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THE

CANADIAN

Naturalist & Geologist,

AND PROCEEDINGS OF THE

NATURAL HISTORY SOCIETY

OF MONTREAL.

CONDUCTED BY A COMMITTEE OF THE NATURAL HISTORY SOCIETY.

VOL. II. MAY, 1857. No. 2.

See Page 98.

Montreal:
B. DAWSON, No. 23, GREAT ST. JAMES STREET.
PRINTED BY JOHN LOVELL.

Price 15s. per Annum, in Advance.

THE

Canadian Naturalist & Geologist.

This Magazine will appear bi-monthly, and be conducted by the following Committee, appointed by the Natural History Society of Montreal :—

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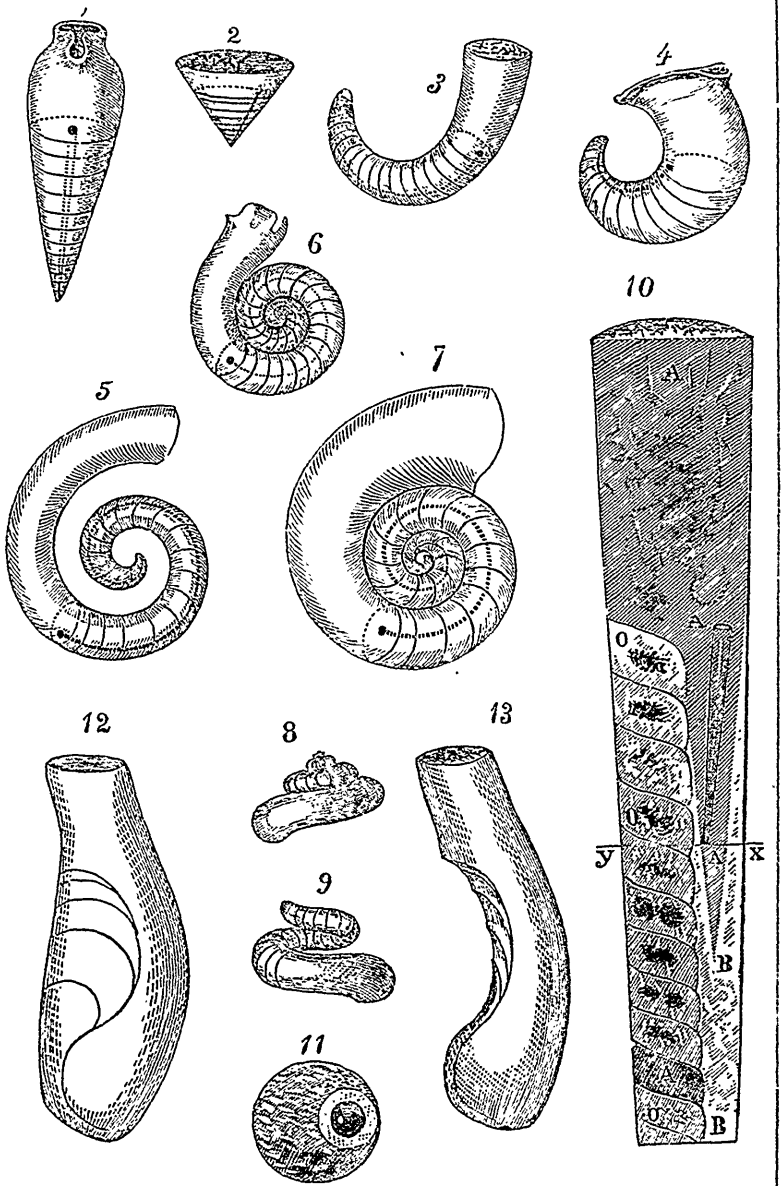
CONTENTS OF NUMBER II.

PLATE II.



Genera of Fossil Cephalopodia.—See page 135.

THE

CANADIAN

NATURALIST AND GEOLOGIST.

VOLUME II. MAY, 1857. NUMBER 2.

ART. IX.—*The Testimony of the Rocks.* By HUGH MILLER.

This work comes to us with the melancholy interest which always attaches to the last thoughts of a great man, and especially to those thoughts which by their consuming intensity, have aided in wearing to the death the frail tenement in which a gifted soul did its earthly work. In reading this book, so full of lofty faith and true sympathy with God, with nature, and with man, the sad end of its author ever recurs to us like a hideous dream which cannot be true; and we feel more forcibly impressed on our minds the suspicion arising from many minute but important circumstances, that we do not yet know the real manner of Hugh Miller's death; and that the vulgar explanation of suicide under mental aberration, is but the thought of common minds, seeking a common solution for a strange and almost unaccountable event. Hugh Miller as we remember him, calm, thoughtful, and self-possessed, yet full of quiet enthusiasm, is the writer of this book but not the subject of the coroner's verdict; and though we must

admit that his brain, irritated by over work, had become a prey to undue excitement and groundless fears,—we shall suspend our judgment on the question of accidental death or suicide, until we meet our friend again in that world where he now enjoys an emancipation from his earthly toils and frailties.

The subject of this work was one on which its author thought deeply and often; and few men were better fitted for it by the rare combination of acute powers of observation applied to nature, and firm faith in revealed religion. The question of the relations of the Bible to science, and especially to the science of the earth, is not one which either naturalists or theologians can afford to neglect. Those who have no settled faith in the inspiration of the written word may smile at any attempt to compare it with the deductions of science. Those who do not appreciate the mass of evidence accumulated by modern geology, may sneer at what appears to them an upstart and unsettled jumble of hypotheses. Nevertheless, it is morally certain that the Bible must maintain a constantly increasing ascendancy over the minds of men, and that they must accept it as a revelation of God, as the Creator as well as the Redeemer. On the other hand the leading principles of geology rest on a basis of facts, firm as the everlasting hills, and their popular acceptance is daily widening. The Testimony of the Rocks, in its bearing on the natural and revealed theologies, must therefore form a department of inquiry running parallel with the acceptance among civilized men of that testimony and of those theologies.

The Testimony of the Rocks is not a systematic treatise, but a collection of lectures, yet the writer's strong love of order has thrown the matter into an arrangement which brings out very forcibly and lucidly his two leading views. First, that there has been throughout the long periods of geological history, a constant and regular onward march of new forms of existence, corresponding with the received views of the relative rank of organization of animals and plants, yet not proceeding from spontaneous development, but from creation. Secondly, that the introduction of new forms of animals and plants corresponded with the days or rather long "eons" represented by the Mosaic vision of creation. The first lecture accordingly contains a connected sketch of the history of plants, from the old fucoids of the Silurian seas, and the huge cryptogams and antique conifers of the Devonian and Carboniferous erus, to the more varied vegetation of the modern

period, retaining the leading types of the old forms, but giving them a much lower relative position. The succession of plants is well and powerfully sketched, especially in the singular parallelism between the historical succession and the botanical arrangement; and its bearing on natural theology is thus stated.

"Let us then, in grappling with the vast multiplicity of our subject, attempt reducing and simplifying it by means of the classifying principle, not simply, however,—again to recur to the remark of the metaphysician,—as an internal principle given us by nature, but as an external principle *exemplified* by nature. Let us take the organisms of the old geologic periods in the order in which they occur in time; secure, as has been shown, that if our chronology be correct, our classification will, as a consequence, be good. It will be for the natural theologians of the coming age to show the bearing of this wonderful fact on the progress of man towards the just and the solid, and on the being and character of man's Creator,—to establish, on the one hand, against the undue depreciators of intellect and its results, that in certain departments of mind such as that which deals with the arrangement and development of the scheme of organic being, human thought is not profitlessly revolving in an idle circle, but progressing Godwards, and gradually unlocking the order of creation. And, on the other hand, it will be equally his proper business to demand of the Pantheist how,—seeing that only *persons* (such as the Cuviers and Lindleys) could have wrought out for themselves the real arrangement of this scheme,—how, I say, or on what principle, it is to be held that it was a scheme originated and established at the beginning, not by a *personal*, but by an *im*personal God. But our present business is with the *fact* of the parallel arrangements, Divine and human,—not with the inferences legitimately deducible from it."

The second lecture takes a similar view of the history of animals, with the same result, even more strikingly exhibited, in consequence of the greater completeness of our knowledge of fossil zoology. This part of the subject affords an admirable field for the descriptive powers of the author, and he makes creation proceed before us in a series of magnificent pictures, which, as he well says, surpass in interest the historic revelations of Egyptian obelisks and Assyrian friezes.

Then follows the well-known lecture delivered before the Young Men's Christian Association of London, which was at the time the

best popular summary of that theory of day-periods which is likely now to be the currently received mode of reconciling Scripture with geology. In the present work this lecture is followed up by another view, recently added to the former, and though in a somewhat different aspect, long familiar to the minds of expositors, that of the optical representation of creation to Moses, in a series of days representative of periods. As this is a comparatively unfamiliar view, we give the author's closing summary.

"Such a description of the creative vision of Moses as the one given by Milton of that vision of the future, which he represents as conjured up before Adam by the archangel, would be a task rather for the scientific poet than for the mere practical geologist or sober theologian. Let us suppose that it took place far from man in an untrodden recess of the Midian desert, ere yet the vision of the burning bush had been vouchsafed; and that, as in the vision of St. John in Patmos, voices were mingled with scenes, and the ear as certainly addressed as the eye. A "great darkness" first falls upon the prophet, like that which in an earlier age fell upon Abraham, but without the "horror;" and, as the Divine Spirit moves on the face of the wildly troubled waters, as a visible aurora enveloped by the pitchy cloud, the great doctrine is orally enunciated, that "in the beginning God created the heavens and the earth." Unreckoned ages, condensed in the vision into a few brief moments, pass away; the creative voice is again heard,—"Let there be light," and straightway a gray diffused light springs up in the east, and casting its sickly gleam over a cloud-limited expanse of steaming, vaporous sea, journeys through the heavens towards the west. One heavy, sunless day is made the representative of myriads; the faint light waxes fainter,—it sinks beneath the dim, undefined horizon; the first scene of the drama closes upon the seer; and he sits awhile on his hill-top in darknes, solitary but not sad, in what seems to be a calm and starless night.

"The light again brightens,—it is day; and over an expanse of ocean without visible bound the horizon has become wider and sharper of outline than before. There is life in that great sea,—invertebrate, mayhap also ichthyic, life; but, from the comparative distance of the point of view occupied by the prophet, only the slow roll of its waves can be discerned, as they rise and fall in long undulations before a gentle gale; and what most strongly impresses the eye is the change which has taken place in the atmospheric sce-

nery. That lower stratum of the heavens occupied in the previous vision by seething steam, or gray, smoke-like fog, is clear and transparent; and only in an upper region, where the previously invisible vapor of the tepid sea has thickened in the cold, do the clouds appear. But there, in the higher strata of the atmosphere they lie, thick and manifold,—an upper sea of great waves, separated from those beneath by the transparent firmanent, and like them too, impelled in rolling masses by the wind. A mighty advance has taken place in creation; but its most conspicuous optical sign is the existence of a transparent atmosphere,—of a firmanent stretched out over the earth, that separates the waters above from the waters below. But darkness descends for the third time upon the seer, for the evening and the morning have completed the second day.

"Yet again the light rises under a canopy of cloud; but the scene has changed, and there is no longer an unbroken expanse of sea. The white surf breaks at the distant horizon, on an isulated reef, formed mayhap by the Silurian or Old Red coral zoophytes ages before, during the bygone yesterday; and beats in long lines of foam, nearer at hand, against a low, winding shore, the seaward barrier of a widely spread country. For at the Divine command the land has arisen from the deep,—not inconspicuously and in scattered islets, as at an earlier time, but in extensive though flat and marshy continents, little raised over the sea level; and a yet further fiat has covered them with the great carboniferous flora. The scene is one of mighty forests of cone-bearing trees,—of palms, and tree-fern, and gigantic club mosses, on the opener slopes, and of great reeds clustering by the sides of quiet lakes and dark rolling rivers. There is deep gloom in the recesses of the thicker woods, and low thick mists creep along the dank marsh or sluggish stream. But there is a general lightening of the sky over head; as the day declines, a redder flush than had hitherto lighted up the prospect falls athwart fern covered bank and long withdrawing glade. And while the fourth evening has fallen on the prophet, he becomes sensible, as it wears on, and the fourth dawn approaches, that yet another change has taken place. The Creator has spoken, and the stars look out from openings of deep unclouded blue; and as day rises, and the planet of morning pales in the east, the broken cloudlets are transmuted from bronze into gold, and anon the gold becomes fire, and at length the glorious sun arises out of the sea, and enters on his course rejoicing. It

is a brilliant day; the waves, of a deeper and softer blue than before, dance and sparkle in the light; the earth, with little else to attract the gaze, has assumed a garb of brighter green; and as the sun declines amid even richer glories than those which had encircled his rising, the moon appears full orbed in the east,—to the human eye the second great luminary of the heavens,—and climbs slowly to the zenith as night advances, shedding its mild radiance on land and sea.

"Again the day breaks; the prospect consists, as before, of land and ocean. There are great pine woods, reed-covered swamps, wide plains, winding rivers, and broad lakes; and a bright sun shines over all. But the landscape derives its interest and novelty from a feature unmarked before. Gigantic birds stalk along the sands, or wade far into the water in quest of their ichthyic food; while birds of lesser size float upon the lakes, or scream discordant in hovering flocks, thick as insects in the calm of a summer evening, over the narrower seas, or brighten with the sunlit gleam of their wings the thick woods. And ocean has its monsters: great "*tanninim*" tempest the deep, as they heave their huge bulk over the surface, to inhale the life-sustaining air; and out of their nostrils goeth smoke, as out of a "seething pot or cauldron." Monstrous creatures, armed in massive scales, haunt the rivers, or scour the flat rank meadows; earth, air, and water are charged with animal life; and the sun sets on a busy scene, in which unerring instinct pursues unremittingly its few simple ends,—the support and preservation of the individual, the propagation of the species, and the protection and maintenance of the young.

"Again the night descends, for the fifth day has closed; and morning breaks on the sixth and last day of creation. Cattle and beasts of the fields graze on the plains; the thick skinned rhinoceros wallows in the marshes; the squat hippopotamus rustles among the reeds, or plunges sullenly into the river; great herds of elephants seek their food amid the young herbage of the woods; while animals of fiercer nature, the lion, the leopard, and the bear,—harbor in deep caves till the evening, or lie in wait for their prey amid tangled thickets, or beneath some broken bank. At length, as the day wanes and the shadows lengthen, man, the responsible lord of creation, formed in God's own image, is introduced upon the scene, and the work of creation ceases forever upon the earth. The night falls once more upon the prospect, and there dawns yet another morrow,—the morrow of God's rest,

—that Divine Sabbath in which there is no more creative labor, and which, "blessed and sanctified" beyond all the days that had gone before, has as its special object the moral elevation and final redemption of man. And over *it* no evening is represented in the record as falling, for its special work is not yet complete. Such seems to have been the sublime panorama of creation exhibited in vision of old to

> "The shepherd who first taught the chosen seed,
> In the beginning how the heavens and earth
> Rose out of chaos;"

and, rightly understood, I know not a single scientific truth that militates against even the minutest or least prominent of its details."

In its details we believe that this view will admit of some modification, but we may accept the principle as the best guide to the reconciliation of the two documents in the present state of knowledge. The two following lectures pursue this principle of explanation into details, with many interesting and beautifully sketched illustrations. The next subject is the Noachian deluge, which the author with most modern interpreters, and believes to have been universal, only in so far as relates to man and the region he then inhabited. Rising again to general views, we have in the ninth lecture a sketch of the relations that in past and darker ages have obtained between imperfect views of religion and creation, and equally imperfect information on the system of nature. This naturally leads to an investigation of the errors still widely prevalent, that result from such half truths and biassed reasonings; and we have much sharp criticism of the rationalistic expositors who regard Genesis as a myth, and the unreasonable anti-geologists who refuse to accept the Testimony of the Rocks.

Having thus far restricted himself to a somewhat orderly investigation of his more immediate subject, the author desirous of giving to his work that scientific originality which in these days of progress can alone attract the working naturalist, adds in an expanded form the interesting paper on the less known fossil floras of Scotland, read by him before the British Association in 1855. Though not strictly a sequel to the previous subject, this paper forms a practical illustration of the succession of fossil floras, just as in the Footprints of the Creator, the Asterolepis and its allies, are the text of that noble specimen of natural theology. The geologist inter-

ested in fossil botany will find in this part of the work a collection of valuable facts which have hitherto been singularly neg'ected by Scottish geologists. The following extract gives a summary of the olde ' fossil land plants of Scotland, which there as in Ireland and in America, occur unequivocally for the first time in the Devonian series.

"The remains of a terrestrial vegetation in this deposit are greatly scantier than those of its marine plants; but they must be regarded as possessing a peculiar interest, as, with the exception of the spore cases of the Ludlow rocks, the oldest of their class, in at least the British islands, whose true place in the scale can be satisfactorily established. In the flagstones of Orkney there occurs, though very rarely, a minute vegetable organism, which I have elsewhere described as having much the appearance of one of our smaller ferns, such as the maidenhair-spleenwort, or dwarf moonwort. It consists of a minute stem, partially covered by what seems to be a small sheath or hollow bract, and bifurcates into two fronds or pinnæ, fringed by from ten to twelve leaflets, that nearly impinge on each other, and somewhat resemble in their mode of arrangement the leaflets of one of our commonest Aspleniums,—*Asplenium trichomanes.* One of our highest authorities, however, in such matters (Professor Balfour of Edinburgh) questions whether this organism be in reality a fern, and describes it from the specimen on the table, in the Palæontological chapter of his admirable Class-Book, simply as "a remarkable pinnate frond." (Fig. 13, p. 56.) We find it associated with the remains of a terrestrial plant allied to lepidodrendon, and which in size and general appearance not a little resembles one of our commonest club mosses,—*Lycopodium clavatum.** It sends out its branches in exactly the same style,—some short and simple, others branched like the parent stem, in an arrangement approx-

* I figured this species from an imperfect Cromarty specimen fifteen years ago. (See "Old Red Sandstone," first edition, 1841, Plate VII. Fig. 4.) Of the greatly better specimens now figured I owe the larger one (Fig. 120) to Mrs. Mill, Thurso, who detected it in the richly fossiliferous flagstones of the locality in which she resides, and kindly made it over to me; and the specimen of which I have given a magnificent representation (Fig. 12, p, 55) to my friend Mr. Robert Dick. I have, besides, seen several specimens of the same organism, in a better or worse state of keeping, in the interesting collection of the Rev. Charles Clouston, Sandwick, near Stromness.

imately alternate; and is everywhere covered, stem and branch, by thickly set scale-like leaflets, that, suddenly narrowing, terminate in exceedingly slim points. It has, however, proportionally a stouter stem than Lycopodium; its leaves, when seen in profile, seem more rectilinear and thin; and none of its branches yet found bear the fructiferous stalk or spike. Its resemblance, however, to this commonest of the Lycopodia,—a plant that may be gathered by handfuls on the moors by which the flagstone are covered,—is close enough to suggest a new reading of the familiar adage on the meeting of extremes. Between the times of this ancient fossil,—one of the oldest of land plants yet known,—and those of the existing club moss that now scatters its light spores by millions over the dead and blackened remains of its remote predecessor, many creations must have intervened, and many a prodigy of the vegetable world appeared, especially in the earlier and middle periods,—Sigillaria, Favularia, Knorria, and Ulodendron,—that have had no representatives in the floras of latter times; and yet here, flanking the immense scale at both its ends, do we find plants of so nearly the same form and type, that it demands a careful survey to distinguish their points of difference. Here, for instance, to illustrate the fact, is there a specimen of *Lycopodium clavatum*, from one of these Caithness moors, that agrees branch for branch, and both in the disposition of its scales and in general outline, with the specimen in the stone. What seems to be an early representative of the Calamites occurs in the same beds. Some of the specimens are of large size,—at least from nine inches to a foot in circumference,—and retain their thickness, though existing as fragments several feet in length, with but little diminution throughout. They resembled the interior casts of Calamites in being longitudinally furrowed; but the furrows are flatter, and are themselves minutely striated lengthwise by lines as fine as hairs; and, instead of presenting any appearance of joint, there run diagonally across the stems, interrupted and very irregular lines of knobs. These I find referred to by Dr. Joseph Hooker, in describing a set of massive but ill preserved remains of the same organism detected in South Ness quarry, near Lerwick, by the Hon. Mr. Tuffnell, as taking, in two of the specimens, "the appearance of transverse knobs and bars (mayhap spirally arranged) that cross the striæ obliquely. But though the knobs," he adds, "may perhaps indicate a peculiar character of the plants, they have more probably been caused by pres-

sure during silicification." As, however, they also occur in the best preserved fragment of the plant which I have yet seen,—a Thurso specimen which I owe to my friend Mr. Dick,—I deem it best to regard them, provisionally at least, as one of the characteristics of the plant. I may mention, that while I disinterred one of my specimens from the Thurso flagstones, where it occurred among remains of Dipterus and Asterolepis, I derived another specimen from the great overlying formation of pale Red Sandstone to which the lofty hills of Hoy and the tall mural precipices of Dunnet Head belong; and that this plant is the only organism which has yet been found in this uppermost member of the Lower Old Red, to at least the north of the Moray Frith. Another apparently terrestrial organism of the lower formation, of, however, rare occurrence, very much resembles a sheathing bract or spathe. It is of considerable size,—from four to six inches in length, by from two to three inches in breadth,—of a broadly elliptical and yet somewhat lanceolate form, deeply but irregularly corrugated, the rugæ exhibiting a tendency to converge towards both its lower and upper terminations, and with, in some instances, what seems to be the fragment of a second spathe springing from its base. Another and much smaller vegetable organism of the same beds presents the form of a spathe-enveloped bud or unblown flower wrapped up in its calyx; but all the specimens which I have yet seen are too obscure to admit of certain determination. I may here mention, that curious markings, which have been regarded as impressions made by vegetables that had themselves disappeared, have been detected during the last twelvemonth in a quarry of the Lower Old Red Sandstone near Huntly, by the Rev. Mr. Mackay of Rhynie. They are very curious and very puzzling; but though some of the specimens present the appearance of a continuous midrib, that throws off, with a certain degree of regularity, apparent leaflets, I am inclined to regard them rather as lying within the province of the ichnologist than of the fossil botanist. They bear the same sort of resemblance to a long, thickly-leaved frond, like that of the "hard fern," that the cast of a many-legged annelid does to a club moss; and I was struck, on my first walk along the Portobello beach, after examining a specimen kindly sent me by Mr. Mackay, to see how nearly the tract of a small shore crab (*Carcinus Mœnas*) along the wet sand resembled them, in exhibiting what seemed to be an obscure midrib fringed with leaflets.

