River in the far west, to the Island of Prince Edward in the East. In common with the botanists of other countries we must necessarily take cognizance of those discoveries in structural and physiological botany which are daily challenging a careful examination. But our position in a comparatively new country points out to us a special path of research which it will be our duty to follow—that which has for its object the investigation of the special botany of Canada, the geographical and local distribution of the plants. The indigenous plants whose products are now used or are capable of being applied to the useful arts, will deserve a large share of attention, and no doubt regard will also be had to those, that are suited to our climate but have not yet been introduced. Strewed around her path in the woods and on the shores of our lakes are many plants capable of yielding food and physic, dyeing and tanning materials, oils, fibers for spinning, and paper making, &c. Even in the midst of the city of Kingston, growing on vacant lots, and in court yards, there are drug plants enough to stock a Liverpool warehouse. Such will no doubt be brought into use when better known, and thus an increase, will be effected in the production of the country.

"While leaving to other Societies the discussion of the more general questions of science and to special Societies their peculiar topics, we propose to employ the Botanical Society as an instrument for the collection of facts and the working out of details which are of immediate interest to the botanist alone, but of the greatest importance in leading to correct results in general science. Scientific Societies on a broader basis have too often degenerated into popular institutions, calculated rather for the amusement of the many than for the encouragement and aid of the few who are engaged in the prosecution of original discovery. We shall be guarded against such a result, in a great measure by the special object of our Institution, but it will be needful, also, while we attempt to spread a taste for Botany, and to diffuse correct information as to its objects, its discoveries and its useful applications, that we should seek rather to bring our members and the public into scientific modes of thought and expression than to allow our Society to yield up its scientific character to suit the popular taste. There is much reason to believe that the want of an organization of this kind, whose duty is to collect and record facts and discoveries, has been the means of losing to science materials of great value. There have been casual residents in Canada, at different times, who have made collections of greater or less extent and who have in some cases, carried out special investigations in Botany without leaving any printed record of their labours. Some of these may still be rescued from oblivion; but there are also other observations, and discoveries made by present residents in the country which, we may confidently hope, will be made available to the Society's purposes.

"The objects sought by the establishment of a Botanical Society in this country are of great importance, both in a scientific and economical point of view. The field is broad and the soil is rich. The extent to which we can cultivate will depend entirely upon the number of the laborers, and the zeal and industry which they display. Let us therefore not be disappointed with our first results. Let us lay a foundation and persevere in the work and workers will gather around us as they have done before in the Botanical Societies of other countries. To organizations of this kind more than to any other means, are we indebted for the advanced state of botanical science, at this day; and in a country such as this, it is especially needful to have a wide spread organization in order to elicit satisfactory results. In an attempt to organise a Society such as this, we may confidently appeal to many classes of the community. The theologian, and moralist see in the vegetable kingdom a display of the power and wisdom and goodness of our Creator, and beautiful types of spiritual teaching; the medical man recognises in it, the source of his most potent drugs; the sanitary reformer knows, that the simpler forms of vegetation are often the cause, and more frequently the index of more widely spread diseases; the lawyer finds in the microscopical structure of vegetable products a ready means of detecting frauds, adulterations and poisonings; the commercial man recognizes the value of a science having such bearings, and directly devoted to the extension of the sphere of industry; the spinner and paper maker, must here obtain their knowledge of the mechanical condition of vegetable fibres; the farmer, the gardener the orchardist, the vine-grower, the brewer, the dyer, the tanner, and the lumberman, must all apply to botany for an explanation of matters that daily come before them in their various avocations. As an utilitarian institution then our Society is worthy, and will no doubt receive warm support; but it is to be hoped that many zealous laborers will enter the field from higher motives—a desire to promote the cause of science."

The Rev. Principal Leitch reviewed some of the leading points brought forward in the addresses, and referred briefly to some of the more important advantages that might accrue to the country from an institution such as the one that had been proposed, alluding especially to the inducements which it would give to botanical research. Dr. Lawson, he said, when enumerating the grounds for the establishment of a Botanical Society, omitted the weightiestof all, viz, that we can count upon his services. Without his large and valuable experience in the management of such societies I fear we would have little heart to carry out the scheme. He for a long period acted as Secretary to the Edinburgh Botanical Society—one of the most active in the world; and from his accurate knowledge of the details of management, and his well merited distinction in botanical science, he is qualified in no ordinary measure for organizing such a society as the one we contemplate. The labour will fall chiefly upon his shoulders, but we must pledge ourselves to lend him every assistance in our power.

Communications for the Society are to be addressed to Prof. Lawson, Kingston, Canada West.

The Liverpool Naturlists Field-Club held their first meeting on Saturday last under favourable and auspicious circumstances. About ninety-five ladies and gentlemen met at the landing-stage and proceeded thence to Bromborow, in Cheshire one of the most interesting localities about Liverpool for the study of Natural History. Arrived there they divided into parties of about thirty each, to explore the neighbourhood. One division was lead by a geologist qualified to explain the nature of the surrounding strata; another by two or three proficient botanists; and the third by a gentelman whose name is known to the students of microscopical science. After rambling about and investigating the natural curiosities of the neighbourhood (during which time many curious specimens were obtained), the parties met at a charming little spot in the vicinity called Raby Mere, and partook of a homely but plentiful tea in a garden attached to a farmhouse. At this stage of the proceedings a prize was awarded according to previous arrangement, to a young lady, for the greatest variety of wild flowers collected during the ramble; and several beautiful specimens of plants and insects, as well as a fine viper, were examined by the excursionists with interest. A Commettee meeting was then held in the open air, when it was determined to offer a prize on the occasion of each excursion; the next field meeting was fixed and a great many new members were proposed. The Society already numbers nearly 200 members and promises to be the most extensive of the kind in England. The eqcursionists returned home delighted with their days ramble. We may mention for the government of other clubs of this kind, that more that the third of those present were ladies, who were deeply interested in all the proceedings.—*Athenæum.*

New form of Microscope.