"But the genuine vegetable organism of the formation, indicative of the highest rank of any yet found in it, is a true wood of the cone-bearing order. I laid open the nodule which contains this specimen, in one of the ichthyolite beds of Cromarty, rather more than eighteen years ago; but though I described it, in the first edition of my little work on the Old Red Sandstone, in 1841, as exhibiting the woody fibre, it was not until 1845 that, with the assistance of the optical lapidary, I subjected its structure to the test of the microscope. It turned out, as I had anticipated, to be the portion of a tree; and on my submitting the prepared specimen to one of our highest authorities,—the late Mr. William Nicol,—he at once decided that the "reticulated texture of the transverse section, though somewhat compressed, clearly indicated a coniferous origin." I may add, that this most ancient of Scottish lignites presents several peculiarities of structure. Like some of the Araucarians of the warmer latitudes, it exhibits no lines of yearly growth; its medullary rays are slender, and comparatively inconspicuous; and the discs which mottle the sides of its sap-chambers, when viewed in the longitudinal section, are exceedingly minute, and are ranged, so far as can be judged in their imperfect state of keeping, in the alternate order peculiar to the Araucarians. On what perished land of the early Palæozoic ages did this venerably antique tree cast root and flourish, when the extinct genera Pterichthys and Coccosteus were enjoying life by millions in the surrounding seas, long ere the flora or fauna of the Coal Measures had begun to be?

"I may be here permitted to mention, that in a little volume, written in reply to a widely known and very ingenious work on the Development hypothesis, I described and figured this unequivocally genuine lignite, in order to show that a true wood takes its place among the earliest terrestrial plants known to the geologist. I at the same time mentioned,—desirous, of course, that the facts of the question should be fairly stated, whatever their bearing,—that the nodule in which it occurred had been partially washed out of the fish-bed in which I found it, by the action of the surf; and my opponent, fixing on the circumstance, insinuated, in the answer with which he honored me, that it had *not* belonged to the bed at all, but had been derived from some other formation of later date. He ought, however, to have taken into account my further statement, namely, that the same nodule which enclosed the lignite contained part of another fossil, the well-marked scales

of *Diplacanthus striatus*, an ichthyolite restricted, like the Coccosteus (a specimen of which occurred in a neighboring nodule,) to the Lower Old Red Sandstone exclusively. If there be any value whatever in palæontological evidence, this Cromarty lignite must have been deposited in a sea inhabited by the Coccosteus and Diplacanthus. It is demonstrable that, while yet in the recent state, a Diplacanthus lay down and died beside it; and the evidence in the case is unequivocally this, that in the oldest portion of the oldest terrestrial flora yet known, there occurs the fragment of a tree quite as high in the scale as the stately Norfolk Island Pine, or the noble cedar of Lebanon."

J. W. D.

ARTICLE X.—*Notes on the Natural History of the Mountain of Montreal,*

1. *The Ruffed Grouse* (*Tetrao Umbellus*) *breeds upon the mountain.*—While taking a walk a few days since, I was somewhat surprised to hear distinctly the drumming of a grouse in the wood on the back part of the mountain, overlooking the Cemetry. I only heard the closing notes, but, being quite familiar with the sounds, was well satisfied that they proceeded from a bird of this species. Turning soon afterwards to cross towards the city, I had ample confirmation of my suspicions. Another grouse had been started on that side by two young men who were climbing up the hill. The bird alighted within a few yards of the spot where I was standing, but again took wing immediately upon seeing me. It remained, however, long enough for me to observe that it was a fine large male. It was certainly a different bird from the former, and accordingly there were on that day, at least, two males on the mountain; and further, as it is quite probable that they have their consorts, no doubt, they will breed there, if not killed by some of the sportsmen who frequent that locality.

Mentioning the above circumstances afterwards to a friend, he informed me that he believed grouse were always to be found on the mountain. If so, it is a remarkable fact. The habits of this species are not those of an open country bird. The little patch of wood which covers the hill actually extends into the suburbs of the city, and it is not only isolated from the main body of the forest by many miles in width of cultivated land, but it is also

traversed every day in all directions by scores of enthusiastic young Nimrods, who fire at everything that happens to be clothed with feathers, no matter how small. It is wonderful that so conspicuous a bird as a ruffed grouse could remain there a single week without being killed, and yet, there is reason to believe, that the species has maintained its ground in this spot since the days when the red men were masters of the island.

2. *A rare English Butterfly, common.*—Near McTavish's Monument I started a very beautiful butterfly, but after much tantalizing effort had the melancholy satisfaction of seeing it soar away out of sight. Not being an entomologist, it is quite probable that I did not adopt the proper method to ensure success. Ascending to the brow of the mountain, I saw another evidently of the same species. This also escaped. Within half an hour two others were met with, the latter of which was secured after several ineffectual attempts. It turns out to be "the Camberwell Beauty," a species whose geographical range comprises at least portions of both the old and new worlds, and upon this account may be regarded with more than ordinary interest. In some of the quotations to be given presently it will be seen that this insect is rare in Britain, and highly prized by collectors. It appears to be common in Canada. The following figure and description will perhaps enable the reader, who is not already acquainted with the species to recognize it.

Fig. 1.

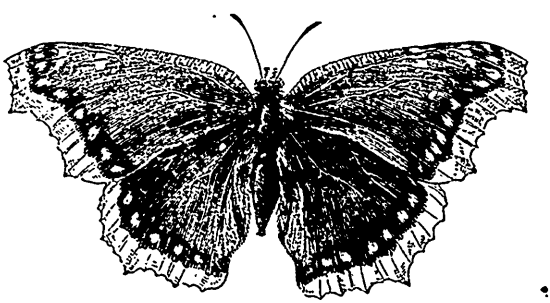


Fig. 1.—The Camberwell Beauty (*Vanessa Antiopa.*) Taken on the Mountain of Montreal, 24th April, 1857.*

* Drawn and Engraved by Mr. J. Walker, Montreal.

Description.—The general colour of the upper side of the wings of this species is a deep chocolate brown, but with the hind and side margins ornamented with a cream coloured border. Between the cream-colour and the chocolate there is a second border consisting of a band of velvet black with a number of violet-blue spots. On the front margin of the anterior wing there are two yellowish spots on the outer half. The under sides of the wings are dark brown with some curved lines of black. There is also a small yellow spot near the middle of each wing on the under side, and two others on the border. It is, further, to be observed, that the white border on the upper side is sprinkled with minute black spots, and that there are some similar small spots, but of yellow on the front part of the wing in addition to the two large ones mentioned.

This species lives through the winter, and no doubt those I saw on the mountain had not long since left their hybernating retreats. The caterpillar is black with a series of red spots on the back, and with each articulation of the body armed with tufts of spines. It feeds upon the leaves of the poplar and willow, and according to some authors, on those of the elm. In a paper read before the Cleveland Academy of Natural Sciences, in 1854, by Prof. Kirtland, "On the Diurnal Lepidtoptera of Northern and Middle Ohio," it is stated that "*Vanessa Antiopa*—though a species introduced from Europe, has become very common. It often in its perfect state survives over the winter, and may be seen flying during the first days of spring. The larva, which often feeds on the foliage of the Lombardy poplar, excited strong prejudice some years since against such trees, from an erroneous belief that their tenant was venomous like Cleopatra's asp."

This caterpillar goes into the chrysalis state in July, and shortly after the new brood of butterflies may be seen flying about. It is said that there is a second brood of caterpillars, and the butterflies from them, on the approach of cold weather, retire into winter quarters, and come out again in the next spring.

The chrysalis is of a grey colour dappled with black, shaped something like the body and head of a grasshopper, without the wings and legs. It has a double row of spines on its ventral side, and is suspended by the small end to the under side of a rail, branch of a tree, or other convenient support.

It is said this species has been introduced into America from Europe, and perhaps entomologists are in possession of knowledge

sufficient to enable them to decide a question of this kind. Upon this point I can give no opinion, but, on referring to several works, I find that in England it is there a rare species. The following extracts, taken from the Zoologist, 1846, will shew how it is prized by the entomologists of that country.

Occurrence of Vannessa Antiopa at York.—A specimen of this rare British butterfly was brought to me alive this day, which was caught in a garden in the suburbs of this city; it and two others were flying in company with the red admiral (*Vanessa Atalanta.*) The captor was unsuccessful with the others, he being only provided with a rhubarb leaf, with which he knocked the one down, that is now in my possession. —*Robert Cook, Colliergate, York.*"

"*Occurrence of Vannessa Antiopa near Epping.*—A female specimen of this insect was captured here on the 12th instant, and another seen. A fine female was also taken about the same time near Yaxely.—*Harry Doubbleday; Epping, September 20th*, 1846."

"*Occurrence of Vanessa Antiopa at Winchester.*—On Friday, September 4th, I had the pleasure of taking a fine female specimen of this rare and beautiful insect, near some willows; I have seen three others near the same spot.—*John T. Rogers; North Walls, Winchester.*"

"*Capture of Vanessa Antiopa near Stowmarket.*—Entomologists will be pleased to hear that they have now an opportunity of witnessing in a fine and perfect state, a specimen of the splendid butterfly, '*Vanessa Antiopa*'—Camberwell Beauty. A pair of this fine species were caught on Wednesday last, in the grounds of the Vicarage, Stowmarket, which, from their rare appearance, are rendered exceedingly interesting and remarkable, their visits here appear to be at very remote and uncertain periods, for until four or five years previous to 1819, Vanessa Antiopa had not been seen for nearly forty years, when it was observed in abundance in various parts of the kingdom. In 1819, a few were caught in Suffolk, and one was taken in the following spring, which had lived through the winter; since that period it has not been seen in England. Those caught at Stowmarket were found on the mulberry-tree, near the Vicarage House, planted by Milton, during his residence with the Rev. Dr. Young, the then Vicar, and who was tutor to the immortal poet, and no doubt the wide spreading branches of this celebrated tree attracted the notice of the butterflies in their search after food. We have been informed that Dr. Probart captured one of these beautiful insects in his garden one day last week.—*Ipswich Paper.*"

From the above extracts it will be seen that this insect, which is quite common in Canada, is regarded as an object of the greatest interest in Britain. The English specimens have the border pure white, and ours, although unquestionably the same species, is, therefore, one of those instances in which a difference of several thousands of miles in the geographical range of a

species is marked by a change sufficient perhaps to classify it as a permanent variety, but not to authorise a distinct, specific appellation. It is wonderful that so delicate a thing as a butterfly should be so widely distributed, and yet, another of our species, "The Painted Lady," *Cynthia Cardui*, occurs in England, France, the Brazils, Africa, Iona, and New South Wales.* The "Red Admiral," *Vanessa Atalanta*, above mentioned, is another British butterfly which abounds in this country, and there are many others of which, it is to be hoped, some practical entomologist will volunteer to give an account in this Journal.

3. *The Isabella Tiger Moth.* (*Arctia Isabella.*)—Another interesting little object was the caterpillar of the Isabella tiger moth, easily recognised by its warm furry jacket, and by the peculiar distribution of the colours of its body, black at both ends, and red in the middle. When touched, it suddenly rolls itself up into a round ball, and remains motionless until the danger is past. Without understanding the wonderful transformations of insect life, who could fancy that this little mass of fur, in shape like a lady's boa, is destined in a few days to become a beautifully painted moth, no longer creeping on the ground on 16 short legs; but soaring through the air upon four delicate scale covered wings. Yet nothing is more true than this, that every caterpillar begins life as real *bona fide* caterpillar and ends it, provided the ordinary course of nature is not interrupted by some accident, as a winged insect. This moth is described by Professor Emmons in his work upon the insects of New York, as having the "thorax tawny and brownish: abdomen tawny, deeper colour beneath, and marked with three rows of black spots, about six or seven in each row, running on the back and middle of the sides. Forewings tawny, and marked with a few black scattering spots; hind wings nearly transparent, slightly tawny, and marked with six tawny spots; legs black or dark brown."

Professor Emmons says that the caterpillar feeds "upon sundry kinds of herbs;" but he does not inform us when it goes into the chrysalis state, or when the moth makes its appearance, and as I am unacquainted with the subject, I cannot, I am sorry to say, give any further information upon this point.

The caterpillar of the Isabella tiger-moth, although itself a most harmless little creature, is often made the victim of other insects

* Wollaston on the Variation of Species, p. 32.

In a former number some account was given of the ichneumon flies, and of their mode of providing for their young, by depositing their eggs in the bodies of the larvæ of the wheat midge. All caterpillars are more or less subject to the same scourges. In the valuable little work published, Dr. Fitch, "On the noxious, beneficial and other insects, of the State of New York," the following interesting paragraph occurs.

"The knowledge and skill which these ichneumon and other parasitic hymenopters often shew in their proceedings are truly wonderful. Every person will recollect the larva of the Isabella tiger-moth, (*Arctia Isabella,*) the large caterpillar with stiff even-shorn hairs of a tan color, and black at each end of his body, which crawls about our yards, and often enters our dwellings, and will probably have observed the fact that if, when crawling, he is rudely touched, he suddenly stops and doubles himself together for a moment, and then straightens himself again and resumes his journey. The long stiff hairs with which he is protected, much like a porcupine, we should think would render it impossible for an insect enemy to place an egg anywhere upon his skin. Mr. P. Reid tells me he once saw one of these caterpillars crawling with a hurried eager step across a dusty road, with an ichneumon fly pursuing him, striving to cling upon his back, but falling off in consequence of the rapid motion of the caterpillar. The fly finding itself frustrated in its every effort, next, as if humming to itself the refrain, 'It will never do to give it up so,' flew a few feet forward of the caterpillar, and turning, darted back with all its energy, hitting the caterpillar square in his face. The caterpillar thus roughly assailed suddenly stopped, and bent himself together in his accustomed manner, and in an instant the fly alighting upon his back, appeared to fix an egg at the margin of one of the breathing pores, which had become fairly exposed by the caterpillar doubling his body thus together. In a moment the caterpillar was recovered from his shock, and was crawling rapidly forward again, when the fly struck him a second time in the same way, and thus he was stopped, and had an egg deposited in his side three times before he reached the tall grass beside the highway, in which he was secure from further molestation."

4. *Terrestrial Mollusca.*—While turning over the stones in search of geological specimens, I found during a single visit to the mountain no less than five species of land shells. Three of these were easly determined—a fourth appears to be a described

species, but of the fifth I can find no account, and it may be new. These two must, therefore, remain unnoticed for the present.

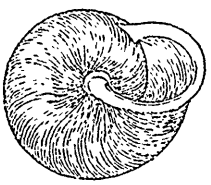


Fig. 2.

Fig. 3.

Figs. 2 *and* 3.—*Helix Albolabris* (Say.) (*The White Lipped Helix.*) Montreal Mountain, 24th April, 1857.

In the above two figures the largest and most common species is represented, and the following is the description given in Gould's Invertebrata of Massachusetts.

"Shell orbicular, depressed-conical, thin, shining, of a yellowish brown or russet-colour; whorls five or six, rounded, separated by a well defined suture, and forming a moderately elevated spire, regularly and distinctly wrinkled by the lines of growth, which are crossed by very numerous, delicate, revolving hair lines, scarcely visible without a magnifier; aperture, semi-elliptical, contracted by the lip, which is white and very broadly reflected; outer edge sharp, somewhat waved, and coloured orange on the back; umbilicus covered by the extremity of the lip. Diameter generally over one inch.

"The animal varies in color, sometimes being pure white, cream-colour or greyish; head brownish above; tentacula dusky at tip; eyes black; back shagreened with granular tubercles; foot rather more than twice the diameter of the shell, pointed behind."

This is one of the most abundant of the few species of snails found in Canada. In all newly cleared lands the whitened shells of dead specimens are everywhere to be met with and living ones may be procured by searching under decaying logs, rotten stumps or stones. Limestone cliffs overgrown with small trees and herbage are more especially favoured haunts of this species. Dr. Gould remarks:

"This is our largest snail, and, though so simple in its structure and coloring, is a pleasing shell. Its delicately striated surface,

and broad white lip, cannot fail to gain admiration. It is subject to very little variety, the principal variations being the want of the white reflected lip, and the open umbilicus in its immature stages.

"The economy of these animals may be briefly stated as follows: They subsist upon decaying leaves and vegetable fibre, under which they usually shelter themselves. In moist weather and after showers, they issue from their retreats, and crawl over the leaves or up the trunks of trees, until driven back by a change of the weather. In early spring they are often seen collected in groups on the sunny side of the rocks. In June they deposit their eggs, to the number of thirty to eighty, in the light mould by the side of rocks and logs. These are white, opaque, and elastic; and in about twenty to thirty days the young animal issues from them with a shell consisting of one whorl and a half. In October they cease to feed, and select a place under some log or stone where they may be sheltered for the winter, and there they fix themselves with the mouth upwards. This they close by secreting a thin, transparent membrane, and as the weather becomes cold, they grow torpid and remain in that state until the warmth of spring excites them to break down the barrier, and enter upon a new campaign of duty and pleasure."

Fig 4.

Fig. 5.

Figs. 4 and 5.—Helix Alternata. (Saz.)

This species is easily recognised when good specimens are procured, by the numerous bands of brown colour which ornament the surface. It is more depressed or flatter than *H. albolabris*, and the umbilicus is not covered over, but open, so that all the whorls may be seen from the under side. In the dead and partly decayed shells the colour for the greater part disappears, but the perfect ones make rather handsome cabinet specimens. It is thus described in the work above cited.

"Shell orbicular, depressed, slightly concave above and below; general tint a light fawn color, which, on the upper surface, alter-

nates, in about equal proportions, with oblique, zigzag bars of dark-brown; these bars grow narrower and lighter on the lower surface as they converge to the umbilicus; they are generally interrupted by a light coloured zone which issues from the middle of the inner margin of the aperture; whorls five to six, flattened above, conspicuously plaited at the lines of growth, so as to produce a rough surface above, but nearly smooth beneath; the shell has a sharp dividing line between the upper and lower surfaces in all its earlier stages, which disappears only at maturity, forming a circular aperture, slightly modified by the preceding whorl; lip simple and delicate; umbilicus large and deep, exhibiting all the volutions. Diameter often an inch.

"*Animal* with the head and tentacula of a light slate color, back brown, remainder of the upper surface brownish orange; eyes black; base of foot drab coloured; collar saffron. Tentacula one third of an inch long, blackish at tip. Foot not much exceeding the diameter of the shell, terminating in a broad, flat, obtuse tip; a light marginal line runs along the foot from the head to the posterior tip."

The habits of this species are similar to those of *H. Albolabris*.

Fig. 6. 

Fig. 6.—*Helix Monodon.* (Rackett.)

The species represented by Fig. 6.—"the single-toothed snail," is much smaller than either of the other two, and not so abundant. It has a sort of a tooth on the whorl just at the edge of the aperture. The technical description is thus given.

"Shell slightly convex; whorls five or six, narrow, diminishing very gradually in breadth from the outer whorl to the apex, marked by very fine lines of growth, and covered with a dark russet or chesnut coloured epidermis, which is beset with very minute, hair-like projections; aperture contracted by a deep groove behind the lip; lip white, narrow, reflexed, a little grooved on its face, extending on the base to the umbilicus, and slightly contracting it, and its outer edge not projecting beyond the surface of the whorl; umbilicus deep, not exhibiting all the volutions, partially covered by the lip; base rounded, very much excavated at the umbilical

region, with a compressed, elongated white tooth at the aperture. Greatest diameter nearly half an inch.

"*Animal* yellowish-brown, darker on the head and tentacula. Foot narrow, cylindrical, half as long again as the diameter of the shell, terminating in a point. Eyes black.

The hair-like projections above mentioned, and also represented in the figure, did not appear on the specimens I collected on the mountain, and Dr. Gould says they are often wanting at every stage of growth.

E. B.

ARTICLE XI.—*Instructions for Collecting and Preserving Insects.* By WILLIAM COUPER, Toronto, Cor. Mem. Lit. & His. Soc., Quebec, and Nat. His. Soc., Montreal.

During the last two years, I have had several letters from young men, residing in various parts of the Province, soliciting information with regard to the methods of collecting and preserving insects. This, of course, shews that entomology is rapidly coming into notice in Canada. To give the young Canadian tyro every information; to encourage and initiate as many as possible into the delightful study of entomology is my whole desire.

Canada, with its vast extent of forest and cultivated lands will surely continue to furnish fresh material to hundreds of entomologists, for many years to come. In England, there are not less than three hundred persons engaged in the study of entomology, and during the last few years many new species have been added to the old collections.

With one or two exceptions, the present collections of Canadian *Coleoptera* are either local or composed of captures made within certain limits; therefore, a thoroughly Canadian collection cannot be established until the parties who are engaged in the study, come to some arrangement for the exchange of duplicates.