'On Microscopic Vision, and a New Form of Microscope,' by Sir D. Brewster.—In studying the influence of aperture on the images of bodies as formed in the camera, by lenses or mirrors, it occurred to me that in microscopic vision it might exercise a still more injurious influence. Opticians have recently exerted their skill in producing achromatic object-glasses for the microscope with large angles of aperture. In 1848 the late distinguished optician, Mr. Andrew Ross, asserted "that 135° was the largest angular pencil that could be passed through a microscopic object-glass," and yet in 1855 he had increased it to 170°! while some observers speak of angular apertures of 175°. In considering the influence of aperture, we shall suppose that an achromatic object-glass with an angle of aperture of 170° is optically perfect, representing every object without colour and without spherical aberration; when the microscopic object is a cube, we shall see five of its faces, and when it is a sphere or a cylinder, we shall see nine-tenths or more of its circumference. How then does it happen that large apertures exhibit objects which are not seen when small apertures with the same focal length are employed? This superiority is particularly shown with test objects marked with grooves or ridges and obliquely illuminated. The marginal part of the lens will enlarge the grooves and ridges, and they will thus be rendered visible, not because they are seen more distinctly, but because they are expanded by the combination of their incoincident images. Hence we have an explanation of the fact—well known to all who use the microscope,—that objects are seen more distinctly with object-glasses of small angular aperture. In the one case we have, with the same magnifying power, not only an enlarged and indistinct image of objects, but a false representation of them, from which their true structure cannot be discovered; while in the other we have a smaller and distinct image, and a more correct representation of the object. But these are not the only objections to large angular apertures and short focal lengths. 1. In the first place, it is extremely difficult to illuminate objects when so close to the object-glass. 2. There is a great loss of light, from its oblique incidence on the surface of the first lens. 3. The surface of glass,—with the most perfect polish,—must be covered with minute pores, produced by the attrition of the polishing powder; and light, falling upon the sides of these pores with extreme obliquity, must not only suffer diffraction, but be refracted less perfectly than when incident at a less angle. 4. When the object is almost in contact with the anterior lens, the microscope is wholly unfit for researches in which mechanical operations are required, and also for the examinations of objects inclosed in minerals or other transparent bodies. 5. In object-glasses now in use, the rays of light must pass through a great thickness of glass of doubtful homogeneity. It is a question yet to be solved whether or not a substance can be truly transparent, in which the elements are not united in definite proportion; in which the substances combined have very different refractive and dispersive powers; and in which the particles are so loosely united that they separate from one another, as in the various kinds of decomposition to which glass is liable. If the best microscopes are effected by these sources of error, every exertion should be made to diminish or remove them.

1. The first step, we conceive, is, to abandon large angular apertures, and to use object-glasses of moderate focal length, obtaining at the eye-glass any additional magnifying power that may be required. 2. In order to obtain a better illumination, either by light incident vertically or obliquely, a new form of the microscope would be advantageous. In place of directing the microscope to the object itself, placed as it now is almost touching the object-glass, let it be directed to an image of the object, formed by the thinnest achromatic lens, of such a focal length that the object may be an inch or more from the lens, and its image equal to, or greater, or less than the object. In this way the observer will be able to illuminate the object, whether opaque or transparent, and may subject it to any experiments he may desire to make upon it. It may thus be studied without a covering of glass, and when its parts are developed by immersion in a fluid. 3. The sources of error arising from the want of perfect polish and perfect homogeneity of the glass of which the lenses are composed, are, to some extent, hypothetical; but there are reasons for believing,—and these reasons corroborated by facts,—that a body whose ingredients are united by fusion, and kept in a state of constraint from which they are striving to get free, cannot possess that homogeneity of structure, or that perfection of polish, which will allow the rays of light to be refracted and transmitted without injurious modification. If glass is to be used for the lenses or microscopes, long and careful annealing should be adopted, and the polishing process should be continued long after it appears perfect to the optician. We believe, however, that the time is not distant when transparent minerals, in which their elements are united in definite proportions, will be substituted for glass. Diamond, topaz, and rock crystal are those which appear best suited for lenses. The white topaz of New Holland is particularly fitted for optical purposes, as its double refractions may be removed by cutting it in plates perpendicular to one of its optical axes. In rock crystal the structure is, generally speaking, less perfect along ths axis of double refraction than in any other direction, but this imperfection does not exist in topaz.—Prof. Stokes and Mr. Stoney suggested some modifications of Sir David Brewster's theoric views; and a member of the Section whose name we did not catch, stated that several attempts had been made to form an image of objects more removed from the first or object glass of the microscope than at present, by using an additional lens, but hitherto without success.

CORRESPONDENCE.

Remarks on the Fauna of the Quebec Group of Rocks, and the Primordial Zone of Canada, addressed to Mr. Joachim Barrande. By SIR W. E. LOGAN, Director of the Geological Survey of Canada.

MONTREAL, 31st Dec., 1860.

MY DEAR MR. BARRANDE,

I am much indebted to you for your letter of the 6th August, which was accompanied by a copy of your communication to Professor Bronn of Heidelberg, dated 16th July. Agreeably to your request, I took an early opportunity of letting Mr. Hall have a copy of your communication to Prof. Bronn, and he received it on the 11th or 12th September.