Very little has been done in *Lepidoptera;* I believe there is not one good collection of this Order in the Province, and yet, thousands of beautiful moths may be captured during summer. We are, therefore, far behind our neighbors in the United States, in our knowledge of this branch of entomology. Indeed, I may say the same of *Hymenoptera* and *Diptera.*

It is probably the difficulty of the pursuit that deter many from commencing it, but from experience I can say, that it is not so hard to learn as may be imagined, provided the tyro take an interest in it. He must be fully determined on what Order he is to study, as it is almost impossible to study all the Orders; and once resolved to follow any favorite branch, his next move will be towards the formation of a collection. "All entomologists begin (I believe, without exception) with being collectors of insects; and, therefore, he who is simply a collector of insects, is not on that account, to be despised. We do not see the apple trees produce fruit at once, but first comes the bud, then the blossom, and afterwards the fruit; so the collector of insects, his first desire is simply that of getting—

"Crecropias innatus apes amor urget habendi."

But even in pursuit of that object, he cannot but notice some modes of getting succeed better than others, that he finds certain insects in certain places, and so by degrees a habit of observation is formed. Now, of all branches of study, entomology is perhaps, the most attractive to the young. One great advantage is, that it is a pursuit which combines the healthful exercise of the sportsman with no small amount of head-work at home; and with this advantage over any other pursuit in which the out-door exercise and the in-door study are totally disconnected, because here each reacts upon the other; the entomologist carefully examines a specimen under the microscope to ascertain to what group it should belong, and during his next walk he takes pains to observe the habits of the species when at large, in order to be able by analogy to trace with what species it has affinity."

Insects are to be looked for everywhere, nevertheless, there are certain places more productive than others. I may here state that I used the sweeping-net on the mountain behind Montreal, and also on the low shrubbery in that locality, situated between that city and Lachine; both of these places are very productive in Coleoptera. I captured four species of *Lebia*, as well as several species of *Curculionidæ* and *Cassidæ*. If there is an entomologist residing in Montreal, he should make frequent visits to these places.

Moss should be carefully examined (for the minuter species,) especially on the trunks of trees. The fungi and agarics must never be neglected, as they frequently teem with life. Dead ani-

mals, partially dried bones, are excellent traps for *Coleoptera*, especially *Necrophidæ*, *Silphidæ*, *Nitidulidæ*, &c. Planks and chippings of wood may be likewise employed as successful agents in alluring a vast number of species which might otherwise escape notice. The muddy banks of rivers, and the alluvial deposits of marshy grounds are pre-eminently rich, and must be carefully searched for *Carabidæ*, *Staphylinidæ*, &c. Felled timber should never be overlooked, especially beneath the bark. The waters, particularly stagnant pools, teem with life, and during the autumnal months the collector must be on the *qui vive* with his water net,* as several fine specimens of *Dyticidæ* and *Hydrophilidæ* can be added to his collection.

The *instrumenta belli* of the Coleopterist. A sweeping-net is the first thing to be obtained; strong brass wire makes the best ring for this net; then a bag is made of linen or berlin wool canvas to suit the size of the ring, which is attached to the end of a stick. The use of this net is to sweep low shrubbery, flowers and grass; the rarest and smallest beetles are captured with it. I use but one ring for all my nets, viz:—the sweeping, gauze, and water-nets; it is hinged in the centre, for the purpose of being more portable; the ends are bent round and flattened, so that one end sits on the other; the handle is of wood, and bored at one end, into which a screw is inserted. After the net is put on, the ends of the ring are placed upon the stick, and tightened with the screw. I carry all the nets in my pocket, and make use of them as required, and also use the handle as a walking stick.

A collecting bottle, (any wide mouthed one will answer) with a good cork stopper; the bottle should be encased in tin to prevent its being easily broken. My friend, F. H. Ibbetson, Esq., late Assistant Com. General, of Montreal, a profound entomologist, generally wrapped a piece of cotton around his collecting bottle, which he found to serve two purposes, to prevent any sudden blow on the tin breaking the bottle, and as a bandage, should any cut or injury be received. The bottle is half filled with fine saw-dust, which has been previously sifted through a piece of net, whereby all that is too coarse is separated; the saw-dust is then moistened with spirits of wine or good alcohol, and it is then ready for use. I use this method for collecting *Hemiptera*, *Orthoptera*, *Hymenoptera and diptera*.

* This net is made of coarse canvas, on the same principle as the sweeping-net.

Insects collected as above described, will keep fresh (provided the bottle is kept well corked), for upwards of a year, and are always in good condition for the cabinet.

A scizzors, camels-hair brushes, a pair of pliers, and pieces of card are necessary. A drying-box is the next requisite, one made of pine will answer the purpose, it must contain at least four boards to slide like drawers, the boards to be covered with cork, or any other soft material that pins can stick into.* After an excursion, the contents of the collecting bottle are emptied on a piece of white paper, and the new captives selected therefrom, and mounted on pins† suitable to the size of the insects. They are then placed in the drying-box, and left there until they are thoroughly dry, when they are transferred to the cabinet wherein the entomologist arranges his collection. The cabinet must be made to shut very close so as to exclude the dust and minute parasitic insects.

The pin should be stuck through the centre of either the right or left elytron of coleopterous insects; I find the right side to answer best, especially for small specimens.

HOW TO COLLECT LEPIDOPTERA.

To collect butterflies and moths on the wing, the entomologist must use a net which should be made of white book muslin, or of green lino or net. The insect when seen is pursued, and the instant it is captured a sharp turn is given to the net, and the specimen is a prisoner; a slight squeeze on the thorax with the finger and thumb, the insect becomes paralysed, and in that state pinned.

Nocturnal moths are often found asleep on palings or trunks of trees, and may be taken without the aid of the net; crepuscular species may also be found in the same position, but they will readily take alarm when the collector approaches, therefore, the net is necessary to capture them.

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* When cork cannot be procured the following composition will answer:—10 oz. of yellow rosin, 6 oz. of yellow wax, 2 oz. of tallow, and 1 oz. of turpentine. Melt them together over a fire, and when they are well melted and mixed, set the box or drawer upon a table or other place which is perfectly horizontal, then pour the mixture gently into the box, so as to cover the bottom about the tenth of an inch. Before it cools, cover it completely with white paper previously prepared.

† Entomological Pins may be obtained of W. Gale, Crown Court, Cheapside, London, England.

Moths are attracted by light. The English lepidopterists adopt the following plan to capture *Bombyces, Geometridæ, Pyralides*, and even the *Sphingidæ;* sometimes the genus Smerinthus make their appearance. "To obtain moths by light it is advisable to have one light outside the room in advance of the window, and one inside the room; the former light bringing the moths within the sphere of attraction of the inner light. Those who try this plan will find that all nights are not equally successful; sometimes the moths will come in perfect swarms, and all sorts of rare species come to the collector, instead of his having to go in search of them; at other times, though the weather seems favorable, no moths will come, and the collector becomes disheartened, and declares the light "no go." It is no use to try light on a bright moonlight night, but dark and dull nights, with not much wind, are generally the best."

Butterflies and moths are pinned through the centre of the thorax, and held as nearly as possible vertical, if anything with a point rather inclining backwards. When a specimen is pinned on the setting-board or drying-box, then cut braces of card tapering nearly to a point, and place one under each of the wings to keep them in a horizontal position; in three or four days the insect becomes dry, then the braces may be removed, and the specimen transferred to the cabinet.

In summer care must be taken to exclude mites from the setting-boards as well as the cabinet. A mixture of equal parts of oil of thyme, oil of anise, and spirits of wine spread over the setting-board, together with a piece of camphor is necessary. Lepidopterous insects are also procured by means of what is termed a breeding-box, which is divided into compartments, with about six or seven inches of good earth, for such species as go through their transformations under ground care should be taken that the earth is free from vegetable matter, as it will mould and destroy the pupæ. The inside of the box should be rough, so that such caterpillars as form dry cocoons, can attach themselves more naturally; the top to be covered with gauze or wire frame. It requires considerable attention to feed caterpillars, therefore, it is much easier to hunt for pupæ and cocoons. For this purpose the lepidopterist must carry a tin-box containing some sand and moss, and a trowel: a round bladed one is best; with this instrument he can dig at the roots of trees, and other favorable localities. "No pupæ hunter can hope for success, unless he have a good

stock of patience and perseverance; he must not mind cold hands, wet feet, or an aching back, for, although these are drawbacks, yet is the pursuit quite exciting when successful, and it will reward the seeker, not merely of *Lepidoptera*, but also of all the other orders of insects." The best months for digging are September, October and November, if the weather permits.*

The generic name of each species determined, is written on a piece of paper fixed to the bottom of the same pin which supports the insect, and if possible procure both sexes, and place them side by side in the cabinet.

When the entomologist goes on an excursion, he should carry a blank book in his pocket, to note observations on the habits of insects. When thus he examines and observes for himself, he feels a greater ownership in the knowledge so obtained, than he would feel in any information derived from learning a passage in a book by heart. "A person may learn a great deal from books, and yet, from a want of observation, may be unable to read the pages of the book of nature, daily spreads out before us, ever fresh and ever interesting. Each time that the collector of insects catches a species which is new to him, he receives a thrill of pleasure, for he is adding a rarity to his collection." And these pleasures, it will be observed, though of so high an order, are positively within the reach of all; it has been well said, "happiness is within our reach if we will but take it," and such is entomology.

ARTICLE XII.—*The Muskrat,* (*Fiber Zibethicus.*)

GENUS FIBER.—Illiger.

DENTAL FORMULA.

Incisive $\frac{2}{2}$; *Molar* $\frac{3-3}{3-3} = 16$.

"Lower incisors, sharp-pointed, and convex in front; molars, with flat crowns, furnished with scaly transverse zig-zag laminæ. Fore-feet with four toes and the rudiment of a thumb; hind-feet,

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* I prefer the winter months to hunt for the cocoons of Bombyces, such *Attacus luna, A. polyphemus, A. ceropia* and *prometheus*; they are more readily detected on account of the trees at this season being without foliage.

with five toes, the edges furnished with stiff hairs, which assist the animal in swimming, instead of the feet being palmated or webbed, hind-toes, slightly palmated. Tail, long, compressed, granular, nearly naked, having but a few scattered hairs. Glands, near the origin of the tail, which secrete a white, musky, and somewhat offensive fluid. Mammæ six, abdominal.

"This genus differs from the ARVICOLÆ in its dentition; the first inferior molar, has one point more than the corresponding tooth in the latter, and all the molars acquire roots immediately after the animal becomes an adult. We have frequently heard complaints made by students of natural history, of the difficulties they had to encounter at the very outset, from the want of accuracy and uniformity in the works of authors, when stating the characters by which they defined the genera they established. The justness of these complaints may be well illustrated by examining the accounts of the present genus as given by several well-known writers.

"ILLIGER says it has four molars on each side, (*Utrinqui quaterni*,) see Prodomus systematis mammaliarum et avum, making in all twenty teeth. WIEGMAN and RUTHE, have given the same dental arrangement, see Handbuch der Zoologie, Berlin, 1832. F. CUVIER, who has been followed by most authors, has given it—Incisive $\frac{2}{2}$; Canine $\frac{1}{1}=\frac{1}{1}$, = sixteen teeth. GRIFFITH, Animal Kingdom, vol. iii., p. 106, describes it as having—Incisive $\frac{2}{2}$; Canine $\frac{1}{1}=\frac{1}{1}$ = twenty teeth; and in his synopsis of the species of mammalia, (sp. 532,) its dental arrangement is thus characterized —Incisive $\frac{2}{2}$, Canine $\frac{1}{1}=\frac{1}{1}$, Cheek-teeth, $\frac{3}{3}=\frac{3}{3}$, giving to it the extravagant number of twenty-eight teeth. This last statement is most probably only a typographical error. A correct examination and description of the teeth of this genus requires a considerable degree of labour, besides great attention and care, as they are placed so close to each other that without a good magnifying glass it is difficult to find the lines of separation, and almost impossible to ascertain their number, without extracting them one by one.

"The descriptions and figures of their dental arrangement, by Baron CUVIER, and F. CUVIER are correct: see Ondatras, dents des mammifères, pl. 53, p. 157, and Recherches sur les ossemens fossiles, t. 5, p. 1.

"ILLIGER's generic name, Fiber, is derived from the latin word *Fiber*, a beaver. There is only one species described as belonging to this genus."

FIBER ZIBETHICUS.—Linn.

THE MUSK-RAT.

It appears that the first correct description of the muskrat was prepared in 1725, by Monsieur *Sarrasin*, then king's physician at Quebec, and who was a correspondent of the French Academy. The animal had been previously most erroneously described by several authors, but Sarrasin's account was founded upon personal observation, and the dissection of numerous specimens, and furnished the materials which enabled Buffon to prepare a good article upon the species.

The muskrat inhabits every part of the United States north of 30°, and all British America to the Arctic seas; it has been found at the mouth of the *Mackenzie River*, in latitude 69°, on the Rocky Mountains, and on the Columbia, west of the chain. It is thus so organized that it can subsist in the coldest as well as in a climate bordering upon the tropical. Its habits are aquatic, spending the greater portion of its time when awake in the waters and procuring its food principally, in that element. Although occasionally seen in the day time, yet it is strictly a nocturnal animal, and consequently, rather difficult to observe. Fresh water mollusca roots of aquatic plants, and such tender grasses as may chance to grow at the margin of the stream constitute the food of the muskrat. Along the banks of the Canadian rivers there may be occasionally seen great numbers of the shells of different species of *Unio* that have been opened and devoured by these animals. In one of the neighbouring States a gentleman who had a garden in the vicinity of a small stream was surprised to find that every night quantities of his turnips were carried away. Upon examination, the missing vegetables were traced to the muskrat houses at a considerable distance. Upon opening several of these, turnips, carrots, parsnips, and even ears of indian corn were found in plenty. The stalks of the latter are so tall that the ears are beyond the reach of the muskrat, but it was found that the animal, in order to obtain them, cut the stems off just above the roots with its sharp front teeth. Sir John Richardson states that: "In the autumn before the shallow lakes and swamps freeze over, the muskrat builds its house of mud, giving it a conical form, and a sufficient base to raise the chamber above the waters. The chosen spot is generally amongst the long grass, which is incorporated with the walls of the house, from the mud being deposited

amongst it; but the animal does not appear to make any kind of composition or mortar by tempering the mud and grass together. There is, however, a dry bed of grass deposited in the chamber. The entrance is under water. When ice forms over the surface of the swamp, the muskrat makes breathing holes through it, and protects them from the frost by a covering of mud. In severe winters, however, these holes freeze up in spite of their coverings, and many of the animals die. It is to be remarked that the small grassy lakes selected by the muskrat for its residence, are never so firmly frozen nor covered with such thick ice as deeper and clearer water. The Indians kill these animals by spearing them through the walls of their houses, making their approach with great caution, for the muskrats take to the water when alarmed by the sound on the ice. An experienced hunter is so well acquainted with the direction of the chamber and the position in which its inmates lie, that he can transfix four or five at a time. As soon as from the motion of the spear it is evident that the animal is struck, the house is broken down and it is taken out. The principal seasons for taking the musk-rat, are the autumn before the snow falls, and the spring after it has disappeared, but the ice is still entire. In the winter time the depth of snow prevents the houses and breathing holes from being seen. One of the first operations of the hunter is to stop all the holes with the exception of one at which he stations himself to spear the animals that have escaped being struck in their houses and come hither to breathe. In the summer the muskrat burrows in the banks of the lakes, making branched canals many yards in extent, and forming its nest in a chamber at the extremity, in which the young are brought forth. When its house is attacked in the autumn it retreats to these passages, but in the spring they are frozen up. The muskrat is a watchful but not a very shy animal. It will come very near to a boat or canoe, but dives instantly on perceiving the flash of a gun. It may be frequently seen sitting on the shores of small marshy islands in a rounded form, and not easily to be distinguished from a piece of earth, until, on the approach of danger it suddenly plunges into the water. In the act of diving, when surprised, it gives a smart blow to the water with its tail."

Sir John says that in the north there are three varieties:

1. The Black Musquash, rare.

2. The Pied Musquash, with dark blackish brown patches on a white ground.

3. The White Musquash.

The only kind we have seen in Canada is brown above and ash-coloured below. It is here principally taken by means of a steel trap like a common rat-trap, baited with parsnips, and set an inch or two under water. It is also shot, and can be taken in any kind of trap, as it has none of the cunning of the fox or the beaver. They are very prolific. It is said they breed three or four times in a year, and have from three to six young ones at a litter. In many of our Canadian rivers, even in the well settled Townships, there are small secluded bays, where, on account of the small elevation of the banks, the forest still remains, the trees overhanging the water. In such places especially, if there be a growth of reeds or other aquatic plants in the stream, the muskrats build their houses, and when left undisturbed for a few years become very numerous.

Now and then a family of Indians on their way to the hunting grounds in the autumm will encamp in the vicinity, and in a few days exterminate the colony. We know of one of those places. There is an ancient fisherman living upon a small island near. He supports himself by selling the pike, perch and bass, the returns of his rod and line, and also turns many a penny by disposing the skins of the muskrats, the produce of his traps. He looks upon the rat plantation as his own legitimate property, and is loud in his indignation when two or three canoe-loads of Indians make their appearance.

The flesh of this animal is eaten by the Indians and trappers, and is said to be very good. As Audubon declares that the smell is less unpleasant than that of the skunk, the flesh may be relished by a hungry man, but from what we have seen of the species, we would as soon think of dining off a dish of any other kind of rats.

We do not know whether this species in its extreme northern haunts hybernates, or not.

DESCRIPTION.

"Body, of a nearly cylindrical shape, resembling that of the Norway rat. Head, short; neck, very short, and indistinct; legs, short; thighs, hid in the body, Tail, two-thirds the length of the body, compressed, convex on the sides, thickest in the middle,

tapering to an acute point at the extremity; covered with small scales, which are visible through the thinly scattered hairs. Incisors, large; upper ones a little rounded anteriorly without grooves, truncated on the cutting edge; lower ones, a little the longest; nose, thick, and obtuse; whiskers, moderate in length, seldom reaching beyond the ear; eyes, small and lateral, nearly concealed in the fur; ears, short, oblong, covered with hair, and hidden by the fur.

"On the fore-legs, the wrists and fingers only are visible beyond the body, they are covered with a short shining coat of hair.

"The thumb has a conspicuous palm, and is armed with a nail, as long as the adjoining finger nails. Hind-legs, as short as the fore-legs, so that the body when the animal is walking touches the ground.

"The hind-feet are turned obliquely inwards, and at first sight remind us of the foot of a duck. The two middle toes may be called semi-palmated, and there is also a short web between the third and fourth toes. The margins of the soles and toes, are furnished with an even row of rigid hairs, curving inwards; under-surface of feet, naked; claws, conical, and slightly arched.

"The whole body is clothed with a short, downy, fur, intermixed with longer and coarser hairs. In many particulars the skin resembles that of the beaver, although the fur is far less compact downy and lustrous.

COLOUR.

"Fur, on the upper parts a third longer than beneath; from the roots to near the extremities, blueish-gray, or lead-colour, tipped with brown; on the under surface it is a little lighter in colour, and the hairs are tipped with brownish-gray. This species, when viewed from above, appears of a general dark-brown colour with a reddish tint visible on the neck, sides, and legs; chin, throat, and under-surface, grayish-ash; tail, dark-brown. Incisors, yellow; nails, white. The colour of this animal, so much resembles that of the muddy banks on which it is frequently seated, that we have often, when looking at one from a little distance, mistaken it for a lump or clod of earth, until it moved.

DIMENSIONS.

"Length of head and body, ...	15	inches.
" of tail, ...	10	"
From heel to longest nail, ...	3	"
Height of ear, ...	½	"

Audubon and Bachman, Vol. 1, p. 108."

ARTICLE XIII.—*On the Wood-Chuck.* (*Arctomys Monax.*)

GENUS ARTOMYS, *Gmel. Cuv.*

DENTAL FORMULA.

Incisive $\frac{2}{2}$; *Canine* $\frac{0}{0}=\frac{0}{0}$; *Molar* $\frac{5}{4}=\frac{5}{4}=22$.

"Incisors strong, narrow, and wedge-shaped, anterior surface rounded; molars, with the upper surface thick and heavy.

"Head large, mouth small, and placed below; eyes large, ears short, paws strong; fore-feet with four toes and the rudiment of a thumb; hind-feet with five toes; nails strong, compressed; tail bushy; no cheek pouches.

"The name *Arctomys*, is derived from two Greek words (*arktos,*) a bear, and (*mus,*) a mouse.

"There are as far as we are informed, but eight known species of the genus as it is now defined, five on the Eastern Continent and three in North America.

ARCTOMYS MONAX.—LINN.

WOOD-CHUCK. MARYLAND MARMOT. GROUND-HOG.

CHARACTERS.

"*Brownish-gray above; head, tail, and feet, dark-brown; nose and cheeks ashy-brown, under surface reddish.*

DESCRIPTION.

"The body is thick, and the legs are short, so that the belly nearly touches the ground. Head short and conical; ears short, rounded, and thinly clothed with hair on both surfaces; eyes moderate; whiskers numerous, extending to the ear; a membrane beneath the ears, on the posterior parts of the cheek, and a few setæ on the eye-brows; legs, short and muscular; fore-feet, with four toes, and the rudiment of a thumb, with a minute nail; hind-feet, with five toes. Toes long and well separated, palms naked, with tubercles at the roots of the toes. The middle toe longest—the first and third, which are nearly equal to each other, not much shorter; the extremity of the nail of the outer, extends only to the base of the nail of the adjoining toe; fore-claws moderately arched, obtuse and compressed; the soles of the hind-feet long, and naked to the heel; hind-feet semi-palmated; nails channelled

near the ends. Tail bushy, partly distichous; body clothed with soft woolly fur, which is mixed with coarse long hairs.

COLOUR.

"This species (like the foregoing one) is subject to many variations in the colour of its fur, which may account perhaps for its numerous synonymes. We will, however, describe the animal in its most common colouring.

"The finer woolly fur is for two-thirds of its length from the roots upwards, of a dark ashy brown, with the extremities light yellowish-brown. The long hairs are dark brown for two-thirds of their length, tipped sometimes with reddish white, but generally with a silvery white. The general tint of the black is grizzly or hoary; cheeks, and around the mouth, light gray; whiskers black; head, nose, feet, nails and tail, dark brown; eyes black. The whole under surface, including the throat, breast, belly, and the fore and hind legs, reddish orange.

"The specimens before us present several striking varieties of colour; among them is one from Lower Canada, coal-black with the exception of the nose and a patch under the chin, which are light gray; the fur is short, and very soft; and the tail less distichous than in other varieties of this species.

DIMENSIONS.

"Adult Male.

From point of nose to root of tail, - - - - -	18¾	inches.
Tail (vertebræ,) - - - - - - - - - - - -	3⅞	"
Tail, to end of hair, - - - - - - - - - -	5⅞	"
Ear, posteriorly, - - - - - - - - - - -	¾	"
Girth of body, - - - - - - - - - - - -	17	"
From fore to hind claw, when stretched, - -	26	"

"We have found some difference in the length of the tail, in different individuals, it being, in some specimens, nearly seven inches long including the hair.

"Weight 9lb. 11 oz.—*Audubon and Bachman, Vol.* 1, *p.* 16."

The Woodchuck belongs to the order RODENTIA* or the "gnawers," that group of the mammalia which includes the beaver, muskrat, hares, mice, rats, and rabbits The animals of this order have the two front or incisor teeth in each jaw constructed like so many chisels for the purpose of cutting to pieces the va-

rious vegetable substances upon which they subsist. The extraordinary labours of the beaver, or even the mischief that can be effected by a common rat are good proofs of the efficiency of such instruments. These teeth have the enamel only on the front sides, so that the posterior portion being the softest, is worn away more rapidly and leaves a sharp edge where it is most needed. The jaws of the Rodents, also, are so articulated and contrived, that they have no motion sideways, but only in a direction from behind forwards.

The woodchuck is found throughout the north-eastern United States, Nova Scotia, New Brunswick, Canada, and also, it is said, in the Hudson's Bay territory. It is a harmless little animal, subsisting upon vegetable food during the summer, and sleeping during the winter. The young are brought forth in May or June, generally four or five in a litter, but sometimes seven or eight. The burrow in which each pair resides, is usually dug in the side of a small sandy or gravelly eminence, and often in a perfectly level field. It is at first a little sloping downwards, and then continued along horizontally, sometimes twenty or thirty feet when it is terminated, in a comfortable round chamber where the occupants can dwell in security. About the time the leaves fall in the autumn, these animals retire to their burrows, roll themselves up, and remain quite torpid until spring. When taken out in this state they can be rolled about like a ball without being relaxed. While feeding, they keep the upright position, stooping down to get a mouthful, and then sitting upright to eat it. When pursued, they usually manage to get to their burrows pretty quickly, or if such a place of retreat be more convenient, into a pile of loose stones or old logs. They do not store up provisions as is generally supposed. In the autumn they become exceedingly fat, and their flesh is not bad eating. In Canada, this animal is called by the French habitans, *Siffleur*, and by English, the woodchuck, ground-hog, or marmot. They bite severely, and will fight with a dog several times their own size. They are sometimes seen in the woods erect, with their backs against a tree, asleep in the warm sunshine.

It appears that the species described by Sir John Richardson under the name of *Arctomys empetra*, is the same as *A. monax*. The following anecdote relating to the hybernation of the woodchuck is given in Audubon & Bachman's work.

"Concerning this latter most singular state of existence, we are gratified in being able to communicate the following facts, related to us by the Hon. DANIEL WADSWORTH, of Hartford, Connecticut. "I kept," said he to us, "a fine Wood-Chuck in captivity, in this house, for upwards of two years. It was brought to me by a country lad, and was then large, rather wild, and somewhat cross and mischievous; being placed in the kitchen, it soon found a retreat, in which it remained concealed the greater part of its time every day. During several nights it attempted to escape by gnawing the door and window-sills; gradually it became more quiet, and suffered itself to be approached by the inmates of the kitchen, these being the cook, a fine dog, and a cat; so that ere many months had elapsed, it would lie on the floor near the fire, in company with the dog, and would take food from the hand of the cook. I now began to take a particular interest in its welfare, and had a large box made for its use, and filled with hay, to which it became habituated, and always retired when inclined to repose. Winter coming on, the box was placed in a warm corner, and the Wood-Chuck went into it, arranged its bed with care, and became torpid. Some six weeks having passed without its appearing, or having received any food; I had it taken out of the box, and brought into the parlour;—it was inanimate, and as round as a ball, its nose being buried as it were in the lower part of his abdomen, and covered by its tail—it was rolled over the carpet many times, but without effecting any apparent change in its lethargic condition, and being desirous to push the experiment as far as in my power, I laid it close to the fire, and having ordered my dog to lie down by it, placed the Wood-Chuck in the dog's lap. In about half an hour, my pet slowly unrolled itself, raised its nose from the carpet, looked around for a few minutes, and then slowly crawled away from the dog, moving about the room as if in search of its own bed! I took it up, and had it carried down stairs and placed again in its box, where it went to sleep, as soundly as ever, until spring made its appearance. That season advancing, and the trees showing their leaves, the Wood-Chuck became as brisk and gentle as could be desired, and was frequently brought into the parlour. The succeeding winter this animal evinced the same disposition, and never appeared to suffer by its long sleep. An accident deprived me of my pet, for having been trodden on, it gradually became poor, refused food, and finally died extremely emaciated."

"May we here be allowed to detain you, kind reader, for a few moments, whilst we reflect on this, one among thousands of other instances of the all-wise dispensations of the Creator. Could any of the smaller species of quadrupeds, incapable, as many of them are, of migrating like the swift-winged inhabitants of the air to the sunny climes of the South, and equally unable to find any thing to subsist on among the dreary wastes of snow, or the frost-bound lands of the North during winter, have a greater boon at the hands of Nature than this power of escaping the rigours and cold blasts of that season, and resting securely, in a sleep of insensibility, free from all cravings of hunger and all danger of perishing with cold, till the warm sun of spring, once more calls them into life and activity? Thus this and several other species of quadrupeds, whose organization in this respect differs so widely from general rules, may be said to have no winter in their year, but enjoy the delightful weather of spring, summer, and autumn, without caring for the approach of that season during which other animals often suffer from both cold and hunger."

ARTICLE XIV.—*On the "Fisher" or Pekan. "Pennant's Marten." (Mustela Canadensis.)*

GENUS MUSTELA.—Cuv.

DENTAL FORMULA.

Incisive $\frac{6}{6}$; *Canine* $\frac{1}{1}$—$\frac{1}{1}$; *Molar* $\frac{5}{6}$—$\frac{5}{6}$ = 38.

"Head, small and oval; muzzle, rather large; ears, short and round; body, long, vermiform; tail, usually long and cylindrical; legs, short; five toes on each foot, armed with sharp, crooked, slightly retractile claws. No anal pouch, but a small gland which secretes a thickish offensive fluid. Fur, very fine.

"This genus differs from the genus Putorius, having four carnivorous teeth on each side, in the upper jaw, instead of three, the number the true weasels exhibit, and the last carnivorous tooth on the lower jaw, has a rounded lobe on the inner side, which renders this genus somewhat less carnivorous in its habit than Putorius, and consequently a slight diminution of the cruelty and

ferocity displayed by animals of the latter genus, may be observed in those forming the present.

"There are about twelve species of true Martens known, four of which inhabit North America.

"The generic name MUSTELA, is derived from the Latin word *mustela*, a weasel."

MUSTELA CANADENSIS.—SCHREBER.

PENNANT'S MARTEN OR FISHER.

BLACK FOX OR BLACK CAT OF THE NORTHERN HUNTERS.

CHARACTERS.

"*Head and shoulders, mixed with grey and brown; nose, lips, legs, and tail, dark brown.*

SYNONYMES.

LE PEKAN, Buffon, vol. xiii., p. 304, A.D. 1749.
MUSTELA CANADENSIS, Schreber, Saugeth. p. 492, 1775.
MUSTELA PENNANTI, Erxleben, Syst., p. 470, A.D. 1777.
FISHER, Penn., Arct. Zool., 4 vols., vol. i., p. 82, A.D. 1784.
MUSTELA CANADENSIS, Gmel., Lin., vol. i., p. 95, 1788.
WEJACK, Hearne's Journey.
FISHER, or BLACK FOX, Lewis and Clarke, vol. iii., p. 25.
FISHER, WEASEL, or PEKAN, Warden's United States.
MUSTELA PENNANTI, Sabine, Frank. First Journey, p. 651.
MUSTELA CANADENSIS, Harlan, F., p. 65.
" " Godman, vol. i., p. 203.
MUSTELA GODMANI, Less., Mamm., p. 150.
MUSTELA CANADENSIS, Rich., F. B. A., p. 52.
PEKAN, or FISHER, Dekay, Nat. His. N.Y., p. 31.

DESCRIPTION.

"The head of this species bears a stronger resemblance to that of a dog than to the head of a cat. Its canine teeth, in the upper jaw, are so long that with the slightest movement of the lip they are exposed. Head, broad and round, contracting rather suddenly toward the nose, which is acute. Eyes, rather small and oblique; ears, low, broad, semicircular, and far apart, covered on both surfaces with short soft fur; whiskers, half the length of the head; body, long, and formed for agility and strength.

"The pelage is formed of a short fine down next the skin, intermixed with longer and coarser hairs about an inch and a half in length; these hairs are longer on the posterior parts of the animal than on the shoulders.

"The feet are robust. Fore-feet, shorter than the hind-feet, thickly clothed with rather fine and short hairs; nails, long, strong, curved, and sharp; soles, hairy; the toes on all the feet are connected at the base by a short hairy web; the callosities consequently make only a slight impression when the animal is walking or running on the snow.

"Tail, long, bushy, and gradually diminishing to a point toward the extremity.

"This species has so strong a smell of musk (like the pine marten,) that we have found the skin somewhat unpleasant to our olfactories, several years after it had been prepared as a specimen.

COLOUR.

"Fur on the back, from the roots to near the extremity, chesnut-brown, tipped with reddish-brown and light grey. On the head, shoulders, and fore part of the back, there are so many long whitish hairs interspersed, that they produce a somewhat hoary appearance. Whiskers, nose, chin, ears, legs, feet, and tail, dark-brown; margins of the ears, light-brown; hips and posterior part of the back, darker than the shoulders; eyes, yellowish-brown; nails, light horn-colour.

"In some specimens we have seen a white spot on the throat, and a line of the same colour on the belly; others, have no white markings on the body. We have seen a specimen, nearly white, with a brown head. Another obtained in Buncombe county, North Carolina, was slightly hoary on the whole upper surface.

DIMENSIONS.

"From point of nose to root of tail	23 inches.
Tail (vertebræ)	12 do.
" to end of hair	14½ do.
Breadth of head	3½ do.
Height of ear	1 do.
Breadth of ear	2 do.
From point of nose to eye	2 do.
" heel to point of longest nail	4¼ do.

Weight, 8½ lbs.

—Aud. & Bach., p. 307.

The Fisher or Pekan is about the size of a small fox, of a general dark brown or nearly black colour, frequents swampy lands, and preys upon fish, frogs, squirrels, mice, and other small animals. It is found all over the continent as far south as the Carolinas. In the newly settled portions of Canada, it occurs rarely, but wherever there is a dense population, it never is seen.

Very little appears to be known of the habits of this the largest true marten of North America. The hunters complain that, like the carcajou, the fisher will follow a line of marten traps-breaking them in pieces and devouring the bait.

We know of at least one instance of this kind. A school teacher in one of the new townships occupied his leisure hours in trapping various animals. Several times in succession he found that an animal of some kind had gone the whole of his round and not only stolen all his bait, but had even torn a marten to pieces which had been caught. In order to arrive at some further acquaintance with this mysterious visitor, he set a stout steel trap baited with a bird near one of his "dead-falls," and the next morning found secured in it a large fisher, who made a fierce battle with the dog, although one of his legs was fast in the trap. Another was shot near Port Hope in Upper Canada, by a hunter named Marsh, who said it was up a tree in pursuit of a marten. Marsh killed them both. Sir John Richardson says the fisher preys much upon frogs, but will also kill the Canada porcupine by biting it in the belly. About forty years ago, when this animal was more common in the state of New York, the hunters used to obtain them by following their tracks in the snow, when the animals had been out in quest of food on the previous night, thus tracing them to the hollow trees in which they were concealed, which they chopped down. It is said that as the tree was falling, the fisher would dart from the hollow which was often fifty feet from the ground, and leap into the snow, when the dogs usually seized and killed him, although not without a hard struggle, as this animal is greatly more dangerous to dogs and hounds than either the grey or red fox.

When taken alive and kept in confinement, it is said they are usually sullen and voracious, growling, snapping and spitting when approached. They are nocturnal in their habits, although sometimes seen abroad during the day.

It is said they bring forth once a year, depositing their young in the trunk of a large tree usually thirty or forty feet from the ground. A female was killed in the month of April pregnant with three young.

ARTICLE XV.—*On the Beaver.—Castor fiber.*

GENUS CASTOR.—Linn.

DENTAL FORMULA.

Incisive $\frac{2}{2}$; *Canine* $\frac{0}{0}$—$\frac{0}{0}$; *Molar* $\frac{4}{4}$—$\frac{4}{4}$ = 20.

"Incisors very strong. In the upper jaw their anterior surface is flat and their posterior surface angular. The molars differ slightly from each other in size, and have one internal and three external grooves. In the lower jaw the incisors present the same appearance as those of the upper; but are smaller. In the molars there are three grooves on the inner side, with one on the external.

"Eyes small; ears short and round; five toes on each foot. On the fore-feet the toes are short and close; on the hind-feet long and palmated. Tail, large, flat, and scaly. Mammæ, four, pectoral: a pouch near the root of the tail, in which an unctuous matter is secreted.

"There is but one well established species known to belong to this genus.

"The generic name is derived from the Latin word *Castor*, a beaver.

CASTOR FIBER.—Linn.

(VAR. AMERICANUS.)

American Beaver.

CHARACTERS.

Larger than the ground-hog, (Arctomys monax;) of a reddish-brown colour, with a short downy grayish fur beneath; tail, flat, scaly, and oval.

DESCRIPTION.

"The shape of the body bears a considerable resemblance to that of the musk-rat; it is, however, much larger, and the head is proportionally thicker and broader. It is thick and clumsy, gradually enlarging from the head to the hips, and then is somewhat abruptly rounded off to the root of the tail.

"Nose, obtuse and divided; eyes, small; ears, short, rounded, well clothed with fur, and partially concealed by the longer surrounding hairs: moustaches, not numerous, but very rigid, like hogs' bristles, reaching to the ears; neck, rather short. The fur is of two kinds. The upper and longer hair is coarse, smooth, and glossy; the under coat is dense, soft, and silky. Fore-feet, short and rather slender; toes, well separated and very flexible. The fore-feet are used like hands to convey food to the mouth. The fore-claws are strong, compressed, and channelled beneath. The middle toe is the longest, those on each side a little shorter, and the outer and inner ones shortest.

"The hind-feet bear some resemblance to those of the goose. They are webbed beyond the roots of the nails, and have hard and callous soles. In most of the specimens we have seen, there is a double nail on the second inner toe. The palms and soles are naked. When walking, the whole heel touches the ground. The Beaver is accustomed to rest itself on its hind-feet and tail, and when in this sitting position contracts its fore-claws in the manner of the left hand figure represented in the plate. The upper surface of all the feet, with the exception of the nails, which are naked, is thickly covered with short adpressed hairs.

"The tail is very broad and flat, tongue-shaped, and covered with angular scales. The root of the tail is for an inch covered with fine fur. The glandular sacs containing the castoreum, a musky unctuous substance, are situated near the anus.

COLOUR.

Incisors, on their outer surface, orange; moustaches, black; eyes, light-brown. The soft under down is light grayish-brown. The upper fur on the back is of a shining chesnut colour; on the under surface, and around the mouth and throat, a shade lighter. Nails, brown; webs between the toes, and tail, grayish-brown. We have seen an occasional variety. Some are black; and we examined several skins that were nearly white.

DIMENSIONS.

From nose to root of tail,.....	23 inches.
Tail,.....	10 do.
From heel to end of middle claw,.....	5½ do.
Greatest breadth of tail,.....	3¼ do.
Thickness of tail,.....	⅞ do.

Weight, 11¼ lbs.

The geographical range of the beaver appears to have been at one time co-extensive with the whole of North America, from the Arctic Ocean south, to the Tropic of Cancer, or Gulf of Mexico. The progress of civilization has, however, exterminated the animal in nearly all of that portion of the continent which constitutes the United States and the settled portions of Canada. North of the Ottawa, and in the head waters of the streams which flow into the St. Lawrence below Montreal, it is still abundant. An exploring party in crossing the wild country between Matchedash Bay at the southern extremity of the Georgian Bay, to the county of Renfrew in 1853, saw great numbers of their works in the numerous streams and lakes of that region. They are therefore still quite common between Lake Huron and the Ottawa.

The American beaver cannot be distinguished from that of Europe. The fur of the latter is a little lighter in colour than that of this continent. It was once an inhabitant of the British Islands, where it has been found associated with the remains of the extinct mammoth. There is also an extinct beaver, whose remains have been discovered in Europe and another in America, which appear to have been the size of a sheep. The following is the best account we have seen of the habits of this species.

"Beavers prefer small clear-water rivers and creeks, and likewise resort to large springs. They, however, at times, frequent great rivers and lakes. The trappers believe that they can have notice of the approach of winter weather, and of its probable severity, by observing the preparations made by the Beavers to meet its rigours; as these animals always cut their wood in good season, and if this be done early, winter is at hand.

The Beaver dams, where the animal is at all abundant, are built across the streams to their very head waters. Usually these dams are formed of mud, mosses, small stones, and branches of trees cut about three feet in length and from seven to twelve inches round. The bark of the trees in all cases being taken off for winter provender, before the sticks are carried away to make up the dam. The largest tree cut by the Beaver, seen by PREVOST, measured eighteen inches in diameter; but so large a trunk is very rarely cut down by this animal. In the instance just mentioned, the branches only were used, the trunk not having been appropriated to the repairs of the dam or aught else by the Beavers.

In constructing the dams, the sticks, mud and moss are matted and interlaced together in the firmest and most compact manner;

so much so that even men cannot destroy them without a great deal of labour. The mud and moss at the bottom are rooted up with the animal's snout, somewhat in the manner hogs work in the earth, and clay and grasses are stuffed and plastered in between the sticks, roots, and branches, in so workmanlike a way as to render the structure quite water-tight. The dams are sometimes seven or eight feet high, and are from ten to twelve feet wide at the bottom, but are built up with the sides inclining towards each other, so as to form a narrow surface on the top. They are occasionally as much as three hundred yards in length, and often extend beyond the bed of the stream in a circular form, so as to overflow all the timber near the margin, which the Beavers cut down for food during winter, heap together in large quantities, and so fasten to the shore under the surface of the water, that even a strong current cannot tear it away; although they generally place it in such a position that the current does not pass over it. These piles or heaps of wood are placed in front of the lodges, and when the animal wishes to feed he proceeds to them, takes a piece of wood, and drags it to one of the small holes near the principal entrance running above the water, although beneath the surface of the ground. Here the bark is devoured at leisure, and the wood is afterwards thrust out, or used in repairing the dam. These small galleries are more or less abundant according to the number of animals in the lodges. The larger lodges are, in the interior, about seven feet in diameter, and between two and three feet high, resembling a great oven. They are placed near the edge of the water, although actually built on or in the ground. In front, the Beavers scratch away the mud to secure a depth of water that will enable them to sink their wood deep enough to prevent its being impacted in the ice when the dam is frozen over, and also to allow them always free egress from their lodges, so that they may go to the dam and repair it if necessary. The top of the lodge is formed by placing branches of trees matted with mud, grasses, moss, &c., together, until the whole fabric measures on the outside from twelve to twenty feet in diameter, and is six or eight feet high, the size depending on the number of inhabitants. The outward coating is entirely of mud or earth, and smoothed off as if plastered with a trowel. As Beavers, however, never work in the daytime, no person we believe has yet seen how they perform their task, or give this hard-finish to their houses. This species does not use its fore-feet in swimming, but for carrying burthens: this

can be observed by watching the young ones, which suffer their fore-feet to drag by the side of the body, using only the hind-feet to propel themselves through the water. Before diving, the Beaver gives a smart slap with its tail on the water, making a noise that may be heard a considerable distance, but in swimming, the tail is not seen to work, the animal being entirely submerged except the nose and part of the head; it swims fast and well, but with nothing like the speed of the otter, (*Lutra Canadensis.*)

The Beavers cut a broad ditch all round their lodge, so deep that it cannot freeze to the bottom, and into this ditch they make the holes already spoken of, through which they go in and out and bring their food. The beds of these singular animals are separated slightly from each other, and are placed around the wall, or circumference of the interior of the lodge; they are formed merely of a few grasses, or the tender bark of trees: the space in the centre of the lodge being left unoccupied. The Beavers usually go to the dam every evening to see if repairs are needed, and to deposit their ordure in the water near the dam, or at least at some distance from their lodge.

They rarely travel by land, unless their dams have been carried away by the ice, and even then they take the beds of the rivers or streams for their roadway. In cutting down trees they are not always so fortunate as to have them fall into the water, or even towards it, as the trunks of trees cut down by these animals are observed lying in various positions; although as most trees on the margin of a stream or river lean somewhat towards the water, or have their largest branches extended over it, many of those cut down by the Beavers naturally fall in that direction.

It is a curious fact, says our trapper, that among the Beavers there are some that are lazy and will not work at all, either to assist in building lodges or dams, or to cut down wood for their winter stock. The industrious ones beat these idle fellows, and drive them away; sometimes cutting off a part of their tail, and otherwise injuring them. These "Paresseux" are more easily caught in traps than the others, and the trapper rarely misses one of them. They only dig a hole from the water running obliquely towards the surface of the ground twenty-five or thirty feet, from which they emerge when hungry, to obtain food, returning to the same hole with the wood they procure, to eat the bark.