I am of course aware, from the correspondence you have had with my friend Mr. Billings and myself, how far you are acquainted with our discoveries at Quebec. On two occasions, just previous to the receipt of your last letter to Mr. Billings (received the 8th November), I devoted the short time I could spare from other engagements connected with the Geological Survey, to farther researches at Point Levi. I have satisfied myself, notwithstanding the conglomerate aspect of the bands of rock which contain our new fossils, that the fossils are of the age of the strata. Without entering at present on minute details of structure, I may say that the chief part of the specimens, found up to this time, are from two parallel out-crops, which might be taken as representing two distinct layers. If they are such, they are comprehended in a thickness of about 150 feet; but the circumstances of the case, connected with the physical structure, make it probable that the one band is a repetition of the other through the influence of an anticlinal fold or a dislocation. Both outcrops dip to the south-eastward.

From the more northern out-crop (which we shall call A^2) we have obtained *Orthis* 1, *Leptæna* 1, *Camerella* 1, *Lingula* 2, *Discina* 1, *Agnostus* 3, *Conocephalites* 1, *Arionellus* 4, *Dikelocephalus* 6, *Bathyurus* 4. From the more southern out-crop (which we shall call A^3) we have *Dictyonema* 1, *Orthis* 2, *Leptæna* 1, *Strophomena* 1, *Camerella* 1, *Cyrtodonta* (?) 1, *Murchisonia* 3, *Pleurotomaria* 7, *Helicotoma* 2, *Straparollus* 2, *Capulus* 2, *Agnostus* 1, *Bathyurus* 4, *Cheirurus* 2, *Amphion* 2. From a third out-crop, which is still farther southward, and supposed to be another repetition of the same band (which we shall call A^4), we have *Orthis* 1, *Camerella* 1, *Asaphus* (*A. Illœnoides*) 1, *Bathyurus* 1. Tracing A^2 or A^3 round the extremity of a synclinal, and finding occasional indications of the fossils of A^2 and A^3, we arrive at a position on the south side of the synclinal. We shall call the position P. Here the band A^2 or A^3 ends, but a bed of sandstone a little above it is traceable over an anticlinal to a junction with a conglomerate band lower than A^2 or A^3, shewing that A^2 or A^3 must merge into it. Call this A^1. In this we have *Asaphus* (*A. Illœnoides*) 1, *Menocephalus* (*M. globosus*) 1. These two species occur in the same fragment of rock. Of all these fossils, 1 *Orthis* is common to A^2, A^3 and A^4 ; 1 *Leptœna*, 1 *Camerella*, 1 *Lingula*, 1 *Agnostus*, and 1 *Bathyurus*, are common to A^2 and A^3 ; 1 *Asaphus* is common to A^3 and A^1.

The dip at P is to the south-eastward, and therefore an inverted dip. North-west of this, and therefore above it, at such a distance as would give a thickness of between 200 or 300 feet, we have a band of shale with nodules of limestone, the nodules made up of other rounded masses in a matrix holding fossils, many of them silicified. From a few of these compound nodules we have obtained *Orthis* 11, *Leptœna* 1; this band we shall call B^1. A band like this occurs about half a mile or more to the south-westward. It may be a higher band, or it may be the same band, but we shall call it B^2. From this we obtain *Crinoidœa* (columns) 3, *Orthis* 1, *Camerella* 1, *Nautilus* 1, *Orthoceras* 1, *Leperditia* 1, *Trilobites* (2 genera undetermined) 2. In another position to the south-east, on the south-east of the same anticlinal previously mentioned, we meet with a conglomerate band supposed to be the same as B^2 ; but, in case it should be different, we shall call it B^3. Here we have *Orthis* 3, *Pleurotomaria* 2, *Murchisonia* 1, *Ophileta* 1, *Helicotoma* 1, *Nautilus* 1, *Maclurea* 1, *Orthoceras* 3 or 4, *Cyrtoceras* 1, *Bathyurus* 1, *Illœnus* 2, *Asaphus* 1. Of all these fossils. 1 *Orthis* and 1 *Camerella* are common to B^1 and B^2; the same *Orthis* and *Camerella* with 1 *Leptœna* are common to B^1, A^4, A^3 and A^2.

To the north of all these exposures, and on the north-west side of a synclinal running parallel with the synclinal already mentioned, fossils have been obtained in a cliff of about 100 feet, composed of limestone conglomerate, thin bedded limestones and shales.

Their equivalence is not yet quite certain, but the strata are supposed to be not far removed from A[1] and A[2]. We shall call this cliff A. The fossils from it are *Tetradium* 1, *Orthis* 1 *Lingula* 2, *Trilobites* (genus undescribed) 1, with a great collection of compound *Graptolidæ*, described and being described by Mr. Hall under the genera *Graptolithus* 25, *Retiolites* 1, *Reteograptus* 2, *Phyllograptus* 5, *Dendrograptus* 3, *Thamnograptus* 3, *Dictyonema*, 3.

I have given you these details of localities, because as the subject requires further investigation we do not yet wish to commit ourselves entirely as to the equivalency of separate exposures. But there is no doubt that the whole is one group of strata deposited under one set of alternating circumstances. The whole fauna, as known up to the present time, is composed of—

Articulata,.........................	36	species.
Mollusca, ...	55	"
Graptolidæ, ...	42	"
Radiata,............................	4	"
	137	

Of this fauna not one species is found in the Anticosti group, where we have a gradual passage from the fauna of the Hudson River formation to that of the Clinton, and not one of any formation higher than the Chazy. Mr. Billings recognises one species, *Maclurea Atlantica* (Billings) as belonging to the Chazy, and six species as belonging to the Calciferous. They are *Lingula Mantelli* (Billings), *Camerella* undescribed, *Ecculiomphalus* undescribed, *Helicotoma uniangulata* (Hall), *H. perstriata* (Billings), and one remarkable species of an undetermined genus, like a very convex *Cyrtodonta*, which occurs both at Mingan and Point Levi. All of the forms, particularly the trilobites, remind the observer of those figured by Mr. Dale Owen from the oldest fossiliferous rocks of the Mississippi valley, while independent of the six species identical with Chazy and Calciferous forms, there are many others closely allied to those found in the latter formation in Canada.