They never form dams, and are sometimes to the number of five or seven together; all are males. It is not at all improbable, that

these unfortunate fellows have, as is the case with the males of many species of animals, been engaged in fighting with others of their sex, and after having been conquered and driven away from the lodge, have become idlers from a kind of necessity. The working Beavers, on the contrary, associate, males, females, and young together.

Beavers are caught, and found in good order at all seasons of the year in the Rocky Mountains; for in those regions the atmosphere is never warm enough to injure the fur; in the low-lands, however, the trappers rarely begin to capture them before the first of September, and they relinquish the pursuit about the last of May. This is understood to be along the Missouri, and the (so called) Spanish country.

Cartwright, (vol. i., p. 62.) found a Beaver that weighed forty-five pounds; and we were assured that they have been caught weighing sixty-one pounds before being cleaned. The only portions of their flesh that are considered fine eating, are the sides of the belly, the rump, the tail, and the liver. The tail, so much spoken of by travellers and by various authors, as being very delicious eating, we did not think equalled their descriptions. It has nearly the taste of beef marrow, but is rather oily, and cannot be partaken of unless in a very moderate quantity, except by one whose stomach is strong enough to digest the most greasy substances.

Beavers become very fat at the approach of autumn; but during winter they fall off in flesh, so that they are generally quite poor by spring, when they feed upon the bark of roots, and the roots, of various aquatic plants, some of which are at that season white, tender, and juicy. During winter, when the ice is thick and strong, the trappers hunt the Beaver in the following manner. A hole is cut in the ice as near as possible to the aperture leading to the dwelling of the animal, the situation of which is first ascertained; a green stick is placed firmly in front of it, and a smaller stick on each side, about a foot from the stick of green wood; the bottom is then patted or beaten smooth and even, and a strong stake is set into the ground to hold the chain of the trap, which is placed within a few inches of the stick of green wood, well baited, and the Beaver, attracted either by the fresh bark or the bait, is almost always caught. Although when captured in this manner, the animal struggles, diving and swimming about in its efforts to escape, it never cuts off a foot in order to obtain its liberty; probably be-

cause it is drowned before it has had time to think of this method of saving itself from the hunter. When trapping under other circumstances, the trap is placed within five or six inches of the shore, and about the same distance below the surface of the water, secured and baited as usual. If caught, the Beavers now and then cut off the foot by which they are held, in order to make their escape.

A singular habit of the Beaver was mentioned to us by the trapper, PREVOST, of which we do not recollect having before heard. He said that when two Beaver lodges are in the vicinity of each other, the animals proceed from one of them at night to a certain spot, deposit their castoreum, and then return to their lodge. The Beavers in the other lodge, scenting this, repair to the same spot, cover it over with earth, and then make a similar deposit on the top. This operation is repeated by each party alternately until quite a mound is raised, sometimes to the height of four or five feet.

The strong musky substance contained in the glands of the Beaver, is called castoreum; by trappers, bark-stone; with this the traps are baited. A small stick, four or five inches long, is chewed at one end, and that part dipped in the castoreum, which is generally kept in a small horn. The stick is then placed with the anointed end above water, and the other end downwards. The Beaver can smell the castoreum at least one hundred yards, makes towards it at once, and is generally caught.

Where Beavers have not been disturbed or hunted, and are abundant, they rise nearly half out of water at the first smell of the castoreum, and become so excited that they are heard to cry aloud, and breathe hard to catch the odour as it floats on the air. A good trapper used to catch about eighty Beavers in the autumn, sixty or seventy in the spring, and upwards of three hundred in the summer, in the mountains; taking occasionally as many as five hundred in one year. Sixty or seventy Beaver skins are required to make a pack weighing one hundred pounds; which, when sent to a good market, is worth, even now, from three to four hundred dollars.

It is stated by some authors that the Beaver feeds on fish. We doubt whether he posesses this habit, as we on several occasions placed fish before those we saw in captivity, and although they were not very choice in their food, and devoured any kind of vegetable, and even bread, they in every case suffered fish to remain untouched in their cages.

The food of this species, in a state of nature, consists of the bark of several kinds of trees and shrubs, and of bulbous and other roots. It is particularly fond of the bark of the birch, (*Betula,*) the cotton-wood, (*Populus,*) and of several species of willow, (*Salix;*) it feeds also with avidity on the roots of some aquatic plants, especially on those of the *Nuphair luteum.* In summer, when it sometimes wanders to a distance from the water, it eats berries, leaves, and various kinds of herbage.

The young are born in the months of April and May; those produced in the latter month are the most valuable, as they grow rapidly and become strong and large, not being checked in their growth, which is often the case with those that are born earlier in the season. Some females have been taken in July, with young, but such an event is of rare occurrence. The eyes of the young Beaver are open at birth. The dam at times brings forth as many as seven at a litter, but from two to five is the more usual number. The young remain with the mother for at least a year, and not unfrequently two years, and when they are in a place of security where an abundance of food is to be procured, ten or twelve Beavers dwell together.

About a month after their birth, the young first follow the mother, and accompany her in the water; they continue to suckle some time longer, although if caught at that tender age, they can be raised without any difficulty, by feeding them with tender branches of willows and other trees. Many Beavers from one to two months old are caught in traps set for old ones. The gravid female keeps aloof from the male until after the young have begun to follow her about. She resides in a separate lodge till the month of August, when the whole family once more dwell together."

ARTICLE XVI.—*Hints to the Young Botanist, regarding the collection, naming and preserving of Plants.*

The season for collecting plants in the vicinity of Montreal may be said to commence towards the latter end of April and to extend to the beginning of October. But few plants will reward the early excursions of the botanist, who will measure their value and interest proportionally. Immediately on the melting of the snow, appear the *Hepatica triloba,* with its purplish-white flowers, the

Sanguinaria Canadensis, with its palmate-lobed leaf and rich white flower, and the delicate *Claytonia*, with its pretty rose-colored Corolla, and the discovery of even one of these floral pioneers in early spring, gives as much gratification to the mind of the excursionist, as the richer and more luxuriant collections of midsummer. The Composite plants of August and September, the waving Grasses, the Ferns with their handsome fronds, and the delicate tufted Mosses adorn the autumnal season, whose close is marked by the bright and picturesque tints of leaves that once were green. The varieties of flowers characteristic of spring, summer and autumn, form a pleasing contrast to the mind, and this circumstance alone stimulates the enthusiasm of the botanist to continue his researches sedulously in the field till plants be no more.

The young botanist, who commences the collection and preserving of plants, should determine to prosecute his labours with zeal and assiduity. Without this ennobling spirit, he will ere long find what he at first considered a pleasure, to become an arduous task, fruitful of no enjoyment. His excursions to the country should be frequent, and as varied as possible; visiting mountain, hill, field, forest, valley, marsh, island, river and lake-shores. He should make a point, also, of collecting and preserving specimens of every plant that crosses his path, in order to render his herbarium a complete one. He can adopt no better plan at the beginning than to confine himself to a certain well-defined district, and to collect all the plants within it. When his herbarium of the district is complete, it will be of greater value than a larger but more scattered collection, and should opportunity permit, he can readily extend his researches over a wider range of country. To a resident in Montreal, its Mountain, so rich in plants and so near at hand, affords facilities for the formation of a beautiful herbarium of no small size, or the Island itself, if botanized throughout its whole extent, will furnish a characteristic collection of plants, many of them to be found within an extended range of latitude and longitude on either side. To relieve the monotony of a botanical excursion, it is advisable to be accompanied by one or more companions, who, besides affording pleasant society, will often be more fortunate in finding plants, and none more willing to favor another with duplicate specimens.

On starting upon a botanical excursion, it is requisite to be equipped with convenient apparatus for collecting and carrying plants. The following may be mentioned among the instruments most required:

1. A good *stout pocket-spud* or *digger*, made of steel, and furnished with a slightly curved wooden handle, pierced to allow a string to pass through, whereby it may be attached to a strap or belt round the waist. It will often be found useful in digging out roots and detaching plants from the crevices of rocks. If it be not obtained, a very good substitute is a *strong broad knife*, which may be sharp on both edges, and introduced into a leather sheath made for the purpose. It will also serve to cut the branches of shrubs and trees.

2. A *Vasculum* or *Tin Box*, for the purpose of carrying plants. This should be of sufficient dimensions to hold full sized specimens. A proper sized vasculum should be from 17 to 20 inches long, 7 to 9 inches wide and about 5 inches deep, and convex on the sides, so as to give more room within. The lid should be of large size and well secured against accidental opening. Two loops may be placed on the lower surface to receive a strap, by means of which the box may be carried on the back or side. A vasculum of smaller size may also be carried for the purpose of receiving more delicate plants, Ferns, Mosses, &c.

3. A Botanical *Field Book* will always be found convenient to preserve plants with very delicate flowers or leaves. It consists of two boards, between which is placed a quantity of absorbent paper in folded sheets, forming from twelve to twenty-four layers. The plants are carefully placed between these layers of paper, and subjected to immediate pressure by means of leather straps attached to the boards. The field Book may be made of any size to suit the fancy of collector. An ordinary portfolio containing bibulous paper will answer equally well, provided a uniform pressure can be applied to the plants.

4. A *Pocket Lens* or small magnifying glass will sometimes be of use in examining the fruit of Ferns, Mosses, &c., as well as the very delicate fresh-water *Algæ* and microscopic *Fungi*. It should therefore be in every botanical traveller's pocket.

In collecting botanical specimens, it should be made a rule, that, as far as practicable, the entire plant should be taken with its root, stem, leaves and flowers. The specimen cannot be said to be perfect without the fruit and seed; hence, should these not be obtained when the plant is in full flower, they can be gathered at a later season. If the plant be too large to be taken entire, it will suffice to possess a flowering branch, the fruit and some well formed leaves. In this case, the collector should observe the

characters of the parts not taken, as the bark, roots, &c., and also notice the form and size of the plant, more especially if it be a shrub or tree. Another point to be attended to is the collection of more than one specimen of each species, which, after drying, will enable the botanist to make choice of the finest specimen for his herbarium and give him the advantage of having duplicates for exchange with other botanical collectors. As soon as gathered, the plants are to be carefully placed in the vasculum in such a way as to prevent injury to the flower and crushing of the leaves. If small and very delicate, and more especially, if the flower be tender and deciduous, they should be immediately pressed between the layers of bibulous paper in the Field Book or Portfolio, care being taken to arrange the parts so as to preserve the natural habit and appearance of the whole plant. Some plants may be gathered from different localities and any variations observed are to be noticed. Should this be done over extensive districts, the geographical range of distribution will in many instances be ascertained and will constitute a valuable desideratum in this country. Monstrosities, which are interesting in a morphological point of view, should likewise be preserved and the circumstances in which they were found, mentioned. In an excursion, notes may be taken of the general features of the country, scenery, &c., as these will be of much value for subsequent reference.

On returning from a botanical travel, it should be the object of the collector to name all the plants he has gathered and subject them to pressure immediately. It is much more easy to examine the characters of a plant when it is fresh, and the flower can be more readily dissected for the purpose of ascertaining the relations and dispositions of its parts, which are always referred to in botanical descriptions. We shall allude to the mode whereby the names of plants may be easily arrived at; but as this will require some general explanations regarding their natural classification, we shall leave the subject till our collection of plants is safely under pressure.

For the purpose of drying plants, it is necessary to have the following apparatus:—

I. *Absorbent Paper*, of good texture, and large size—say 18 inches long by 11 broad. This will answer all ordinary plants, but in the case where the flowers or leaves are delicate and cannot easily be transferred, it is advisable to place them first within a sheet of thin crown tea paper or fine blotting paper, from which

they are not to be removed till the second or third changing. There should always be a sufficient quantity of absorbent paper at hand for placing the plants newly collected, and for changing older collections in process of drying. As soon as the wet paper is removed, it should be hung up or spread out to dry, so as to be ready for use when required.

II. *Boards.* These are intended to be placed at certain intervals between the absorbent paper, say at a distance of two inches, in order to preserve a uniform pressure. They should be of the same size as the paper, and about $\frac{1}{8}$ of an inch in thickness. There should also be two boards, $\frac{3}{4}$ of an inch thick, to serve as strong outside boards—one underneath, the other above. Sheets of firm past-board are sometimes convenient for separating plants with stout woody stems from the more delicate ones, and thus preventing injury. They are also useful for packing up collections of dried plants temporarily.

III. A *Lens*, a small *Knife* or *Scissors*, and an ordinary *pair of Forceps*, should always be on the table for use when required. A sufficient number of small slips of paper should be cut for the purpose of writing down the Name of each plant, the Order to which it belongs, its Habitat or place where found, the Date of gathering, and any other remarks that may be considered worthy of notice—more especially in relation to deviations in form, size, locality of growth, &c., &c. These slips or labels should be placed beside the plants to which they refer.

IV. *Weights* are required to apply pressure to the plants after being arranged in the paper. If there be but one weight, it shou'd be placed exactly upon the centre of the upper outside board, and should not be less than 100 pounds. It is preferable to have two or three different weights, so as to vary the amount of pressure from 60 to 120 pounds, according to the wet or dry state of the plants—those having been pressed for a week or so and more or less dry, not requiring so heavy a weight as previously. Some Botanists use screw-presses by which they are enabled to regulate the amount of pressure according to circumstances, but they are far from being so convenient as the ordinary weights.

Being thus furnished with the necessary apparatus, the collector adopts the following mode of pressing the plants and preparing them for the herbarium. One of the outside boards is placed upon the table immediately in front of him, and over it two sheets of absorbent paper. Upon this he spreads out one or more speci-

mens according to their size, and arranges the parts in such a manner as to preserve as much as possible the natural habit and appearance of the whole plant. Should the plant be too large for the paper, it is to be folded upon itself and the flexure may be retained by passing it through a slip of paper, slit half an inch more or less for the purpose. The label containing the name, &c., of the plant is then to be placed with it, and the whole is to be covered by four or six sheets of paper. In doing this gradually from below upwards, care should be taken that every part of the plant be well spread out. The right hand will effect this easily, with the assistance of the knife or forceps, if required. The next specimen or set is to be arranged upon this in the same way, and a similar number of sheets laid over it, repeating the process till it is thought necessary to insert a thin board in order to preserve uniform pressure. Other parcels of paper and specimens are arranged in like manner above it, and so on, till all the plants are prepared, when the second outside board is to be placed on the top, the whole removed to a safe corner and the necessary weight, as formerly mentioned, applied. The plants are to be transferred from wet to dry paper with the utmost care, using both hands and the forceps, when necessary. The first changing should be within twelve hours, and the second likewise after the first, as a general rule. For the following five or six days, a change every twenty-four hours will suffice, after which the interval may be extended more or less. A pressure of ten or fourteen days will effect the drying of most plants, and such as are properly dried should be removed and the remainder continued under pressure. Some succulent plants are very tenacious of life and will sprout even under great pressure. To prevent this, they must be immersed in boiling water for six or eight minutes, then dried with a towel and put between a double quantity of paper. The great point in drying plants is to effect the object as rapidly as possible, for then they are most likely to retain their natural appearance and colour.

A few other special directions, which have been omitted, may be mentioned here. For example, roots should be well washed and dried or otherwise cleaned before putting the plant in paper; bulbs, if large, should be slit in half or partially scooped out; large dry fruits may be wrapped in paper with the name of the plant to which they belong, and afterwards placed with them in the herbarium while large succulent fruits may be preserved in

wide-mouthed, glass-stoppered bottles, containing alcohol, or a strong solution of salt and water, or pyroligneous acid diluted with little more than one-half of water. It is likewise advisable to preserve seeds in separate parcels of paper, to prevent their being scattered or lost. As soon as the specimens are thoroughly dried, they should be removed and either prepared at once for the herbarium, or placed in sheets of smooth thin paper, with name, &c., and temporarily stowed away, till a more convenient time permit their proper arrangement. The Botanist should make choice of the best and most perfect specimens for his own herbarium, and the remaining plants should always be carefully preserved for the purposes of exchanges, donations, &c. He will be frequently called upon by other collectors, and his botanical generosity will always prove as much a source of gratification to himself as to the recipient of his favors. Nor is it a lost gift, as ere long he is doubly paid by the bounty of him whom he once befriended.

In forming a herbarium, it is necessary to place the plants either in stiff portfolios or volumes, which may be numbered, or in wooden cases or boxes, say 4 inches deep, with a double lid, one on the top and the other on the front side. If the collection, however, is likely to become large, it is preferable to get a cabinet made specially for the purpose, having folding doors and containing sliding drawers or trays, whose measurement should be as follows: length 19 inches, breadth 11½ inches, and depth 4 inches. The trays may number twenty or twenty-four, disposed in two rows, but the size of the cabinet depends on the collector himself who is better able to judge of his requirements.

Having wherein to place his plants, he now prepares them finally for preservation. For this purpose, he must have a quantity of good thick white paper, cut in single sheets, and measuring 17 inches in length and 10½ inches in width.* In all herbaria, the plants should be fastened to the paper by white thread or, what is better, by means of thin fine glue, or a solution of gum Arabic and gum Tragacanth in a sufficiency of water. The mode of procedure is as follows: The operator places a sheet of paper in front of him and lays the plant to be fastened to it upon a newspaper on his left side, with its upper surface undermost. The glue is then applied carefully to its under surface by means of a

* The best paper of the kind is that sold by Messrs. Weir & Dunn, of this city, under the name of B. Laid Medium 34 lbs, flat (Mill 60.)

camel's hair pencil, immediately after which, the plant is to be lifted and turned by the fingers or forceps and transferred to the sheet of paper upon which the root, stem, leaves and flowers are to be slightly pressed. Two or even three specimens of the same species may be placed on the sheet, provided there be sufficient room. The name of the plant is then to be neatly written at the bottom of the sheet, generally on the right hand side, with its locality or habitat, date of collecting, and other particulars if worthy of notice. As soon as this is done, the specimen is to be put under a slight and uniform pressure for an hour or two and afterwards removed to its proper place in the cabinet. The other specimens are to be prepared in the same way, and should the stems be strong and thick, they may be more firmly secured by narrow strips of gummed paper, laid transversely across. In order to preserve the specimens from the attacks of insects, they may be lightly touched with a solution of corrosive sublimate in camporated spirit, say half a drachm to the ounce.

In placing the plants in the herbarium, all the species of a genus should be put together, and each genus should be marked and separated by a single sheet of firm coloured paper of fine texture. If they be arranged according to the Natural System, which is the best mode of classification, the plants included in each order should be inserted within a sheet of larger and stiffer paper, as cartridge paper, to which the name of the order is attached so as to be readily seen when reference requires to be made to it. The Natural Orders should likewise be arranged according to an approved system. The only other points of importance regarding the herbarium are, that it should be well secured under lock and key and put in a safe and dry place, and the trays subjected to an occasional airing to prevent the adhering of moisture to the paper, and thus preserving the specimens from becoming mouldy.

We now offer a few remarks in reference to the naming of plants. This may be either a task of some difficulty or one of great ease to the young botanist, according to his knowledge of the structure and anatomy of the various parts of plants, and the means he may adopt to discover their names. If previously unacquainted with botanical science, he should gradually make himself familiar with the plant, more especially the flower and the different forms of roots and leaves—the various terms applied being studied through means of a glossary. The flower requires special attention, because it may be said to form the basis of clas-

sification, and is constantly referred to in the descriptions of plants. It should be studied in all its stages of development from the bud to the mature fruit. The accomplishment of this will be found easy, if the flowers of different plants be taken one after the other, and their various parts carefully dissected, so as to observe their number, form, position, and the relations they bear to each other.

We have not space here to enter into the details of naming and classifying plants, and we consider it in a great measure unnecessary, inasmuch as we can refer the student to the elaborate and very simplified directions upon the subject in "*Gray's Lessons on Botany*," a work which cannot be too strongly recommended for general use, from the ability with which the author has succeeded in popularising the Science of Botany and rendering its study easy and interesting. It has the advantage also of containing a copious Glossary or Dictionary of Botanical Terms, to which reference can be made when required. The observations which bear upon the naming and classifying of plants will be found in Lessons XXVIII to XXXII included, extending from the 173rd to 199th page. The ample illustrations there given will, if carefully studied, impart to the young student sufficient knowledge to enable him to discover the names of other plants in like manner. It will be observed that Professor Gray adopts an Artificial Key to the Natural Orders, and it may be mentioned that this is by far the easiest method of determining the names of plants. The Artificial Key will be found at the beginning of his "Manual of the Botany of the Northern United States,"* which should be in the hands of every botanical collector in Canada, as it is the only modern work which describes the plants that grow in this Province in common with the Northern States, and of these there are a vast number.

J. B.

ARTICLE XVII.—*On the Genera of Fossil Cephalopoda occurring in Canada.* See plate II.

In a former number of this Journal (See Vol. 1, page 315,) some account was given of the Orthoceratites, and we shall here resume the subject by a general description of other groups, the remains of which either have been found or are likely to be

* Gray's "Lessons on Botany" and "Manual of Botany" may be had from B. Dawson, Bookseller, Great St. James-street, Montreal.

found in Canada. The typical form of the shell of animals of this division is a hollow cone, divided into numerous compartments by transverse partitions called septa, which are penetrated and connected together by another hollow cylinder or tube called the siphon or siphuncle. Starting with this idea we have the following modifications of the shell in the different genera:

1. *Orthoceras.*—In this genus the shell is straight, the transverse section either circular, oval or more or less triangular, and the siphon either central, marginal, or between the margin and the centre. Fig. 2, represents a short very rapidly tapering form. The species as yet discovered in this country are all long and very gradually tapering.

2. *Cyrtoceras.*—This genus is the same as the former, but is curved, and the siphuncle is in the greater number of species situated near the margin on the side of the convex curvature as shewn by the dotted line in fig. 3. It is sometimes, however, central or even near the other or concave side.

3. *Nautilus.*—Same as Cyrtoceras, but so closely coiled that the whorls are all in contact, Fig. 7. In these three genera it will be observed that the form of the aperture is the same as the tranverse section of the tube, but in the next four it is not.

4. *Gomphoceras.*—Straight, the same as Orthoceras, but with the aperture contracted in the middle so as to consist of two lobes. The position of the siphon is equally variable with Orthoceras. Fig. 1.

5. *Phragmoceras.*—Fig. 4. Same as Gomphoceras, but with the shell curved. The siphon is usually on the inside, but species have been found with it differently situated.

6. *Lituites.*—This genus has the contracted aperture of the last two; a portion of the shell is closely coiled and the remainder free and straight. Fig. 6.

7. *Gyroceras.*—Fig. 5, represents one form of this remarkable genus. The shell has no straight portion, and in some of the species it is closely coiled as in Nautilus. The siphuncle in the species as yet described is between the centre and the outside. The aperture has been detected in some species found in Bohemia, and is thus described by M. Barrande. In noticing *G. mirum*, a species whose surface is decorated with spines arranged in rows, he says: "It is not, however, on account of the ornament that I have named this species as above; but the mouth of the shell appears to me very wonderful, being neither round nor elliptical,

as in other allied forms, but half-closed by the bending back of the shell upon itself. Looking at the mouth of this shell, one might think that for half its extent it had been closed by a septum, the direction of which is symmetrical and inverse to that taken by the septum of the body chamber. On first examining these specimens, I was inclined to think that half the aperture was closed by a loosened septum; but further observations in eight or ten individuals shewed that it could not be an accidental condition, and lastly I found a specimen in which the whole circumference of the mouth could be traced with certainty. This semiclosure of the orifice of the shell in Gyroceras, appears, therefore, to be analogous to the contraction of the mouth in Pragmoceras, Gomphoceras and Lituites, above mentioned; but is peculiar in this, that it is not the lateral margins that are bent towards each other, as in these genera, but only the inner (under) margin is pressed back, (*Journal of the Geological Society, Vol.* 10, *p.* 23, *of Miscellanies.*)

8. *Trochoceras.*—Figs. 8 and 9 represent two forms of this genus, the tube is coiled with a double curve like that of a snail, and the whorls are either in contact as in Fig 8, or separate as in Fig. 9.

9. *Ascoceras.*—In this genus that portion of the shell which contains the air chambers, appears to be turned upwards, and recessed into one side of the body chambers. A small portion of it only remains at the bottom as seen at the base of Fig. 12. The siphon in specimens denuded of the shell can also be seen at the base. This genus has been recently discovered in the lower Silurian Rocks of this country, by Mr. Richardson, of the Geological Survey of Canada.

Fig. 10, is a longitudinal section of an Orthoceras with a large marginal siphuncle. The spaces marked with the letter O, are the air chambers. A A A the large chamber of habitation which according to the views of M. Barrande, the distinguished palæontologist of Bohemia, extended into the siphuncle. In the lower part of the siphuncle is a space marked B of a lighter colour. M. Barrande is of opinion that certain species of this genus secreted a calcareous matter in the siphon which at length partially filled the tube. The letters B B indicate the position of this deposit in the specimen figured which is the *Orthoceras communis* of Europe. Professor Hall considers the Orthoceratites of the Trenton limestone, with these large marginal siphons to be gene-

rically different from Orthoceras proper, and has accordingly constituted a new genus *Endoceras*, for their reception. Another genus quite common in the Black River limestone of Canada, is *Gonioceras*, (Hall.) But a single species is known (*Gonioceras anceps.*) and it is remarkable for its form, almost flat like a two edged sword. We shall give figures of this and other species in a future article.

There are many species of Orthoceras in the Silurian Rocks of Canada, not yet named, and owing to the close resemblance of some of these, and also to the fact that they generally occur in mere fragments, it is most difficult to identify them, or to decide whether they are new species or not. It will probably be many years before materials will be collected to complete this part of the Ancient Natural History of the Province, and we would therefore earnestly recommend all public Institutions in their exchanges not to part with any of their Orthoceratites, for it is only by *combining the light afforded by all the collections* that the Cephalopoda of the Silurian Rocks of Canada can be worked out. It is also very desirable that gentlemen in possession of these relics should publish short descriptions of their specimens, in one of the scientific journals of the Province. This remark applies to every other department of Natural History. In fact, there is not one single species either recent or extinct concerning which, there is not yet much to be made known. Every little fact, therefore, no matter how unimportant it may appear at the time to the observer, is to a greater or less extent of value, and should be communicated for publication.

Fig. 11, is a transverse section of the specimen represented by Fig. 10, at the line from Y to X. It shews the siphuncle with the thickness of the calacerous secretion upon the inner surface. A small Orthoceras is shewn in the siphon of Fig. 10, into which it had found its way after the death of the larger individual.

The figures have all been copied from the Bulletin of the Geological Society of France, of January, 1855.

ARTICLE XVIII.—*Notes on the Land Birds observed round Montreal during the winter of* 1856-7, *by* W. S. M. D'Urban.

The late winter having been one of a very remarkable character, whether we consider the severity of some portions, or the unusual mildness of others, I am induced to offer for insertion in the

Canadian Naturalist and Geologist, a few remarks on the Land Birds observed by me, in my ornithological rambles in the immediate neighbourhood of Montreal, from November 1st to March 31st, and which I hope may not be found altogether uninteresting.

I have mentioned three species, viz: the *Robin*, *Snow bird* and *American Shrike*, which can hardly be considered as winter residents here, but are noticed because stragglers remained for some time after the cold weather had set in. The to al number of species which wintered round Montreal exclusive of these three, is 15. The number mentioned as wintering in the neighbourhood of Toronto in a paper by G. W. Allan, Esq., published in the "Canadian Journal," for March 1853, is 24. Of these the following twelve, viz: Bald Eagle, Pigeon Hawk, Great Horned Owl, Little Horned Owl, Goldfinch, Tree Sparrow, Common Crossbill, Canada Jay, Red Bellied Nuthatch, Hairy Woodpecker, Quail, Canada Grouse, were not observed by me near Montreal during the winter months Two species which wintered here, viz: Hawk Owl and Brown-creeper, are not mentioned as occurring about Toronto. Observations extending over several years would doubtless add considerably to the number of species which pass the winter in the neighbourhood of Montreal.

In the following notes I have adhered to the nomenclature and arrangement adopted in Audubon's Synopsis of the Birds of North America.

Surnia funerea—Gmel.—Hawk Owl. I met with one of this owl November 19th, 1856. It was sitting in a tree in an open field by the side of the Mile-End Road, and though the sun was shining brightly, did not appear to be at all inconvenienced by the bright light. It was shy and restless, frequently changing its place, and often dropping down from the tree to the ground and flying up again. It flew off before I could get within shot and crossed the road in front of me. Not wishing to lose a chance, I fired, but without success, being too far off. Before I could reload, it again crossed the road and pitched in a tree near were I first saw it, and after some trouble I obtained a shot and wounded it. Although much hurt in its wing and body it flew across a field before I could secure it. I placed my gun upon it as it lay on the gound and it remained quite motionless till I attempted to kill it when it fought fiercely and struck its claws into my hand. Its flight was low and had great resemblance to that of a Hawk, for which I at first mistook it. Its stomach contained the fur of

mice. I received another specimen from Laprairie which was shot in December. On 27th February, about sunset, I saw one sitting on the top of a tree in a small wood also near Mile-End road, and was just about to fire at it, when a hare ran past me which I shot. The report of the gun frightened the Owl and it flew away and I lost sight of it. Presently, however, seeing a large flock of Crows pitched on some trees about half a mile off I went towards them and found them mobbing the Owl which was sitting motionless in the top of a very high tree. I fired at it, and though apparently struck by the shot, it took no notice beyond shaking itself and turning its head to look down at me. I then gave it another shot and it fell half way down the tree, but recovering itself flew away and disappeared behind some bushes.

Although this bird has somewhat the appearance of a Hawk, yet there is no Owl with which I am acquainted in which the formation of the breast-bone and merry thought differs so much from that which obtains amongst the Falconidæ. The *sternum* is very weak and the *forked-bone*, consists of two separate pieces, only united at their apices by a slight cartilage, I am not aware that this fact has been previously noticed by ornithologists, and I can find no mention made of it in the works of Wilson, Audubon, Richardson or Yarrel.

Surnia nyctea. Linn. Snowy Owl. I saw only one of this Owl alive during the winter. On 17th January, one of the coldest days of the season, I walked across the ice to Nun's Island, and saw a Snowy Owl sitting on an isolated branch of a tree, near the farm yard attached to the Convent. It was so very shy I could not get near it. I visited the island several times afterwards in hopes of obtaining a fair shot at it, but was always unsuccessful, and it disappeared when the mild weather set in about 6th February. When I reached the island it was invariably exactly in the same spot, looking like a lump of snow in the tree, but whenever I attempted to get within shot; it would fly off and pitch on a fence, always shifting its place as I approached. The whiteness of its plumage rendered it very difficult to be seen when flying over the snow, and one day it flew past me without my seeing it till close to me, and was out of shot before I could draw off my mit to pull the trigger. Once I tried the expedient of putting a white shirt over my clothes, unfortunately, a friend with me not made similarly invisible, frightened it off before I got within shot. It probably subsisted on the rats in the farm yard,

or perhaps on the snow buntings, large flocks of which were always feeding there. At the end of January, I was shown a specimen said to have been shot near Montreal a few days before I saw it.

Syrnium nebulosum. Linn. Barred Owl. I shot a specimen of this species on 21st January. It was sitting in a tree in a small wood on Nun's Island and was very tame and stupid. It had some animal like a small rat almost whole in its stomach and was the fattest bird I ever skinned, the entire body being covered with a thick coating of hard white fat. Another specimen was killed on St. Helen's Island in January, and several others were exposed for sale in the markets.

Certhia familiaris. Linn., Brown Creeper. This little bird was numerous on the 6th February in the woods on Nun's Island, flying from tree to tree in company with the black-capt tits and nuthatches. I shot several specimens. The weather at the time was extremely mild.

Parus atricapillus. Linn. Black cap Tit. Very numerous every where round Montreal throughout the winter.

Turdus migratorius. Linn., Robin. One shot November 6th in a swamp near Monklands. I saw a bird which I thought was a robin in December and another at the beginning of January.*

Plectrophanes nivalis. Linn., Snow Bunting. Very abundant. In January large flocks were always to be seen feeding in the farm-yard on Nun's Island. When alarmed they would fly up and pitch in a long row on the ridge of the roof of the farm buildings, alighting again as soon as the danger was past. One specimen which I shot there had its crop full of the sprouted seeds of onions or leeks, and its whole body partook of their odour. In others, shot at the same time, I found grains of wheat and some small seeds. They also feed much on the seeds of a species of Euphorbia when the snow is not too deep. Their white bodies and black wings give them a very curious and peculiar appearance when seen against a clear winter sky.

Niphœa hyemalis. Linn. Common snow-bird. This species continued abundant up to the second week in November, after which I lost sight of them.†

Linaria minor. Ray, Lesser red poll. First observed 24th November, but not numerous till beginning of February, when immense flocks appeared in the neighbourhood and continued

* Spring arrival, 13th April, 1857.

† Spring arrival, 5th April, 1857.

here till middle of April. A great number were in very handsome plumage, and some small flocks consisted entirely of males with red breasts, whilst in others, all were destitute of the red on the lower parts, but I met with flocks towards the end of the winter consisting indiscriminately of males and females. Hundreds were exposed for sale in the markets, and appeared to have been taken by means of nets or traps, as they had all been killed by crushing the skull, and none exhibited any shot marks. These large flocks fed on the seeds of the birch and alder, but principally on those of thistles, &c., not covered by the snow and must have been of great service in reducing the progeny of those noxious weeds. The Canadian farmers however, who are themselves too indolent to rid their farms of the weeds which are so injurious to their crops, for the sake of gaining a few coppers, destroy without mercy these useful and harmless birds,—the means which a wise providence has provided for checking the increase of those troublesome plants which on some of the Canadian farms threaten to entirely usurp the place of the crops.

Linaria pinus, Wils. Pine Linnet, I met with only one small flock which was feeding on an alder tree in a swamp near Mile-end Road, November 20th, 1856, and of which I shot two specimens.

Corythus enucleator, Linn, Common Pine Finch or Pine Grosbeak. The first time I observed a flock of this fine bird sufficiently close to identify, was on the 6th January, but I saw some birds at the beginning of December, which I could not distinguish, but which were very probably of this species. When I first saw them they were feeding on the berries of the Mountain Ash in company with a large flock of Waxwings as noticed in the "Canadian Naturalist and Geologist" for February, page There cannot be a greater contrast than exists in the manner of feeding and internal formation of these two birds which subsist on the same berries. The Grosbeak with its strong bill and hard muscular stomach, discards the skins of the berries, swallowing nothing but the pulp and pips or seeds, which are ground to pieces by the action of the gizzard aided by small stones which I found in all I opened. The Pips thus crushed communicate a strong odour of Prusic acid to the whole body. The pulp seems to be very easily digested as although always present in the throat and crop, I could never detect it in the true stomach. The Waxwing on the contrary having a comparatively weak bill, capacious throat,

and soft membranaceous stomach, swallows the berries whole and unbroken, and the pips pass out of its body without having undergone any change by the process of digestion and imparts no smell to the flesh, the fruity portion only being retained for the nourishment of the bird. At first sight it would appear as though the strong bill of the Pine Grosbeak was not needed in opening such soft berries as those of the Mountain Ash and Cranberry on which they principally feed in winter, but when the thermometer is many degrees below Zero the berries are frozen as hard as stones, and it must require great force to crush them. This species was most numerous at the end of February and beginning of March, when very large flocks were constantly feeding in every garden in Montreal where there were any berries to be obtained and they were extremely tame rendering it difficult to avoid blowing them to pieces by discharging the gun too close to them. I did not see any after 11th March, so I suppose they must have left about that time. These flocks consisted almost entirely of dull coloured individuals, females and young birds, and I saw but two or three old males in their handsome red plumage.

Corvus Americanus—Aud.—American Crow. Plentiful up to 10th December, only a few seen in January and beginning of February—became abundant at the end of February and extremely numerous at end of March. They subsisted on such scattered grain as they could find amongst the stubble in such fields as became bare of snow during the frequent thaws.

Garrulus cristatus—Linn.—Blue Jay. I was given a specimen shot on 25th November, near Mile-end Road. Its stomach contained a little fur and the lower incisor of a mouse. I did not see any myself during the winter months, but I am told they were common at Cote des Neiges feeding on Mountain Ash berries &c. This is not unlikely, as I am aware they winter at Sorel.

Lanius Borealis—Vieill.—Great American Shrike. I shot the first specimen of this species on 11th October, on the common near Mile end road. Its stomach was filled with the black field-crickets so abundant in this country. I met with several other examples in October and November, and the stomach of one shot on 20th November contained the fur of mice. The smaller Rodentia appear to constitute the staple article of food of a great many birds in the winter season. I saw the last Shrike on 2nd of December when the ground was covered with snow. All I saw were sitting on the topmost branch of a tree or bush. This

bird when wounded is extremely bold and fierce, giving very hard blows with its powerful bill. *

Bombycilla garrula—Vieill.—Black throated Waxwing or Bohemian chatterer. This was the most abundant bird round Montreal during the winter. From the beginning of January to the 22nd April, large flocks were constantly flying round the city frequently feeding in the gardens even in the very heart of the town. They were however much more shy than the Pine Grosbeaks, readily taking alarm, and were often difficult to approach. Comparatively only a small portion were in really handsome plumage, many specimens being entirely destitute of the waxlike prolongations of the shafts of the quill feathers and the yellow band across the wings, and having nothing but a narrow white stripe on the wing feathers. I obtained specimens showing every gradation from the bird of last year to the full plumaged male. The mature females are nearly as handsome as the males. The ovarium and eggs of an old female dissected by me on 22nd April, were still very small. They fed on the berries of the Mountain Ash and Cranberry, at first, and when these failed on the dried fruit of the common Thorn. It was a remarkable thing to see this species feeding on the same trees frequented by its almost sole congener the Cedar bird in the autumn. The one exclusively a winter visitor the other as strictly a summer bird of passage. I have not seen any more of this bird since the last heavy fall of snow on 27th April.

Sitta-Carolinensis—Linn.—White breasted Nuthatch. I shot one specimen on 19th November, and saw several in the woods on Nun's Island, on 6th February.

Picus pubescens—Linn.—Downy Woodpecker. Tolerably plentiful throughout the winter. Rather numerous in the woods at Nun's Island in January. Capt. Macdonald, A. A. G., showed me a remarkable variety which he shot there on 16th January. It was a male and had a large olive coloured patch on the wing coverts of each wing.

Tetrao umbellus—Linn. Rather numerous all through the winter on the Mountain, and in the swamps near the mile-end road. It is curious to see the tracks of this bird on the snow, round every small bush it has come to, and of which it has nipped off all the buds it could reach.

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* Spring arrival, April 13th.

Besides the above species it is very probable that several escaped observation. I received a specimen of the Gos-Hawk, Astur palmnbarius, shot near Laprairie at the end of December or beginning of January. It is not unlikely that several species of Hawks occurred here at the beginning of the winter, which I did not observe. An announcement appeared in the Montreal papers at the end of February, to the effect that a yellow bird (or Goldfinch) and a Rossignot (or Song Sparrow) had been lately seen at Cote des Nieges. What reliance is to be placed on this statement, I am unable to say. The weather at the time was so mild that it seems not improbable there may be some truth in this and other reports of the kind, which came to my knowledge. I will conclude these very rough and hasty notes by expressing the hope, that they may be the means of eliciting further and more valuable information on the birds of this and other parts of Canada, from observers with abler pens than my own, for the "Naturalist," and should such be the case, any trouble they may have cost me will be most amply repaid.

W. S. M. D'URBAN.

Montreal, 13th May, 1857.

ARTICLE XIX.—*Notes on the Bermudas and their Natural History*, with special reference to their *Marine Algæ*, by the Rev. ALEX. F. KEMP; read before the Botanical Society of Montreal.

The small group of Islands called the "Bermudas," or the "Somers Islands," make up together a "miniature Archipellago," on the western side of the Atlantic Ocean, in lat. 32° 15′ North, and long. 64° 51′ West, about 600 miles from Cape Hatteras, in North Carolina. They are alone amidst the waste of waters, as solitary sentinels at the most northerly outposts of the West Indian group. It is said that they number as many islands as there are days in the year, and perhaps were every little rock which lifts its head above the water and is adorned with a sage bush or a cedar tree to be counted, this might be true; but there are not more than from twelve to twenty islands which properly deserve to be designated as such. The four principal of these are, the Main Island, or Bermuda proper, which is about 15 miles long,

in a direction nearly S. W. and N. E, and on which Hamilton the chief Town of the Islands and the Seat of Government is situated; St. George's, about 3½ miles long, on which is a Town of the same name, Garrisons, and the head-quarters of the Military; Somerset, 3 miles, united by a bridge to the main-land; Ireland's Island, 1½ miles long. The others which are of any importance lie chiefly on the southern side of the group, at its north-eastern extremity. The whole islands are thus not more than 25 miles long by from 2 miles to a few yards, in some parts, broad. The land has the appearance from the sea of a range of low undulated hills, none of which rise to a higher elevation than 250 feet.

The geological formation of this group is somewhat peculiar. The lower strata of which it is composed, and upon which it has been built, is a hard calcareous sandstone. It is exposed chiefly on the south side of the main island at low water mark, and, in situ, it lies in an almost horizontal position. By the force of the swell which rolls in from the South, sometimes with fearful violence, large masses of this rock are torn from their beds, broken into fragments, and heaped up in distorted forms. The mass of rock superimposed upon this base is composed of what may be termed a corallinaceous sandstone of different degrees of induration and of fineness. Some parts, by reason of exposure to the atmosphere and other causes, have become extremely hard, and have resisted the action of the elements apparently for ages. This formation has a curiously twisted and irregular stratification, or rather it can scarcely be said to have any proper stratification at all. The section it is true presents us with lines of rock running through it at all angles of inclination and assuming the most fantastic appearances; but these give no sure index of the time of their deposition, but rather reveal the chemical processes by which the mass of calcareous sand has become gradually cemented and indurated. There does not appear to be any distinct evidences in any part of the islands of volcanic action or of violent disturbances of nature. All that can be said is, that there may at one time have been a subsidence of the land and a considerable denudation and erosion of its rocks, with perhaps a subsequent elevation to some extent. Land-shells of the genus Helix are found embedded in the rock now covered by the sea at high water, and there are appearances of sea beaches considerably above the present rise of the tide; but these movements have apparently been effected

during the lapse of ages, without any disturbance or fracture of the rock formations.

This land thus superimposed on the limestone rock of the Tertiary period has evidently been formed by the combined action of the sea and the wind—the sea eroding the Polypi corals, grinding their fragments into sand, and washing them up on the beach; and the strong winds which characterize the latitude of these islands drives with great force and to some distance the sands of the shore upon the higher lands. The sand thus forms great drifts, just as the snow does in our Canadian winter, and becoming cemented by some kind of chemical action, which may be witnessed in process at the present day, it gradually hardens into a granulated porous rock.