From the physical structure alone no person would suspect the break that must exist in the neighbourhood of Quebec, and without the evidence of the fossils, every one would be authorized to deny it. If there had been only one or two species of an ancient type, your own doctrine of colonies might have explained the matter, but this I presume would scarcely be applicable to so many identities in a fauna of such an aspect. Since there must be a break, it will not be very difficult to point out its course and its character. The whole Quebec group, from the base of the magnesian conglomerates and their accompanying magnesian shales to the summit of the Sillery sandstones, must have a thickness of perhaps some 5000 or 7000 feet. It appears to be a great development of strata about the horizon of the Chazy and Calciferous, and it is brought to the surface by an overturn anticlinal fold with a crack and a great dislocation running along the summit, by which the Quebec group is brought to overlap the Hudson River formation. Sometimes it may overlie the overturned Utica formation, and in Vermont points of the overturned Trenton appear occasionally to emerge from beneath the overlap.

A series of such dislocations traverses eastern North America from Alabama to Canada. They have been described by Messieurs Rogers, and by Mr. Safford. The one in question comes upon the boundary of the Province not over a couple of miles from Lake Champlain. From this it proceeds in a gently curving line to Quebec, keeping just north of the fortress; thence it coasts the north side of the Island of Orleans, leaving a narrow margin on the island for the Hudson River or Utica formation. From near the east end of the island it keeps under the waters of the St. Lawrence to within eighty miles of the extremity of Gaspé. Here again it leaves a strip of the Hudson River or Utica formation on the coast.

To the south-east of this line the Quebec group is arranged in long narrow parallel synclinal forms with many overturn dips. These synclinal forms are separated from one another on the main anticlinals by dark grey and even black shales and limestones. These have heretofore been taken by me for shales and limestones of the Hudson River formation, which they strongly resemble, but as they separate the synclinals of the Quebec group must now be considered older. I am not prepared to say that the Potsdam deposit in its typical form of a sandstone is anywhere largely developed above these shales, where the shales are in greatest force. Neither am I prepared to assert its absence, as there are in some places masses of granular quartzite, not far removed from the magnesian rocks of the Quebec group, which require farther investigation; but, from finding wind-mark and ripple-mark on closely succeeding layers of the Potsdam sandstone where it rests immediately upon the Laurentian series, we know that this arenaceous portion of the formation must have been deposited immediately contiguous to the coast of the ancient Silurian sea, where part of it was even exposed at the ebb of tide. Out in deep water the deposit may have been a black partially calcareous mud, such as would give the shales and limestones which come from beneath the Quebec group.

In Canada no fossils have yet been found in these shales, but the shales resemble those in which *Oleni* have been found in Georgia (Vermont). These shales appear to be interposed between eastward dipping rocks equivalent to the magnesian strata of the Quebec group, and they may be brought up by an overlapping anticlinal or dislocation. We are thus led to believe that these shales and limestones, which may be subordinate to the Potsdam formation, will represent the true primordial zone in Canada.

Mr. Murray has this season ascertained that the lowest rock that is well characterized by its fossils in the neighbourhood of Sault Ste. Marie, near Lake Superior, really belongs to the Birdseye and Black River group, and that it rests on the sandstones of Ste. Marie and Lacloche, the fossiliferous beds at the latter place being tinged with the red color of the sandstone immediately below them. These underlying Lake Superior rocks may thus be Chazy, Calciferous, and Potsdam, and may be equivalent to the Quebec group and the black colored shales beneath. The Lake Superior group is the upper copper-bearing series of that region, and rests uncomformably upon the lower copper-bearing series, which is the Huronian system. The upper copper-bearing series holds nearly all the metals, including gold, and so does the Quebec group, each making an important metalliferous region. Each when unmetamorphosed holds a vast collection of red colored strata. The want of fossils in the Lake Superior group makes it difficult to draw lines of division, but if any part represents the primordial zone, I should hazard the conjecture that it is the dark colored slates of Kamanistiquia, which underlie all the red rocks.

Professor Emmons has long maintained, on evidence that has been much disputed, that rocks in Vermont, which in June 1859 I for the first time saw and recognized as equivalent to the magnesian part of the Quebec group, are older than the Birdseye formation; the fossils which have this year been obtained at Quebec pretty clearly demonstrate that in this he is right. It is at the same time satisfactory to find that the view which Mr. Billings expressed to you in his letter of the 12th July, to the effect that the Quebec trilobites appeared to him to be about the base of the second fauna, should so well accord with your opinions; and that what we were last spring disposed to regard at Georgia as a colony in the second fauna, should so soon be proved, by the discoveries at Quebec, to be a constituent part of the primordial zone.

I am, my dear Mr. Barrande,

Very truly yours,

W. E. LOGAN.

Mr. Joachim Barrande, Rue Mézière, No. 6, Paris.

List of Donations to the Library and Museum of the Natural History Society of Montreal, from 1st *June,* 1859, *to* 3rd *October,* 1860.

Continuation of Report from Page 230.