This being the general geological character of the Bermudas, it may be supposed that there will be found around their coasts numerous bays and estuaries; being also of coral origin, it may be expected that they will present more or less the appearance of the Lagoons so common to the coral islands of the Pacific. It is well known that the Polypi, or coral animals, when floating free, attach themselves to any obstruction that lies in their path, and that around this they deposit their limey secretions; and these gradually accumulating and rising in the course of unnumbered generations, take the form of a ring or belt, more or less perfect, according to the form of the obstructing rock. Most of the reefs that are yet covered with water have this appearance, and rise frequently from a great depth, like a forest of calcarous trees in the sea. According to this principle of coralline life, we find the whole group of islands partaking of this general circular character; and, including the reefs which stretch out under water a distance of about 10 miles, the whole group assumes the form of an egg-shaped oval, which again we find divided into greater and lesser circles. In the south-west there is the Great Sound, a circular basin of water, with openings narrow and intricate to the north and west, and attached to it there are several smaller basins or harbours of the same general form. To the east of this there is Harrington Sound, a beautiful sheet of water about 2 miles in breadth, forming an almost complete circle, and very deep, with but a narrow entrance on the north side—so narrow indeed as not to admit of the full rise and fall of the tide within the Sound. To the north-east of this again there are Castle Harbour and Saint George's Harbour, connected with each other by a narrow strait. These harbours have several

outlets to the north, the east, and the south; together they are about 3½ miles in diameter, and are each of them of a somewhat circular form. They are studded with innumerable islets, and the great number of shoals and reefs with which they are filled renders their navigation, as we sometimes found to our cost, a matter of some difficulty and requiring much skill. In the nooks, corners and bays formed by this extremely varied arrangement of land and water, to which the instincts and habits of the Polypi have given their peculiar and typical form, and in the salt marshes and little lakes which are formed in the valleys, we find the habitats of a great variety of most interesting Marine Fauna and Flora —a perfect paradise, in which an earnest Naturalist may luxuriate.

The climate of the Bermudas, from their position, may be termed sub-tropical. The Thermometer in winter seldom falls below 56° Fah.—on a cool evening it may fall to 52°. In the summer months it ranges from 68° to about 90°. The atmosphere is at all times very humid, and frequently disagreeably so. Spring and Autumn are most paradaisical seasons in Bermuda. The heavens, the earth and the sea then appear in their most gorgeous robes, and from the highest peak of the land, as from a noble and beautiful pedestal, they may be surveyed in every direction stretched out in all their solemn grandeur. In the flora of such a climate it may be expected that we shall find the productions of both the temperate and the tropical zones. Vegetation puts on here a decidedly Oriental garb. The beautiful fan-shaped Palmetto, the gracefully luxuriant Banana, the bright blood-red Pomegranate, the deep green umbrageous Fig, the Orange and the Lemon with their perfumed flowers and luscious fruit, the familiar Grape Vine, and the Oleander, the ornament of every garden, at once strike the eye. Besides these there are the Cedar, (Juniper Verginiana) which covers the islands with its dark ever-green foliage, and the sage bush with its tiny waxen flowers and pleasant odor—the most prolific of weeds and the plague of the farmer. There are also a great abundance of Cacti among which we have seen the magnificent night-blooming Grandiflorus. Several fine species of Acacia and the curious fruit-bearing, reticulate-branched Calabash, also the *pride of India*—a deciduous tree famous for its summer shade—the wrinkled Pawpaw and the graceful Coffee plant with its pretty flowers, all indigenous to the tropics, grow and flourish here. In the kitchen garden, melon, pumpkin, squash and cucumber vines, with tomatoes and sweet potatos, &c., grow in

great luxuriance. Of the temperate products the cereals hold an inconspicuous place. Formerly barley was much cultivated; now scarcely a patch is any where to be seen. Flour, the staple of life, is imported entirely from the United States. Formerly the chief wealth of a Bermudian planter consisted in his Cedar trees which were cared for and guarded with religious reverence. Now this kind of product is worth very little. It is only valuable for house and ship-building purposes on the islands, the export is now comparatively trifling. The result of this revolution is that the land fit for cultivation is being gradually cleared, and the potato, the onion, and Indian Corn, together with the world-famous Arrow-root, are taking the place of the Cedar, and now constitute the chief wealth of the Bermudas. There is an annual spring exportation of potatoes, tomatoes, and onions to the United States of many thousand pounds value. Under proper management, with a little more enterprise and outlay of capital, these islands might also send to the States' market large quantities of sweet and bitter oranges, figs and grapes of the best quality, peaches, and even olives; but at present little or no care is taken in the cultivation of these fruits, and as they are exposed to so many hazards from which it requires skill and care to preserve them, they are for the most part neglected.

The land Fauna of these islands is comparatively limited, there being no permanently running fresh water streams; and with the exception of rats, mice, and a few rabbits, there are no quadrupeds worth noting. The only noxious animal that is found here is the Centipede, large individuals of which are frequently seen in old and damp houses. There are moths, butterflies, fire-flies and coleoptera in great abundance. The air in summer is vocal with the voice of the Cicadae. Cockroaches, millepedes, spiders, ants, mosquitos, fleas, (Pulex iritans and P. penetrans, or the chigœ,) abound and are somewhat troublesome. The Entomologist may find here a rich field for investigation. A great variety of birds are to be met with in Bermuda. A list of eighty-three has been compiled, but most of them are but transient visitors. A few winter on the islands; the usual residents are few. With the exception of two accidental stragglers which have been seen from the eastern hemisphere, viz: The Wheatear (Saxicola Aenanthe) and the Corn Crake, (Crex Pratensis,) all the others are common to North America. The constant residents are the Sylvia sialis or Blue Bird; the Orpheus Carolinensis, or Black Bird; the Pitylus Cardinalus, or

Red Bird; the Vireo Noveboracensis, or Chick of the Village; the Corvus Americanus, or American Crow; the Gallinula Chloroporus, or Common Moorhen; the Perdix Virginianus, or Virginia Quail, nearly extinct. It was abundant formerly when barley was more cultivated, but now it is probably a bird of passage. The summer residents are, the Phæton Aetherius, or Long-tail; the Sterna Dougallii, or Roseate Tern, and the S. Anglica, or Marsh Tern. There are, besides these, a large number of autumnal and winter visitants, some of which revisit the islands in spring on their way to the north. Among these are the American Swallow and the Bank Swallow, the Snowy Owl, the Cedar Waxwing, the Sandpiper, the American Woodcock, the Black-crowned Night Heron, the great White Heron and the Green Heron, the Canada Goose, nine species of the Duck tribe, several species of Gulls, and the Thalassidroma Wilsonii or Mother Carry's Chicken. To these may be added, the Cohow, a bird of historic note in the early Chronicles of Bermuda, but now nearly extinct. A few pairs were seen some years ago, but no specimens are known to exist, and the vague descriptions of fishermen do not afford any clue by which to determine the species of this nocturnal bird.

Having said so much about the earth and the air, the sea now claims our attention as not less, if not more, prolific of life than the others. In the lower forms of life, on the line which bounds the animal and vegetable kingdoms, there are several striking examples to be found in these islands. In the class Porifera or Sponges there are several curious varieties. The most frequently met with as well as the largest, is S. fistularis. In the Polypi or lowest class of the Radiate sub-kingdom, there are innumerable examples and a great variety of species. In the Anthozoa division especially, the Hydroida, Helianthoida and Asteroida, are numerous and beautiful. These are the great Contractors by which the islands have been erected without cost or trouble to the proprietors. Night and day, with unwearied activity, many species of this class are converting the inorganic elements of the sea into "this too solid earth." The Pharoahs who built the Pyramids had not such a host as these at their command. Already they have achieved a victory over the turbulent sea, and if the world lasts as long again as it has done, they are destined largely to alter the face of nature on the seas. Their beautiful forms, their graceful movements, and their curious habits are a source of infinite delight to those who love to contemplate the wealth of

the Creator's wisdom and power. Of the class Echinodermata, there is also a large variety. We are not sure that any representatives of the ancient Encrinites have been seen in the Bermudas, but they are doubtless to be found. The Asteriadæ, or true Star fish and the Echinidæ, or sea eggs, are numerous, as well as striking in their forms, and beautiful in their colors. The Radiate Class Acalephæ or jelly fishes including the myriads of tiny Medusæ which fill the waters, are largely represented, among which may be noted the Physalia or Portuguese man-of-war. It is the delicate forms of these Medusæ that give the phosphorescent appearance to the ocean, and which makes sailing by night so like passing through a sea of fluid fire. In the sub-kingdom Articulata several families of crustaceans are very noticeable. The Cray-fish is found of a large size and is chiefly used as bait for fishing. Land and sea crabs are also numerous, of which not the least interesting are the soldier crabs. They may be seen carefully selecting empty univalve shells in which to take up their abode. They march about apparently with conscious pride, bearing these shells on their backs, and clothed in these cast off garments of a lower class of animals. In the Molusca division there is nothing very striking or peculiar in Bermuda. A large fine Pecten is much used as an article of food. Of the Vertebrata there are an infinite variety, and here as in other places this sub-kingdom is of great economical value. In spring the Greenland whale is a common visitant, and the capture of whales is a considerable business on the islands. With the whale comes the Selachii or the Sharks, and two species of Ray, the Mer-Ray and the Whip-Ray. Turtles are also found in summer. Fish is a common food of the inhabitants, and the poorer class of people seldom eat any other kind of animal food than fish. Of these they have an abundant choice. A large fish called the Grouper is caught in the summer at certain places on the coast, brought in alive, and stored in fish-ponds for future use. Another large and fine fish is called the Rock-fish; another is the Hind, not so large as the former, but beautifully ornamented over its body with bright radiating spots. There are also the Angel-fish, the Hog-fish and the Grunter, with a variety of others which are caught at different seasons and in particular localities.

We now come to note the Marine Algæ, to the collection and classification of which our leisure time, during our residence there, was chiefly devoted. In this department of botany, the waters

of the Bermudas are very rich. The coral rocks with their caverns and sinuosities afford just the shelter and other requisite conditions required for the growth and propagation of Algæ. Accordingly we find a great abundance of individuals and a wide variety of species. The storms and the currents together drive them upon the shelving part of the shores, on which during the spring, summer, and autumn months, they may be gathered in great abundance, and in a good state of preservation. Besides this, the shallow bays and estuaries, and the deep pools formed in the hollows of the rocks, afford a rich harvest to the industrious collector.

This large and interesting Class of plants has been divided into three great Sub-Classes, distinguished exclusively by their color, and not by anything peculiar in their structure or habits. These colors are,—Olivaceous (Melanosperms); Red (Rhodosperms); Grass-green (Chlorosperms.) The last is characteristic of those Algæ which are found in fresh water, and in the shallow parts of the sea along the shores, and generally above half-tide level; this color is rarely found in plants that grow at any depth. The Olivaceous are almost entirely confined to marine species, and are found chiefly between half-tide and low-water mark, and those which inhabit deep water are of a darker hue and stronger texture than the others. The Red reach their maximum in deep water, and are seldom found above low-water mark, and those which are found between tides lose much of their brilliancy, and assume purple, orange or green tints. We have thus at the two extremities *green* and *red* colors, and between them the combination of both in the Olivaceous plants.

In the arrangement of these Sub-Classes, the Melanosperms being the most highly organized in their structure and fructification, and containing also the largest individuals of the family, are placed *first* in order. The Rhodosperms standing next in these particulars, and at the same time being the most beautiful in their structure and delicate in their tissues, are placed *second*. The Chlorosperms being the most simple in their structure and exhibiting in most cases a lower form of fructification, are placed in the *third* rank.

Our space will only permit us to give a catalogue of the Algæ we found in Bermuda under these three classes, and in doing so we adopt the classification of Harvey in his Nereis Boreali-Americana, so far as this monogram reaches. The Sub-Class Chlorospermæ has not yet been published.

I. MELANOSPERMEÆ OR FUCALES.

ORDER I. Fucaceæ. This order is the most extensive among the Melanosperms, comprising 230 species, more than half of which belong to the genus Sargassum; the rest are distributed into 20 or 30 generic groups. The largest number of generic forms are found between the parallells of 30° and 40°, N. and S. In the Northern seas this order is, however, more striking than in the southern, and covers a larger surface of coast. The American genera are seven in number, of which the following representatives are found in Bermuda, viz.: Sargassum vulgare, S. bacciferum) and several species not described by Harvey); Fucus, ceranoides and F. distichus.

ORDER II.—Sporochnaceæ. Sporochnus pedunculatus, a plant with a beautiful crested stalk consisting of bissoid jointed fibres.

ORDER IV.—Dictyotaceæ. Haliseris polypodioides; Padina pavonia and P. (undescribed). Zonaria parvula and Z. lobata; Taonia atomaria or Shroedaria; Dictyota dichotoma; D. crenulata; D. ciliata; D. intricata; D. Bartayresiana; Asperococcus sinuosus.

ORDER V.—Chordariaceæ. Mesogloia vermicularis; M. virescens; M. Griffithsia.

II. RHODOSPERMEÆ OR CERAMIALES,

ORDER I.—Rhodomelaceæ. Acanthophora Thierii; Digena simplex; Polysiphonia fibrillosa; P. elongata; Bostrychia scorpioides; Dasya Mucronata; D. pediculata.

ORDER II.—Laurenciaceæ. Laurencia obtusa; L. papillosa; L. scoparia, and several varieties.

ORDER III.—Corallinaceæ. Corallina officinalis; and several undescribed.

ORDER IV.—Sphærococcideæ. Botryoglossum platycarpum; Gracilaria multipartita; G. comervoides; G. armata; G. divaricata.

ORDER V.—Gelladiaceæ. Gelidium corneum; G. abnorme; Eucheuma isiformis or Wardemania; Hypnea musciformis.

ORDER VIII.—Helminthocladeæ. Helminthora divaricata; Liagora valida; L. pulverulenta.

ORDER IX.—Wrangeliaceæ. Wrangelia penicillata.

ORDER X.—Rhodymeniaceæ. Rhodymenia palmata; R. laciniata.

ORDER XI.—Cryptonemiaceæ. Gigartina Teedii; Chondrus crispus; Chylocladia rosea; Chrysymenia Halymenioidis; Ch. uvaria; Gloiosiphonia Capillaris.

Order XII.—Spyridiaceæ. Spiridia aculeata.

Order XIII.—Ceramiaceæ. Ceramium rubrum; C. fastigiata, Calithamnion plumula; C. floccosum; C. luxurians.

III. CHLOROSPERMEÆ OR CONFERVALES.

Order I.—Siphoniaceæ. Codium Bursum; C. tomentosum; C. adhaerens; Bryopsis plumosa; B. hypnoidis.

Order II.—Confervaceæ. Cladophora pellucida; C. gracilis.

Order III.—Ulvaceæ. Enteromorpha ramulosa; Ulva latissima; U. Lactuca; U. Linza; U. (undescribed, laminate ribbon shaped, and with a sort of bifurcate termination, 6–12 inches long;) Porphyra laciniata (rare).

In this last division we have so far adopted the order given in Harvey's Manual of the British Marine Algæ, but there are several genera and species found in the Bermudas which are not described in that book, and these, too, are among the most beautiful and curious of the class, and are probably of the order Ulvaceæ; viz: Anadyomenia stellata; crisp to the touch; frond of a circular form, growing in small clusters; of a deep emerald green in the water, a gem of the sea, and of a beautiful stellate celular structure; Anadyomenia Anthrosaccia, a rare plant, consisting of a delicate cup-shaped green frond, with radiate tubular cells, set upon a calcareous stem one and a half inches long. This is the only marine plant that we know of, that assumes the appearance of a terrestrial flower. In its living state it is exceedingly beautiful.

There is also the beautiful genus Caulerpa or creeping root plants, which abound in deep pools, and on which the Turtles for the most part feed, viz., C. pilata, two varieties; C. prolifera; C. plumosa. Besides these, there are several confervoid plants in our collection which we have not been able to determine.

These are the ornaments with which the great ocean fringes the land which it embraces. These form the forests, the gardens and parterres in which the smaller fauna of the ocean delight to disport themselves and to hunt for their prey. The dark Olivaceous Fucales are many of them also iridescent and glisten in metallic lustre with the brilliant colours of the Rainbow. The Laurencia and the Dictyota form gardens in retired places of fine shrub-like fronds. The grass-green Uiva has more than the beauty of the richest velvet. The Bryopses with their delicate plumes, marginate the rocks at low tide. The clustered and branchy Eucheuma with its blood-red color, and other red

plants, add warmth to the general coloring. Thus it is that nature strives to cover with grace and beauty the otherwise nude and barren rocks of the sea.

Having said so much about the Natural History of these islands, it would be ungracious not to say something of their inhabitants. This is one of the Old World settlements. Here there were no Aborigines, excepting the insects, the crabs and the birds. The still vexed Bermoothes were supposed in Shakespeare's time to be inhabited only by "Gorgons and Hydras and Chimæras dire." Of inhabitants in these days, Bermuda generally has in its garrisons about 1000 soldiers, and in its hulks 1200 convicts; the civilians amount to about 12,000, two-thirds of whom are "colored people,"—the emancipated slaves and their descendants. The whites are for the most part a fine class of people, possessing the manners of English gentlemen; affectionate in their demeanor to strangers and hospitable to the full measure of their ability. If not remarkable for their piety they are at least religious. In morals they are not worse than like classes of people in England. Their education and intelligence are by no means behind the age. With the exception of a few lawyers, they are all engaged in commercial and agricultural pursuits, and are not devoid of enterprise or ability. The colored people here as everywhere exhibit the characteristic features of the race. Emancipated from the slavery and the tutelage of their owners, without the previous preparation of education, they have not always shown that sagacity and wisdom in the use of their liberty, and in the improvement of their condition which might be desired. The antipathy between the races is besides very strong here. Neither in churches, schools, nor in social life, do they associate together. It is however wrong, as a recent American writer asserts, to say, that emancipation is here a failure. It cannot be denied, even by the most prejudiced, that the colored people are now in a greatly better social, moral, and religious condition than they were in 1834. It is alleged that they are lazy and wont work. Some of them certainly are so; but so are some whites. If the black man does not work, neither does the white. Besides, he wont work for nothing or without a motive any more than the white. It is to us wonderful that considering the immoral influences to which the blacks were and are exposed, that they are not worse than they are. Nevertheless, we say, that they are upon the whole an industrious people. They do almost all the work that is done on the island. They

build ships and boats. They are famous fishermen, daring boatmen, and skilful pilots. They do all the loading and unloading of ships. They cultivate almost all the land, and raise ninety-nine hundredths of the potatoes, onions, tomatoes, and arrow-root, which constitute the commercial wealth of Bermuda, and these are no inconsiderable items. They have been all but excluded from any influence in the government. The Legislature were so frightened in 1834 that they raised the property franchise to an amount beyond the reach of any excepting a few of the most fortunate of the colored race. That they are somewhat ignorant we grant; but what schools have been provided for them? A few miserable things. We shall ever stand up for the blacks. Our opinion is, that had they the government of the island in their hands for five years, they would not manage legislation worse than the whites, but would unquestionably put some life into the old stagnant system of Colonial polity.

The government of the Islands is the old irresponsible form of administration, which, till within a few years, prevailed in all the British Colonial possession. There is a Governor appointed by the Crown, and a Council or Upper Chamber, whose members, eleven in number, hold office for life, and are nominated by the Colonial Office. The Parliament proper, or House of Assembly, consists of four representatives from each of the nine tribes or parishes, into which the country is divided. These members of the Legislature must be residents, and must hold property in the parishes which they represent. For the Franchise there is also required a property qualification of considerable amount for Bermuda. The judiciary is formed upon the English model, and consists of a Court of Chancery, a Court of Errors, and a Court of General Assize.

Taking the Natural History of the Bermudas as a whole, from man, the crown and top of the Vertebrata, to the tiniest of the Porifera—from the "Cedar to the Hyssop," in the domain of Flora—and from the greatest to the least striking aspects of the inorganic land and sea, we find much to love and to admire, and reasons innumerable for unbounded praise to the God who made them all.

Miscellanies.

Introduction to Cryptogamic Botany, by the Rev. M. J. Berkeley, M. A., F. L. S. With 127 Illustrations on Wood, drawn by the Author. London and New York: H. Bailliere. Price, $5. 1 vol. 8vo, pp. 604. Being Volume XII of Bailliere's Library of Standard Scientific Works.

An introductory work on the Cryptogams in the English language and at an available price, has long been wanted. Hitherto the student of these lower forms of vegetation could find no treatise to assist him excepting Dr. Lindley's *Vegetable Kingdom*, and more lately "The Micographic Dictionary," neither of which were special treatises, nor calculated to fill his necessities. No one was more competent to supply the want than the author of the work before us, who has devoted a good part of his life to the study of these organisms, and has in them earned a world-wide reputation among botanists. That the nature of the work may be the better understood, we extract the following from the preface, and give a summary of its contents:

"It remains only to state that the work is not intended nor calculated for persons who have not already some general knowledge of Botany. At the same time, it is believed, unless the Author has entirely failed in his attempt, that there is no part which is not intelligible to any one who has made himself master of Dr. Lindley's or Dr. Balfour's Introductions to the Study of Botany."

A concise and able introduction occupies the first 70 pages; we have only room for the following extract from it, to which we invite the attention of our microscopic readers:

"I shall not dwell upon the extreme and manifold interest of the several objects which come within the view of the Cryptogamist. If variety and delicacy of structure, beauty of form and colour, and the nicest transitions from group to group, from genus to genus, besides a host of curious questions of physiology and adaptation of means to particular ends, are worthy to engage attention, Cryptogams most surely will not be amongst the most

unprofitable objects of study. There will be scope, too, for the acutest powers of thought and observation, unless he is content merely to skim the surface of things. Even independently of the necessity of using optical instruments, a point very much exaggerated, for if the minuter points of physiology in Phenogams are deeply studied, no less an amplifying power is necessary, and perhaps even greater tact and skill in manipulation, the difficulties which arise from the wide limits within which not merely species but accredited genera are capable of varying, are sufficient to exercise the highest mental qualifications. It does not follow, however, that the end obtained should be at all proportional to the necessary labour. The objects which the accomplished Cryptogamist has in view are not comprised within the mere determination of species, or the admiration of the exquisite forms and combination which meet him at every turn. If he aims at nothing higher than the first, he may indeed be useful in his generation, provided he be cautious enough, and possessed of sufficient self-denial to prevent his striving to glorify himself, rather than to clear the road for investigators of higher pretensions. If beauty of form and singularity of structure be alone his object, his time may be passed agreeably enough; but in most cases, like ten thousand microscopists of the present day, he will be but a mere trifler, without any better aim than innocent amusement; or, if he be a dabbler in science, with some wish to attain reputation which he has not the patience to seek after by a continued course of study and mental discipline, he will be deriving general inferences from isolated, half-understood facts to the detriment and confusion of real science. Perhaps of all literary dissipation, the desultory observations of the mere microscopist are the most delusive. And even where the objects are higher, it is well that every one whose attention is much directed to this greatly abused instrument, should remember that if he wishes to penetrate the secrets of nature, he must look beyond his microscopist,—a fact of which some microscopists of considerable reputation do not seem at all aware. The paramount importance of the subject is to be seen in far different matters."