Donors' Names.	Donations.
Mr. James Milne........	The Annual of Scientific Discovery for 1851, 1852 and 1853.
G. D. Watson, Esq.....	Dictionnaire des Arbitrages des Changes. 2 vols.
Mrs. Ramsay...........	Papers relating to the Nat. History Society.
Geo. Molson, Esq......	Travels in Upper and L. Egypt, by Tourrens.
Lady Franklin.........	Fourth number of the Meteorological Papers published by the Board of Trade.
East India Company....	Bombay Meteorological Register for 1859.
Essex Institute........	Series of their Historical Collections.
Society of Antiquaries, of Copenhagen.......	Transactions of the Societé Royale des Antiquaries du Nord.
Wm. Spink, Esq.......	Geological Reports.
	Statutes of Canada, 1860.
	Exploration of Red River, by Professor Hind.
	Appendices to the Journals of the Legislature. 5 vols.
The Authors...........	The lower Coal Measures as developed in British North America, by Dr. Dawson.
	On the Silurian and Devonian Rocks of Nova Scotia, by Dr. Dawson.
	Description of Canadian Fossils, by Prof. James Hall, Albany.
	Notes on the Coal Fields of Pictou, by Henry Poole.
	New localities of Silurian Fossils in Nova Scotia, by Rev. Dr. Honeyman.
	The Natural History of Washington Territory from the Smithsonian contributions to knowledge.

LIST OF DONATIONS.—*Continued.*

DONORS' NAMES.	DONATIONS.
Lyceum of Natural History, New York......	Their Annual Nos. 1, 3, 8, 9, 10 and 13.
Boston Nat. Hist. Society	Their proceedings.
The Publisher..........	British American Journal.
	Journal of the Canadian Institute.
S. Jones Lyman........	Specimen of Striped Bill-Fish. (*Lepidosteus.*)
	Do. Spider Crab.
	Do. Lepidosteus.
John Leeming, Esq.....	Do. the Peleated Woodpecker.
	A live specimen of the Soft Shelled Turtle. (*Aspidonectes spinifer.*)
James Ferrier, jr , Esq..	A Sebright Bantam.
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A. Wurtele, Esq.......	Specimen of Wood gnawed by Beavers.
Dr. Dawson............	Specimens of Lepas and Balanus found in dredging at Portland.
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Mr. A. G. Baynes.......	A Red-bellied Snake. (*Coluber amvenus.*)
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Mr. F. Carlisle.........	A handsome Gilt Frame for the Portrait of Sir J. Kempt.
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Mr. Date..............	A Horse's Tooth taken up by the dredge in the Harbour of Montreal.
J. A. Perkins, Esq......	A Brazilian Nut.
Mr. Wm. Jail..........	A large Hen's Egg weighing 4¾ ounces.
W. S D'Urban, Esq.....	A case of Coleoptera.
Mr. Donegani..........	A Black Hare. (*Lepus Americanus var.*)
Mr. Gough............	Specimen of a Hawk.
	A very large Claw of a Lobster found at Saco, Maine.
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DONORS' NAMES.	DONATIONS.
Mr. Joshua Bell........	A Pine Grosbeak.
Mr. H. Vennor..........	An Indian Calumet found at Woodstock, C.W.
	Specimen of the Teeth of a Seal.
	Do. Petrified Wood from Bermuda.
Mr. J. Leslie...........	The Antlers of a Caribou.
Joseph Martin, Esq......	Female Sebright Bantam.
	Male do. do.
James Martin, Esq......	The Nest of the Mason Wasp.
Mr. A. G. Vennor......	Three specimens of the Anodon Fluviatilis.
Dr. Durkee, Boston.....	A cast of the head of a Flat-head Indian from the Columbia River.
Mr. Massey............	A piece of Mexican Gold Ore.
Mr. Hilton	A specimen of a Tortoise.
Mr. Dickson...........	Two live Tortoises.
Mrs. Thomson	Two pieces of Petrified Wood from Egypt.
	A curious Spoon from Ceylon.
G. L. Rolland, Esq	Specimen of Copper Ore from Acton, C. E.
	Do. do. do. Lake Superior.
	Do. Silver Ore do. do. do.
Mr. J. Micheson, Phila..	A pair of Canvas Back Ducks.
Mr. J. Jail.............	A pair of Ducks hatched from one Egg.
W. Robertson, Esq., M.D.	Two specimens of a Crustacean from Tahiti.
Duncan Robertson, Esq.	Specimens of Native Cloth from Tahiti.
R. S. Fowler..........	Specimens of Shells from the Stomach of a Flounder.
George Buntin, Esq.....	A pair of Black Ducks.
	Specimen of the Eared Grebe.
	Do. Wilson's Snipe.
	A young Duck Hawk.
Mr. Marler............	A Barred Owl.
Mr. Cunningham.......	Specimens of Copper Ore from Acton.
Thos. E. Blackwell, Esq.	A large Bust of the late Dr. Buckland.
Mr. W. Hunter.........	Specimens of the American Gold Fish.
	French Notes and Coins.
	A pair of Golden-crowned Thrushes.
	A young Bittern caught near Lachine.
	Specimen of the Jumping Mouse. *Meriones (jaculus) acadicus.*
	Specimen of Short Legged Pewitt Fly-Catcher (Female).
	Specimen of the Female Indigo Bird.
J. A. Perkins, Esq......	A large specimen of Mica fromthe Ottawa.
Anonymous......	Three Vials of small Shells.

INDEX.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTINS, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF OCTOBER, 1860.

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

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

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE. Mean amount of, in tenths.	RAIN. Amount of, in inches.	SNOW. Amount of, in inches.	WEATHER, CLOUDS, REMARKS, &c. &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.					6 a. m.	2 p. m.	10 p. m.
1	30.202	30.161	29.912	27.0	42.8	39.6	.129	.209	.232	.88	.75	.95	E.	S.	S. S. E.	67.70	2.5	1.039	......	1st frost, clear.	Rain.	Rain.
2	29.973	29.992	30.026	39.0	49.0	43.8	.232	.297	.269	.95	.84	.93	W. S. W.	W. S. W.	W. by N.	14.42	2.5	......	......	Cu. Str. 10.	Cu. Str. 6.	Cu. Str. 10.
3	30.119	30.188	140	43.1	53.9	49.0	.261	.288	.315	.95	.70	.89	W. S. W.	W.	W. by W.	8.30	1.0	......	......	" 9.	" 9.	" 9.
4	084	29.981	29.955	45.6	46.8	46.0	.293	.305	.286	.95	.96	.92	N. E. by E.	N. E. by E.	N. E. by E.	333.20	1.5	0.480	......	Rain.	Rain.	" 10.
5	29.903	789	868	46.5	53.7	45.0	.305	.341	.275	.96	.83	.92	S. by E.	W. S. W.	W. N. W.	158.70	2.0	0.051	......	Cu. Str. 4.	Cu. St. 8.	Clear.
6	980	956	30.105	36.0	48.7	35.6	.170	.253	.156	.80	.74	.75	N.W. by W.	N.W. by W.	W.	345.20	1.5	......	......	Cirr Str. 4.	Clear.	"
7	923	752	29.564	36.4	50.3	49.0	.184	.254	.315	.85	.65	.89	S. S. W.	S. W.	S. E. by E.	17.90	2.0	0.010	......	Clear.	C. C. Str. 6.	Cu. St. 10.
8	220	218	338	41.4	49.3	39.6	.251	.247	.183	.96	.71	.77	N. E.	W.	W.	321.90	3.0	0.800	......	Rain.	" 6.	Clear. Aurora Borealis.
9	334	441	467	37.9	47.7	40.0	.193	.267	.197	.85	.81	.78	W. by S.	W. by N.	N. by E.	411.90	1.5	......	......	Cu. Str. 10.	Cu. Str. 8.	Cu. Str. 10.
10	479	440	434	37.6	53.0	52.4	.193	.251	.294	.86	.63	.79	S. W.	S.	S. by E.	130.60	1.5	......	......	C. C. Str. 4.	Cir. Cum. 8.	" 8.
11	198	633	765	52.0	51.2	39.0	.321	.252	.195	.86	.68	.82	S. by E.	W.	W. by N.	414.70	1.0	Inapp.	......	Cu. Str. 6.	Cu. Str. 10.	" 2. Aurora Borealis.
12	820	785	898	32.4	50.0	41.0	.168	.258	.212	.95	.71	.82	W. S. W.	S. S. W.	S. W.	78.80	1.0	......	......	Clear, white frost.	C. C. Str. 8.	Clear. Faint Aurora Borealis.
13	930	900	30.100	31.6	51.4	38.1	.149	.296	.186	.84	.79	.81	W.	W. S. W.	S. W. by W.	76.30	1.0	......	......	" " "	Clear.	" Do. Do.
14	30.300	30.185	124	30.5	52.0	40.6	.148	.208	.197	.89	.53	.78	W. S. W.	S. W.	S.	105.70	1.0	......	......	" " "	Cu. Str. 6.	Cu. Str. 10.
15	29.985	29.894	29.878	57.0	38.1	36.2	.164	.165	.197	.76	.77	.93	N. E.	N. E.	W. S. W.	50.70	2.5	0.100	1.10	Cu. Str. 10.	Rain.	" 10.
16	865	750	798	34.1	57.5	51.0	.182	.302	.302	.93	.66	.82	W. S. W.	W. S. W.	W. by S.	164.40	3.5	0.196	......	Clear, white frost.	Cu. Str. 4.	Rain.
17	964	30.074	30.184	40.3	54.2	41.0	.210	.308	.241	.86	.74	.95	E. N. E.	N. E. by E.	N. E. by E.	156.00	2.0	......	......	Cu. Str. 4.	" 8.	Cu. Str. 2.
18	30.229	224	216	36.2	58.2	43.0	.191	.394	.254	.90	.82	.92	N. E. by E.	N. E. by E.	S. by E.	105.20	1.5	......	......	C. C. Str. 8.	Clear.	Clear.
19	095	069	140	36.0	63.7	47.9	.179	.416	.280	.87	.72	.88	S.	S. W. by S.	N. E. by N.	64.50	1.0	......	......	Clear, white frost.	Cu. St. 2.	"
20	263	200	274	36.3	49.3	39.2	.170	.175	.180	.80	.50	.77	N. E. by E.	N. E. by E.	N. E. by E.	330.50	1.5	......	......	C. C. Str. 4.	" 4.	Cir. Cum. 2.
21	080	29.989	29.930	35.3	54.2	40.6	.160	.308	.241	.78	.74	.95	N. E. by E.	N. E. by E.	N. E. by E.	232.80	2.5	2.522	......	" 6.	Rain.	Cu. Str. 10.
22	29.919	954	978	44.0	47.2	45.6	.289	.225	.209	1.00	.70	.99	N. E. by E.	N. E. by E.	N. E. by E.	254.80	4.0	......	......	Cu. Str. 10.	Cu. Str. 10.	Clear.
23	986	814	756	44.4	54.2	48.7	.289	.335	.310	1.00	.80	.92	N. E. by E.	N. E. by E.	N. by W.	138.60	4.5	......	......	Hazy.	" 10.	Cu. Str. 10.
24	660	657	752	43.4	54.6	50.0	.254	.362	.335	.92	.87	.93	S. W.	W. S. W.	S. W.	110.20	2.5	......	0.17	Cu. Str. 10.	C. C. Str. 4.	C. C. Str. 8.
25	800	814	825	49.7	59.1	51.2	.341	.317	.350	.96	.62	.90	S. S. W.	S. S. W.	S. E. by S.	42.00	1.5	......	......	" 00.	" 6.	Clear.
26	673	756	976	49.3	54.2	40.3	.311	.231	.203	.96	.55	.82	S. E. by S.	W. by N.	N. N. W.	14.50	2.0	0.843	......	Rain.	Cu. Str. 10.	"
27	30.103	30.156	30.339	32.6	55.0	37.0	.162	.349	.190	.89	.81	.84	W.	S. S. W.	S. E. by E.	69.60	1.0	......	......	Clear, white frost.	Clear.	"
28	313	214	168	32.7	51.0	46.8	.162	283	.256	.89	.78	.81	N. E. by E.	N. E. by E.	S. S. E.	191.50	1.5	......	......	Cu. Str. 4. "	Cu. Str. 8.	Cu. Str. 10.
29	031	026	048	45.3	51.6	50.5	.293	.368	.354	.96	.96	.96	S. W.	S. W.	W. by N.	218.40	4.0	0.746	......	Rain.	Cu. Str. 10.	" 6.
30	168	122	098	46.1	55.0	50.6	.305	.355	.354	.97	.84	.96	E. by S.	N. E. by E.	N. E. by E.	60.70	3.0	......	......	Cu. St. 10.	" 10.	C. C. Str. 6.
31	080	003	068	49.9	70.1	62.0	.335	.469	.519	.93	.67	.97	E. by S.	E. by S.	E. S. E.	144.40	1.5	......	......	C. C. Str. 6.	" 6.	Clear.