The author divides Cryptogamic plants into two great classes, THALLOGENS AND ACROGENS, described and sub-divided as follows:

Class I.—Thallogens.—Seldom herbaceous or provided with foliaceous appendages, * * * * Spermatozoids not spiral.—Comprises

Alliance I. Algales, (*Sea-weeds.*)—Deriving nutriment from the water in which they are submerged.—Occupying 150 pages.

Alliance II. Mycetales.—Deriving nutriment from the matrix or the surrounding air; mycelium more or less evident.—Subdivided into

1. Fungales (*Fungi*). Occupying 137 pages.
2. Lichenales (*Lichens*). Occupying 57 pages.

Class II.—Acrogens.—Mostly herbaceous, and provided with foliaceous appendages. * * * * Spermatozoids spiral.—Comprises

Alliance III. Characeales (*Charas*)—Spores solitary.—A small order containing but three genera. Occupying 5 pages.

Alliance IV. Muscales (*Liverworts and Mosses*).—Spores numerous, giving rise to a plant which produces one or more successive of fructifying archegonia.—Occupying 70 pages.

Alliance V. Filicales (*Ferns and Allied Plants*).—Spores numerous, producing a prothallus which bears a single set of archegonia, which yield fructifying plants.) Occupying 57 pages.

The absence of a synoptical table of contents, and of a running title to the right-hand page, is in some measure compensated for by the unusually full index at the end of the volume, where the reader will also find a valuable classified catalogue of the most note-worthy works relating to Cryptogamic Botany.

The Publisher has done his part to make the book valuable; the printing being good, the type clear, and the engravings though scant in numbers sparse—well executed. The paper of our copy is, however, uneven; the first half of the volume being of much better quality than the remainder.

A Scientific Exploring Expedition, consisting of three or four persons, is about to proceed, under the sanction of the government, through the Western portion of British America. It is intended that the party should proceed from Lake Superior to Lake Winnipeg, and from thence through the country lying between the northern branch of the Saskatcharan and the boundary of the United States. The government is desirous of making the Expedition as scientifically useful as possible; and with this view, the assistence and counsel of the Royal Society have been solicited. The Council has appointed a Committee to act in the matter, and a report has been drawn up. The Expedition is to be commanded by Mr. John Palliser.—*Athenæum*, April 25.

Memoir of John Dalton, and history of the Atomic Theory up to his time; by Robt. Angus Smith, Ph. D.F.C.S. (Published also as vol. xiii, New series, of the Memoirs of the Literary and Philosophical Society of Manchester.) 298 pp. 8vo. London, 1856, H. Baillière.—In the life of a philosopher or the history of a principle in philosophy, when either is faithfully executed, there is profound instruction. They not only teach us methods of research, but illustrate its true spirit and aim, and the secret of its strength. The young student will search the world over, unsuccessfully perhaps, for a subject for investigation. The philosopher finds a subject in the most familiar phenomena about him, and by steady scrutinizing labor, draws forth facts and principles of fundamental value. The history of Dalton and his atomic theory has for this reason as well as others a special value to the student in science. The work of Dr. Smith has a peculiar merit, from its bringing out Dalton's theory of atoms in its true relations to the speculations of former centuries. He treats briefly of the views on atoms among the ancient Greeks, and thence traces the subject through the period of Alchemy and the earliest beginning of Chemistry to the development of Dalton himself when the mathematical basis of this science and its simple system of numbers were first made clear. A fine portrait of Dalton forms a frontispiece to the volume.—"*Silliman's Journal.*"

Electric Illumination.—A few weeks since, some experiments on electric illumination were made at Paris, surpassing all that had before been done. The success was due to an electric regulator invented by MM. Lacassagne and Thiers, called by them an *electro-metric* repeator. It is complicated in structure and cannot well be described here. The inventors placed four of their electric lamps on the platform of the Arc de Triomphe de l'Etoile, and projected the light one day on the Champs Elysées, towards the Place de la Concorde, and a second on the avenues of Neuilly or de l'Impératrice, the change having been made because of the numerous gas lights of the Champs Elysées. These gas lights were made to look dull and smoky, yet diminished the effect of the electric light; but in the avenues of l'Impératrice the light presented intense brilliancy.

Each lamp was sustained by means of sixty of Bunsen's pairs, and furnished with a spherical reflector of metal, or of glass silvered by a battery in the manner described beyond.

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.

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.			Mean Velocity in Miles per hour.			Amount of Rain in inches.	Amount of Snow 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.			6 a. m.	2 p. m.	10 p. m.
29·581	29·635	29·721	7·9	29°1	12°3	·063	·105	·078	·84	·82	·90	W. S. W.	W. by S.	W. by S.	19·85	13·28	5·02	.....	.....	C. C. Str. 5.	Cir. Str. 10.	C. Str. 10.
716	717	923	6°5	14°3	— 1°5	·059	·076	·040	·90	·84	·83	W. by S.	N. W.	N. W.	12·22	6·82	1·09	.....	.....	C. Str. 8.	" " 4.	Clear.
30·229	30·213	30·069	— 4°3	13°9	6°2	·138	·083	·057	·84	·64	·79	W. N. W.	S. by W.	S. E. by E.	6·13	0·38	2·22	.....	Inapp.	Light Cirri. 2,	Clear.	C. Str. 10.
29·729	146	214	6°7	24°2	12°5	·059	·115	·083	·90	·76	·82	N. E.	N. E. by E.	N. by E.	8·81	0·40	2·23	.....	0·41	Snow.	Snow.	C. " 10.
30·289	079	29·860	9°1	14°3	2°5	·082	·191	·147	·83	·87	·90	E. by N.	N. E. by E.	N. E. by E.	12·51	9·37	2·62	.....	1·70	C. Str. 10.	Snow.	Rain.
29·961	986	30·033	27·6	45·5	— 35·1	·144	·303	·186	·83	·89	·84	S. by W.	N. W.	E. by W.	6·06	1·22	0·30	0·140	.....	" 8.	C. C. Str. 9.	C. C. Str. 6. Lunar Halo.
916	915	29·885	33·4	50·8	40·9	·169	·337	·252	·82	·87	·92	S. S. E.	S. E. by S.	S. E.	2·62	13·63	8·16	.....	.....	C. C. Str. 8.	C. Str. 4.	" 6.
616	935	910	39·1	45·1	30·9	·224	·282	·171	·89	·87	·89	S. E.	S. W.	W. by S.	17·53	10·93	17·55	0.890	Inapp.	" " 6.	Str. 10.	C. C. Str. 4.
30·255	30·309	30·345	7·0	13·6	10·1	·061	·074	·066	·88	·83	·87	N. W.	W. N. W.	S.	17·06	7·30	3·41	.....	.....	Clear.	Clear.	Clear Zodiacal Light.
29·881	29·892	30·388	9·6	20·0	— 7·5	·067	·103	·026	·90	·87	·86	S. S. E.	W. by W.	W. by N.	10·31	9·53	4·83	.....	0·05	C. Str. 10.	Str. 6.	" " "
30·486	30·455	603	— 11·9	— 5.0	— 11·9	·021	·031	·021	·75	·82	·73	W. N. W.	W.	W. N. W.	2·70	8·60	9·91	.....	.....	Clear.	Light Cirri. 4	" " "
762	569	439	— 19·9	11.7	2·1	·016	·168	·042	·80	·82	·84	E. N. E.	S. E.	N. E. by E.	1·32	5·80	4·80	.....	.....	Clear.	C. C. Str. 6.	" " "
29·825	29·713	29·941	11·1	38·4	33·6	·101	·207	·196	·96	·87	·91	S. S. E.	S. W.	W. by N.	12·63	6·35	13·17	.....	Inapp.	C. Str. 10.	Snow.	C. Str. 10.
358	297	856	12·0	17·3	11·7	·081	·084	·066	·84	·73	·76	E. N. E.	N. E. by E.	N. E. by E.	14·32	6 53	8 63	.....	.....	C. C. Str. 2.	C. C. Str. 4.	" " 4.
725	795	863	38·0	46·1	36·4	·217	·282	·200	·90	·86	·90	S. W. by W.	S. W. by W.	E. N. E.	8·60	1·35	0·01	0·040	.....	Cir. Str. 10.	C. Str. 10.	Fog.
750	779	785	34·5	35·5	35·5	·203	·210	·187	·91	·90	·89	N. E. by E.	N. E. by E.	N. E.	0·63	1·50	0·22	0·959	.....	Rain.	" 10.	Rain.
855	615	597	32·5	36·7	31·5	·182	·218	·182	·91	·90	·91	S. S. W.	N. E. by E.	W. by W.	1·01	0·01	0·01	0·047	.....	Cir. Str. 4.	Fog.	Rain.
780	862	983	30·0	36·0	27·8	·171	·199	·144	·90	·87	·88	W. by N.	N. E. by N.	N. E. by E.	3·00	4·90	4·65	.....	.....	" " 10.	C. 2.	C. Str. 10.
905	956	30·185	17·4	24·0	15·6	·106	·14	·098	·87	·80	·88	N. E. by E.	N. E.	N. E. by E.	31·72	15·75	5·33	.....	2·60	Snow.	C. C. Str. 8.	Clear Zodiacal Light.
30·202	30·030	29·808	4·8	26·8	17·0	·051	·104	·096	·85	·74	·83	N. E.	N. E. by E.	N. E. by E.	17·80	10·20	8·37	.....	.....	Clear.	C. Str. 10.	Snow.
29·537	29·504	29·902	15·9	28·4	23·6	·089	·161	·144	·78	·89	·90	N. E. by E.	W. by N.	S. W.	1·47	8·70	9·70	.....	8·45	Snow.	" " 10.	Clear Zodiacal Light.
883	782	752	24·4	41·0	33·0	·123	·240	·187	·79	·87	·90	S. W. by W.	S. W. by N.	S. W. by W.	5·87	6·81	12·08	.....	.....	C. C. Str. 4.	" " 10.	C. Str. 10.
695	562	757	29·9	42·0	33·5	·152	·225	·195	·82	·79	·91	S. W. by N.	S. W. by W.	S. W. by W.	14·99	9·01	0·62	.....	.....	Cum. Str. 10.	" " 10.	" " 10.
740	588	317	35·0	50·0	40·5	·199	·304	·227	·89	·80	·85	S. S. E.	S.	S. W. by N.	1·98	0·01	0·20	Inapp.	.....	" " 2.	Rain.	Rain.
370	434	697	41·6	42·9	30·1	·243	·233	·109	·85	·79	·86	W. S. W.	W. S. W.	S. W. by N.	2·561	15·82	18·00	.....	.....	" " 4.	C. Str. 6.	Clear Zodiacal Light.
958	30·114	30·257	13·5	12·1	5·7	·075	·070	·058	·80	·73	·89	N. W.	N. W.	N. W.	2·407	11·33	18·70	.....	.....	Str. 4.	Clear.	Clear Aurora Borealis.
30·255	001	29·764	— 1·0	16·5	12·3	·043	·096	·083	·87	·83	·83	N. E. by N.	S. W. by S.	S. E. by E.	18·70	11·87	1·36	.....	.....	Clear.	Clear.	C. C. Str. 10.
378	374	29·541	9·4	22·5	9·6	·079	·115	·079	·88	·82	·99	S. W.	W. by N.	N. W. by W.	6·70	15·70	10·02	.....	1·80	Cum. Str. 10.	Cum. Str. 4.	Cum. Str. 4.

REPORT FOR THE MONTH OF MARCH, 1857.

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.			6 a. m.	2 p. m.	10 p. m.
29·496	29·570	29·654	4°4	23°1	9°0	·051	·095	·067	·86	·84	·90	S. E.	S. E.	N. E. by E.	0·63	1·86	1·56	.....	.....	Cum. Str. 4.	Cum. Str. 10. Solar Halo.	Clear Aurora Borealis.
801	837	883	2°0	17°0	6°8	·046	·089	·052	·83	·85	·80	N. N. E.	N. E. by E.	N. N. W.	13·02	8·12	8·80	.....	.....	C. C. Str. 4.	Clear.	Clear.
827	791	685	— 3°0	16°0	16°7	·041	·084	·090	·91	·84	·90	W. S. W.	W.	S. W.	7·10	2·33	7·90	.....	.....	Clear.	Clear.	C. C. Str. 10.
717	749	857	1·3	26·4	22·8	·121	·119	·112	·91	·71	·77	S. by W.	S. by W.	S. by W.	4·77	0·33	1·51	.....	Inapp.	Snow.	C. C. Str. 4.	Cum. Str. 10.
891	716	650	10·0	39·0	33 7	·079	·214	·179	·88	·84	·85	E. by N.	S. S. E.	S. S. E.	1·02	7·03	13·60	.....	.....	Hoar Frost.	Cum. Str. 10.	" 10.
270	610	377	31·1	25·2	14·1	·171	·112	·066	·89	·70	·76	S. S. E.	W. N. W.	W. by N.	0·11	13·07	14·25	.....	2·94	Snow.	Snow.	C. C. Str. 4.
562	829	932	2·0	20·1	2·1	·042	·114	·042	·76	·74	·76	W.	W. by N.	W. S. W.	20·60	19·93	7·22	.....	.....	Cum. Str. 10.	Cirr. 2.	Clear.
30·188	30·160	30·120	— 5·0	19·5	5·7	·031	·103	·058	·82	·81	·87	W. by S.	S. W.	S.	0·46	2·36	1·42	.....	.....	Clear.	Clear.	Clear.
29·894	29·550	29·412	5·0	28·0	23·6	·053	·135	·135	·89	·82	·90	N. E. by E.	S. by E.	S. by E.	3·31	5·42	9·31	.....	4·72	Cum. Str. 10.	Cum. Str. 10.	Snow.
629	946	860	6·2	25·1	1·3	·058	·147	·041	·92	·90	·83	W. N. W.	W.	W.	16·73	10·11	14·00	.....	.....	" " 4.	Clear.	Clear.
945	912	802	— 11·4	23·7	6·2	·021	·118	·053	·80	·87	·88	N. E. N.	E. by E.	E. N. E.	0·37	1·51	1·48	.....	.....	C. C. Str. 2.	C. C. Str. 6.	C. C. Str. 6.
809	879	30·123	0·0	17·5	— 1·0	·037	·083	·038	·73	·85	·83	W.	N. W. by W.	S. S. E.	5·76	8·51	12·03	.....	.....	Cirr. Str. 8.	Cum. Str. 10.	Clear.
30·105	30·049	29·878	— 6·0	33·0	15·6	·031	·187	·078	·81	·90	·88	S. W.	S. W.	S.	9·12	11·77	3·71	.....	.....	Clear.	C. C. Str. 8.	Clear Zodiacal Light.
29·641	29·610	715	12·3	37·0	25·1	·073	·199	·123	·78	·83	·80	W. by S.	W. N. W.	N. W. by W.	2·83	7·00	11·17	.....	.....	Clear.	C. Str. 10.	" " "
910	904	897	8·7	38·9	25·0	·059	·214	·093	·88	·84	·70	S. W. by S.	S. W.	S. by W.	0·99	6·99	2·08	.....	.....	Clear.	Clear.	" " "
762	688	642	2·3	36·1	30·1	·108	·210	·169	·77	·91	·86	E.	E. by N.	N.	0·00	2·26	1·15	.....	.....	C. C. Str. 10.	Sleet.	C. Str. 10.
667	805	937	23·0	36·6	26·0	·152	·199	·118	·85	·83	·73	W.	W. by W.	N. E. by N.	8·61	10·92	1·47	.....	0·61	C. Str. 10.	C. Str. 6.	Clear Aurora Borealis.
891	585	646	15·9	33·2	32·3	·081	·187	·187	·74	·90	·86	E. by N.	N. E. by E.	E. by N.	6·60	11·02	0·10	Inapp.	0·34	" 8.	Rain.	C. Str. 10.
535	836	243	30·4	33·4	27·1	·182	·187	·137	·91	·90	·82	N. E. by E.	N. E. by E.	N. E. by E.	13·00	44·36	40·00	0·726	.....	" 10.	C. Str. 10.	" 10.
390	561	610	27·2	32·1	24·1	·146	·191	·108	·88	·85	·80	N. E. by E.	N. E. by E.	N. E. by E.	26·10	3·46	1·06	.....	2·46	" 10.	" 10.	" 4.
680	614	750	19·0	26·7	25·5	·110	·129	·129	·83	·80	·82	N. E. by E.	N. E. by E.	W. by S.	2·36	2·81	17·78	.....	4·74	" 8.	Snow.	Snow.
30·100	30·186	30·241	20·1	43·5	29·2	·089	·252	·152	·70	·85	·85	W. by S.	E. S. E.	E. by S.	11·03	0·21	0·85	.....	.....	Clear.	Light Cirr. 3.	Clear Aurora Borealis.
29·993	29·794	29·749	22·0	31·6	32·9	·115	·186	·178	·82	·83	·86	N. E. by E.	S. E.	W. by N.	4·14	8·63	8·26	.....	.....	C. Str. 10.	Sleet.	C. Str. 10.
724	646	546	34·7	48·6	36·2	·186	·261	·210	·83	·74	·91	W. S. W.	S. by E.	S. W. by S.	2·17	2·20	1·82	Inapp.	.....	" 10.	Cum. Str. 10.	" 10. Rain.
490	4·3	521	32·7	34·7	29·5	·189	·178	·160	·92	·83	·86	W. by N.	W. by N.	W. by N.	3·56	13·55	14·30	.....	1·20	" 5.	" 8.	Snow.
546	596	671	28·1	39·0	33·2	·135	·214	·170	·78	·84	·85	W. by N.	W. S. W.	W. by N.	8·01	11·80	9·05	.....	.....	" 8.	" 4.	Cum. Str. 4.
614	599	651	30·7	41·8	35·0	·152	·217	·191	·79	·90	·85	W. S. W.	S. W. by W.	W. by N.	12·42	8·78	8·73	.....	Inapp.	Snow.	" 8.	" 10.
637	649	687	32·9	41·1	35·3	·178	·191	·170	·86	·70	·76	W. S. W.	W. by N.	W. by N.	6·42	3·70	9·13	.....	.....	Cirr. Str. 9.	" 8.	" 8.
731	740	812	34·3	46·9	36·6	·191	·234	·192	·85	·69	·83	E. by N.	S. S. W.	S. E. by E.	10·28	1·77	0·10	.....	.....	" 8.	" 2.	" 7.
890	914	938	29·9	47·1	36·3	·160	·252	·192	·86	·74	·82	W. S. W.	W. by N.	W. by N.	2·37	6·34	3·50	.....	.....	Clear.	C. C. Str. 2.	Clear.
880	775	642	33·9	51·6	34·2	·178	·274	·189	·86	·70	·77	W.	S. W. by W.	S. W. by W.	1·06	1·77	9·22	.....	.....	Clear.	" 4.	Cum. Str. 10.

REMARKS FOR FEBRUARY 1857.

Barometer. { Highest, the 12th day, 30·762 inches. Lowest, the 14th day, 29·207 inches. Monthly Mean, 29·915 inches. Monthly Range, 1·558 inches.

Thermometer. { Highest, the 15th day, 46°1. Lowest, the 12th day, 20°1. Monthly Mean, 21°61. Monthly Range, 66°20.

Greatest intensity of the Sun's rays, 89°7.
Lowest point of Terrestrial radiation, —21°7.
Mean of Humidity, 850.
Rain fell on 6 days amounting to 20·74 inches; it was raining 36 hours 40 minutes.
Snow fell on 9 days amounting to 15·11 inches; it was snowing 42 hours 30 minutes.
The most prevalent wind was the N. E. by E. The least prevalent wind was the S. E by S.
The most windy day was the 27th day; mean miles per hour, 18·03.
Least windy day, the 17th day; miles per hour, 0·34.
Aurora Borealis visible on the 4th night.
Lunar Halo on the 6th day.
Zodiacal Light very bright during the month.
The Electrical state of the atmosphere has indicated right high and constant tension.
Ozone was in moderate quantity.

REMARKS FOR MARCH, 1857.

Barometer. { Highest, the 22nd day, 30·241 inches. Lowest, the 19th day, 29·243 " Monthly Mean, 29·718 inches. Monthly Range, 0·998 "

Thermometer. { Highest, the 30th day, 54°3. Lowest, the 11th day, —11°4. Monthly Mean, 23°79. Monthly Range, 65°7.

Greatest intensity of the Sun's rays, 94°7.
Lowest point of Terrestrial radiation, —12°9.
Mean of Humidity, 826.
Rain fell on 3 days amounting to 0·726 inches; it was raining 10 hours 50 minutes.
Snow fell on 9 days amounting to 17·01 inches; it was snowing 57 hours 40 minutes.
Most prevalent wind the W. by N. Least prevalent wind, the E.
Most windy day, the 19th day; mean miles per hour, 39·12.
Least windy day, the 16th day; mean miles per hour, 1·13.
Most windy hour, from 6 to 7 p. m., 19th day: 77·70 miles.
There were 2 days perfectly cloudless.
Aurora Borealis was visible on 3 nights.
Zodiacal Light very bright and well-defined.
The Electrical state of the atmosphere has indicated moderate intensity.
Ozone was in moderate quantity.
"*Rossignol*" first heard on the 25th day.
Wild Geese first seen on the 30th day.