REPORT FOR THE MONTH OF NOVEMBER, 1860.

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE. Mean amount of	RAIN. Amount of, in inches.	SNOW. Amount of, in inches.	WEATHER, CLOUDS, REMARKS, &c. &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.					6 a. m.	2 p. m.	10 p. m.
1	30.097	30.114	30.176	61.3	68.4	62.6	.498	.543	.523	.91	.79	.94	S. E. by E.	E. S. E.	E.	70.80	2.0	Inapp.	......	Cu. Str. 10.	Cu. Str. 10.	C. C. Str. 6.
2	121	205	189	54.5	54.3	48.2	.411	.362	.310	.97	.87	.91	N. E. by E.	N. E. by E.	N. E. by E.	268.50	2.5	......	......	" 10.	" 10.	Cu. Str. 4.
3	168	29.901	29.871	46.0	66.1	55.3	.280	.536	.403	.80	.84	.93	N. E. by E.	N. E. by E.	E. N. E.	145.90	1.5	......	......	" 10.	" 4.	" 10.
4	29.412	624	715	50.5	53.3	43.2	.354	.244	.231	.96	.60	.83	S. W. by W.	W.	W. S. W.	317.00	3.0	0.903	......	Nim. 10.	" 4.	Clear. Aurora Borealis.
5	399	617	721	39.0	52.7	44.6	.201	.232	.241	.86	.60	.84	W.	W.	E. S. E.	178.50	1.5	......	......	Clear.	C. C. Str. 6.	Cu. St. 10.
6	691	656	679	41.5	42.3	38.1	.235	.199	.208	.91	.74	.91	S. E.	E. N. E.	W. S. W.	48.70	3.0	0.546	......	Cu. Str. 10.	Rain.	Rain.
7	770	796	947	36.0	38.6	33.3	.191	.186	.164	.90	.80	.85	W.	W. N. W.	W. by N.	365.70	3.5	0.211	......	Rain.	Cu. Str. 10.	Clear.
8	30.000	979	30.000	31.3	45.6	40.0	.155	.218	.201	.89	.66	.86	W. S. W.	W. S. W.	N. E. by E.	106.70	1.5	......	......	Clear, white frost.	C. C. Str. 8.	Cu. Str. 9.
9	29.997	886	29.845	37.1	47.5	33.3	.206	.242	.168	.93	.74	.90	W.	S. W.	S. W.	17.20	2.0	......	......	C. Cu. Str. 10.	Clear.	Clear.
10	784	664	500	34.0	44.6	39.1	.183	.189	.216	.90	.64	.91	N. E. by E.	N. E. by E.	N. E. by E.	251.76	3.5	......	......	" 6.	Cu. Str. 10.	Rain.
11	465	456	426	39.1	49.4	40.1	.216	.297	.254	.91	.85	.92	E.	N. N. E.	N.	296.60	2.5	0.536	......	Cu. Str. 6.	" 10.	Cu. Str. 10.
12	515	513	614	39.0	47.3	45.3	.208	.267	.269	.90	.82	.88	W. by N.	W.	N.W. by N.	62.50	2.0	......	......	C. C. Str. 8.	" 4.	" 9.
13	795	812	887	42.1	46.2	37.3	.244	.285	.199	.91	.84	.89	W. by N.	W. by N.	N. W.	115.70	1.5	......	......	" 6.	" 2.	Clear.
14	950	950	991	30.1	47.0	34.2	.145	.232	.167	.89	.73	.88	W.	W. by S.	W. N. W.	70.60	2.0	......	......	Clear, white frost.	Clear.	"
15	895	917	30.006	33.1	41.2	38.9	.143	.240	.201	.70	.83	.86	N.W. by W.	S. W. by W.	S. S. W.	81.40	2.5	......	......	Cu. Str. 4.	C. C. Str. 10.	Cu. Str. 10.
16	30.015	30.034	055	35.4	41.0	31.8	.169	.154	.155	.84	.61	.89	N. E. by E.	S. S. W.	S.	7.40	3.0	......	......	C. C. Str. 6.	Cu. Str. 6.	Str. 1.
17	29.900	29.859	29.697	29.2	36.4	32.7	.142	.129	.162	.88	.61	.84	E. N. E.	N. N. W.	N. by W.	49.80	2.5	......	......	" 4.	" 6.	Cu. Str. 10.
18	280	218	323	31.1	35.9	33.4	.155	.177	.168	.89	.85	.89	N. E. by E.	N. by E.	N. E. by E.	74.30	3.5	Inapp.	0.15	Snow.	" 10.	" 10.
19	165	174	230	34.5	38.9	35.2	.190	.201	.199	.93	.86	.96	N. E. by E.	N. E. by E.	S. S. E.	63.60	3.5	0.372	......	Nim. 10.	" 10.	" 10.
20	180	320	422	36.0	39.3	33.8	.186	.173	.162	.86	.73	.84	S. S. E.	W. by N.	W. N. W.	238.40	4.0	0.110	......	Cu. Str 10.	" 10.	" 9.
21	600	621	801	27.0	30.9	28.7	.129	.124	.146	.88	.84	.90	W. S. W.	W. S. W.	S. by W.	130.40	3.0	......	......	" 4.	" 10.	" 9.
22	879	869	868	22.4	35.0	32.0	.095	.162	.149	.79	.80	.84	W. S. W.	S. W.	S. W.	101.30	2.5	......	......	" 8.	" 10.	" 10.
23	867	797	604	35.0	40.4	37.5	.183	.203	.214	.90	.82	.95	S. by W.	S. E. by E.	S. E. by E.	228.50	2.5	......	Inapp.	" 10.	" 10.	" 4.
24	907	135	232	39.1	27.6	22.1	.227	.105	.179	.99	.70	.65	W. S. W.	W. S. W.	W. S. W.	720.00	3.0	3.190	......	Rain.	Sleet.	" 6.
25	465	659	972	20.4	21.1	23.2	.075	.076	.106	.70	.71	.86	W. by N.	W. by N.	W. S. W.	710.00	3.0	......	......	Cu. Str. 10.	Cu. Str. 6.	" 10.
26	30.183	30.142	30.054	13.4	24.7	26.3	.057	.120	.123	.72	.89	.87	W. S. W.	S. by W.	S. S. E.	546.00	2.0	......	......	Clear.	" 6.	" 10.
27	29.665	29.580	29.851	32.3	41.0	32.6	.162	.212	.162	.89	.82	.89	S. by W.	W. S. W.	W.	314.00	2.5	......	3.54	Snow.	" 6.	Clear.
28	894	890	851	20.8	28.3	19.6	.091	.129	.081	.85	.82	.77	W.	N. N. W.	W. S. W.	119.00	2.5	......	......	Clear.	" 8.	"
29	571	594	502	20.4	34.4	32.0	.082	.169	.169	.74	.84	.88	S. W.	S. W.	W.	57.10	2.0	......	......	C. C. Str. 4.	Sleet.	Cu. Str. 10.
30	400	314	225	32.1	35.4	33.0	.143	.160	.168	.79	.87	.89	W.	W.	N. E. by E.	69.10	2.0	Inapp.	Inapp.	Cu. Str. 10.	Snow.	Sleet.
..	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

REMARKS FOR OCTOBER, 1860.

Barometer....... { Highest, the 27th day, 30·339 ... ; Lowest, the 11th day, 29.198 " ; Monthly Mean, 29.919 " ; " Range, 1.141 " }

Thermometer... { Highest, the 31st day, 70°1. ; Lowest, the 1st day, 26°1. ; Monthly Mean, 45°48. ; Monthly Range, 44°0. }

Greatest intensity of the Sun's rays, 85°0.
Lowest point of Terrestrial radiation, 22°2.
Mean of Humidity, .839.
Amount of Evaporation, 1.32 inches.
Rain fell on 11 days, amounting to 4.787 inches; it was raining 69 hours and 44 minutes.

Snow fell on 2 days, amounting to 1·27 inches; it was snowing 11 hours.
Most prevalent wind, the N. E. by E.
Least prevalent wind, the E.
Most windy day, the 11th day; mean miles per hour, 16.88.
Least windy day, the 3rd day; mean miles per hour, 0.23.
Aurora Borealis visible on 4 nights.
The Electrical state of the Atmosphere has indicated high tension.
Two distinct and smart shocks of an earthquake were felt here at 5·55 a.m. on the morning of the 17th day, the wave passing from E. to W. The sound wave was distinctly perceptible after the passage of the earth wave.

REMARKS FOR NOVEMBER, 1860.

Barometer. ...... { Highest, the 2nd day, 30.205 inches. ; Lowest, the 24th day, 28.950 " ; Monthly Mean, 29.730 " ; Monthly Range, 2·255 " }

Thermometer. { Highest, the 1st day, 71°4. ; Lowest, the 26th day, 12°0. ; Monthly Mean, 37°59. ; Monthly Range, 59°4. }

Greatest intensity of the Sun's rays, 82°1.
Lowest point of terrestrial radiation, 12°0.
Mean of humidity, .839.
Rain fell on 10 days, amounting to 5.898 inches; it was raining 48 hours 29 minutes.

Snow fell on 4 days, amounting to 3.69 inches, it was snowing 7 hours and 50 minutes.
Most windy day, the 24th day; mean miles per hour, 29.35.
Least windy day, the 16th day; mean miles per hour 0.33.
Most prevalent wind, the S. W.
Least prevalent wind, the E.
Aurora Borealis visible on 1 night.
The Electrical state of the Atmosphere has indicated constant and moderate intensity.
The Symmetrical wave was well marked during the month.
Snow birds *(Plectrophanes Nivalis)* 1st seen on the 3rd day.